



## Republic of Yemen

# **National Biodiversity Strategy and Action Plan II `` achieving a resilient, productive and sustainable socio- ecosystem by 2050. ``**

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**National Biodiversity Planning to Support the implementation of  
the CBD 2011-2020 Strategic Plan in Yemen**



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**ACRONYMS :**

<b>AREA</b>	<b>Agricultural Research and Extension Authority</b>
<b>MA</b>	Ministry of Awqaf
<b>BD EA</b>	Biodiversity Enabling Activities
<b>CAMA</b>	Civil Aviation and Meteorology Authority
<b>CBD</b>	Convention on Biological Diversity
<b>CBOs</b>	Community Based Organisations
<b>CCD</b>	Convention on Combat Desertification
<b>CCU</b>	Climate Change Unit
<b>CDM</b>	Clean Development Mechanism
<b>CITES</b>	Convention on International Trade in Endangered Species
<b>co</b>	cobalt
<b>CO2</b>	Carbon dioxide
<b>Cr</b>	Chromium
<b>Cu</b>	copper
<b>DAC</b>	Development Assistance Committee
<b>DPPR</b>	The Third Socio-Economic Development Plan for Poverty Reduction
<b>EA</b>	Ecosystem Approach
<b>EIA</b>	Environmental Impact Assessment
<b>EPA</b>	Environment Protection Authority
<b>EPC</b>	Environmental Protection Council
<b>EPF</b>	Environmental Protection Fund
<b>EPL</b>	Environment Protection Law
<b>EU</b>	European Union
<b>FAO</b>	Food and Agricultural Organisation
<b>FNC</b>	First National Communication
<b>FRA</b>	Forest Resources assessment
<b>GDFCD</b>	General Department of Forestry and Combating Desertification
<b>GCC</b>	Gulf Cooperation Council
<b>GDP</b>	Gross Domestic Product
<b>GEF</b>	Global Environmental Fund
<b>GEF</b>	Global Environment Facility
<b>GHG</b>	Green House Gases
<b>GIS</b>	Geographical Information System
<b>GOY</b>	Government of Yemen
<b>GCC</b>	Gulf Cooperation Council
<b>GRC</b>	Genetic Resources Center
<b>GTZ</b>	German Technical Corporation
<b>ha</b>	Hectares
<b>ICT</b>	Information and Communication Technology
<b>ICZM</b>	Integrated Coastal Zone Management
<b>ICZMP</b>	Integrated Coastal Zone Management Plan
<b>IFM</b>	Innovative Finance Mechanism
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>IPM</b>	Integrated Pest Management

<b>ITQ</b>	Individual Transferable Quotas
<b>IUCN</b>	International Union on Conservation of Nature
<b>Kg</b>	kilogram
<b>Km</b>	Kilometer
<b>LDC</b>	Least Developed Country
<b>LMOs</b>	Living Modified Organisms
<b>LNG</b>	Liquefied Natural Gas
<b>LPG</b>	Liquid Petroleum Gas
<b>M&amp;E</b>	Monitoring and Evaluation
<b>M3</b>	Cubic meters
<b>MAI</b>	Ministry of Agriculture and Irrigation
<b>MBIs</b>	Market Based Instruments
<b>MCSI</b>	Ministry of Civil Service & Insurance
<b>MOA</b>	Ministry of <i>Awqaf</i> (Endowments)
<b>MoF</b>	Ministry of Finance
<b>MoLAD</b>	Ministry of Local Administration
<b>MDG</b>	Millennium Development Goal
<b>MEE</b>	Ministry of Electricity and Energy
<b>MFW</b>	Ministry of Fish Wealth
<b>MJ</b>	Mega joules
<b>MOI</b>	Ministry of Information
<b>MOLA</b>	Ministry of Legal Affairs
<b>Mn</b>	Manganese
<b>MORC</b>	Ministry Of Road & Construction
<b>MoC</b>	Ministry of Culture
<b>MOE</b>	Ministry Of Education
<b>MOHE</b>	Ministry Of high Education
<b>MPIC</b>	Ministry of Planning and International Cooperation
<b>MoT</b>	Ministry of Tourism
<b>MSRA</b>	Marine Science Research Authority
<b>MWE</b>	Ministry of Water and Environment
<b>NAPA</b>	National Adaptation Programme of Action
<b>NAPCD</b>	National Action Plan Combating Desertification
<b>NBF</b>	National Biosafety Framework
<b>NBSAP</b>	National Biodiversity Strategy and Action Plan
<b>NGOs</b>	Non-governmental Organisations
<b>Ni</b>	nickel
<b>NRA</b>	Natural Resource Accounting
<b>NSCDAP</b>	National Strategy to Combat Desertification and Action Plan
<b>NSES</b>	National Strategy for Environmental Sustainability
<b>NWRA</b>	National Water Resource Authority
<b>ODA</b>	Overseas Development Assistance
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>PA</b>	Protected Areas
<b>Pb</b>	Lead
<b>PERSGA</b>	Regional Organisation for the Conservation of the Environment of the Red Sea and

	Gulf of Aden
<b>PES</b>	Payment for Ecosystem Services
<b>PESs</b>	Payment for Ecosystem Services
<b>PPCR</b>	Pilot Program for Climate Resilience
<b>PPP</b>	Public Private Partnership
<b>PRSP</b>	Poverty Reduction Strategy Paper
<b>R&amp;D</b>	Research and Development
<b>RAMSAR</b>	Convention for the Conservation of Wetlands
<b>REDD</b>	Reduced Emissions from Deforestation and Degradation
<b>RMS</b>	Resource Mobilisation Strategy
<b>RNRRC</b>	Renewable Natural Resources Research Center
<b>SLR</b>	Sea Level Rise
<b>SFD</b>	Social Fund for Development
<b>SWF</b>	Social Welfare Fund
<b>SNRMP</b>	Sustainable Natural Resources Management Programme
<b>TEEB</b>	the economics of ecosystem and biodiversity
<b>TFCA</b>	Transfrontier Conservation Area
<b>TORs</b>	Terms of Reference
<b>TPPs</b>	Tradable Pollution Permits
<b>UKAID</b>	United Kingdom Agency for International Development
<b>UNCCD</b>	United Nation Convention to Combat Desertification
<b>UNDP</b>	United Nations Development Programme
<b>UNEP</b>	United Nations Environment Programme
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organisation
<b>SoLREA</b>	the State-Owned Land and Real Estates Authority
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>USA</b>	United States of America
<b>USAID</b>	United States Agency for International Development
<b>USD</b>	United States Dollar
<b>WAVES</b>	Wealth Accounting and Valuation for Ecosystem Services
<b>WB</b>	World Bank
<b>WTA</b>	Willingness to Accept
<b>WTP</b>	Willingness to Pay
<b>YTPB</b>	Yemen Tourism Promotion Board
<b>Zn</b>	Zinc
<b>ZOA</b>	Zakat (alms giving) obligations/dues Authority

## **Foreword**

### **Acknowledgement**

### **Executive Summary**

#### **1. Key Biodiversity Issues**

As per Yemen Ecosystem Valuation study, the value of Yemen key ecosystem is estimated to worth approximately USD 287,829 million, which is about ten times the value of GDP(USD 20,000 million per year) if the values of ecosystem products were integrated in the country's GDP. Unfortunately, most of the values of ecosystem goods and services such as value of energy from fuel wood, medicinal plants, the medicinal values of forests, animal fodder, water and pollinators. etc are ignored in economic decision making, and thus are not accounted for when estimating GDP and deriving national income accounts. Omitting ecosystem values while estimating GDP and economic decision making is the resultant of low societal awareness on ecosystems values associated with market failures under current policy and economic distortion, legislation inadequacy & institutional and social weaknesses. These factors have also been cited as underlying causes, which interact collectively to result in increased population and high growth rates and widespread poverty and the subsequent production and consumption patterns that are unfavorable to biodiversity conservation, but rather advocating over consumption.

To curb the consequences of direct and indirect drivers of biodiversity loss, the GOY has devised an updated National Biodiversity and Action Plan (NBSAP2), containing revised vision, mission and strategic goals, which are mainly delineated to address the current most pressing issues contributing biodiversity, including Biodiversity loss & Habitats destruction, overconsumption of biological resource, natural & anthropogenic pressures contributing to biodiversity loss, Policy distortion, institutional weakness and poor public awareness.

The revised NBSAP2 vision calls for “achieving a resilient, productive and sustainable socio-ecosystem by 2050”. This vision is translated into shorter terms mission or action plan for the period 2015-2025, which is mainly focused on halting overall biodiversity loss and maintaining healthy, productive & functional ecosystems based on establishing coherent & resilient ecological networks supported by restructured policies & adequately mandated and empowered local communities & institutions for sustainable and equitable use of natural capitals of importance to human well-being and economic prosperity.

Yemen's vision is split into five strategic goals, outlining national outcomes concerned with the following national priority areas: 1) Biodiversity and Ecosystems Conservation, 2) promotion of sustainable use of biological resource, 3) reduction of natural & anthropogenic pressures contributing to biodiversity & ecosystem loss, 4) biodiversity & poverty mainstreaming into sectoral development plans, & 5) promoting good governance in biodiversity management.

The NBSAP2' strategic goals were designed so as to be highly aligned to the five CBD Strategic Plan goals, namely those devoted addressing the underlying causes of biodiversity loss (strategic goal A), reduction of the direct pressures on biodiversity and promotion of sustainability(strategic goal B), improvement of biodiversity status, and safeguarding ecosystems and biological diversity(strategic goal B), enhancing the benefits to all from biodiversity and ecosystem services, and strengthening implementation capacity and capacity building.

State of the NBSAP2 alignment is being further envisaged by translating the five national goals into 20 national SMART targets, where each of which is closely aligned and consistent

with specific Aichi target spelled out by the global Strategic Plan 2010- 2020. Specifically the NBSAP2 20 targets were converted to detailed actions plans, containing comprehensive policy measures and actions which are highly relevant for internalizing the various aspects of Aichi targets such as the following : a) incorporation of the value of biodiversity and ecosystem services into sectoral development policies and poverty reduction strategies (Targets 1 and 2); enforcing positive incentives and removing harmful subsidies (Target 3); developing landscapes that have sustainable production and consumption and ensure the use of natural resources falls well within safe ecological limits (Target 4); expansion of the national marine and terrestrial protected areas network to meet Aichi targets (Target 11); restoration and safeguarding key ecosystem services, especially of importance for water delivery and livelihoods (Target 14); strengthening ecosystem resilience and the contribution of biodiversity to carbon stocks, including the restoration of at least 15 per cent of degraded ecosystems (Target 15), and mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources (Target 20). Annex 2 presents more details on the degree of alignment of national targets with Aichi targets.

The following provides summaries of underlying drivers and direct causes of biodiversity loss, and presents highlights on strategic perspectives expressed in terms of five strategic goals, being national priority outcomes for reversing biodiversity loss. The national outcomes are results-based and country driven, and thus are articulated in terms of 20 country-driven outputs, where each individual output entails more focused objectives that are achievable at specific sectoral level, and respond to an Aichi target. Each output entails strategic actions to achieve the target, and include estimated potential costs to implement designated actions.

## **2. Ecosystems Loss**

To address the issue of inadequacy of protected area network, the NBSAP2 seeks to protect, recover and restore forest biological diversity through adequate and effective protected area networks, restoration of degraded ecosystems, and conservation of endemic and threatened species. Specific target to be achieved by end of planning period (2025) is articulated by target1 of the action plan, which is given as follows:

- Target 1: At least 5%(by 2020) and 7% (by 2025) of terrestrial and inland water areas, and 6% (by 2020) and 12% (by 2025) of coastal and marine areas will be under protection, effectively managed by local communities, and integrated into the wider landscape and seascape.

(Aichi target 11).

## **3. Loss of flora and fauna, including endemic species**

Addressing biodiversity loss, the NBSAP2 aims at conservation and rehabilitation of key endemic taxa, mammal and bird species vulnerable to extinction due to climatic changes associated with inadequate in situ & ex-situ conservation capacity and lack of knowledge and awareness on the status and number of rare and endangered plants in the country. The intended target to be achieved by end of planning period is articulated as follows:

- Target 2: By 2025, 50 % of endemic, rare & endangered plants, mammal and bird species will be conserved (Aichi target12)

## **4. Genetic Erosion**

Despite its richness of agrobiodiversity landraces and genetic species, Yemen genetic resources are vastly degrading, and this clearly shown by high level of food insecurity incurred by the growing decline of cereals and wheat production combined with the



progressive increase of grain importation to meet population needs. To address the continuing decline of Yemen genetic resources & the consequent food insecurity, the NBSAP2 aims to minimise genetic erosion of cultivated plants & domestic animals through improved ex-situ conservation capacity and improved biosafety management. Specific targets to be achieved by end of planning period are as follows:

Target 3: By 2020, 70% of the genetic diversity of Yemen cultivated plants species , & domestic animals will be conserved in gene banks (Aichi 13)

## 5. Deforestation

Yemen's forests, woodlands and rangelands deliver a wide range of economic benefit, services which have been estimated to be worth some USD 260,787 million per year<sup>1</sup>. Forest and rangelands biodiversity are currently deteriorating owing to unsustainable logging for which the NBSAP2 seeks to promote the sustainable harvesting of forest products and to achieve the following target:

- Target 4: To reduce forest & rangelands harvesting by 15% in 2020, and by 30% in 2025 (Aichi Target5).

## 6. Over Extraction of Water Resources

The wadis ecosystems & ground water aquifers provide the country's poor population with about 62100 million liter of domestic water in addition to around 805 million m<sup>3</sup> for agricultural purposes<sup>2</sup> annually. As per the findings of economic valuation report on Yemen ecosystems, the value of both irrigation and domestic water delivered by aquatic ecosystems annually is estimated to be worth approximately USD13,873 million per year<sup>3</sup>. Currently, water ecosystems is being vastly depleting as a result of high population growth(3.5%), high water inefficiency, indiscriminate water extraction for agriculture mainly for Qat, erratic rainfall and absolute scarcity of water resources. This depletion has resulted in annual water deficit amounting for 1.465 billion m<sup>3</sup>/year with subsequently notable reduction of per capita annual share of fresh water combined with disparity in water supply amongst urban and rural population. To halt water depletion, the NBSAP2 calls for restoring and protecting water ecosystems to ensure adequate & safe water supply and sanitation for the Yemeni people , including the rural poor, women, and other vulnerable groups. Specific targets to be achieved under this area is as follows: Target 5: Aquatic ecosystems have been restored and safeguarded so as to increase their capacities to sustainably deliver water services to about 65% of Yemeni population by 2020, and 85% by 2025 (Aichi 14)

## 7. Damaging Fisheries:

Yemen marine & coastal ecosystems is rich with wide range of habitats such as coral reef, mangrove, wetland, palm trees, lagoons, beaches (sandy & rocky), dunes, Sabkha, Seagrass Beds & Turtle Nesting Sites. Marine habitats and their diversity of organisms & species provide a wide range of ecosystem goods, services and benefits which have been estimated to worth approximately USD 541 million. Despite their importance to National economy, marine habitats loss occur owing to damaging fishing patterns, which result in the loss of coral reefs, sea-grass and mangroves and wetlands that host the country fisheries, marine turtles, birds and marine flora and fauna , and thus causing notable decline in fishery species, particularly rock lobster and shrimp stocks and some demersal fish species with severe impact on malnutrition of poor people living in coastal areas. In order for Yemen to curb the various threats contributing to marine biodiversity loss, the NBSAP2 seeks to promote sustainable management and harvesting of marine resources, and to strengthen climate change **resilience**

<sup>1</sup> Valuation report on key ecosystems of Yemen (2014)

<sup>2</sup>Source : Economic Valuation of Key Ecosystem, Republic of Yemen 2014.

<sup>3</sup>Source : Economic Valuation of Key Ecosystem, Republic of Yemen 2014.

of marine ecosystems with aim to ensure sustainable delivery of marine products to support Yemeni people livelihoods, including local poor & women. Key targets to be achieved under this component is as follows:

- Target 6: By 2025, all Yemen fish stocks are managed and harvested sustainably through applying ecosystem based approaches, recovery plans, seasonal fishing ban of threatened species, banning of destructive fishing methods, control illegal and unregulated fishing and strict monitoring of fishing methods, practices and techniques (Aichi Target 6)
- Target 7: By 2025, all pressures impacted by climate change and anthropogenic factors are mitigated and minimized, so that coral reefs, fish, birds, turtles and plants species of marine ecosystems are maintained and functioning well (Aichi Target 10)

### **8. Threatening Agriculture**

The agriculture sector through inappropriate practices continues to be the largest driver contributing to biodiversity loss, including the loss of crops, reduction of fodder, wood, biological species, genetic resources and livestock with continuing reliance on import to meet country needs of these products. Such unsustainable management practices beside the distortion of agricultural macroeconomic policies and the resultant heavy subsidization of irrigation water, subsidized pricing for agrochemicals along with free or low price of irrigation water, are severely affecting land resources and contributing to agrobiodiversity loss. To curb the impact of unsustainable agriculture practices the NBSAP2 in the action plan calls to increase agricultural productivity and sustainability through the diffusion of green technology in irrigation, pest control and protection of soil erosion against flood with ultimate end support sustainable livelihoods and local food security. Target to be achieved under this output is as follows:

- Target 8: By 2020, 50% of Yemen's agricultural lands will be managed sustainably, and by 2025 the sustainability principles will cover the entire agricultural lands (Aichi Target7) .

### **9. Urban Encroachment**

Urban encroachment are evolving at high rates contributing directly to biodiversity and ecosystems loss, particularly the loss of environmentally sensitive areas such as farm land, forest and green cover, flora & fauna, wetlands & coastal habitats, valleys beds and banks, wetlands and coastal areas. Yemen's urbanization stress is attributed to multiple policy drivers such unabated population growth, increased urban immigration, poor land use planning and out-dated urban plans. The absence of comprehensive land use plans and human settlement plans has resulted in the growth of informal settlements associated with conversion of agricultural land to residential, commercial and industrial use with anticipated notable threat to country food security. The massive rural- urban migration has in turn led to large-scale abandonment of fertile agricultural land in rural areas, the rapid conversion of fertile agricultural land to residential, commercial and industrial use in urban areas and the subsequent food insecurity. In addition, population have grown in major cities up-to levels that exceed their absorptive capacities to deliver basic services causing multiple crises in transportation and road systems, waste disposal, water supply systems, sanitation, health and other basic services.

To address urbanization issues, the NBSAP2 seeks to minimize impacts of uncontrolled urbanization on biodiversity loss by promoting sustainable land use planning & management.

This aim is translated in the action plan into multiple actions, focusing on minimizing land & natural habitats conversion via restriction of land conversions of critical ecosystems for other uses and strict application of EIA and SEA while permitting and approval of land conversion combined with firm enforcement of land regulation, pricing, registration and ownership. Prohibition of roads construction & infrastructures nearby sensitive ecosystems, particularly the key areas of breeding, feeding, birds migration sites. Complimentary to these restrictions, the action plan pays attention for enhancing land policies and planning via promoting ecosystem approach, integrating biodiversity values & sustainability while development of road and infrastructure development policies plans, integrating the planning of biodiversity and protected areas into the wider landscape with specific focus on broadening conservation zones of protected areas to include connectivity corridors and buffer zones into national and local land use plans.

- Target 9: By 2025, biodiversity values & the maintenance of key ecosystem services have been integrated into national & local land use planning based on developing and implementing a number of land-zones and land use management plans (Aichi Target2).

## 10. Unfavorable Tourism

Tourism is a rapidly growing industry and Yemen coastal zones & islands are primary destination sites for tourism-based development. Meeting these tourism demands has led to disturbance of the habitats, particularly the salt marshes, lagoons, wetlands and mangroves. In addition, visitors' activities have exerted extensive direct pressure on biodiversity in the form of trampling, hunting, plant collection and waste disposal. The construction of tourism infrastructure combined with roads development, pollution and solid waste generation, and excessive use of water & electricity are among direct pressures contributing to unsustainable tourism management and biodiversity loss.

To address the impacts of unfavourable tourism, the NBSAP2 aims to achieve the conservation of biological resources based on integrating ecologically sustainable management practices into tourism and recreation sector with ultimate end to minimize the impact of tourism activities on biodiversity and natural habitats & keeping tourism levels within carrying capacity of eco-sites. The attainment of this output will be realized through numerous policy options clustered in two activity groups respectively focused on improvements of management & planning capacities at site levels and strengthening enforcement capacity EIA. Improving eco-sites planning will be realized through development and implementation a national tourism and local plans that are aligned with national biodiversity and protected area goals.

11. Target 10: By 2025, Ecotourism sector is benefiting from ecosystem services and has incorporated sustainability & biodiversity concerns into local ecotourism development plans and programmes (Aichi target 4). **Wasteful consumption & production**

As repeatedly reported, current business community, manufacturing industry and development sectors are not adequately committed to sustainability and environmental excellence for which their production activities are reported to be destructive, polluting & hazardous to biodiversity and ecosystems. The main casual factors contributing to the existence of current production pattern across all production sectors are attributed to the destructive methods applied in materials consumption & production; excessive disposal of wastes, effluents and pollutants into the natural environment, inappropriate practices, excessive use of none green or antiquated technologies, overconsumption of raw materials as production inputs, inadequate application of recycled and recyclable products and extensive use fossil fuel with high carbon contents. To reduce adverse impacts of current production patterns on ecosystems, the

NBSAP2 calls for implementation of sustainable development strategies and promotion of green technology into development sectors, **mainly into mining; oil and gas;** manufacturing industry; infrastructure & road; energy production; urban planning; and tourism sectors. The enforcement of green tech will be met through the introduction of incentive scheme advocating sustainable production and consumption and adhering to environmental excellence. This scheme will be supported by the introduction of incentives and tax exemption for the lower use of raw materials; lower carbon content in energy and lower waste disposal in waste treatment facilities; the diffusion of green technologies, and use of renewable, recycled and recyclable products; EIA enforcement; prevention of pollution and efficient use of energy, among others. The enactment of incentives and tax exemption schemes will be realized through designating an entity along with establishing certification scheme by which environmental excellence as regard to energy-efficiency, materials use -efficiency, and water-efficiency will be verified, registered and certified.

Targets to be achieved:

- Target11: By 2025, several business communities and public sectors, including ecotourism, mining, energy, industry and land use planning are benefiting from ecosystem services and have incorporated sustainability & biodiversity concerns into their national and local development plans and programmes, keeping the impacts of use of natural resources well within safe ecological limits (Aichi target 4).

## 12. Climate change & Desertification

As per climate scenarios, Yemeni people particularly rural poor are expected to be most vulnerable to declining access to water and decreasing agriculture productivity, destruction of coastal agricultural land & properties under warmer climate. In response to this impact, the NBSAP2 calls for enhancing the socio- ecosystems resilience against natural disasters through two complementary strategic approaches, namely devoted for building socio- ecosystems resilience against adverse impacts of natural disasters and renovation of degraded ecosystems. Building socio-ecosystems resilience against anticipated warmer climatic and weather events will be realized through the adoption of the ecosystem-based adaptation approach (EBA) and establishing a monitoring scheme to monitor and control the impact of extreme climatic and weather events. Restoration interventions covered by the NBSAP2, entails restoration programs to restore at least 15 per cent of degraded ecosystems by 2025, focusing mainly on rehabilitation of terraced agriculture, and restoration & conservation of degraded watersheds, rangelands, forest & coastal wetlands, thereby contributing to climate change mitigation and adaptation and to combating desertification.

- Target 12 : By 2025, ecosystem resilience and the contribution of biodiversity to carbon stocks have been enhanced via restoration of at least 15 per cent of degraded ecosystems (Wetlands, Mangrove, Forest and terraces ), thereby contributing to climate change mitigation and adaptation and to combating desertification (Aichi Target15)

## 13. Spread of invasive alien species

To prevent and mitigate the impact of alien invasive, the NBSAP2 calls for developing and implementing national & local strategies, focusing on promoting integrated risk-based approach to control and manage intentional and unintentional introductions of these organisms. An important priority in this regard is to implement eradication programmes of the invasive alien plant species known as *Prosopis juliflora* , threatening wadies ecosystems and farm lands. The target to be achieved in this area is the following:

- Target 13: By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

#### **14. Ecosystem Contamination**

In the absence of financial, technical treatment and recycling capabilities, garbage & wastewater are directly discharged in the environment without treatment. Also in the absence of effective regulations, food industry and hospitals are operating without adequate consideration of environmental impact and large quantities of untreated solid and liquid waste are directly dumped in the environment. Towards this end, the NBSAP2 is designed to protect ecosystems loss by reducing impacts of pollutants and contaminants on soils, water, plant species, and marine ecosystems through control of chemical pollution and eutrophication, including from land-based activities.

- Target14: By 2025, the use of agrochemical substances, pesticides and other land-based pollutants on land, aquatic and marine ecosystems have been reduced by 50 percent (Aichi Target 3) ”.

To reach this target, the action plan under this output calls for mitigating impacts of solid waste & wastewater from hospitals, industry, mining and manufacturing sectors on human beings and their environment through improved design, introduction of green-technology, changing production processes, recycling hazardous/useful materials from waste, and producing non-wasteful products.

#### **15. Increased GHG Emission**

To address the GHG emission issue, the NBSAP2 calls for improving climate change mitigation through restructuring EPA to host the National Climate Fund (NCF) and the adoption of nationally appropriate mitigation actions (NAMAs) with specific focus on reducing GHG emissions through multiple actions including the shift to renewable energy, the promotion of smart agricultural practices and the introduction of bio-energy production especially from solid waste and wastewater in main cities. The promotion of smart agricultural practices is to be achieved through carbon sequestration activities such as the expansion of protected areas, restoration of “Blue Carbon” ecosystems (mangroves and sea-grass beds), reforestation to reduce emission from deforestation and forest degradation (REDD).

- 16.** Target 15: “Energy resilience has been promoted and is manifested by 14% reduction of energy-related GHG emissions in 2020, and 23% in 2025” (Aichi target 15)

#### **17. Policy Distortion**

To address the policy and legislation issues influencing biodiversity loss, the NBSAP2 calls for policy and legislative reforms with focus to mainstream biodiversity concepts and values into environmental sectors, namely into water, agriculture, fishery and forest and rangeland. Mainstreaming biodiversity values into environmental sectors will be achieved through three strategic options. Strategic option 1 seeks to introduce a Payment scheme for Ecosystems Services (PES). The introduction of PES will be realized through number of policy options, such as polluter-pays-principle (emission tax), tradable pollution permits (TPPs), individual transferable quotas (ITQs) for fishery, pollution, water abstraction and other resource user fees.

Additional reform will focus on removal of harmful incentives & subsidies contributing to the loss of biodiversity, arable land, water & marine resources and introduction of positive incentives with aim to achieve the following targets:

- Target 16: By 2025, the values of biodiversity & ecosystem services are recognized by decision makers & integrated into key environmental sectors (Aichi Target 2).
- Target 17: By 2025, subsidies on water efficiency use are approved, subsidies on agro-chemicals & fertilizers are removed and fuel subsidies for water pumping are eliminated (Aichi Target 3)
- Target 18: Positive incentives for the conservation and sustainable use of biodiversity are developed and enforced (Aichi target 3)

## **18. Widespread Poverty**

Poverty in Yemen is attributable to inability to access land, water, agro-biodiversity products, fishery, energy and genetic resources which are collectively the consequence of biodiversity deterioration. Poverty is further aggravated by inability to access education & health services combined with inability to access productive assets such as public employment opportunities, financing credits and Zakat. To address various forms of poverty casual drivers, the NBSAP2 calls for alleviating poverty through : enabling local poor access to productive resources, including credit, land, water, education, knowledge and information, as well as to public services, and participate in planning & management of natural resources & basic services that would enable them to withstand against poverty, benefit from expanding employment and raise their standards of living. Meeting this objective requires promoting distributive justice of common public assets such as the state lands, zakat, public fund and financing credit. The distributive justice aims at ensuring equitable access to public assets through a holistic-integrated reform focused on reforms of land, zakat, social welfare fund, financing credit and employment policy, harmonization of public investment and decentralization in management of natural resources and planning, including management and delivery of basic services.

- Target 19: "Yemeni poor and vulnerable, including local communities, youth and women enabled to equitably access to water, marine, forest and land resources, thereby leading to reduction of population living under national poverty level by 15% in 2020, and by 30% in 2025" (Aichi targets 14 & 16)

## **19. Institutional and Social Weaknesses**

Key drivers contributing to institutional weakness of biodiversity management at system level include lack of good governance under tight centralization management triggered by outdated laws, inadequate law enforcement, inadequate government funding of conservation projects and incomplete legal frameworks for promoting decentralization & local community involvement. The NBSAP2 calls for institutional restructuring targeted at putting in place harmonized mandates of environmental agencies; and promotion of decentralization in management and planning for natural resources, including the delivery of water services.

- Target 20: "In partnership with government, community-based management approach has been widely promoted to cover 50% of Yemen's protected area by 2020, and 100% by 2025, thereby leading to improved effectiveness of Yemen's protected areas along with promotion of traditional knowledge and practices on conservation and sustainable use of biological resources" (Aichi target 18).

## **20. Lessons Learned From Previous Biodiversity Planning**

Stakeholders review of the previous NBSAP concluded that the development process of the NBSAP1 was participatory and inclusive, allowing wide range of stakeholders representing 6 provinces to be part of consultation process, which has led the development of viable strategy that reflect the common interest and development needs of various environmental partners without denial of any group's interest specially of those who are marginalized and vulnerable groups such as women and youth. This process has contributed significantly in improving awareness and common understanding on biodiversity issues and helped in building consensus among stakeholders regarding the strategy contents. Nevertheless, key aspects and considerations such as gender, poverty, livelihoods and food security, ecosystem resilience to climate change, sustainable finance of NBSAP, and communication and outreach plan have not been well-mainstreamed and integrated in the process of producing the NBSAP. Therefore, more effort was paid for addressing these deficiencies based on a renewed and participative 'biodiversity planning ' complying to the global guidance contained in the CBD's Strategic Plan for 2011-2020 and at the same time meeting the national priority needs. In line with CBD guidance, the current version is highly aligned to Aichi targets, and also very responsive to national priorities.

## I. INTRODUCTION

### 1.1 Location, physical features and climate of Yemen

Yemen is an arid Middle Eastern country, occupying an area of 527,970 square km at the southern end of the Arabian Peninsula. It is bordered to the north by Saudi Arabia, to the East by Oman, and to the South and West by a 2,200 km coastline along the Gulf of Aden, Arabian Sea and the Red Sea (see Figure 1-1 below). Yemen controls Bab el Mandeb, the strait between the Red Sea and the Gulf of Aden, a heavily used shipping lane.

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. Yemen's coastal and marine ecosystems which include extensive mangroves, coral reefs, and sea grass areas are of major economic importance for fisheries and tourism.

Some of Yemen's ecological zones are confined to small areas (e.g., islands), with human communities, flora and fauna highly adapted to subsist within them. Other zones are much larger (e.g., Temperate Highlands) and support the majority of the country's agricultural production. In both cases, climate change poses a major threat.

### 1.2 Population & Migration: Demographic Drivers of Habitats and Ecosystem Services

The current population of Yemen is estimated at about 24.5 million. At the current growth rate of 3.6 percent, the population is expected to be 31.6 million inhabitants by 2020.<sup>4</sup> The high rate of growth is attributed to high fertility rate, caused by low female education and employment. Between 2000 and 2012, the percentage of urban population rose from 26% to 32% percent. In rural areas the percentage decreased from 74% in 2000 to reach 68% in 2010 and this is caused by an increased immigration to urban cities. High urbanization caused a proliferation of unplanned settlements and accompanying environmental degradation in cities, resulting in inability of Yemen's municipalities to provide the necessary land, service, and facilities which in turn caused significant threats to human health, biological resources, and ecosystems productivity. The growing population at the current rate increases the pressures on natural resources and the corresponding ecosystems capacity to survive and deliver their services sustainably. It increases the demands on foodstuff, scarce water resources, urban space, etc, causing significant increase of waste & pollution, which in turn, puts additional pressure on social services, and contributes to loss of biodiversity and agricultural land. The increasing population of the Yemen combined with unbalanced socio-economic development is the underlying cause of migration of rural population and hence the loss of farmlands to meet imbalanced population increase in urban areas. The migration from rural areas has adversely affected agricultural production on the one hand and has caused concentration of population in a few big cities on the other. Such unabated increase of population & migration causes higher pressures on limited resources & services, such as food, energy, water and timber in both rural and urban areas.

**1.3 Poverty:** Poverty in Yemen is also more pronounced in rural areas. Rural areas have 68% percent of the total population, it accounts for 84 percent of the poor. Therefore, rural poor adds more pressure on natural resources to meet their daily needs of livestock, fuel wood, crops and fodders. The poor are one of the population groups most reliant on environment for their livelihood. At the same time this group is the most affected by environmental problems

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<sup>4</sup>Human Development.Report,2009



and the way natural resources are exploited. Yemen's GDP per capita was about 1,100 US\$ in 2009 and about 40 percent of the population lives in poverty.

In 2013, Yemen ranked 154 according to the HDI. As an LDC, Yemen experiences numerous development challenges which include high population growth rate and poverty, inadequate access to basic social services, limited infrastructure, high illiteracy rate, low per capita income, slow economic growth, and environmental degradation. There are also large gender disparities, with significant gaps in women's access to economic, social and political opportunities. Biodiversity is an important issue that does not only refer to the environmental challenges that affect natural resources and its life; it affects also the quality of life, especially the vulnerable groups such as the poor, women and children. Since the majority of the Yemen population are rural dwellers whose main livelihoods depends on access to natural resources, poverty will tend to rise when biodiversity declines and vice versa. As such, any efforts to reduce poverty in Yemen, must constantly be accompanied by proper biodiversity conservation measures. The Poverty Reduction Steerage Paper (PRSP) acknowledges the relationship and linkages between poverty issues and environment protection. The poor are one of the population groups most reliant on environment for their livelihood.

The current trends in socio-economic development and natural resources use pose significant threats to biodiversity & ecosystem loss. Poor economic growth and continued imbalances characterized the structure of the GDP and reduced the potential for job creation. Hence, unemployment rose from 12 per cent in 2000 to 16.8 percent in 2005. Although, Yemen economically depends mostly on declining oil resources, the opportunities offered by oil revenues have not been adequately exploited to transform the structure of the economy and achieve adequate socio-economic development. However, the weak governance and absence of a culture of rule of law is also a major challenge on the way ahead to achieve adequate socio-economic development.

#### 1.4 Composition of Biological Resources

Because of its altitudinal variation & its location at the cross-roads of the African, Asian, and Palearctic ecological zones, Yemen is rich with a wide range of terrestrial, coastal, and marine natural habitats, species and genetic diversity, including many endemic species. These resources are of major economic importance

because of their potential for tourism and the wildlife and fisheries they support. Also, numerous plants are used in traditional medicine, in local industries, and for grazing and fuel wood.

Yemen terrestrial land hosts a variety of ecosystems and habitats, including mountainous forest, woodlands shrubs, rangelands, arable land, urban systems, inland aquatic systems & dry sandy deserts. As per recent classification of land use, the largest portion of Yemen terrestrial land is dominated by desert (52.4% of the total land area) with limited use potential. Together with forest and woodlands, rangelands comprise almost 44.5% of the land area, with the remaining 3% being arable land supporting rich crop diversity (table 1).

Categories	1000 ha	Coverage % of Yemen Land Area
Pasture	21,551	40.8%
Forest & woodland	1,955	3.7% <sup>6</sup>
Desert	27,681	52.4%
Arable land	1,609	3.0%
<b>Total Land Mass</b>	<b>52,797</b>	<b>52,797</b>

<sup>5</sup>Source: FAO, FRA (2010)

### 1.4.1 Rangelands

Rangelands or pasturelands cover 40.8% of the total land area of Yemen, i.e. 21,551 thousand hectares. As defined by the national action plan to combat desertification, this vegetation cover “is made up of natural grasslands, agro-forestry tree and shrub formations”<sup>7</sup> It comprises a wide spectrum of woody species, grasses and forbs and includes a number of succulent plants belonging to the *Euphorbia* and cactus-like species. Rangelands form an important resource in view of their environmental role, provision of forage for herds and flocks and due to its economic significance as a cheap source of livestock feed. Rangelands are quite variable in their condition judged from plant cover, species composition, and degree of use.

### 1.4.2 Forest

Though Yemen has been known as the greenest country in the Arabian peninsula, its green cover is only 2,420 thousand ha, being about 4.6% of the country land mass. Of which 23% (or 549 thousand ha) is recognized as forest land, 58% (1,406 thousand ha) is classified as other woodlands, and 19% (465 thousand ha) of the country tree cover is known as agroforestry, see table2.

Yemen Forest is typified as mangrove forest, Hyphaene trees, Tihama Acacia forest, Acacia-Commiphora forest, valleys forest ( *Ficus* spp, *Acacia* spp, Other Forest Trees), and *Juniperus* spp forest. As given in table 2, the vast majority of these forest or 68% (375 thousand ha) occur in the Central Highlands and Wadis and the remaining 32% are located in the Coastal Plains & Al-Mahara Source.

Other woodland areas in the Yemen currently amounts to 1,406 thousand hectares, and are fully found in escarpment and western mountains. Yemen woodlands species in this area are classified as a combined cover of shrubs, bushes and tree, such as Tihama Acacia woodland, Acacia-Commiphora woodland, and Acacia-Commiphora woodland /shrubland among others.

Table 2: Forest and tree cover in Yemen<sup>8</sup>

Categories	1000 ha	% of Yemen Tree Cover	% of Yemen Land Area
Forest	549	23%	1.0%
Other wood land	1,406	58%	2.7%
Agro-forestry, Date Palms & Other land with tree cover	465	19%	0.9%
Total area with tree cover	2,420		4.6%

Table 3: Woodland Resources<sup>9</sup> by ecological Zones

Main physiographic regions	Forest land [1000 ha]	Woodland [1000 ha]	Agroforestry, Date Palms [1000 ha]	Total land with trees [1000 ha]	Share of total land with trees
Coastal Plains	156		5	161	6.7%
Escarpment and W. Mountains		1,405	381	1,786	73.8%
Central Highlands and Wadis	375		37	412	17.0%
Mahra Woodland & Juniper	19			19	0.7%
other tree in other area			42	42	0.1%
Total	550	1,405	465	2,420	1.7%

<sup>7</sup>Source: national action plan to combat desertification of 2000, FAO, UNCCD UNDP, November 2000

<sup>8</sup>Source: FAO, FRA (2010)

<sup>9</sup>Source: FAO, FRA (2010)

**1.4.3 Agroforestry:** Agroforestry ecosystems currently account for about 465 thousand ha, being 19% of Yemen total woodlands. Agroforestry lands are mainly the home for Yemen crop products as well as for date palm tree and shrub species which are of socio economic importance. Agroforestry occur across three physiographic regions, namely the Western Mountains; the Coastal Plains and Central Highlands, including the Wadies. Approximately 82% (381 thousand ha) of Yemen agroforestry area is found in the escarpment and western mountains & the remainder of which is found in Central Highlands, other area & Coastal Plains at a share of 8%, 9% and 1% respectively.

#### **1.4.4 Marine Ecosystem**

Yemen's Coastal & Marine habitats encompass lagoons, sandy & rocky beaches, dunes, mangrove swamps, wetlands, coral reefs and seagrass beds. These habitats are diverse and host a total of 416 species recorded from the Yemeni Red Sea including 401 species of bony fish and 21 species of cartilaginous fishes (rays =5 species, sharks = 16 species). The coral reefs in the country support over 300 species in 60 genera and 14 families of scleractinian stony coral. Coral reefs are highly diverse marine ecosystems that are a habitat for various fish communities in the sea.

A total of 169 marine species were recorded from the Socotra Archipelago<sup>10</sup>. Compared to other parts of the Red Sea, the shallow nutrient rich waters above the wide continental shelf of Yemen are rich fishing grounds. This account does rather improperly reflect the current knowledge of Yemen's coastal and marine biodiversity. As a matter of fact 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, which are tolerant to saline environments. Studies indicate that the Gulf of Aden coast supports few communities of sea grasses compared to the Red Sea coastline.

#### **1.4.5 Freshwater Ecosystems**

Yemen freshwater resources originate mainly from two principal water ecosystems, namely shallow aquifers and surface water with modest contribution from non-conventional water sources, namely from treated wastewater. Surface water resources mainly produced from the runoff of 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. Water available from both sources is limited due to low rainfall rate (i.e. 800 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). Surface water flows throughout Yemen are limited to periodic flood overflows (intercepted for agricultural purposes) associated with occasional intense or extended rainfall, and to residual flows from seepage and/or springs. Only occasionally do any peak flows in the major Wadis in Yemen reach the Red Sea or the Gulf of Aden and this is due to limited annual rain fall. Groundwater resources are in the form of deep fossil groundwater basins and shallow alluvial aquifers recharged directly from precipitation during rainy seasons. Fossil water is exploited at high rate, and it is estimated that water table of deep aquifers are dropping at annual rate of 3-7 m in most basins. Recent official records also estimated that over 60,000 wells are currently in operation, and are serviced by more than

<sup>10</sup> EPA 2009. Yemen's role in the conservation of biodiversity, 4<sup>th</sup> Biodiversity National Report submitted to CBD 2009.

381 drilling companies, acquiring operating about 656 drilling rigs, of which only 20% of these operating rigs are officially registered.

#### **1.4.6 Desert and Dry Areas:**

*This includes parts of the northern areas of the country extending to Al-Rub-al-Khali (The Empty Quarter). The environment is harsh in these areas because they are generally dry with little rain occasionally. However, this situation is reversed during the rainy seasons when five wadies, with a total catchment area of 53,100 sq. km, drain into the interior deserts, leading to recharge of ground water aquifers and the consequent survival & occurrence of green oases and habitats serviceable for hosting woodland & shrub species of multiple use and importance for rural peoples. During this period, several woodland & shrub species spread across deserts oasis, wadis drainage lines, wadis beaches and sand dunes. Acacia tortili, perennial grasses like Pennisetum sp, and Orchard-like Ziziphus are among the most dominant species. Acacia provides excellent firewood and the leaves and pods are an important source of fodder for domestic animals during both rainy & dry seasons. Orchard-species also provide high quality animal forage, building materials, firewood, forage sites for bees and fruits which are sold in local markets.*

### **1.5 Importance of Biodiversity and Ecosystem Services**

#### **1.5.1 Forests and woodlands :**

Forests and woodlands are an important habitat for wildlife and birdlife. Forests in Yemen are home to various wildlife such as Arabic leopard (*Panthera pardus nimir*), Arabian wolf (*Canis lupus*), Caracal Lynx (*Caracal caracal*), striped hyena (*Hyaena hyaena*), lesser Indian civet cat (*Viverricula indica*), wild Cat (*Felis sylvestris*), Arabian Oryx (*Oryx leucoryx*) and many others.

Yemen's forest and woodland resources deliver a wide range of direct & indirect benefits to Yemeni peoples & to environment. Forest direct benefits are derived in the form of fuel wood, fodder, medicinal plants and honey production among others. Indirect benefits are provided by as services for retaining ecosystems functions, such as carbon sequestration, pollination, and soil erosion prevention, biodiversity conservation, protection of watersheds, prevention of land degradation and desertification. These economic benefits have been partially valued & it has been found that direct & indirect benefits of services delivered by Yemen forest has been estimated to be worth some USD 260,787 million per year<sup>11</sup>. The value of fuelwood is inclusive of the contribution from rangelands. Unfortunately, most of the ecosystem values such as value of energy from fuel wood, the medicinal values of forests & pollinators are not taken into account when estimating GDP. Thus, a significant value portion of forest ecosystem services and functions is undervalued while unsustainable management, decision making and consumption of natural resources, lead to the subsequent loss of forest resources. One of the factors contributing to the overlooking of ecosystem values and forest loss is attributed to policy & law failures, which are consequently given high priority in updating the current strategy. Specific attention is to be given to policy reform in the sectors of energy, traditional health sector, water sector so as to ensure the integration of the ecosystem values in deriving national income accounts and at all levels of decision making.

<sup>11</sup> Valuation report on key ecosystems of Yemen (2014)

### 1.5.2 Rangelands

Yemen's rangelands provide fuelwood, a source of energy for the rural poor population, fodder for livestock (cattle, camels, goats, sheep and donkeys) and medicinal plants. In addition, the rangelands offer services and functions which support economic production processes such as habitat for wildlife, pollinators, soil erosion prevention and soil maintenance, carbon sequestration and watershed properties. Total value of goods and services produced by Yemen rangelands has been estimated to be worth some USD 12,146 million per year. The bulk of this value (80.3%) is the value of fodder used by livestock, while the remaining 19.7% is the value of other benefits such as honey production, medicinal plants, pollination of agricultural products and Soil erosion prevention. The total area coverage of the rangelands in Yemen is estimated at approximately 22 million hectares, and provides 55 million tons of fodder for survival of about 9.4 million sheep, 9.2 million goats, 0.44 million camels and 1.7 million cattle<sup>12</sup>. As per current study on economic valuation of key ecosystem of Yemen, total value of fodder delivered by Yemen's Rangelands in 2012 was estimated at approximately USD 9,752 Million<sup>13</sup>.

### 1.5.3 Mangroves

Mangroves are forests but have been classified under marine ecosystems. Covering approximately 980 hectares, mangroves provide vital functions mostly protective roles for the coastline and other marine ecosystems such as sea grass. Mangroves are also known to have extraordinary properties of absorbing nutrients thus reducing marine pollution. Moreover, they provide food, in the form of fish to communities and are a source of tourism opportunities. Based on the assumptions and availability of data, the use values of mangroves were estimated at USD 482 million. This amount is the aggregated summation of the values of fuelwood, fodder, fish production and carbon stock (69.4%, 0.1%, 30.2% and 0.4% respectively). Other functions such as absorption of nutrients, reduction of pollution and protective functions of mangroves were not estimated due to lack of data.

Plate2: Mangrove in Kamaran Island



### 1.5.4 Marine Ecosystems

Yemen marine & coastal ecosystems is rich with wide range of habitats such as coral reef, mangrove, wetland, palm trees, lagoons, beaches (sandy & rocky), dunes, Sabkha, Seagrass Beds & Turtle Nesting Sites. These habitats support the life of diverse range of marine and terrestrial species and provide essential homes for marine & coastal resources such as marine turtles, birds and other marine flora and fauna.

Marine habitats and their diversity of organisms & species provide a wide range of ecosystem goods, services and benefits of significant value to the Yemen's society. These benefits include: food such as lobster, cuttlefishes, shrimps and sharks, genetic resources, natural medicines; coastal protection; tourism, leisure & energy provision. As per economic valuation report of Key eco-systems, it is estimated that value of fish harvest in the country is approximately USD 541 million annually, which is the value of coral reefs, mangroves and sea grass.

Fishery resources are the most important goods delivered by marine ecosystem. They play an important role in supporting Yemen's economic growth, food supply & food security and

<sup>12</sup>Source : Economic Valuation of Key Ecosystem, Republic of Yemen 2014.

<sup>13</sup>Source : Economic Valuation of Key Ecosystem, Republic of Yemen 2014.

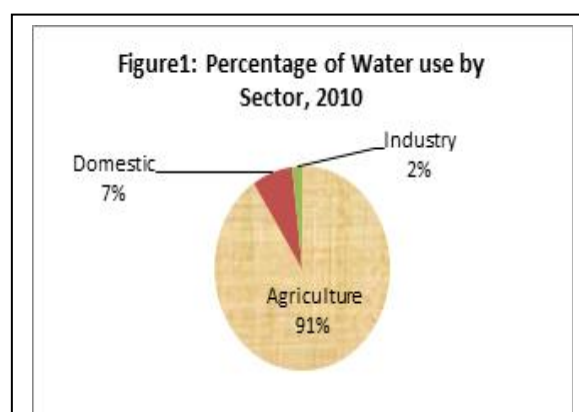
addressing poverty issue through job creation for the rural poor. In figures, fisheries is regarded as the Yemeni economy's third sector in order of importance, contributes a 1.7% share to the country's GDP<sup>14</sup>, and provides more than 350,000 people with jobs<sup>15</sup>, being 8 to 10% of the total Yemeni labour force. In addition, the fishing sector contributes to the total national export through a share of 3.8%<sup>16</sup>. Higher share of export from fisheries is highly feasible, provided that on-spot refrigeration has been introduced so as to improve freshness quality & meet export standards. Recent fishery data shows that production volume has increased from 179 thousand tons in 2007 to 199 thousand tons in 2010. Similarly, the export value has increased from US\$173 million in 2007 to US\$ 210 million<sup>17</sup> in 2010.

Yet, fishery resources can offer greater potential for the country's economic development and are expected to play a vital role in ensuring food security, promoting pro-poor economic growth, and also achieve diversification of sources of income in the national economy, contributing through all these means to the country's overall achievement of national policies related to food security and poverty eradication. Specifically, the sector has the potential to increase its contribution to national food security and poverty eradication through enabling coastal people to equitable access and benefit from fishery resources, and subsequently contribute to overall achievement of MDG1.A as regard the reduction of proportion of Yemeni people under poverty, which is an important target of National Fisheries Sector Strategy<sup>18</sup> (NFSS 2011). It has also the potential to promote the benefit sharing of natural resources, conservation, sustainable use of biodiversity and ecosystems services, thus contributing to the achievement of UNDP goal on Sustainable Management of Natural Resources with specific relation to the attainment of outcome 4 concerned with improvement of sustainable and equitable use of natural resources.

The coastline & island habitats have high tourist potential to provide **alternative livelihoods** for **coastal** community. Main eco sites of potential importance include corals and scenic beauty of Shabwa coastal islands, Sharma - Jethmun turtles and Kamaran mangroves and birds. In addition, Yemen wetlands present ample opportunities for tourism and recreational activities owing to their aesthetics and flora and fauna diversity. Potential wetlands for ecotourism development in Yemen include Bab al Mandeb, Hanish islands, Khokha, Aden and other wetlands. The wetland and mangrove habitats in Yemen coasts & islands also provide multiple ecosystem goods, services and benefits to the Yemen's society. These benefits include fuel wood & charcoal for rural energy, fodder for livestock, timber, medicinal plant, food and honey. Their potential for carbon sequestration, soil fertilization, pollination and soil erosion prevention make them a region of global environmental significance.

### 1.5.5 Freshwater Ecosystems

Freshwater Ecosystems, specifically the Wadis & underground Aquifers are the sources of water needed for Agriculture, Industry & Household development. As per 2010 data from Central Statistical Authority (CSO), agriculture accounts about 90% of available surface and ground water, while the remainder goes for household & industry at percentage of 7% and 1% respectively. The total area under



<sup>14</sup> Joint assessment, WB 2011

<sup>15</sup> Yemen NAPA, 2007

<sup>16</sup> Joint socioeconomic assessment, WB, 2011

<sup>17</sup> FAO Year Book, 2010, Fishery and Aquaculture Statistics

<sup>18</sup> Source : National Fisheries Sector Strategy, ministry of fish wealth, 2011.

cultivation is estimated at 1.5 million hectare, of which 56% depends on rainfall, 21% on ground water, 4% on spring streams & 16% are spate irrigated<sup>19</sup>. Spate irrigation in Yemen relies on approximately 800 dams which harvest rainfall water in the highlands to be used for irrigation in low lands.

The wadis ecosystems & ground water aquifers provide the country's poor population with about 62100 million liters of domestic water in addition to around 805 million m<sup>3</sup> for agricultural purposes<sup>20</sup> annually. As per the findings of economic valuation report on Yemen ecosystems, the value of both irrigation and domestic water delivered by aquatic ecosystems annually is estimated to be worth approximately USD13,873 million per year<sup>21</sup>. Of this amount, the largest (9.8%) is value of irrigated agriculture and the remainder 7.2% is the value of households water.

### 1.5.6 Agroforestry

Yemen agroforestry systems are very important to local populations in terms of food security, income generation and environmental protection, but have not been sufficiently documented and evaluated. Yemeni agroforestry systems comprise numerous indigenous tree and shrub species ecosystems associated either individually or collectively with the main country cropping systems. Yemen agroforestry cropping ecosystems are managed for production of wide range varieties of indigenous products of cereals, fruit, vegetables, fodder, etc. Tree and shrub ecosystems host numerous species and are mainly dominated by *Zizyphus* orchards, *Acacia* spp, *Ficus* spp, and date palm. Trees within agroforestry systems perform various functions ranging from protection against: sand encroachment and sand blasting, drying wind effect, water erosion, sunshine, animals, etc. They also provide various products including: fruit, construction wood, fuel-wood, fodder, honey, etc. Agroforestry systems are also valuable grazing areas providing forage for livestock, (e.g. sorghum stover and crop residues), but the value of fodder used by livestock is estimated under section 1.5. 2 on rangeland . The agroforestry provide useful products for household as well as for local and national economies. Such commodities range from food and medicinal products for humans and animals, to construction and fuel-wood, and cash income. They furthermore contribute to the sustainability of soil nutrient and water cycles and buffer climatic extremes. The agriculture sector – including plants, animals and forestry - plays a fundamental role in achieving food security, increasing the GDP, diversifying the economic platform, creating job opportunities and reducing poverty, particularly in rural areas. It absorbs almost “ 33% of the work force and accounts for 11.4% of GDP<sup>22</sup> (current prices) in the average during the period 2001-08. However, its exports did not exceed 1.2% of the gross non-oil exports in 2008”<sup>23</sup>.

The cultivated system contributes to food security significantly. In 2009, cereals production was 756,000 Tons, representing 15.2% of the national demand<sup>24</sup> . Currently, Yemen only meets 7.8% of wheat demand (2010 data), which is down from 8.9% in 2005, and 89% in 1970. Yemen relies on imports of wheat, which opens it up to severe price swings, such as in 2008 & in 2011. As per 2014 survey, food insecurity was about 10.6 million, of whom 5 million (or 19 percent of the population) were severely food insecure (Comprehensive Food Security Survey (CFSS)). During the 2015 war- March to June- , food insecurity has reached a critical situation under which about 12.9 million people, or 44 percent of the population, no longer have enough to eat, and 6 million of whom are facing extreme food insecurity resulting

<sup>2</sup> Ministry of Planning and Development, Second Five Year Plan

Ministry of Planning and Development, Second Five Year Plan (p 166)

<sup>20</sup>Source : Economic Valuation of Key Ecosystem, Republic of Yemen 2014.

<sup>21</sup>Source : Economic Valuation of Key Ecosystem, Republic of Yemen 2014.

<sup>22</sup> The 2<sup>nd</sup> National MDG Report, Core Report Team 2010

<sup>23</sup> The 2<sup>nd</sup> National MDG Report, Core Report Team 2010

<sup>24</sup> The 2<sup>nd</sup> National MDG Report, Core Report Team 2010

in high acute malnutrition or excess mortality, according to a report from the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) in June 2015. The agriculture sector can address both food sovereignty and food security through higher production of grains, and increased incomes from expanded production of cash crops. In the meantime, Yemen may need to consider either a national or regional grain reserve program to help alleviate issues from global price shocks due to their dependency on imports. Moreover, the rapidly growing population at the rate of 3.5% annually is increasing the demand of the scarce natural resources - on water resources, foodstuff and other products.

Unplanned expansion of urban centers in some areas exceeds the capacities of the available resources to meet new demands. It is also causing sanitation and waste management problems and putting pressure on civic/municipal services, in addition to loss of biodiversity and agricultural land.

In sum, total estimated value of key ecosystem in the country is estimated at approximately USD 287,829 million as shown in table 4, 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. From this end, it can be deduced that only a small fraction of the ecosystem value is integrated in the country's value of goods and services produced in a year (GDP).

Key ecosystem	Economic value (USD Million)
Forest	260,787
Rangeland	12,146
Wetland	13,873
Marine	541
Mangroves	482.9
<b>Total</b>	<b>287,829</b>

Most of the ecosystem values such as the value of energy from fuelwood, the medicinal values of forests, pollinators, etc. are not taken into account when estimating GDP. Thus, a significant portion of ecosystem services and functions are ignored in economic decision making. One of the factors contributing to the overlooking of ecosystem values in derivation of national income accounts is the informal sector as majority of trading in ecosystem functions and service occurs in the informal sector (energy, traditional health sector, water sector, etc.). It is therefore important that efforts be geared towards integration of ecosystem values in deriving national income accounts and at all levels of decision making.

The ecosystem values are derived from their contribution to various economic production sectors. One of the issues arising is whether the estimated economic values are sustainable over time. Due to the fact that there is high dependence on fuel wood as a source of energy, and that water resources and marine resources are depleted at an accelerated rate, it can be concluded that there is a need to reduce consumption and utilization of key ecosystem to sustainable rates in order to achieve non-declining ecosystem values over time.

### 1.6 Legal and Institutional Framework for Biodiversity Management

Given the significant importance of Yemen biodiversity and ecosystems to national economy and the livelihoods of Yemeni people, the Government has undertaken several efforts to enhance institutional frameworks so as to be adequately mandated and empowered to safeguard, protect and conserve the country's depleting natural assets effectively. To this end, the Ministry of Water and Environment (MoWE) was established in 2003 with broad responsibilities related to environmental protection and management, including its responsibility for environmental and water policies planning, external relations and legal affairs.

Additionally, in 2001 the Government of Yemen designated the Environment Protection Authority (EPA) as a regulatory body, coordinator of environmental activities among



relevant stakeholders, and as a national body responsible for integrating environmental concern into national development policy.

Recognizing the multiple aspects of biodiversity and environmental issues, the GoY has also designated other key partners to be involved in managing the natural resource base and implementing environmental strategies and these are: the Ministry of Planning and International Cooperation (MPIC) which is responsible for planning and coordination of all development activities and for resource mobilization; Ministry of Agriculture and Irrigation (MAI) which is responsible for food security and agricultural development; Ministry of Tourism which is responsible for development of the tourist infrastructure; Ministry of Petroleum and Mineral Wealth which is responsible for the oil and gas production mining; Ministry of Electricity; and Ministry of Fish Wealth which is responsible for managing fishery resources.

Other Government institutions with responsibilities in the environment sector include: the General Department of Forestry and Combating Desertification (GDFCD); Civil Aviation and Meteorology Authority (CAMA) which is responsible for climate monitoring; Agricultural Research and Extension Authority (AREA) which is responsible for Scientific Research; National Water Resources Authority which is responsible for water management; and National Water and Sanitation Authority which is responsible for the water supply in urban areas, and the General Authority of Rural Water supply.

The economic production sector and NGOs (including academic institutes, consultancies and civil society organizations) are also very active in activities related to natural resource management and environmental protection. These include the Friends of the Environment and the Yemen Ornithological Society. At international level, NGOs like IUCN, Bird Life International, WWF and Wetlands International are considerably active and have active focal points in the Republic.

To contribute to the global environmental protection effort, the Government of Yemen has ratified UNCBD, UNCCD & UNFCCC and is party to a number of relevant international conventions and regional protocols, including the CITES, Hazardous Wastes, Law of the Sea and Ozone Layer Depletion, RAMSAR Convention, World Heritage Convention, and Bonn Convention, which make some provision for meeting global environmental objectives. By ratification of these conventions, the GoY assigned the EPA as a Government agency responsible for monitoring compliance with obligations made under international conventions such as the UNCBD and the UNFCCC. The EPA in this capacity hosts the secretariat and national implementation units of most of GEF/UNDP projects currently ongoing in Yemen, such as the Biodiversity planning, the Climate Change Enabling and the Socotra projects among others. In its capacity as national focal points for UNCBD and UNFCCC, the EPA has been engaged in conservation of biodiversity resources through the initiation and development of several legal and technical activities and improving environmental coordination based on its mandates and the Environmental Protection Law No. (26) for 1995 (EPL). This effort has led to the establishment of EPA board of directors to act as coordinating body for Climate Change, biodiversity, Land Degradation, etc. The current structure of the board of directors include representatives from the Environment Protection Authority (EPA) of the Ministry of Water and Environment (MoWE), the Ministry of Agriculture and Irrigation, the Ministry of Fish Wealth, the Ministry of Planning, the Ministry of Electricity, the Water Resources Authority, and the Ministry of Local Administration. Unfortunately, the board had no role in the production of the NBSAP2 and rarely met and thus it needs to be activated, its structure reformed and given stronger mandates, including the removal of overlapping responsibilities amongst environmental partners.

In its efforts to address desertification and land degradation issues, the Government after it had acceded to the United Nations Convention to Combat Desertification and Drought (UNCCD), has appointed the General Directorate for Forestry & Desertification Control

(GDFDC) as a Focal Point for the CCD. Following its designation as national focal point, the GDFDC developed a National Action Plan to Combat Desertification (NAPCD) to meet the country's commitments stated by the UNCCD.

As yet, there are some synergic and common issues affecting the GDFDC capacities to undertake their responsibilities effectively. These include, inter alia: lack of partnerships of private sector, NGOs and local community in management of forest and degraded land in addition to the lack of inter-institutional coordination and collaboration among relevant parties associated with highly centralization in planning. All of these issues lead to unsustainable, ineffective and inefficient management of the country limited forestry resources and underpin the importance of a cross-sectoral approach in forest management. Therefore, it is urgently needed to strengthen the GDFDC through the creation of an autonomous and independent coordinating body with clear financial mandate, and institutional framework to act as catalyst and coordinating body in the preparation, implementation, monitoring & evaluating desertification and drought.

Beside building the environmental capacity of national institutions, the Government has made tremendous efforts in developing and strengthening legislative frameworks as regard to environmental conservation and such efforts have led to endorsement and enactment of a number of relevant laws – including, Environmental Protection Law (EPL), 1995, The Water law, 2001, and Decentralization Local Governance Law, 2000. However, many of the existing legislations are found either outdated or/and irrelevant to the current environmental problems. Given that they were developed in the absence of coordinated and integrated way, they contain a number of conflicting and overlapping issues, which are thought to be responsible for the weak enforcement and inadequacy of current legislation.

As of yet, however, legislation framework is still incomplete and/or needs to be updated. This include the need for updating the EPL, the development of a Land tenure law, including agricultural land holdings and registration, and the development of an application decree for EIA law as well as the development of a Protected Areas law.

### **1.7 National Biodiversity Process for NBSAP2**

The entire development process has been accomplished applying a participatory planning exercise by which a total of 100 persons, being representatives of media, civil society, universities and scientific research centers, woman and youth groups, local communities, local authorities, central authorities and private sectors were invited to come together in four Multi-Stakeholder consultation workshops and individual meetings to review, discuss, and reach a consensus on their common interests and needs to be covered by the NBSAP2, particularly as regard the content of the action plan, national biodiversity targets, capacity development needs, policy tools for mainstreaming biodiversity aspects, and policies for integrating poverty, gender, climate change issues into the revised NBSAP2.

Because of complexity and multiple aspects of biodiversity, the production of Yemen's NBSAP was highly inclusive and participatory, allowing all environmental partners, key production sectors, research institutions, local communities, and traditionally under-represented groups such as the youth and women to take role in the entire development process. Environmental partners played leading roles in the Production of NBSAP2 and this role was organized via the establishment of a steering committee (SC), which led the entire development process. The established SC has served as coordination and decision-making body, and was formed to include representation of the following key environmental actors:

1. Minister of Water and Environment (MWE), Chair
2. A representative of Ministry of Agriculture and Irrigation(MAI), member
3. Chairman of EPA, member
4. EPA Biodiversity Department, secretariat

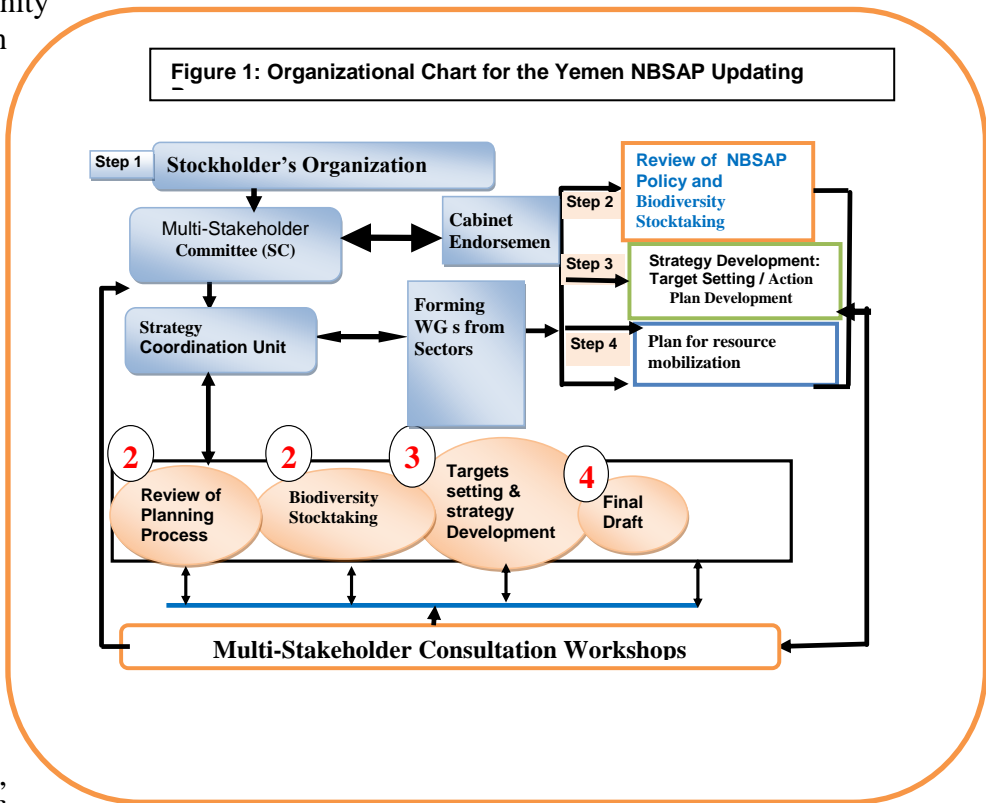
5. A representative of UNDP, member
6. A representative of the Ministry of Planning & International Cooperation (MoPIC), member
7. A representative of the Ministry of Fishery Wealth (MFW), member
8. A representative of the National Women Committee (NWC), member
9. Two representative of the local community of three protected areas (NGOs), member
10. National project director, rapporteurs

In this capacity as coordination and decision-making body, the SC has been closely involved in planning and scheduling the various components of NBSAP2 development, including the approval of national goals, targets, action plan of the NBSAP2 as well as the validation of results concluded by input reports and stakeholders workshops, among others. The EPA role was vital in directing the total efforts towards meeting the global guidance of the CBD's Strategic Plan for 2011-2020, and at the same time meeting the national priority needs. The role of UNDP in partnership with the EPA was also crucial in facilitating and providing logistic services and information for the national experts and participants of the national consultation workshops and meetings. Complementary to this the EPA Biodiversity Department has played an important role through the development of the 5<sup>th</sup> national report to the CBD, and the continuous update of the information of EPA website of CHM to make it easily accessible to developers of input reports, and to stakeholders consultation.

Other SC members roles, namely: the members of Minister of Water and Environment, Ministry of Agriculture and Irrigation, MoPIC, Ministry of Fish Wealth, and National Women Committee were instrumental in mainstreaming the national priority concerns respectively as regard, water conservation; food security and agricultural development; resource mobilization; fishery conservation; and gender mainstreaming into the new version of the NBSAP. The community

based organization such as the community based Management of Bura national park , Aden wetlands and Hawf PA were also very active in demonstrating community based management as a prime policy options in biodiversity management and protection.

The participants to the consultation workshops from economic and production sectors, mainly those from mining; oil and gas; manufacturing industry; infrastructure & road; energy production; urban planning; and tourism sectors have been very active in identifying areas trade-offs and win-



win strategies to resolve conflicting areas regarding the promotion of sustainable production and consumption into their sectors within the NBSAP2. They played leading roles in defining programs, actions and policies needed for embedding such strategies into the NBSAP 2, taking into account these options have the potential to achieve mutual interests of biodiversity conservation and the benefits of their sectors as well. Their valuable contributions in the process have led to tuning the NBSAP2 towards promoting green economy energy resilience, which are of important new aspects internalized into the NBSAP2.

Additionally, the participants of national focal points of CBD, CCD & UNFCCC and other focal points for international conventions and regional protocols such as: the CITES, Hazardous Wastes, RAMSAR Convention, and world Heritage have played important role in mainstreaming and linking some of these Conventions objectives into the action plan, where it deems nationally appropriate. Finally, the presence of academic institutes, consultancies and civil society organizations, particularly the Agricultural Research and Extension Authority (AREA), universities of Sana'a Hodiedah and Aden has contributed significantly in refining and validation of information contained in the he input reports and NBSAP2.

To enable stakeholders be effective partners in this process, Yemen adopted the seven steps biodiversity planning process recommended by the COP of 1995 after being internalized to suit Yemen national requirements for developing NBSAP2. As shown in Figure1, Yemen module for NBSAP2 updating was informative, cyclical, participative and consensus-based process, which means that each outcome of the process was first drafted by knowledgeable experts and this draft, was presented to a national consultation to reach a consensus and agree on its final content.

If no consensus was reached among the stakeholders, a revised version was developed taking into account the views and comments raised by the national workshop. Once the document was approved by the participants of the workshop, then it was made available to national experts to be used as an input document for development of second outcome planned for the next step. All documents prepared during whole cycle of NBSAP2 development were disseminated publicly via number of channels such emails, EPA CHM website and discussion meeting as appropriate. This participative and informative manner was adopted throughout the entire development process i.e, it was applied while producing all components and sub-components NBSAP2, including the policy review and biodiversity stocktaking, national target setting, action plan development, identification of capacity development needs, identification of policy tools for mainstreaming biodiversity aspects, and identification of policies for integrating poverty and climate change issues into the revised NBSAP2, see figure1.

Each consultation workshop included a number of plenary and working groups meetings, where the working groups meetings were devoted to review, discuss and approve or amend the document under discussion on initial basis, while participants of the plenaries were responsible for approving the content and scope of the document under discussion in final shape. After approval of each document by the stakeholders, a revised final version was developed by the designated experts taking into account the recommendations and comments raised by the consultation workshop.

Through Five participatory consultation workshops held in Sana'a and two others conducted in Hodiedah, the national stakeholders representing various governmental sectors and societal groups have reached national consensus on the content of the following elements of the biodiversity strategy:

- Sectoral reports on policy review and biodiversity stocktaking(consultation workshops1)

- National vision, mission, strategic goals split into 20 national targets aligned with Aichi targets (consultation workshops2), for background on Aichi targets please see box1 and annex 2.
- A costed and prioritized Action Plan to implement NBSAP2(consultation workshops3);
- Capacity development plan needs(consultation workshops3);
- A revised action plan and resource mobilization strategy, including mainstreaming of biodiversity into development policies, plans and NBSAP2 utilizing findings of Yemen Ecosystem Valuation study and Yemen report to incorporate climate change issues into NBSAP2(consultation workshops4)
- First draft of NBSAP2 developed but there is a need to build consensus about the content & scope of the draft in a participatory workshop before getting it approved by cabinet and this later is pending improvement of political situation.

This informative approach helped enriching the NBSAP2 contents based on the use and integration of scientific findings concluded by reports and studies into the NBSAP2. Enriching the NBSAP2 has been accomplished by enabling stakeholders to access and validate reports on biodiversity issues, Ecosystem Valuation, capacity development needs, resource mobilization, and climate change with ultimate aim to integrate the validated information of each into the NBSAP2 where it deems necessary. This step has led to the development of an NBSAP2 that integrates emerging issues such as climate change resilience, poverty alleviation, and mainstreaming of Biodiversity and ecosystems values. Most importantly, it helped in the development and integration of a resources mobilization strategy into NBSAP2 which has the potential to secure financing for its implementation.

#### **BOX1: The Aichi Target**

The Aichi targets are the new generation of globally agreed upon targets committed by the parties of the CBD convention at their tenth conference of the parties (CoP-10) held in 2010 in Nagoya. The Aichi targets are committed to be as a part of the CBD Strategic Plan adopted by the CoP-10 for the period 2010 – 2020. Unlike the 2010 targets of the CBD, the current twenty Aichi targets entails targets, calling for integrating new aspects of the CBD strategic plan into the revised national NBSAPs. These include: (i) incorporation of biodiversity and ecosystem values into national and local development and poverty reduction strategies (Target 1); increasing the global terrestrial protected area estate from 12% to 17% and the marine estate from 6% to 10% (Target 11); (iii) strengthening ecosystem resilience to climate change and promotion of ecosystem-based approaches to climate change

Using a cyclical approach, the process facilitated progressive refinements of the various part of the NBSAP2 to ultimately produce most refined outcomes. This has been achieved through successive discussion and feedback by various bodies and individuals assigned in the organization structures of the stakeholders consultations process.

To sum up, the adoption of a participative and consensus-based approach has ensured the identification of national vision, mission, strategic goals and targets that reflect the common interest and development needs of various environmental partners without denial of any group's interest specially of those who are marginalized and vulnerable groups such as women and youth. This indicates that Yemen has already achieved the Aichi target number 17 as regard to the enactment of an effective participatory approach and updating of its national biodiversity strategy and action plan by 2015.

## **1.8 Lessons Learned From Previous Biodiversity Planning**

As a part of NBSAP2 development, special effort was paid by for stocktaking targeted to review and assess adequacy and relevancy of the previous NBSAP with aim to identify key gaps & needs to fill gaps and fulfil Yemen's obligations as stated by the UNCBD. Through this review, national experts in close consultation with stakeholders captured a number of lessons to be considered while developing the NBSAP2 in order to fully comply with the the country's commitment as spelled out by the CBD and its Strategic Plan's Aichi Targets. Key lessons captured by the review include the following:

- 1- Gender, poverty, livelihoods and food security, climate change, and the safe transfer and use of genetic resources have not been well-mainstreamed and integrated in the process of producing the last NBSAP.
- 2- Biodiversity and ecosystems values are not integrated into national and local development plans and planning processes, and thus need to be considered in the new version.
- 3- Several incentives and subsidies are prevailing causing harmful biodiversity impacts, and thus should be removed.
- 4- Current production and consumption patterns are unsustainable and need to be replaced with more friendly schemes.
- 5- Scope and coverage of Yemen's protected areas network is below designated target and this should be overcome via the shifts from PA management as defined by specific boundaries to broader landscape level.
- 6- Yemen ecosystems are degrading rapidly and their resilience needs to be enhanced based on the restoration of at least 15 per cent of degraded ecosystems.
- 7- Societal capacity to withstand economic depression and depreciation of natural resources is progressively being reduced unless the poverty issue is well-mainstreamed and integrated in the process of producing NBSAP2.
- 8- A resource mobilization strategy was lacking in the previous NBSAP with severe impact on implementation of its components. Therefore, effective implementation of NBSAP2 is highly reliant on addressing this challenge.
- 9- Biodiversity issues are cross-cutting issues, and NBSAP2 needs to be coordinated and management properly

## **II Biodiversity Status & Trends**

### **2.1 Ecosystems loss**

Over recent years, Yemeni ecosystems have been subjected to tremendous pressure resulting in notable loss of its distinctive ecosystems such as fresh waters, wetlands, mangroves, coral reefs, sea grass beds, salt marshes, lakes and bays, sandy and rocky beaches, oceanic islands, mountainous woodlands and forests, rangelands, as well as terraced and irrigated valleys. Yemen forest is being degraded due to continuing conversion of forest areas to cultivated

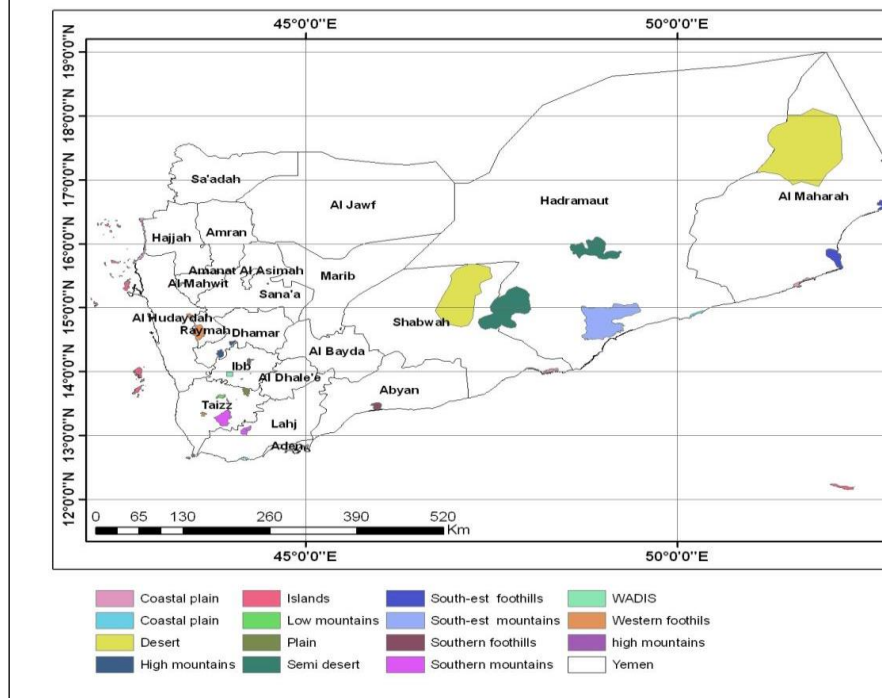
lands, rangelands, bare lands and open shrub lands, causing threats to watershed ecosystems, land degradation, desertification, and subsequently leading to an increase or loss of a large proportion of the biomass with an adverse reduction in delivery of the goods and services it provides particularly fuel wood for energy, fodder for livestock, medicinal plants, wildlife for meat, honey, and genetic resources.

Similarly, water ecosystems are being vastly depleted as a result of high population

growth (3.5% annually), high water use inefficiency, indiscriminate water extraction for agriculture mainly for Qat, erratic rainfall, and absolute scarcity of water resources. This depletion has resulted in an annual water deficit amounting for 1.465 billion m<sup>3</sup>/year with subsequently notable reduction of per capita annual share of fresh water combined with disparity in water supply amongst urban and rural population. Additionally, marine ecosystems loss occur owing to damaging fishing patterns, which result in the loss of coral reefs, sea-grass beds, mangroves and wetlands that hosts the country fisheries, marine turtles, birds and other marine flora and fauna, and thus causing notable decline in fishery species, particularly rock lobster and shrimp stocks and some demersal fish species with severe impact on malnutrition of poor people living in coastal areas. Finally, Yemen cultivated systems which host an important genetic base for production of landraces such as barley, wheat, sorghum, 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.

Ecosystems loss is mainly attributable to ineffective protected areas management combined with inadequate protected areas networks to comply with Aichi requirements. In this context, only six ecological sensitive areas, being 1% of Yemen total mass, have been declared as Protected Areas, indicating large gaps to fulfill the country commitments stated by the CBD Strategic Plan with regards to Aichi Target# 11( Gap assessment Report, EPA 2011). Of Yemen six Protected areas, Socotra and Jabal Bura'a protected areas have been listed as UNESCO World Heritage Sites, and two protected areas have won Equator Prizes for demonstrating best practice. Rosh protected area won Equator Prize 2010 for best practice demonstrating a successful approach for poverty reduction through conservation and

**Map2 . Geographic distribution of Yemen's Key Ecosystems**

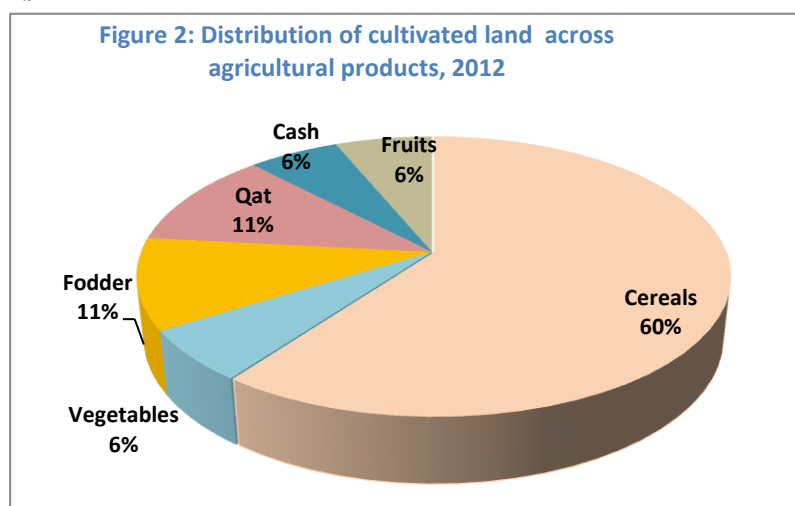


sustainable use of natural resources as well as for benefit sharing between biodiversity conservation, eco-tourism and development. Al-Heswa marshland in Aden won Equator Prize in 2014 for being the first community-made Marshland to exist at a local waste dump site in Yemen, using wastewater effluent. Yet, the current system of protected areas is not adequately representative of the various biodiversity components nor of the entire terrestrial marine and freshwater ecosystems. In addition Yemen's PAs are not designed and managed in the context of an ecosystem approach, and thus not giving due regard to the importance of corridors and interconnectivity of PAs and to external threats such as the impacts of urban sprawl, pollution, climate change, unsustainable tourism, and invasive species.

Despite the progress made in conservation and protection, Yemen's biodiversity and ecosystems are endangered & fast deteriorating, and this is clearly manifested by the degradation of *terrestrial and* marine ecosystem. Degradation of terrestrial ecosystems occurs in various forms such as erosion of farmlands, terraces, fertile soil, rangelands, woodland and forest, while the degradation of marine ecosystems is characterized by loss of wetland, mangrove degradation, destruction of benthic habitats along with coral reefs and erosion of coastal zones. Current degradation of terrestrial, marine and aquatic eco systems is attributed to ineffective management of natural habitats, and this is mainly demonstrated by inadequate biodiversity policies/strategies and regulations; limited information base; limited public awareness on biological resources at the local and national levels, as reported by the gaps assessment report on protected area of 2011. Inadequate biodiversity policies/strategies and regulations is attributable to several gaps that hinder the effective management & conservation of biological resources, and these include: lack of adequate legislation to protect flora and fauna, lack of law enforcement, inadequacy of management plans for protected areas, insufficient financial resources for implementation of management plans, absence of resources mobilization strategy, unclear organizational structure and overlapping mandates of agencies involved in protected area management, unclear borders and zoning of nature reserves, lack of coordination and cooperation mechanisms among stakeholders in protected area management combined with highly centralized management advocating exclusion of local people in management, planning and conservation of nature reserves. Exclusion of local community in protection of natural ecosystems is further constrained by low level of knowledge of local communities and decision makers on ecosystems values and importance and the resultant low level of public awareness on the protection of biodiversity combined with the lack of effective system for sharing biodiversity information and lack of databases, which is evidently manifested by weak capacity in collection storage, analysis of biodiversity data, the absence of techniques, GIS and computerized tools for storing, analyzing and processing of data and mapping of biological resources, particularly under ongoing retardation of traditional knowledge and skills; deficit in qualified technical local staff in species identification, monitoring trends of biodiversity & ecosystems loss, research and protected areas management attributable to the absence of training and education programs.

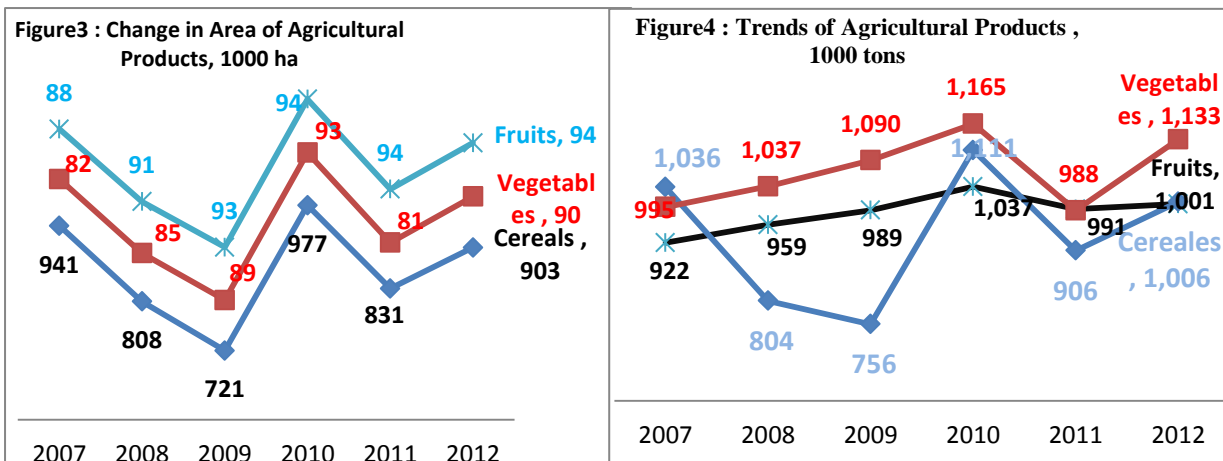
### 2.1.1 Cultivated Systems

Yemen agricultural system accounts for around 45.4% (23,969,838 ha) of the country land mass, and this include farmlands, rangelands, forests and other woodland at a share of 6%, 92% and 2% respectively. The remaining land which

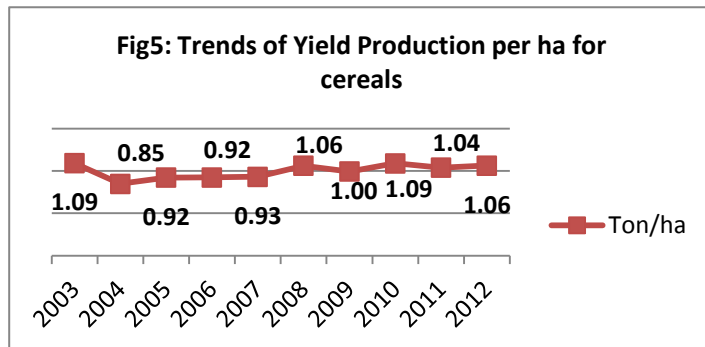




accounts for 54.6% of the country (or 28,827,162 ha) is mostly desert. Yemen's cultivated systems refer to those ecosystems under cultivation, particularly those managed for cereal, cattle and sheep production, namely those systems known as farmlands, rangelands and forest. Yemen total arable area is approximately 1.6 million hectares and another 527,970 hectares are classified as forest and around 22 million hectares are designated as rangeland (FAO, 2009). Of Yemen arable land, only 1.5 million hectares were under cultivation in 2012 and were mainly managed for the production of 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. Fruits, vegetables & cash crops occupied only 6% each, while Qat and animal fodder accounted for 11% each, see figure 2.



The total area under cereals cultivation increased from 941 thousand ha in 2007, to 977 thousand ha in 2010 and then declined to 903 thousand ha in 2012, see figure 3. The total area cultivated for vegetables & fruit production has not reported significant change, over 2007 to 2012 period, & was fluctuating around the averages of 87 & 92 thousand ha respectively.

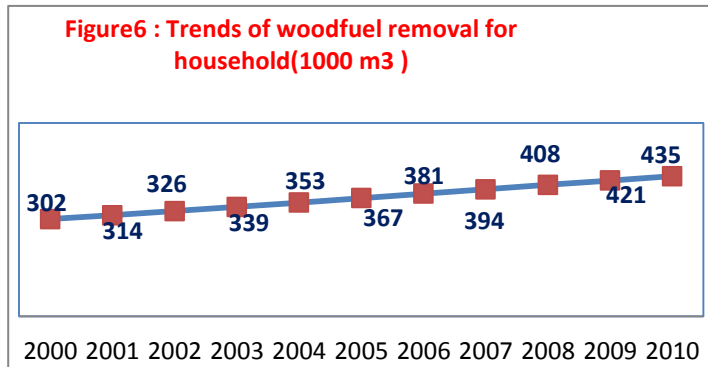


Trends during 2007 to 2012 period indicate that total cereals production has increased from 1,036 thousand tons in 2007, to 1,111 thousand tons in 2010 and then declined to 1,006 thousand tons in 2012. The total production of vegetables was 995 thousand tons in 2007 and slightly increased to reach 1,133 thousand tons in 2012, see figure 4. Fruit & cash crop productions have been dwindling around the average of 983 and 936 thousand tons respectively<sup>25</sup>, see figure 4. Though it occupied the largest portion of cultivated area, cereals productions remained below anticipated land potential over the past ten years. As seen in figure 5, cereal production is characterized by poor yields per hectare especially in rain-fed valleys and mountains that use traditional methods, whereas irrigated crops have relatively higher yields.

<sup>25</sup> Sources: Central planning organization & Yemen Agricultural Statistics Yearbook 2013

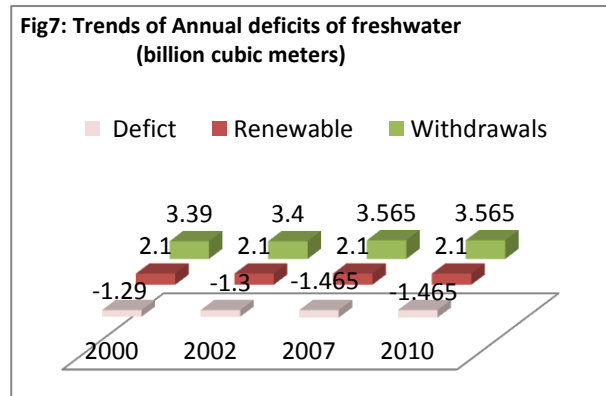
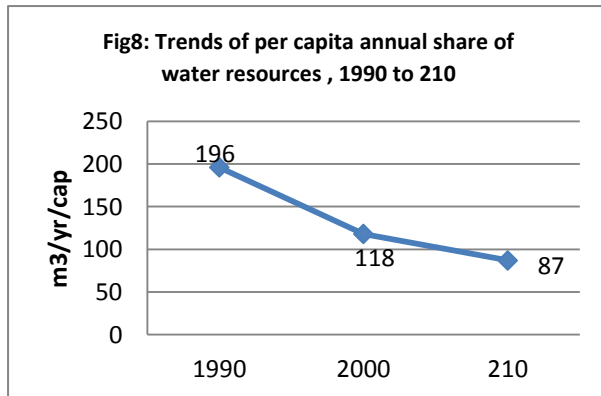
### 2.1.2 Mountains and Forests

During the last decades, a total of 8,764 ha, i.e. 69% of the initial area of *Hyphaene thebaica* woodland (mangrove) in Tihama coastal plain has been destroyed and largely converted to rangeland after being initially cleared for agriculture. In addition, 29% of initial area of The *Salvadora-Tamarix* thicket has converted mainly to wadi agriculture & about 17% of its total



area of the *Acacia* woodland (2,637 ha) has mainly changed to agriculture. At present, a great deal of this area has been converted to cultivated lands, bare lands and open shrub lands. 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. Statistics indicate that 60 per cent of the population is still using wood as fuel, thus alarming that the plant cover is being over depleted and depletion exceeds tree-planting by far resulting in a serious environmental situation. Figure 6 shows that wood removal for household energy in rural areas has increased from 302000 m<sup>3</sup> in 2000 to 435000 m<sup>3</sup> in 2010<sup>26</sup> causing threats to watershed ecosystems, land degradation, desertification, leading to an increased loss of a large proportion of the biomass with an adverse change in carbon stocks.

### 2.1.3 Over Extraction of Water Resources



Water resources are being vastly depleting as a result of high population growth(3.5% annually), high water inefficiency, indiscriminate water extraction for agriculture mainly for Qat production, erratic rainfall and absolute scarcity of water resources. The deficit of freshwater resources has resulted in notable reduction of per capita annual share of available water resources which decreased from 196 m<sup>3</sup> in 1990 to 87 m<sup>3</sup> per year in 2010, see figure8 . Indiscriminate water extraction, 92% of which goes to agriculture, is largely responsible for the overexploitation of groundwater, where estimates indicate an annual water deficit of about 1.465 billion m<sup>3</sup>/year (UNDP data base, 2010), see figure7 . The most disruptive impact caused by the continuing depletion of Yemen’s ground-water resources is the disparity in water supply among urban and rural population. National statistics as reflected in figure 9 indicate that rural population with access to safe and affordable drinking water has fluctuated

<sup>26</sup> Source: FAO, FRA (2010)

between 57% and 59% over the period 2000 to 2008 compared with 72% to 82% for urban areas over the same period, CSO statistics. The disparity in water supply among urban and rural areas is clearly demonstrated in the government officials statistics of 2008, which shows that about 81% of urban population have access to safe drinking water compared with 21% of rural population.

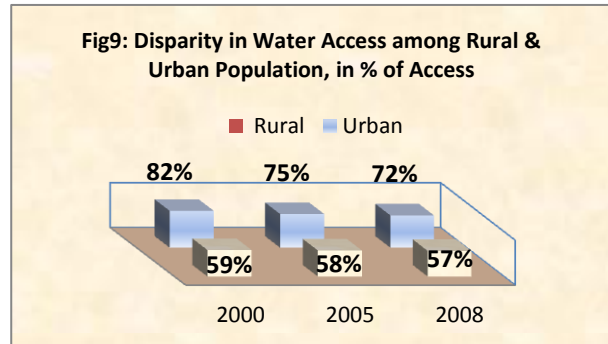
Current annual water extraction is greatly exceeding the ecosystem capacity to renew. Specifically, total annual renewable water resources are estimated at 2.1 billion m<sup>3</sup> (1.1 billion m<sup>3</sup> of groundwater and 1 billion m<sup>3</sup> surface water) while water consumption stands at 3.565 billion m<sup>3</sup>, reflecting a groundwater depletion rate of 1.465 billion m<sup>3</sup> (170%) a year (CSO 2010). Over extraction of water resources in Yemen

resulted in the degradation of watersheds, continuing reduction of groundwater tables, drying of wadis and erosion of wadi bank. Water erosion in the Coastal Plains results in significant 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. In the rugged dissected mountains of the Northern Highlands, water erosion due to rush floods affects seriously the neglected terraces networks, and destroys woody vegetation, increasing bank erosion. In the Mahweet area, road banks are collapsing as they have not been properly consolidated and through gully formation, big chunks of soil are washed off the banks.

Over extraction of water resources and the subsequent depletion of water ecosystems is attributed to numerous drivers, including population explosion, economic development, massive urbanization associated with increased rural to urban migration. Other drivers include the accelerated development and competition for water in the urban, industrial and agricultural sectors combined with ineffective water management policies and practices, erratic precipitation and climate change among others.

On the other hand, chemical fertilizers and pesticides used in agriculture seep into groundwater aquifers causing excessive pollution that exceed the capacity of ecosystems to maintain water quality. Other key pressures contributing to the depletion and pollution of underground water include: excessive pumping of underground water, municipal and industrial water waste, agro-chemicals and other industrial chemicals and discharge of untreated wastewater, insufficient recharge of water aquifers and pollution of underground water combined with the permeation of wastes from garbage dumps or polluted wastewater that are returned to underground basins in some of the oil extraction operations.

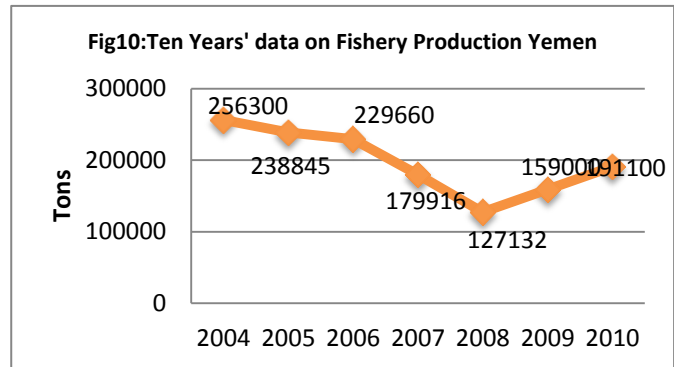
The depletion of ecosystems with the consequent water scarcity leads to reduction in water availability and hence the people access to safe potable water, causing, in turn, financial burdens on rural poor, particularly on women. It also leads to the gradual loss of agricultural land with the subsequent reduction of crop production combined with loss of genetic resources & the extinction of livestock and biodiversity species. In addition, water pollution and deterioration causes multiple many diseases in rural and urban areas such as cholera, bacterial dysentery, infectious hepatitis, salmonellosis, and typhoid.



### 2.1.4 Overharvesting of Marine Resources

The decline in fish stocks is primarily the result of unsustainable catch rates and habitat destruction. This has not only led to reduced levels of productivity in both commercial and non-commercial species, but has also caused the collapse of whole marine habitats, such as coral reefs, sea-grass and mangroves and wetlands that provide the country with fishery resources. Yemen's fish stocks are reported to be harvested at levels above the Maximum Sustainable Yield (MSY), particularly under current weak institutional capacity to monitor and control illegal fishing. It has been reported that illegal fishing & coral collection & trading is continuing by a large number of illegal foreign trawlers operating in the Red Sea, Arabian Sea, Gulf of Aden and Socotra Island (Morgan, 2004).

Over-exploitation has been threatening marine & coastal resources such as fisheries, marine turtles, birds and other marine flora and fauna, causing notable decline in such species, particularly fish species. Though there is lack of data to substantiate the extent of over-exploitation of the fish resources, decline in the production of valuable fish species such as rock lobster and shrimp stocks and some demersal fish species has been observed over the period 2004 to 2010, see figure 10.



Marine & coastal ecosystems loss is characterized by degradation of wetland ecosystems, mangrove loss, destruction of coral reefs, destruction of benthic habitats and inundation of coasts & erosion of coastal zones due to sea level rise, dams upstream and sediment reduction to coastal zones. Marine & coastal resources, including fisheries are being increasingly depleted due to multiple direct causes and indirect causes. Direct causes include resources over-exploitation, modification of important marine/coastal habitats, increased coastal and marine pollution, climate change & natural disasters [tsunami, storm surges] and increased alien invasive. Indirect causes that stand behind coastal & marine ecosystems loss are attributed to the predominance of institutional weakness in addition to inappropriate macroeconomic policy.

Overharvesting of fish stocks & hunting marine turtles & birds combined with overuse of coastal and marine flora and fauna, over grazing of mangroves, cutting of wetland trees are the main features behind unsustainable use and management of marine & coastal resources. Over exploitation of Coastal and Marine resources is aggravated by multiple direct drivers such as the use of ground dragnets in fishing or the use of explosives, utilization of fish stock beyond production capacity, extensive mangroves grazing for feeding camels, mangrove cutting for fuel wood & coral collection for illegal trading. Unsustainable use and management of marine resources resulted in sharp decline of several endemic birds, flora & fauna combined with declining productivity of fish stocks, especially lobster, cuttlefishes, shrimps and sharks.

Habitats are fast deteriorating to meet increased land reclamation for coastal urbanization, industrial growth, oil exploration, fishing; tourism; agriculture; aquaculture, sea water desalination and ports & sewage development. These activities are broadly associated with extensive dredging, land filling, mining and quarrying with subsequent loss of the Red Sea & Arabian sea coastal habitats such as coral reef, mangrove, wetland, palm trees, lagoons, beaches (sandy & rocky), dunes, Sabkha, Seagrass Beds & Turtle Nesting Sites. In turn, the

loss of these habitats leads to the disappearance of several endemic birds & fish species & declining productivity of fish stocks, especially lobster, cuttlefishes, shrimps and sharks. Pollution is another major direct drivers which has been reported to accelerate the depletion of the marine ecosystems, leading to declining fishery stock. According to UNEP (2007) main polluters of marine ecosystems in Yemen are power and desalination plants, sewage treatment facilities, industrial facilities, port facilities, passing ships, agricultural activities, coastal constructions, power generating, mining and quarrying activities. Within the port of Aden the following metals/pollutants were observed in high concentration Lead (Pb), Chromium (Cr), Zinc (Zn), Cobalt (Co), Nickel (Ni), Copper (Cu) and Manganese (Mn). Source of heavy metal pollution include untreated wastewater, desalination plants, electrical power station, refinery plants and oil spills (Nasr, *et al.*, 2006). The drivers for pollution are population and corresponding economic and industrial activity growth which accelerates the rate of waste water production. In addition, the absence of legal framework regulating wastewater quality and monitoring of pollutants quality are among underlying causes escalating marine pollution. Of casual drivers contributing to the predominance of inappropriate macroeconomic policy and the consequent loss of coastal & marine ecosystems in Yemen are the increased poverty level in coastal areas, non-functional fishing law, inadequate policies and plans protecting marine ecosystems, absence of rehabilitation & restoration plans for threatened species/vulnerable ecosystems, lack of fisheries management plans and poor knowledge & awareness on the value of marine ecosystem & its goods and services along with the subsequent lack of social responsibility towards the conservation and sustainable use of depleting marine resources. This situation is further deprived by the weak institutional capacity which is in turn derived from multiple factors such as inadequacy of manpower and capacity to enforce policies & monitor fish harvest level particularly under unknown stock capacity of fishery resources.

## **2.2 Biodiversity Loss**

Biodiversity loss is the result of an increased loss of flora and fauna including extinction of endemic and endangered species; erosion of genetic resources; deforestation, over extraction of water resources, and overharvesting of marine resources. In other words, it is the resultant of over-exploitation of biological resources and the next six sections provide highlights on the causes driving unsustainable consumption of these resources.

### **2.2.1 Loss of flora and fauna, including endemic species**

According to the Gap Analysis of Natural Plant Biodiversity of Yemen (2011), Yemen hosts over 2871 plant species of which 105 are exclusive to Yemen, whereas there are with 825 plant species in the Island of Socotra alone, of which 37 per cent are endemic to the Socotra Archipelago. Similarly, the country hosts a high diversity of terrestrial fauna with an estimated 71 large mammals and more than 363 bird species, of which 13 are considered endemic to Yemen (UNDP, 2010). Additionally, Yemen has a complex and diverse marine ecosystem. A total of 416 species were recorded from the Yemeni Red Sea including 401 species of bony fish and 21 species of cartilaginous fishes. The coral reefs in the country are highly diverse marine ecosystems & are a habitat for about 300 fish species with a high degree of endemism. Owing to habitat destruction over the last decades a great deal of Yemen forest has been converted to cultivated lands, rangelands, bare lands and open shrub lands, causing threats to watershed ecosystems, land degradation, desertification, and subsequently leading to an increase or loss of a large proportion of the biomass with an adverse reduction in the delivery of the goods and services it provides.

Yemeni flora and fauna and their genetic pool have been subjected to tremendous pressure resulting in notable loss of species and genetic pool. UNDP (2010) reported that there has been a reduction in flora and fauna species diversity due to extinction of endemic and rare species. Additionally, the pressure on biodiversity has led to some species being classified as endangered in the country (UNDP, 2010). Preliminary data on the status and number of rare and endangered plants species are available. Some 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. It is notable that 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. Furthermore, most sizeable mammals have long since been hunted into extinction in this country where firearms abound and a large proportion of the natural forests has been cut down. With some dedication and luck, Eco tourists may still spot rare land animals such as the Arabian leopard, hyena, Hamadryas baboon, honey badger, hedgehog, ibex, and fox. 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)

### 2.2.2 Erosion of Genetic Resources

Yemen is endowed with a rich variety of flora and fauna associated with a wide variety of agrobiodiversity landraces which are of important input in current farming systems to meet the food needs of communities and their livestock. In addition, the unique geographical features of Yemen's host a remarkable diversity of habitats, which contain distinctive genetic species, landraces and wild relatives of important food crops and pasture species. Most of Yemen landraces are characterised by having accumulated adaptive capacities to cope with adverse environmental and climatic conditions. For its adaptive capacity, Yemen's agrobiodiversity provides an important genetic base for future crop improvement programs, specifically for the development of landraces such as barley, wheat, sorghum, millet, lentil, and cowpea under changing climate. In addition, many wild relative species of these crops and other plant species having forage and medicinal values are occurring in field edges and remnant natural habitats.

Despite its richness of agrobiodiversity landraces and genetic species, Yemen genetic resources are vastly degrading, and this is partly due due to inadequate biosafety management to handle the transfer of Living Modified Organisms (LMOs) associated with increasing import of food & feeder, and partly because inadequate ex situ conservation of cultivated plant species.

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 & man-made risks, causing adverse damage and loss of genetic resources. Further, the country lacks a law and by law supporting ex-situ conservation & protection of wild and domesticated or cultivated biological resources (plants, animals and microorganisms). Among other issues there is a lack of enforceable regulation & guidelines to manage and control collection, research, importation and exportation of biological materials in addition to strategies on conservation and sustainable use of genetic diversity, including lack of recovery and rehabilitation plan for threatened genetic species. This situation is further aggravated by the limited research capacity to improve knowledge about distribution & importance of genetic diversity combined with limited national management capacity attributable to limited financial resources, equipment and facilities, particularly for

collection, maintenance and reintroduction of plants and animal species in ex-situ programmes.

Inadequacy of biosafety management is attributed to limited financial resources, equipment, expertise, legislation and facilities of the biosafety units in EPA to fully undertake its responsibility as regard handling, safe use and transfer of biotechnology and LMOs. This inadequacy is clearly evident from nonoperational national biosafety framework, lack of a national Biosafety by- law, inadequate legislations to regulate the use and release of living modified organisms and the transfer of biotechnologies, lack of national legal provisions on access to genetic resources and benefit sharing (ABS) as well as the lack of a national framework and administration to regulate the provision and uses of genetic resources, based on prior informed consent (PIC) and mutually agreed terms (MAT). This situation is further aggravated by the lack of information on impacts of living modified organisms (LMO) on biodiversity and inadequate expertise in species identification. 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.

### 2.2.3 Deforestation

Yemen Forest decline and loss of associated biological diversity result from many direct causes and in direct causes. The most important direct causes of forest biodiversity loss are unsustainable logging associated with overgrazing, cutting trees for firewood/ charcoal production, excessive hunting of wild life, over-exploitation of endemic and endangered species & illegal exporting of native genetic species. This status is further aggravated by a number of human-induced causes & natural causes. Anthropogenic drivers include land conversion for agricultural development, forestlands clearance for urbanization, dams & road construction, spread of alien invasive species, increased pollution & dumping of waste, including fertilizers and chemicals. Natural drivers include forest fires, drought & climate change, soil erosion and degradation of terraces.

Yemen rangelands are declining due multiple direct causes and indirect causes. They are adversely affected by overgrazing, uprooting of large quantities of plants for fuel & the encroachment of urban and industrial development. These are cited as major direct drivers accelerating the loss rangelands. As per official figures, the number of livestock in the republic of Yemen is increasing over time causing higher grazing pressure, which in turn lead to ecological change of rangeland habitat & herder communities. This conclusion is supported by the data reported out by Department of Agricultural statistics of the Ministry of Agriculture and Irrigation, which shows that sheep population increased from 6.5 million in 2001 to 9.4 million in 2012, and the goat population rose from 7.2 million to 9.2 million for the same period. This dramatic increase has resulted in rising grazing animals per hectare from 1.43 head/ha to about 2.87 head/ha in 2012<sup>27</sup>. The consequence of this is reduction in rangelands area, declined forage production, undesirable shift in species' composition and decline in species' diversity. Though they contribute significantly to livestock production and have an important bearing on rural economy, no regular and exhaustive monitoring of rangelands has been carried out to generate reliable data and to determine condition and trend, and to guide management plans. One of the primary environmental impacts that have been identified on the forest ecosystem is mangrove and forest loss. Over 95% of the mangroves sampled on the coast of the Red Sea were found to be gravely overgrazed. The main offender

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<sup>27</sup>Republic of Yemen, DAS of Ministry of Agriculture and Irrigation, 2012.

identified in mangrove destruction is camels. In addition, anthropogenic activities such as fuelwood harvesting are other primary causes of deforestation of mangroves.

### **III Key Direct Pressures Influencing biodiversity loss**

Yemeni economic advancement depends to a great extent on its natural resource base. Therefore, Yemen's ecosystem & habitats are being progressively changed to meet the needs of economic development sectors such as fisheries, mineral extraction, land-use conversion, energy & transport sectors and infrastructure development among others. These economic activities are responsible for widespread environmental degradation and pollution. For instance, the agriculture sector is responsible for 90% of all water abstraction. Thus, the sector is the chief contributor to groundwater depletion. In addition, the agriculture sector adds significantly to the pollution of both surface and groundwater, due to intensive and reckless use of pesticides and fertilizers. There is widespread rangeland and mangrove degradation from overstocking and overgrazing. The marine ecosystem has not been exempted from unsustainable use and degradation. There is overexploitation of fishery resources and reportedly the coral reefs have been destroyed by destructive fishing methods. Economic activities in the country lead to natural capital stock depreciation which will manifest in decline in production/output levels, household income and widespread poverty levels at the rural settings. The following sections present underlying causes of biodiversity loss.

#### **3.1 Threatening Agriculture**

From a total land area of about 53 million hectares, only 1.6 million hectares are arable of which 93% are cultivated (CSO 2012). Yemen suffers from a limited area of stable arable lands which does not exceed 3% of the total natural area, while desertification accounts for over 54.6% of the country land. In addition to this, a continuous deterioration of arable lands by 1.8% annually was reported for the period 1999-2006. The loss of arable land is characterized by recession of agricultural and rangelands, water & soil erosion, sand dunes encroachment, desertification, terrace abandonment, loss of soil fertility, destruction of forestation areas and recession of traditional land use systems. This situation is aggravated by the pollution of the scarce land and water resource base, soil salinity and water logging, increased poverty and huge foregone economic returns, adverse social impacts and rural-urban migration, land conversion for urbanization, road construction, industrial and residential construction and weak environmental awareness of the dimensions and impacts of natural resources deterioration. The potential for further loss of agricultural land & desertification is high due to man-made environmental pressures such as drought, climate fluctuations and climate change which are adding serious concerns on the sustainable management of scarce land resources. Unsustainable agriculture is manifested by overgrazing of rangelands, over exploitation of scarce water resources, overconsumption of fauna and flora, excessive use of native genetic species & extensive wood harvesting for fuel and charcoal production. Such unsustainable management practices results in reduction of crops, fodder and livestock with continuing reliance on import to meet country needs. In addition, the distortion of agricultural macroeconomic policies and the resultant heavy subsidization of irrigation water, subsidized pricing for agrochemicals along with free or low price of irrigation water, is severely affecting land resources and contributing to unsustainable use of agriculture product.

#### **3.2 Land Use Change**

Urban encroachment is evolving at high rates contributing directly to biodiversity and ecosystems loss, particularly the loss of environmentally sensitive areas and resources such as



farm lands, forest and green cover, indigenous flora & fauna, wetlands & coastal habitats, valley beds and banks, wetlands and coastal areas. Yemen urbanization is attributed to multiple policy drivers such as unabated 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 associated with conversion of agricultural land to residential, commercial and industrial use with anticipated notable threats to the country's food security. This situation is further aggravated by severe shortages of public services such as road & transportation facilities; electricity services and poor delivery of health and other basic services in primary urban centers. Not only this, but also the increased population in urban cities causes increased domestic water consumption & demands for food, fuel and other natural resources, leading to increased solid & wastewater production and growing air pollution among others. The air pollution is attributed to excessive energy use, industrial activities, transportation and burning of solid wastes. Other wastes are related to water supply, sanitation and liquid and waste management. Records show that only 60%<sup>28</sup> of domestic waste generated is collected and that in 2000 around 86 % and 19 % of urban and rural settlement respectively had access to a sewage network.

### **3.3 Unfavorable Tourism.**

Tourism is a rapidly growing industry and Yemen coastal zones & islands are primary destination sites for tourism-based development. Meeting these tourism demands has led to disturbance of the habitats, particularly the salt marshes, lagoons, wetlands and mangroves. In addition, visitors' activities have exerted extensive direct pressures on biodiversity in the form of trampling, hunting, plant collection and waste disposal. Wastes generated by hotels are often dumped in ecologically sensitive areas and this lead to change animal behavior, particularly in the areas where waste dumps become sources for feeding animal species. The construction of tourism infrastructure combined with roads development, pollution and solid waste generation, and excessive use of water & electricity are among direct pressures contributing to unsustainable tourism management and biodiversity loss. These activities result in the pollution and erosion of estuaries, beaches, marginal sea and sensitive areas, leading to the loss of fish and wildlife habitats and depletion of their populations, social conflicts over access to reduced resources, loss of genetic resources and degradation of the recreational resources that are the basis of tourism.

Biodiversity loss due to ecotourism & recreational activities is attributed to number of indirect drivers such as inappropriate macroeconomic policy and institutional weaknesses. Drivers caused by macroeconomic policy include population growth, poverty, unsustainable production and consumption patterns, inadequate legislative framework and weak enforcement of eco-tourism legislation, particularly as regards the environmental impact assessments. Drivers caused by institutional weaknesses include inefficient management of tourist establishments and services and guest houses, lack of knowledge on eco-tourism attractions, insufficient level of professionalism and training in the tourism sector, and weak local communities and private sector participation in tourism management.

### **3.4 Wasteful Consumption & Production**

The economic sectors that impacts the country biodiversity in association with unsustainable production processes are the mining; oil and gas sector; manufacturing industry; infrastructure & road; energy production sector; urban planning sector; and tourism. The current consumption patterns adopted by various production and economic sectors is reported to be destructive and unsustainable, causing biodiversity loss and ecosystem depreciation. The main casual factors contributing to the existence of current production pattern across all production sectors are attributed to inappropriate practices, abandonment of traditional good practices,

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<sup>28</sup> Status of the Environment Report 2001, EPA

excessive use of non-green or antiquated technologies, overconsumption of raw materials as production inputs, inadequate application of recycled and recyclable products and extensive use of fossil fuel with high carbon contents.

Ecosystems & land conversion is a common practice applied by production sectors with aim to develop infrastructures such as roads, airports, seaports and water & sanitation supply needed for the development of **oil and gas** production, mining, manufacturing industry, urban encroachment and tourism. Despite the importance of these infrastructure in improving the economy, trade development and delivery of water and sanitation services, they have caused biodiversity & habitats loss along with notable reductions in agricultural land and production of crops. Over the period of 1960 to 2005, the network of paved and unpaved roads in Yemen has increased by about 71,300 km<sup>29</sup>, causing the loss of significant areas of fertile lands, wildlife and ecosystems. Similarly, a significant increase in 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. The negative effect of these infrastructures is being severe, specially where such facilities are constructed and operated without compliance with EIA, mitigation plans and adherence to environmental excellence & standards.

Under such unsustainable production growth, air pollution, solid waste & wastewater are among serious environmental pressures threatening Yemen land and biological capital. Air pollution results from energy production & use in mining, oil and gas production, manufacturing industry, transportation and urban planning sectors. In general, the energy consumption patterns in Yemen cause significant adverse environmental impacts, particularly on air quality and water resources. The continuing impacts of current energy consumption patterns is attributed to the limited use of natural gas and renewable energy along with excessive use of fuel of high carbon content in power generation across all these sectors. The transport sector, through transportation network, has an important role in supporting the national economy by facilitating the movement of people and goods. Despite its importance in national economy, the transport sector is environmentally wasteful due to intensive fuel use, along with the use of environmentally polluting of transportation modes & the resultant emission of greenhouse gases in the form of hydrocarbons, lead and the oxides of sulphur, nitrogen and carbon in addition to particulates.

**Mining and processing of industrial minerals and metals** has increased alongside fossil fuel extraction and produce large quantities of solid waste, effluent and chemical waste, causing contamination of soil, air and water; along with habitat fragmentation and conversion; deforestation, erosion and sedimentation of water wadies. In addition to environmental damage and spread of health disease due to the extraction and processing of non-renewable industrial minerals & the encroachment of infrastructure may pose an additional threats. Furthermore, oil and gas exploration and production have led to further economic and social activities, including migration, illegal settlement, agricultural conversion and infrastructure development that can cause even more harm to biodiversity through secondary impacts. More drastically, the reinjection of production waste into underground field have caused high level of contamination of ground water. Similarly, the gas flaring from oil and gas production activities have increased GHG emissions, polluting surrounding air with health hazards. The increased damage & impact of solid waste is attributed to high waste disposal under lack or antiquated waste treatment facilities, limited use of recycled and recyclable products due to lack of and limited recycling capacity .

The **extraction of mineral, oil & gas** has caused widespread ecosystem loss including habitat conversion, degradation and fragmentation through both the extraction process and the deposition of waste products. Oil and gas exploration and production often have a wide range

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<sup>29</sup> World Bank Development Indicators

of negative impacts on ecosystems, including soil, air and water contamination, habitat fragmentation and conversion, deforestation, erosion and sedimentation of wadis beaches. Furthermore, oil and gas exploration and production often stimulate migration, illegal settlement, agricultural conversion and infrastructure development, causing more harm to biodiversity.

The **Manufacturing and industry** sector is dominated by traditional industries such as food processing, textiles, tobacco, wooden products, which cause little environmental damage. However, there has been a slow shift towards the production of intermediate and capital goods, particularly chemicals, rubber, plastics, oil derivatives & metal products & non-metallic products (construction), which are known to be more polluting and hazardous to biodiversity & ecosystems. The manufacturing and industry sector has been identified as one of the most promising sectors in the countries alongside tourism and agriculture. In 2011, the sector contribution to GDP was estimated at 23.8, while its contribution to the country export was estimated at 15.3 %. The sector is however hazardous to the soil, destructive to agricultural land and polluting to the atmosphere. These impacts are due to use of antiquated technology associated with increased use of fossil fuel and lack of waste handling and disposal mechanisms (especially for hazardous wastes); and lack of mitigation plans to minimize adverse impacts on biodiversity and ecosystems. Furthermore, biodiversity concerns and its economic values are not considered in industrial management & policies, and this is clearly marked by a low political will towards sustainable production by business community which is ultimately reflected in the prevailing destructive, polluting & hazardous production modes, non-compliance with EIA, air quality and waste management standards. This situation is further deprived by harmful policies subsidizing over consumption of ecosystems services associated with ineffective government capacity to monitor industrial pollution, hazards & waste & to enforce environmental excellence & standards.

### 3.5 Increased Natural and Anthropogenic Risks

#### 3.5.1 Climate Change

Yemen's ecosystems are already experiencing degradation due to over-exploitation, and climate change impacts. In association to climate change, the country is already suffering from recurrent drought, rain flood, land erosion among other disastrous risks . Extreme weather and climate events such as flash floods and droughts are frequently occurring displacing thousands of people, causing loss of life and significant damage to assets and livelihoods. In 2008, the floods killed 180 people, displaced 10,000 and caused damage and losses to infrastructure, shelter, and livelihoods estimated at US\$1,638 million equivalent to 6 percent of Yemen's GDP<sup>30</sup> with agriculture accounting for nearly 64% of the total losses. Increased climate variability may induce heavy economic losses and spikes in food security and hunger (for example it is estimated that the 2008 flood caused an immediate 15% increase in food insecurity of affected farmers<sup>31</sup>). As Yemen exhibits a high level of food import dependency, much of this reduction in household welfare is due to projected global food price increases resulting from global climate impacts.

Similarly, all Yemen regions suffer from the risk of lengthy **droughts** even though only 2.6% of the country is arable. A serious drought occurred during 1962–1970 and had lasting social and economic consequences. More recently a severe drought was reported to have caused

<sup>30</sup> Government of Yemen (2009). Damage, Loss and Needs Assessment, October 2008 Tropical Storm and Floods, Hadramout and Al-Mahara, Republic of Yemen. Joint Assessment of the Government of Yemen, World Bank, UNISDR and IFRC, supported by GFDRR.

<sup>31</sup> IFPRI (2011). Climate Change and Floods in Yemen: Impacts on Food Security and Options for Adaptation. IFPRI Discussion Paper 01139, Development Strategy and Governance Division.

displacement of thousands of residents in Al Mahwit Governorate.

The international disaster database EM-DAT<sup>32</sup> indicates that landslides hit populated areas of Yemen at least once every four years, with normally very small areas affected & negligible impacts on national economic activities including agriculture. Landslides do however lead to substantial death tolls (for example the 2009 event resulted in 65 deaths, according to EM-DAT). Yemen experiences on average 1 to 5 Dust Storms with visibility of less than 1 km per year<sup>33</sup>. Impacts include erosion of farm land (removing organic matter and nutrient-rich light particles); reduced visibility and high winds disrupting air and land transport, construction, tourism and trade; abrasion of surfaces; and health impacts such as respiratory and cardiovascular diseases<sup>34</sup>.

Under anticipated climate change, extreme weather and climate events are likely to be triggered causing severe impacts on Yemen ecosystems, namely the cultivated systems, marine and aquatic ecosystems with subsequent reduction in ecosystems yields and services<sup>35</sup>.

As concluded by agriculture vulnerability studies, the agriculture sector will be highly impacted and vulnerable to climate changes due to frequent occurrence of drought, flood rains, temperature fluctuation, and changes in precipitation patterns leading to degradation of agricultural lands, soils and terraces, desertification, soil fertility, reduced crop varieties and affecting agricultural income generating activities for local communities specifically and the whole country in general, and consequently, instability of food production levels, loss of soil fertility, landslides, dust storms and sand dunes encroachment. Climate change being associated with increased rain flood, the magnitude of water erosion is anticipated to wash away fertile soil and soil nutrients, causing decline in agriculture productivity and degradation of rangelands. Similarly, the terraces as innovative man-made ecosystems to manage and control water runoff & soil erosion will also be washed away due to anticipated flash floods. Terrace degradation is expected to further increase under current lack of terrace maintenance combined with the abandonment of traditional water-harvesting systems and retardation of the traditional sustainable farming methods. The current government's policy also drives terrace loss and this is reflected in its policy of subsidizing import of grain rather than producing it locally. In addition, the government failure in curbing poverty levels has left the majority of rural population entirely reliant on fuelwood as a source of household income and energy, leading to deforestation and overgrazing.

Of major potential impacts on coastal & marine ecosystems and services is the accelerated Sea Level Rise (SLR) with the subsequent loss of properties, infrastructure and port facilities in coastal areas. Coastal communities currently vulnerable to coastal erosion and storm related flood and/or surge impact would be at highest risk. As projected by SLR scenarios, the projected impacts of SLR in the Aden Governorate will be 43 km<sup>2</sup> of the area inundated, impacting about 100,000 people and the economic costs could be approximately USD 2 billion in today value<sup>36</sup>. Other impacts of SLR based on the 3.3 mm/year are the erosion of sandy shores, inundation of the low land, destruction of coastal critical habitats, saltwater intrusion to both surface and ground water, and increases of flooding events<sup>37</sup>. It is projected

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<sup>32</sup> EM-DAT: The OFDA/CRED International Disaster Database – [www.emdat.be](http://www.emdat.be), Université Catholique de Louvain, Brussels (Belgium).

<sup>33</sup> Middleton, N. J. (1986). A Geography of Dust Storms in South-West Asia. *Journal of Climatology*, 6: 183–196.

<sup>34</sup> Prof. William Sprigg, personal communication

<sup>35</sup> V&A studies developed under National Adaptation Programme of Action (NAPA, 2009)

<sup>36</sup> UNDP, 2013.

<sup>37</sup> UNDP, 2013.

that the SLR scenarios of 33 and 60 cm will result in 48 hectares and 86 hectares of sandy shore erodes respectively (UNDP 2012). The projected SLR has led to Aden being listed among the top 20 cities in the world where most people will be at the greatest risk from sea level rise and storm surges in the developing world (Dasgupta *et al.*, 2009). Further, SLR will inundate mangroves and their possible response will be a shift or migration to shallow water, hence replacing the existing mangrove habitats which imply the loss of breeding and spawning ground for juvenile fish, fish population with the subsequent decline in household income and country's GDP. Climate change also 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) & most of the coastal zone are considered sensitive to the indicated accelerated SLR projections. Under the lack of adaptive capacity & inadequate protective measures, the degree of coastal ecosystems sensitivity and exposure to climate change would be more severe causing threats to local communities livelihood, damage to homes assets and properties; impairing services such as water supply and quality; damage to plantations and crops; coastal erosion and flooding of low-lying areas. Loss of coastal ecosystems, deterioration of wetlands, coastal mangrove loss and intrusion of seawater into coastal groundwater; saline water intrusion is also expected to increase. Additional impacts of climate change is attributed to increased concentration of carbon dioxide (CO<sub>2</sub>) in the atmospheric, leading to increase in CO<sub>2</sub> absorption & acidification of the oceans. This process has significant impacts on the coral reefs structures and formation and thus affects the marine ecosystem productivity due to the central role played by the coral reefs.

Another highly probable disastrous impact of SLR is intrusion of seawater into freshwater bodies (both surface and groundwater). This results in salinity of the freshwater in the country. As highlighted, Yemen is a water-stressed country, climate change could compound the situation to a catastrophic state. This impact is highlighted by Nicholls *et al.*, (2007) with high degree of certainty. In addition water V&A studies show that rainfall level may decrease over much of Yemen territories, the timing of rainfall, the intensity of individual storms, and the onset of rainfall seasons may all change, causing decrease and shift in rainfall pattern & distribution with anticipated increased water scarcity and reduction in water quality supply, leading to increased hardship on rural livelihoods.

A lack of long-term, systematic records of rainfall and temperature severely hampers efforts to quantify long-term changes in climate, assess renewable natural resources such as water, prepare climate projections, and develop adequate policies and programs. In addition, institutional weaknesses undermine the state's ability to withstand against and manage the anticipated occurrence of natural disasters.

Under weak adaptive & protective capacity, it is unlikely for Yemen to build up adequate climate change resilience unless sufficient efforts are devoted to address causal drivers responsible for weak adaptive & inadequate protective capacity. Key casual factors behind weak community resilience against anticipated climate change impacts include: absence of an institutional structure aimed at integrating climate change issues into national plans, lacks of a plan for restoring and safeguarding ecosystems that provides essential service, lack of national and adaptation plans for climate change, limited public awareness on biodiversity issues, among other things.

### **3.5.2 Spread of invasive alien species**

Invasive plants or animals, as non-native species, are spreading rapidly in Yemen ecosystems threatening the vitality of ecosystems and ultimately contributing to the loss of native species particularly those of importance for food supplies. Unfortunately, the extent and number of non-native, exotic species are not precisely studied, resulting in difficulties in understanding and controlling the impacts of introduction of invasive species.

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. Crops such as wheat, lentil and millet are examples of local varieties whose yield and quality are deteriorating as a result of introducing homogenous high yielding varieties. Similarly, the introduction of alien genera of honeybee has resulted in reduction of the Yemeni honeybee race *Apis mellifera jemenitica* as a result of spreading of the Varroa mite pest.

**Plate 1: Spread of Alien invasive (*Opuntia dillenii*) in Bura'a national park**



Such undesirable introduction has had major environment and economic impacts. Recent examples include citrus nurseries, which introduced diseases, and the armyworm.

Some other alien invasive have also caused widespread distortion of eco-systems particularly when introduced under weak environmental set up and control system of their potential impacts. One good example are the spread of *Opuntia dillenii* in Bura'a national park, and the wide range spread of the species of the mesquites plants known as *Prosopis juliflora* in Hadarmout province. This later one was intentionally introduced into in Hadarmout four decades ago as a planting scheme along roads, farms and public garden and have invaded many agricultural lands, irrigation canals, drainages lines and downstream beaches of wadies. However, when introduced to Say'un and Tarim areas under appropriate environmental control system of unwanted weedy comportment, *P. juliflora* have been found of great importance to community there, providing them with substantial quantities of wood, firewood, charcoal and animal fodder. In short, undesirable introduction has had adverse environmental and economic impacts over the past decade and thus control of alien harmful species is necessary to conserve biodiversity and to halt further destruction of ecosystems. Key drivers contributing to the spread of alien invasive include inter alia, weak organizational capacity to evaluate and manage the invasive alien species, absence of specialized body to monitor introduction of invasive alien species, limited quarantine capacity to control intrusion of invasive alien species and lack of legislative framework to control the introduction of alien species, including the lack of curative and corrective measures.

### 3.5.3 Ecosystem Contamination

The volume of solid, liquid and gaseous waste generation including hazardous waste increases rapidly as a direct result of increased population and rapid growth in development sectors, particularly in industry; oil exploration, road transportation; fishing; tourism; and agriculture. Under current improper waste management (wastewaters, solid waste and hazardous wastes), arable land, marine & aquatic ecosystems are being increasingly contaminated, leading to the reduction in eco-systems productivity and hence the delivery of their services.

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. High population results in high production of liquid waste from domestic and commercial sectors, particularly under the absence of water quality monitoring, groundwater monitoring, and monitoring of disposal of sewage and untreated wastewater into water-ecosystems under lack of national water quality standards & and wastewater.

Inappropriate agricultural practices in the forms of excessive use of agro-chemicals, pesticides, insecticides, fertilizers and fruit ripening agent associated with dumping of solid and liquid medical wastes & untreated wastewater into agricultural land may have detrimental side-effects on soils, water, plants, animals and people. The underlying factors are the legal framework; specifically, the policy on agricultural subsidies has resulted in fertilizers becoming affordable to farmers and being used inefficiently. According to UNDP (2006), intensive use of fertilizers and pesticides in the rural areas and the waste from urban areas have resulted in water pollution.

Dumping of raw and partially treated wastewater from agriculture, industry and municipalities in water courses has caused outbreaks of diseases such as cholera, bacterial dysentery, infectious hepatitis, salmonellosis, and typhoid. Contamination of the underlying shallow aquifers with nitrates is also evident in many areas, thus causing serious health hazards. High nitrate content in drinking water and vegetables and the accumulation of heavy metals in food crops can be serious threats to human health. Fertilizers carried by run-off from agricultural lands contribute significantly to the eutrophication of freshwater systems. Residues containing fertilizers and waste from livestock and poultry farms may also contaminate soil and water. Other wastes are caused by discharge of untreated wastewater to underground aquifer, dumping of solid and liquid medical wastes in the water courses of Wadies. In addition, underground water in coastal areas are contaminated primarily by high salinity caused by sea-water intrusion and the water courses of Wadies are contaminated by high total content of suspended solids.

Land pollution due to misuse of pesticides, overuse of chemical fertilizers is likely to result in the decline of soil fertility and nutrients, thus reducing agriculture productivity, worsening agro-economy and threatening the major economic activities responsible for these environmental impacts (i.e. both crop and livestock production).

Similarly, coastal and marine habitats are contaminated from land based sources such as agrochemicals wash and discharge of untreated domestic and industrial wastes and from marine based sources such as oil spills and discharge of wastes from ships passing through the Red Sea and the Gulf of Aden. Other causes of marine pollution are mainly from the domestic and industrial sectors (untreated waste water), as well as plants (desalination, power, and industrial). Thus, the drivers for pollution are population and corresponding growth which accelerate the rate of waste water production. In addition, underlying causes are the absence of a legal framework regulating wastewater quality and monitoring of pollutants quality.

### **3.5.4 Increased GHG Emissions**

Yemen is not an industrialized country, so industrial activities do not contribute much to GHG emissions. However, significant quantities of air pollutants are released annually into the atmosphere in the form of GHG emission, causing a serious health issue in urban & rural areas. As per the latest national GHG inventory<sup>38</sup>, energy related emissions are the most dominant, contributing 69.3 % to total national GHG emissions. The remaining 30.7 % is generated by non-energy sectors; namely the agriculture process, waste production and industrial processes at a share of 23.1%, 4.7 % and 2.9 % respectively. Of the total GHG emissions share (69.3 %) released by the energy sector, the majority of emissions results from fossil fuel consumption for power generation, transportation, and other sectors at a share of 19.3%, 19.2% and 16.6% respectively. These emissions are mainly due to consumption of LPG, Kerosene and diesel in residential, commercial and agriculture sectors at a share of 8%, 3% and 6% respectively. To sum up, it can be said that transportation, power generation,

<sup>38</sup> National GHG inventory for the republic of Yemen, EPA, 2000

residential, commercial and agriculture are the most driving sectors contributing to GHG emissions in Yemen with negative impacts on human well-being, health and ecosystems. As stipulated by the 2<sup>nd</sup> National Communication report, GHG emissions in Yemen are mainly the results of extensive use of high carbon content fuels as well as the use of environmentally inefficient & antiquated technologies in power generation, transport, household, and industry. This situation is further deprived by inadequate conducive institutional arrangements to handle mitigation options and lack of funds to facilitating the transfer of cleaner technology as well as low-waste and no-waste technologies. Under such hindering constraints, the trend in GHG emissions from various sectors is expected to rise significantly in association with anticipated socio-economic development and the continuing hindering circumstances. In its efforts to alleviate GHG emissions, the country is being implementing a number of mitigation interventions such as the promotion of LPG in replacement of Biomass energy in rural areas, shifting towards natural gas in transportation and energy production, promotion of solar energy for households use, among others. Although CDM institutional setup up is already operational and though the shift towards these alternatives provide the country substantial CDM finance potentials, none of these opportunities has been oriented to benefit from CDM potential nor from other climate funding sources. Inability to access and mobilize financial resources from international and national donor agencies is attributed to many reasons, including political unrest, security situation, associated with low national absorption capacities under the absence of National Climate Funds (NCFs) and designated national entity responsible for mobilizing and administrating climate change polices and strategies. This shortage is in turn reflected in the absence of a national low-emission long-term strategy and the lack of nationally appropriate mitigation actions (NAMAs) to reduce GHG emissions from various sectors.

## **IV Indirect Drivers Accelerating Biodiversity & Ecosystems Loss**

### **4.1 Policy and Economic Failures**

Generally, biodiversity conservation, sustainability principles & biodiversity values are not adequately mainstreamed into the national/sectoral, local plans & development policies. Further, policy development responsibilities are fragmented among several highly centralized agencies with no role or weak involvement of the private sector, women groups, local community, and NGOs in planning and management of biodiversity, particularly in the delivery of ecosystems services. Above all, most of the ecosystem values such as value of energy from fuel wood, the medicinal values of forests, pollinators, etc. are not accounted for when estimating GDP.

Under-valuation of goods and services delivered by the country's eco-systems resulted into a number of inappropriate harmful policies in various sectors. For instance, agricultural policies provide subsidies for fertilizers which encourage their excessive use, leading to their accumulation in waterways and subsequent eutrophication and degradation of aquatic ecosystems. Similarly, under-valuation of goods and services delivered by water eco-systems resulted into a number of inappropriate harmful water policies that are reflected by the exclusion of water resources form national accounts, low government investment in the protection of water resources, low water tariffs of water supply for both irrigation and domestic purpose and provision of incentives for unsustainable water use, particularly for qat irrigation. Other policy drivers include the absence of nationally accepted and legally protected water rights, inequity in the ownership of flood water, under-valuation of goods and services delivered by water eco-systems, and illegal water harvesting due to wrong perceptions about ownership of underground water and water wells. In this context, it is worth noting that underground water and water wells are not common property and are illegally owned by local farmers, resulting in loss of state control over ground water use due to excessive pumping. On top of such inappropriate policies, there remains a number of



constraints that hinder the sustainable use of water resources and encourage unsustainable production and consumption patterns of underground water. These include the high population growth and density, accelerating poverty especially in rural areas, uneven population distribution compared with water availability and increased migration from rural areas due to a lack of job opportunities. In the forest and rangeland sectors, inappropriate policy is clearly manifested by an under-valuation of goods and services delivered by forest ecosystem combined with unenforced forestry law & by-laws for the control of alien invasive and lack of regulatory framework on safe distribution and use of pesticides. This situation is further deprived by high population growth and density, increased poverty, land tenure dispute and retardation of traditional values, lack of rangelands legislations and lack of sustainable strategies and plans for forest management.

Finally, the fishery sector is characterized by inadequate policies and plans protecting marine ecosystems, dysfunctional law & by-law regulating fish harvesting, absence of rehabilitation & restoration plans for threatened species/ vulnerable ecosystems, lack of fisheries management plans and poor knowledge & awareness on the value of marine ecosystem & its goods and services along with the subsequent lack of social responsibility towards the conservation and sustainable use of depleting marine resources. Yemen urbanization stress is attributed to multiple policy drivers such as unabated 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 associated with conversion of agricultural land to residential, commercial and industrial use with anticipated notable threat to country food security.

Beside the above mentioned policy deficiencies, Yemen legislations are being evolved in a similar fragmented manner, leading to overlapping and conflicting legislation, rules and regulations associated with fragmented and uncoordinated management of biological resources. This status is further deprived by incomplete by-laws for existing legislation including: the water law, the forest law, the land tenure law, agricultural land holdings registration, the fertilizers and fodder law, the plant pest and disease law and handling of pesticides law.

#### **4.2 Widespread Poverty**

Ranked 160 out of 184 countries in the Human Development Index for 2012, Yemen is one of the poorest countries in the Arab region facing multiple challenges. Unemployment among the 15 - 24 age group is 53% of the labour force. Poverty ratio increased from 34.8% in 2006 to 37.7% in 2008 and 42.8% in 2009. Consequently, 46.6 % of the population is living with less than \$2 a day and most of the disproportionately affected poor groups include women, small scale framers and sharecroppers, landless labor, nomadic herders and artisanal fishermen who are spread over 133,000 small rural settlements.

Poverty is fast growing among vulnerable groups, in particular among women, youth and children, small farmers, landless people, nomadic herders and artisanal fishers. Poverty across all of these groups is vastly occurring due to a shrinking access to resource base such as fertile land and water resources combined with limited access to essential services, particularly to healthcare & education services.

Under the current water management system, the distribution of water is inequitable and this is clearly demonstrated in the government official statistics of 2008, which shows that about 81% of urban population have access to safe drinking water compared with 21 % of rural population. The disparity in water supply among urban and rural areas is being reported to be the result of limited public funding for rural water supply, inequity in the ownership of flood water among upstream and downstream of watershed, absence of nationally accepted and legally protected water rights and the continuing provision of Government subsidized lift-pump credit for irrigation, particularly for powerful individuals. The subsidized lift-pump

credit for irrigation has enabled powerful individuals to access modern drilling and pumping equipment & to capture the bulk of available water resources for irrigating their farms, while the vast majority of rural poor have not been able to access such credit system nor to secure adequate water for survival of their animals and their livelihood. Indeed the continuing provision of subsidized lift-pump credit for irrigation have served to concentrate control of access to water amongst richer farm households, leading to inequitable distribution of water entitlements which may have exacerbated land-holding inequalities.

Similarly, the accessibility of poor people to land resources is more difficult, and this is partly because of the absence of fair land tenure regulation, and partly due to unfair land endowment policy for Wakf land. Under such policy distortion, higher-income people can easily access Wakf and trust lands against no cost or for low cost at best, while the rural poor particularly the women and youth are rarely able to access the public lands.

Beside their inability to access basic natural resource, poor communities are not adequately able to access education and healthcare services as well as water and sanitation services. The provision of education and healthcare services across rural and urban areas remain inadequate & unevenly distributed with severe shortage of health infrastructure and severe lack of schools in rural communities. Additionally, other areas of service provision such as water and sanitation facilities are also lacking, with 52 per cent of the population in 2008 still without access to an improved water source according to the MDG Report, 2010. Inability to access education, healthcare, water and sanitation services in rural areas is attributed to limited public spending associated with a highly centralized policy by which the basic services are developed & provided. Under such centralized planning and management of basic services, central authorities are fully responsible for planning local development needs, and local councils are poorly involved in designing, identifying and implementing local development projects and programmes. Exclusion of local community in planning and management of basic services generally widens rural –urban disparities and contributes significantly in depriving rural communities of basic services, income and job opportunities forcing them to immigrate to neighboring gulf countries and to Yemen major cities in search for food and better livelihoods. The massive rural- urban migration has in turn led to large-scale abandonment of fertile agricultural land in rural areas, the rapid conversion of fertile agricultural land to residential, commercial and industrial use in urban areas and the subsequent food insecurity. In addition, population have grown in major cities up-to levels that exceed their absorptive capacities to deliver basic services causing multiple crises in transportation and road systems, waste disposal, water supply systems, sanitation, health and other basic services.

Beside imbalanced financing of social services projects across rural and urban areas, current centralized procurement procedures applied for construction of basic social infrastructures and services further widen the gap in provision of basic services between rural and urban areas. The continuing use of centralized procurement policy is cited to be responsible for the lack of good governance associated with corruption. Under current procurement policy, accountability, transparency and due diligences are questionable, and thus allocated funds for rural development projects are not disbursed for their intended purposes, but rather go to influential Sheikhs. Other serious impacts of current decentralized procurement policy include high implementation cost & or no- implementation of rural development projects; causing rural people deprivation of basic service.

Beside their inability to access basic resource and essential services, poor communities are rarely able to access pro-poor financial assistance such as welfare support and the Islamic Zakat, nor to access public employment opportunities and micro financing credits.

Inability to access financial assistance available under the social welfare fund is referred to several structural barriers, including the limited government allocation for social welfare fund combined with weak governance attributable to centralized management of welfare

scheme; limited law enforcement; and widespread corruption in the central government/agencies managing the welfare scheme. Within such unfavorable climate, current total Government allocation for the social welfare fund is inadequate, not exceeding 1% of GDP, and part of which goes to influential citizens. Under such an inadequate use of the social welfare fund, a beneficiary representing one-member household could receive an amount of YR 21 a day, compared with a payment of YR 8 a day for a five-member household and both level of payments are clearly below poverty line of YR 105 (1998 data). Government support inadequacy is further deprived by the widespread corruption which is reflected in favoritism, injustice and unfair distribution of the financial resources of the social welfare fund. This later is being widely observed by illegally re-direction of significant amounts of the fund in favor of influential people -Sheikhs, ministers and army leaders-, though the fund is claimed to be established for the benefit of poor people. Similarly, the Islamic Zakat which has been primarily founded to alleviate poverty among poor people pursuant to the holy Quran principles, is being misused and managed and this is mainly the result of growing role of political parties in the collection, distribution and management of the Zakat resources in replacement of or in addition to government agencies. This dual system in the management of the Zakat opens the way for the spread of corruption, favoritism, injustice and subsequent depriving the poor of Zakat resources in violation of the Islamic rule governing the provision of the Zakat system. Under such overlapping roles, political parties and government agencies, apply their own rule in providing the Zakat, leading to notable loss of the Zakat resources owing to conflicting objectives & interest of both side involved in the management of the Zakat. In short, this management pattern is being found unfair as it impedes the poor people from accessing the Zakat resources, while at the same time enabling political parties to access these financial resources for their own individual benefit, including the benefit of higher-income people, leading to damage of political parties and increased vertical disparity between poor & rich people.

Inability to access employment opportunities is attributed to low levels of skill among the poor and lack of governance in civil services administration, which is largely manifested by widespread of corruption, favoritism and injustice while selecting civil servants. Under such unfavorable condition, Yemeni poor, especially women and youth, are not equally able to access jobs created under civil service administration unless they are members of the ruling party or parties. Indeed, the ruling party/parties retains full control over recruitment & redirect it for the benefit of the party without applying any qualification criteria or considering development needs. Such an employment policy has been cited to be the single most important driver of social exclusion & marginalization not only among the poor but also across the whole society, especially those people who are members of opposition. Indeed, this recruitment policy has forced a total of 80,000 to 100,000 former PDRY civil servants and military personnel to take early retirement on inadequate pensions (Common country assessment report for RoY, 2011). It further has been cited to be responsible for the huge increase in the wage bill to meet the salaries of thousands of ghost employees in government institutions and army over the past 2 decades.

Several constraints have been cited to limit the ability of people living in poverty to access financing opportunities provided by government banking systems in the form of loans or by development funds in the form of direct economic supports, such as productive inputs, material and machineries among other. In Yemen there are several financing opportunities that might be productively employed to create jobs and alleviate poverty of farmers & fishermen communities and to tackle the economic and social crises facing the country if available resources are appropriately & fairly managed. Unfortunately, the bulk of Government investment injected in the Agricultural and Cooperative Credit Bank (CACB) over the past 2 decades have been illegally re-channeled to go to influential people with little money left for eligible poor like women, landless labor, nomadic herders and artisanal

fishermen. In addition, the Bank is no longer offering credits to the poor & small entrepreneurs at affordable interest rates but rather changed its supportive laws and administrative measures to become a commercial bank serving large entrepreneurs and influential people against low interest rate and without documented guarantee to recover the loans provided. As per IMF, 2001, (p. 54), the bank provides short-term credits to farmers against high interest rates – up to 15 percentage points above the commercial lending banks. Further, the bank has limited impact on poor farmers with only 2200 farmers provided with credit in 2003 and there is favoritism and injustice in distribution of loans to applicants CCA. Not only this, but also investment availability for agriculture credit has decreased to US\$ 30/ha, which is far below neighboring countries of Egypt or Jordan.

Finally, allocations available under existing development funds such as social development fund, heritage & cultural development, tourism promotion, agriculture and fisheries promotion and youth sport Funds are poorly managed & unevenly utilized across the Yemeni society and geographic regions, causing disparity across rural-urban areas. Specific evidence of this context can be seen in the bulk of money transferred by development funds to specific geographic regions to force citizens change their attitudes & choice while voting in parliamentary & local council elections.

#### **4.3 Institutional and Social Weaknesses**

Biodiversity planning & management is reported to be ineffective, and this is attributable to multiple casual drivers that influence the performance of national agencies at systemic, institutional and individual levels. Key drivers contributing to institutional weakness of biodiversity management at system level include lack of good governance under tight centralization management triggered by out-dated laws, inadequate law enforcement, inadequate government funding of conservation projects and incomplete legal frameworks for promoting decentralization & local community involvement. Of these drivers inadequate public funding of biodiversity conservation strategies and low public awareness of biodiversity values and issues have been cited as the most predominant drivers provoking institutional weakness. Low government funding limits the country capacity to expand protected areas (PA) to cover all terrestrial and marine ecosystems, and results in insufficient staffing for PAs and inadequacy of local management plans for protected areas & regional water basins associated with limited financial resources for effective implementation of management plans of declared protected areas.

Legislation weakness across all environmental sectors is attributable to out-dated laws and inappropriate legal frameworks including weak law enforcement and incomplete by-laws for existing laws such as: water law, the forest law, the land tenure law, agricultural land holdings registration, the fertilizers and fodder law, the plant pest and disease law and the handling of pesticides law.

At the institutional level, constraints are due to inappropriate institutional setup for biodiversity conservation and this is attributed to overlapping & duplicated mandates among environmental agencies, weak inter-institutional coordination among environmental partners, inadequate legal frameworks for environmental agencies and limited public & local community participation in biodiversity planning & management of nature reserves & water basins. Excluding local community in planning and managing natural resources results in

ignorance of local people needs, leading to negative attitude towards environmental protection initiatives and hence to failure in attaining the objectives of biodiversity protection. This in turn increases poverty level among poor causing excessive pressure on natural resources.

In order to reduce the widespread detrimental effects of centralization, the Government decreed, in February 2000, Local Authority Law No.4 with aim to shift to decentralization in planning, management and execution of local development programs, including, delivery of social sector services at the district level. Despite progress made in the decentralization process, there are number of root causes hindering smooth transfer of responsibilities to the local levels and hence the enactment of Local Authority Law No.4. These include inadequate capacities of Elected District Local Councils and Line-GoY district local offices to plan and manage natural resources as well as the development and management of basic services. Such an inadequacy is further impeded by poor material assets, limited human & financial resources and the lack of database system for developing and implementing district development plans and community-driven plans. Poor planning capacity at both central and local levels is further attributable to the lack of appropriate databases on natural resources associated with scattered and incomplete data, limited availability and weak access to data, insufficient monitoring systems and networks for data collection, insufficient funds and shortage of skilled personnel specialized in data management. In addition, the current highly centralized databases system is inaccessible to district communities and thus the district executive offices & district local councils remain incapable of technically co-planning, managing, coordinating, directing and monitoring district development plans, particularly with regard to: natural resource management, service delivery, projects development and budgeting. The central database system not only is inaccessible for planning at local level but also costly and unreliable for planning and decision making even at central level. Costly and unreliable database system is due to lack of proper mechanism for regular and timely update of input information of the database. Input information uploaded into the system are estimated from surveys, census and reports that are commonly developed and updated every 5 to 10 years, which makes the database unreliable for effective planning and decision-making.

Low public awareness of biodiversity values and issues hampers the effective planning of Natural resources, and also weakens social responsibility towards the conservation and sustainable use of natural resources. Poor public awareness is mainly due to lack of awareness and communication strategy combined with weak capacity of the designated environmental communication body at EPA as regard production and dissemination of environmental information and awareness products. The EPA communication units lack the technology and facilities needed for production and dissemination of environmental information and awareness materials. Further the designated staff of the unit lack the capacity for effective operation and maintenance of the communication units, namely as regard data acquisition, processing, and production and dissemination of awareness materials. This situation is aggravated by inadequate integration of biodiversity issues into formal education programs and curricula, which in turn limits public appreciation of biodiversity importance. Despondently, media men are not adequately furnished to access biodiversity information owing to the lack of communication and networking technologies.

Also research institutions have inadequate capacity to produce informative research because of the lack of know-how, practices and technologies to undertake such responsibilities. Inadequate capacity of the research centers to produce informative research is mainly attributed to lack of reliable information base and skilled expertise combined with the low financial capacity to access and transfer technologies, particularly with regards to new techs on monitoring environmental changes. Inability of research institutions to produce purposeful research about status and trends of biodiversity and ecosystems loss generally results in poor understanding of biodiversity issues among policy makers and hence leading to difficulties to produce sound conservation strategies that keep natural resources use within the limits of each respective resource. At the individual level, capacity constraints are due to inadequate expertise in various biodiversity areas along with weak individual capacities to manage PA & local water basins, wetlands and rangelands.

## V. National Biodiversity Strategy & Action Plan

### 5.1 Guiding principles

The NBSAP adopts a framework that places the Yemeni people and nature at the center of the government concern in the development process. Thus the components of the NBSAP2 have been developed based on the following sustainable development principles: a) striving to maintain the integrity of Yemen's land and marine resources and their biotic wealth; b) respect for the intrinsic value of all forms of life; c) promote equitable access and distribution of resources; d) pursuit of collaborative participatory and inclusive approaches in management biodiversity management; and e) respect the carrying capacity of biological resources while managing natural resources

### 5.2 The vision, mission & Goals

The NBSAP2 addresses the most pressing issues contributing to biodiversity and ecosystems depreciation, focusing broadly on underlying causes of biodiversity loss, overconsumption of biological resource, anthropogenic pressures contributing to biodiversity loss, including the loss of ecosystem services under inadequate protection & conservation, policy distortion & institutional weakness. To this end, the NBSAP2 vision is **“achieving a resilient, productive and sustainable socio- ecosystem by 2050”**. This vision is translated into a **mission focused on halting overall biodiversity loss and to maintaining healthy, productive & functional ecosystems based on establishing coherent & resilient ecological networks supported by restructured policies & adequately mandated and empowered local communities & institutions for sustainable and equitable use of natural capitals of importance to human well-being and economic prosperity.**

Yemen's vision is split into five strategic goals, outlining national outcomes concerned with the following national priority areas: 1) biodiversity and ecosystems conservation (Outcome 1), 2) sustainable use of natural resource (Outcome 2), 3) reduction of natural & anthropogenic pressures contributing to biodiversity & ecosystem loss (Outcome 3), 4) biodiversity & poverty mainstreaming into sectorial development plans (Outcome 4), and 5) promoting good governance in biodiversity management (Outcome 5). Next section titled “framework of actions” presents more details on the overall national outcomes of NBSAP2 with description of their respective strategic goals articulated in 20 country-driven outputs, whereas each individual output entails more focused objective that is achievable at specific sectoral level, and delineating its corresponding national target, strategic actions to achieve the target, estimated potential cost to implement designated action, indicators to evaluate state of achievement, lead agency and support partners.

### 5.3 Framework of Actions

The five national outcomes or priority areas are designed to be results oriented, and thus they are further elaborated in 20 national targets which are specific, measurable, achievable and time-bound. Each national biodiversity target is aligned to specific global Aichi Target, and at the same time addresses the following nationally driven priorities: expansion of protected areas coverage (Output 1.1), conservation of rare and endangered species (Output 1.2), conservation of genetic resources and Biosafety (Output 1.3), sustainable use of forest forests and rangelands (Output 2.1), sustainable agriculture (Output 2.2), sustainable management of marine living resource (Output 2.3), restoration and safeguarding aquatic ecosystems, delivering fresh water, strengthening socio-ecosystems resilience against climate and other natural disasters (Output 3.1), control of invasive alien species (Output 3.2), mitigating GHG emission (Output 3.3), strengthening preparedness against anthropogenic waste & hazards (Output 3.4), reform of environmental policy distortions (Output 4.1), poverty mainstreaming (Output 4.2), promotion of green technology (Output 4.3), promoting integrated planning in land resources management (Output 4.4), and sustainable tourism (Output 4.5), institutional restructuring (Output 5.1) and improvement of Public awareness, research and knowledge sharing (Output 5.2). In other word, the overall designated outputs are selected to be consistent with national priorities and objectives, and thus accounting for economic and social development and poverty eradication issues as they are the first and overriding priorities. Further, it incorporates the conservation and sustainable use of biodiversity and the climate change issues into the NBSAP2, particularly into agriculture, water, land, fisheries and tourism areas.

#### 5.3.1: Biodiversity and Ecosystems Conservation (Outcome 1)

This outcome aims at conserving, restoring and maintaining the integrity of Yemen's ecosystems by maintaining an adequate network of protected areas, restoring degraded ecosystems, conservation and rehabilitation of key endangered species, ex-situ conservation of rare and endangered plants species and genetic resources. This outcome is translated, in the action plan, into a number of specific policy measures and instruments, clustered under 3 outputs, respectively oriented towards expansion of protected areas coverage (output 1.1), conservation of rare and endangered species (output 1.2), conservation of genetic resources and Biosafety (output 1.3). Scope & contents of these output, including their objectives, area described in the following four sections.

##### 5.3.1.1: Expansion of Protected Areas Coverage (Output 1.1)

This output of the action plan seeks to protect, recover and restore coastal, marine and terrestrial biological diversity through adequate and effective protected area networks, restoration of degraded ecosystems, and conservation of endemic and threatened species. Specific target to be achieved by end of planning period (2025) is articulated by target 1 of the action plan, which is given as follows:

**Target 1: At least 5%(by 2020) and 7% (by 2025) of terrestrial and inland water areas, and 6% (by 2020) and 12% (by 2025) of coastal and marine areas will be under protection, effectively managed by local communities, and integrated into the wider landscape and seascape.**

To meet this target, the action plan is designed to contain numerous actions and instruments, aggregated in four activity groups delineated respectively for expansion of protected area coverage, rational designation and use of land, empowerment of local community members to become active participants in PA management, and improvement of local community livelihoods.

Protection activities in the action plan are targeted to fill the gap in protected area coverage as current protection level is currently 90 % less than the committed international target. Filling the gap in protection coverage will be realized by legally declaring a more ecologically representative network of protected areas to cover 12% of Yemen territorial waters and 7% of Yemen terrestrial land. This will be accomplished by assessing the comprehensiveness, representativeness and adequacy of the current system of protected areas to verify protection gaps and to identify priority for protection, making use of recent findings on biodiversity. Complementary to this intervention, additional restoration interventions will be implemented focusing in-situ conservation of forest genetic resources and forest plantation, particularly mangrove forest along with promotion of restoration of marine ecosystem services by developing and implementing wetland and coral reefs restoration programs.

Rational use of land resources will be met through changing land-use planning modality to integrated planning approach. This approach helps to prevent, mitigate or repair excessive damage to biodiversity resulting from human activities outside protected areas based on rational designation and use of land and land-use planning. Rational land use will be met via demarcation of connectivity corridors for PAs and involving local communities in the designation of connectivity corridors and in determining the use of resources within connectivity corridors. The planning of protected areas within the broader landscapes is an important planning approach to limit habitat fragmentation & improve adaptation to climate change. This approach will be put in place via promoting integrated flood management and establishment of ecologic corridors in the form of vegetated road side & stone walls along the Wadie courses between fragmented areas and protected areas to help spreading of wild plant species. Implementation of conservation management plans for terrestrial protected areas that fully integrate the ecosystem approach into sectoral planning as well as the integrated coastal zone management plans are also vital element for promoting integrated land-use planning, see section for more actions to promote integrated land management.

Empowerment of local communities in PA management will be achieved by further promoting community-based management in the management of nature reserves to cover all protected areas, improving local community capacity in protected areas management and sustainable harvesting of the natural products available in their PAs. Capacity building of local and community actors focuses on strengthening monitoring capacity; enforcement of conservation law, policy, and practice, and planning natural resources.

Local community livelihoods will be improved by enabling them to directly and indirectly access and benefit from the goods and services delivered by Yemen's ecosystems. Direct benefits will be accessed by mainstreaming sustainable management principles in forest, rangelands, mangroves, marine, aquatic and agroforestry areas. This approach will help them access and meet most of their livelihoods needs such as fuel wood & charcoal for rural energy, fodder for livestock, timber, natural medicines, honey and food, including such as lobster, fish, genetic resources and indigenous products of cereals, fruit, vegetables, etc. Indirect benefits will be gained by including them in managing PAs and managing provision of tourism and leisure activities, which will enable them to use the revenues gained in return of these delivery services for increasing their income. Additional poverty alleviation intervention are given under output 4.3 regarding Poverty mainstreaming.

**Indicators:**

- Trends in extent of forest area
- Trends in extent of Grassland
- Trends in extent of mangroves
- Trends in extent of coral reefs



- Trends in extent of marine protected areas
- Trends in extent of terrestrial protected areas
- Extent of promotion of community-based management in PAs
- Extent of wetlands
- Extent of representative coverage of protected areas and other area based approaches, including sites of terrestrial, marine and inland water systems
- Trends in the connectivity of protected and other area based approaches integrated into land- and seascapes
- Trends in area of degraded ecosystems restored or being restored
- Trends in the delivery of ecosystem services and equitable benefits from protected areas
- Population trends of forest-dependent species in forests under restoration

#### **5.3.1.2: Conservation & protection of endemic, rare & endangered species (Output 1.2)**

This output aims at conservation, protection & rehabilitation of key endemic, rare & endangered taxa, mammal and bird species vulnerable to extinction due to climatic changes and other human related impacts associated with inadequate in situ & ex-situ conservation capacity and lack of knowledge and awareness on the on the status and number of rare and endangered plants in the country . The end intended target to be achieved by end of planning period as given in target 2 of NBSAP2 is articulated as follows: **By 2025, 50 % of endemic, rare & endangered plants, mammal and bird species will be conserved** (Aichi target 12)

This output and its corresponding target will be produced through the implementation of a wide-range of policies and instruments such as: Implementation of recovery and rehabilitation strategy and action plans for endemic and threatened species focused on conservation of rare and threatened species, resettlement of endangered species, in-situ conservation programs of key endangered flora, combined in situ and ex situ conservation programmes for key mammals & bird species and restoration programs for their habitats such as wetlands, forests, mangroves and coral reefs. Recognizing the importance of knowledge for producing feasible conservation strategy, special attention is to be given for research, mapping and surveys of endangered species; and strengthening institutional capacity for *ex-situ* conservation, including the maintenance of a data base on endemic and threatened species as well as a networking for environmental information exchange between sectors. Updating Yemen red list of rare and endangered species along with conducting vulnerability & impact study are among the most important inputs for both establishment of data base and development & implementation of recovery and rehabilitation strategy and action plans for endemic and threatened species.

- **Indicators**
- Trends in genetic diversity of cultivated plants, and farmed and domesticated animals and their wild relatives
- Trends in extinction risk of species
- Extent of production of local crops
- Trends in genetic diversity of cultivated plants
- Population trends of farmed and domesticated animals and their wild relatives

#### **5.3.1.3: Conservation of Genetic Resources and Biosafety (Output 1.3)**

This output aims to minimise genetic erosion of cultivated plants & domestic animals through improved ex-situ conservation capacity and improved biosafety management. Improvement of conservation capacity will be achieved through a number of policy measures clustered under four groups of action, respectively dealing with protection and rehabilitation of wild

and cultivated biological resources, improving knowledge and research on genetic resources, implementation of conservation rehabilitation strategies, and strengthening management capacity of genetic resources centers. Activity group 1 is concerned with the conservation of genetic resources and is delineated to protect and rehabilitate wild and cultivated biological resources (plants, animals and microorganisms) through the establishment and strengthening of genetic resources units, gene banks, seed banks, green belts, botanical gardens and public gardens. Complementary to the establishment of genetic units the activity group 2 planned under this output entails measures targeted for strengthening the management capacity of genetic resources units and these will be carried out through provision of specialized training, financial resources, equipment and facilities to genetic centers with aim to improve their capacity as regard the collection, maintenance and reintroduction of plants and animal species in ex-situ programmes. Activity group 3 entails a number of research actions designed for improve awareness about distribution & importance of genetic diversity on genetic resources, including the threat and risks on national biodiversity due to importation of LMOs, food import and and the introduction of biotechnology. Finally, activity group 4 is limited for developing and implementation of conservation rehabilitation.

As for conservation and equitable use of genetic resources, this output calls for minimising the risks incurred by importation of LMOs and the introduction of biotechnology through the setting up of regulatory and administrative frameworks for both controlling the impacts of LMOs transfer and regulating equitable use and access of genetic resources . As for controlling impacts of LMOs transfer, particular attention is geared towards strengthening the capacity of EPA safety unit through endorsing the National Biosafety by-law, developing and enforcing safety criteria and guidelines for the safe transfers and use biotechnologies, improving information exchange through periodic updates of biosafety Clearing House Mechanism (CHM), and controlling risk of importing the LMOs on wild relatives and landraces based on establish quarantine units in airports and to monitor illegal transfers of LMOs. In addition, special emphasis is given to strengthening the capacity of EPA safety unit in the field of Biotechnology and Biosafety through establishing specialized laboratories and training to the local staff and provision of adequate financial resources, equipment, expertise and facilities to both the biosafety unit in EPA and Quarantine centers.

To control access to genetic resources, this output is designed to safeguard the remaining natural resources and to prevent genetic deterioration based on endorsing a national legislation to regulate access to genetic resources and benefit sharing (ABS) in addition to establishing a national framework and administration to regulating provision and uses of genetic resources, based on prior informed consent (PIC) and mutually agreed terms (MAT).

Target to be achieved by end of planning period is : “By 2020, 70% of the genetic diversity of Yemen cultivated plants species , & domestic animals will be conserved in gene banks (Aichi 13)

### **Indicators**

- Population trends of species
- Trends in abundance of selected species
- Trends in extinction risk of species
- Extent of production of local crops
- Trends in genetic diversity of cultivated plants
- Trends of farmed and domesticated animals and their wild relatives

### **5.3.2: Sustainable Use of Natural Resource (Outcome 2)**

Over production, harvesting and utilization of biological resources is evidently observed in many forms, including over-exploitation of endemic and endangered species, overutilization of genetic resources while meeting food & crops needs for people livelihoods, overharvesting of forests & rangelands for meeting wood and fodder products for rural communities, over extraction of water resources for delivering water supplies to various socio-economic sectors; and overharvesting of fisheries resources for meeting local and export needs. To address over-exploitation of natural resources, the strategic Goal 2 of the NBSAP2 calls for promotion of the sustainable management & harvesting of fresh water, forests, crops, fish, invertebrate stocks, indigenous livestock, wildlife and native genetic species of importance for people livelihoods, food security and health care for Yemeni People. For simplicity, this priority outcome 2 in the action plan, is expressed in terms of number of specific policy measures and instruments, grouped under four outputs, respectively oriented for sustainable use of forests and rangelands (Output 2.1), sustainable agriculture (Output 2.2), sustainable management of marine living resource (Output 2.3) and water restoration & conservation (Output 2.4).

#### **5.3.2.1 Sustainable Management of Forests and Rangelands (Output 2.1)**

The NBSAP 2 under Output 2.1 calls for promoting the sustainable harvesting of forest products through promotion of rotational grazing scheme, introduction of forage alternative sources for animal grazing, implementation of forest restoration plans, provision of alternative sources of income for local livelihoods. The attainment of this output will be met through numerous policy options clustered in 4 groups respectively dealing with promotion of innovative practices in forest and rangeland management, strengthening planning and institutional performance, promoting livelihoods & control of Alien invasive species. Specific biodiversity target to be produced by 2025 is given by target 5 in the action plan and is satisfying targets five & six of global Aichi targets. Target 4 as spelled out by the action plans is “ reduce forest & rangelands harvesting by 15% in 2020, and by 30% in 2025 (Aichi Target 5) ”.

Innovative & sustainable practices identified by the action plan include the establishment of carrying capacity for grazing animals, revival of traditional fuel wood harvesting schemes, adoption of rotational Grazing Schemes and the enactment of harvest permits for commercial fuel-wood and timber harvesters based on predefined sustainable annual allowable harvest levels. To improve planning and management, the action plan identifies a number of interventions and measures, which are mainly oriented to enable national and local partners to promote co-management of forest resources, promote participation of the locals in eco-tourism activities, incorporate local community concerns and environmental objectives into the national and district development plans, create community-based forest management plans for rangeland and protected areas management. To improve policies, the action plan under this output seeks to develop forest policy & law to promote sustainable use of non-timber forest products, introduce permits for medicinal harvesters, and enact a mechanism to monitor forest use and land use change within forest lands. The NBSAP2 addresses alien invasive species separately as a crosscutting issue under Output 3.2 below.

As Yemeni rural communities depend heavily on forage for their animals; timber, fuel-wood and charcoal for energy supply and forest food for their livelihoods, and recognizing that non-timber forest products (NTFPs) and ecotourism and other forest ecosystem services are largely omitted from development strategies and poverty strategies, this NBSAP gives special attention for limiting excessive pressures on forest resources by introducing alternative sources of income from non-forest products such as production and marketing of

cheese, dairy, honey and handy craft productions such as hats, mats, baskets, sweepers and beds among others. Most importantly, NFTP's and forest services such as medicinal and food plants play an important role in rural livelihoods and local and national economies, and must be considered in national databases (SCBD 2008). Special emphasis will be placed on mainstreaming biodiversity into development plans, incorporating protected area networks and sustainable production systems into ecosystem-based climate adaptation and resilience plans

Indicators to verify the attainment of target of this output include:

- Trends in extent of forest area
- Trends in extent Grasslands
- Trends in extent of mangroves
- Trends in extent of wetlands
- Trends and extent of fuel-wood harvesting

#### **5.3.2.1.2: Sustainable Agriculture (Output 2.2)**

This output aims at increasing agricultural productivity and sustainability through the diffusion of green technology in irrigation, pest control, and protection of soil erosion against flood.

Unsustainable agriculture is addressed in the action plan as a priority issue with specific aim to improve the productivity of farm lands and rangelands to improve their contribution to livelihoods and local food security. To achieve this sustainable goal, the plan promotes smart agricultural practices, with emphasis on integrated management of land and water resources, the introduction of environmentally sound methods and practices, including revival of indigenous techniques with regard to farming, agroforestry and rangeland management. This includes among others revival of the best traditional practices to control pest - such as cutting or uprooting noxious weeds, crop rotation, crop diversification, and timing of planting and harvesting dates. Other Smart traditional practices include actions to maintain soil productivity, such as leaving crop residues and the replacement of imported synthetic by organic fertilizers. Particular attention for mitigating soil erosion & protecting marginal farm lands based on increasing crop cover & plantation of forages or trees.

Other Smart agricultural practices also will include promoting integrated Pest Management to reduce use of pesticides combined with a switch from water intensive crops such as Qat to other cash crops (coffee, tobacco, prickly pear cactus, and cotton) to reduce water depletion. More importantly in this context is the shift to green technology in efficient irrigation and the shift to rain-fed agriculture.

To improve agricultural land contribution to address livelihoods and local food security, the output gives special emphasis to improving the productivity of farm lands that support sustainable livelihoods and local food security such as fruits and money crops for export (mango, palm trees, olives, coffee, sunflower and honey). Attention also be given to improving food Security among rural families by developing their self-capacity to generate and secure food based on aid and loan programs to promote in-house production of livestock, dairy, poultry and bee products, including promotion of in-house cultivation programs. In addition, access of poor people to land will be improved based on reform of land tenure, involving them in decision-making that would enable them to withstand against poverty, eliminate malnutrition, benefit from expanding employment and raise their standards of living, see Output 4.2 on Poverty Mainstreaming for more actions in this regard.

Target to be achieved under this output is target 5: By 2020, 50% of Yemen's agricultural lands will be managed sustainably, and by 2025 the sustainability principles will be covering the entire agricultural areas (Aichi Target 7)

**Indicators:**

- Extent of agricultural area managed sustainably
- Extent of crop water productivity
- Extent of crop import
- Extent of food security
- Area salinized by irrigation
- Extent and trends of fertilizer/pesticide import

**5.3.2.1.3: Sustainable Management of Marine Living Resource (Output 2.3)**

This output addresses the threats contributing to marine biodiversity loss, giving specific focus on most pressing ones such as over exploitation of marine resources, habitats modification, climate change impacts, marine pollution, ineffective policy & management and alien invasive species. Therefore, the output seeks to promote sustainable management and harvesting of marine resources and to strengthen climate change resilience of marine ecosystems with aim to ensure sustainable delivery of marine products to support Yemeni people livelihoods, including local poor & women.

To halt over exploitation of marine resources, the action plan entails a mix of policy options and instrument , including establishing carrying capacities for mangroves and coral reefs, keeping harvesting levels within ecological limits, applying ecosystems-based approach for management of fishery & marine resources and implementing a seasonal fishing ban on catching rock lobster and other marine species. The action plan also entails actions devoted for protecting fish stocks against unsustainable fishing practices based on banning of destructive fishing methods, diffusion of non-destructive techniques to coastal/marine habitats, control of illegal and unregulated fishing, and strict monitoring of fishing methods, practices and techniques. At policy level, this output pays attention for strengthening planning capacity based on renewal & improvement of current protection plans such as National Adaptation Programme of Action (NAPA), recovery plans for key and threatened fish species, and the update and implementation of more integrated coastal zone management (ICZM) plans. End target of planning period is articulated by target 7 of NBSAP2 & given the following statement:

“ By 2025, all Yemen fish stocks are managed and harvested sustainably through applying ecosystem based approaches, recovery plans, seasonal fishing ban of threatened species, banning of destructive fishing methods, controlling illegal and unregulated fishing and strict monitoring of fishing methods, practices and techniques” ( Aichi Target 6 )

To minimize marine/coastal habitats loss, the output adopts a wide range of conservation, protection & restoration interventions. Conservation initiatives entail the establishment of adequate marine protected areas to meet Aichi targets; establishment of no-take zones in key nursing areas & protection of coral reefs, mangroves, wetlands & fish breeding grounds. Restoration interventions include restoration programs of key threatened fish species & coral reefs, replanting mangroves & palms to protect fish breeding grounds and establishment of artificial reefs along Arabian Sea coast as appropriate.

The action plan also sets out a framework for actions which contributes to enabling human and natural communities to adapt to the potential impacts of climate change. The plan addresses this issues based on adaptation measures focused on mitigating impact of natural disaster risks associated with climate change through strengthening ecosystem resilience against climate

change & other man-made pressures, building dikes and sea walls to mitigate impacts of floods, sea level rise and salt water intrusion. Recalling that climate change issues are poorly understood, the action plan gives special attention for improving knowledge base through research oriented for measuring & documenting the biological and meteorological variables relevant to coral bleaching, mortality and recovery under potential climate scenarios. In addition, research programmes will be launched with to better understand the frequency and extent of coral bleaching and mortality event, including the tolerance limits and adaptation capacity of coral-reef species to increased sea-surface temperature. This activity group will collectively help producing the following NBSAP2 targets:

- By 2025, all Yemen fish stocks are managed and harvested sustainably through applying ecosystem based approaches, recovery plans, seasonal fishing ban of threatened species, banning of destructive fishing methods, control illegal and unregulated fishing and strict monitoring of fishing methods, practices and techniques (Aichi Target6)
- By 2025, all pressures impacted by climate change and anthropogenic factors are mitigated and minimized, so that coral reefs, fish spp., birds, turtles and plants of marine ecosystems are maintained and functioning well ( this correspond to Aichi Target 10)

This output also addresses the environmental impacts of overgrazing by camels and fuelwood harvesting on mangrove ecosystems through replanting mangroves & palms, mangrove restoration programs, introduction of forage alternative sources for camels, and implementation of alternative Program for coastal communities' livelihood. Finally, the Action plan includes actions addressing drivers causing marine & coastal pollution and alien invasive this are given separately under output 3.4 and Output 3.2.

#### **Indicators:**

- Trends & extent of coastal & marine protected areas, coverage of key biodiversity areas
- Trends & extent of marine protected areas management effectiveness
- Trends in PA management involving local communities
- Trends in the delivery of marine ecosystem services
- Number of species which are/are not being fished sustainably
- Trends in extinction risk of species
- Trends in distribution of selected species
- Trends in area of degraded coastal and marine ecosystems restored or being restored

#### **5.3.2.1. 4. Restoration and Safeguarding Aquatic Ecosystems, Delivering Fresh Water (Output 2.4).**

This output aims at restoring and protecting water ecosystems to ensure adequate & safe water supply and sanitation for the Yemeni people, including the rural poor, women, and other vulnerable groups. The attainment of this output will be realized through numerous policy options clustered in 7 groups respectively focused on improvements of institutional performance, policy reform to eliminate harmful subsidies, conservation of degraded water ecosystems, improvement of water harvesting, promotion of integrated water resource management (IWRM) plans for groundwater basins & mitigation of water pollution.

The conservation of water ecosystems will be achieved through declaration of protection zones of degraded water aquifers, implementation of water -spring protection programs, building dams and water reservoirs, construction of traditional water conservation systems (storage tank/cistern) & establishment of flood protection structures along wadies beaches.

To ensure adequate provision of safe fresh water supply to all Yemeni people, the action plan intends to promote water fog harvesting schemes in at least 10 highlands areas & water desalination in 19 coastal cities. Further, the action plan aims at providing appropriate sanitation services for all regions, and thus to improve the health and environmental human development needs of the country. The sanitation services will be extended to 52% of the urban and 37% of rural residents by the year 2020. Further, to overcome water inefficiency in irrigation, the action plan is focused on promoting efficient irrigation techniques, expansion of rain-fed agriculture, promotion of spate irrigation and pressurized irrigation (drip, bubbler) and reuse of retreated waste water for irrigation. It also includes the construction of more dams and dikes, and enhanced use of water harvesting techniques. Also needed are changes to prevalent agricultural practices and processes in favor of modern irrigation techniques such as piped supplies and drip irrigation, and the application of economic feasibility studies in the choice of crops.

To improve water resources management, Specific attention is given for engaging appropriate authorities and stakeholders along with increasing partnership with the public, private sectors local communities in basin management & delivery of water services. Of good instruments included in the action plan for water sector is the promotion of IWRM Plans for groundwater Basins, development of local community - watershed management plans that are responsive to climate change, diffusion of new approaches for water resources planning. The action plan for implementing the water sector target includes raising public awareness and education programs, harmonization of the legislative and regulatory frameworks, and enhancement of national institutional capacities to carry out their planning, follow-up and environmental assessment tasks at the central and local level. Public awareness programs pay attention to changing public attitudes towards water resources as common economic goods to create a sense of common responsibility conserving these depleting resources.

Target to be achieved under this output is: Aquatic ecosystems have been restored and safeguarded so as to increase their capacities to sustainably deliver water services to about 68% of Yemeni population by 2020, and 85% by 2025 (Aichi target 14 ).

**Indicators:**

- Extent and trend of degraded water ecosystems conserved
- Number of integrated water resource management (IWRM ) plans groundwater basins
- Extent of sanitation services in urban and rural areas.
- Number of people with access to safe water nationally
- Extent of reduction of water-borne diseases
- Extent and trend of rural-urban gaps in water supply,
- Extent and trend of local community involved in management of groundwater basins
- Number of water desalination programmes implemented.
- Extent of harmful subsidies phase out
- Number of degraded water aquifers declared as protection zones
- Extent of introduction of water treatment and recycling facilities.
- Extent of use of efficient irrigation techniques
- Trends in area of irrigated land

### **5.3.3 Reduction of Natural & Anthropogenic Pressures Contributing to Biodiversity & Ecosystem Loss (Outcome 3)**

Natural and Anthropogenic Risks to biodiversity are occurring due to climate change; increased ecosystem contamination associated to wasteful production and consumption patterns, increased GHG Emission and spread of invasive alien species. To address natural and anthropogenic impacts on biodiversity the strategic goal 3 calls for reducing the direct pressures of biodiversity loss by building resilient ecosystems through strengthening disaster preparedness against anticipated climate change impact, mitigating ecosystem pollution from economic activities, mitigating impacts of energy related GHG and control of invasive alien species. In other word, this outcome is translated, in the action plan, into a number of specific policy measures and instruments, grouped under four outputs, respectively oriented for strengthening socio-ecosystems resilience against climate and other natural disasters (output 3.1), control of invasive alien species (output 3.2), control of ecosystem pollution (output 3.3) and strengthening Preparedness against anthropogenic waste & hazards (output 3.4).

#### **5.3.3.1 Socio-Ecosystems Resilience Against Natural Disasters (Output 3.1)**

As per climate scenarios, Yemen is anticipated to experience steadily rise in temperatures, and an increase in variability of rainfall and in heavy precipitation events. Under anticipated climate change, extreme weather and climate events such as drought and water flood are likely to be triggered causing severe impacts on Yemen ecosystems, namely the cultivated systems, coastal, marine and aquatic ecosystems with subsequent reduction in ecosystems yields. Rural livelihoods is expected to be most vulnerable to declining access to water and decreasing agriculture productivity, destruction of coastal agricultural land & properties under anticipated sea level rise. Unless adequate adaptive capacity considerations are built into the development planning in Yemen at large, and rural adaptation planning in particular, climate change implications on rural livelihood sustainability is expectedly to become further challenging. To this end, the action plan under this output calls for building the socio-ecosystems resilience against natural disasters through strengthening disaster preparedness, renovation of and conservation of degraded ecosystems. End target to be achieved by 2025 is to restore at least 15 per cent of degraded ecosystems, focusing mainly on rehabilitation of terraced agriculture, and restoration & conservation of degraded watersheds, rangelands, forest & coastal wetlands, thereby contributing to climate change mitigation and adaptation and to combating desertification.

Due to the complexity and interactive relationship of biodiversity issues under changing climate, there is urgent needs for introducing an innovative approach to address such issues in an integrated manner. Towards this end, the action plan under this output adopts the ecosystem-based adaptation approach (EBA) as a new paradigm to strengthen the socio-ecosystems resilience against anticipated climate change impacts. The EBA offers solution to all economic, social and environmental concerns as a functional unit. Specifically, at both environmental and social levels it helps driving biodiversity management towards sustainability, conservation, maintenance, rehabilitation & restoration of ecosystem services to ensure their delivery to local communities, poor, women and vulnerable on equal basis. The delivery of ecosystem services and benefits, in turn, help people adapt to changing conditions. However, Ecosystem-based adaptation should not be overlooked as a stand-alone adaptation mode, it therefore should complement other adaptive management practices, protection modes and technological solutions. In this regard, the action plan calls for establishing a monitoring scheme to assess the adverse impacts of natural and human-induced risks such as climate change, drought, desertification, flood rains and erosion of agricultural lands, soils and terraces among others. The monitoring system encompass a satellite based early warning system combined with establishment of representative observations networks



for meteorology, agro-meteorology and hydro-meteorology, establishment of weather and climate surface and upper air network, and installing a Doppler Radar for enhanced precipitation measurement and more reliable weather and flood forecasting. The establishment of this system will enhance the monitoring of natural and human-caused hazards, which in turn will help in improving the ecosystems and people's ability to manage and withstand against the anticipated occurrence of natural disasters such as climate change, drought, desertification, wind erosion and sand dune encroachment, increased flood rains and loss of agricultural lands, soils and terraces. The monitoring scheme will further help preventing the impacts of drought & desertification, leading to restoration of desertified land & degraded terraces for productive use. Most importantly, the monitoring system along with application of Ecosystem-based adaptation will be important tools to buffer the worst impacts of climate change, maintain the resilience of natural ecosystems, their ecosystem services and the species that support them, and help people adapt to changing conditions. Of key complementary important restoration measures spelled out by the action plan is to implement restoration programs of degraded ecosystems, focusing on afforestation, terraces rehabilitation, dune and wadi bank stabilization, planting green belts & windbreaks to halt dust storms, and watershed protection.

Additional coping measures to address frequent occurrence of drought, temperature fluctuation, and changes in precipitation patterns in agricultural sector include among others (i) crop measures such as crop rotations with intercropping and promoting drought tolerant varieties; (ii) application of traditional practices of soil fertilization & soil moisture to reduce soil contamination, soil moisture loss and water evaporation; (iii) restoration measures like terrace maintenance, restoration of rangelands; (iv) conducting research on drought-, introduction of heat- and salinity-tolerant varieties & low water using crops; (v) introduction of drought tolerant crops varieties; (vi) enhance soil fertility; (vii) and societal coping measures enabling women to promote household and farming activities to enhance their income. In support to ecosystems-based adaptation measures, this output recommends enhancing ecosystem natural adaptation to climate change impacts by establishing carrying capacities for mangroves, rangelands and coral reefs to ensure that harvesting of these resources are kept within safe ecological limits.

Restoration interventions covered by the NBSAP2, entail restoration programs of degraded ecosystems, focusing on afforestation, terraces rehabilitation, dune and wadi bank stabilization, planting green belts & windbreaks to halt dust storms, and watershed protection. To strengthen climate change **resilience** of marine ecosystems, emphasis is given to mitigate the loss of wetlands, coral reefs and coastal mangroves through: (i) flood protection structure, building dikes/ sea walls to mitigate impacts of floods & sea level rise; (ii) restoration & protection of coral reefs, restoration of wetlands, mangroves & palms to protect fish breeding grounds and to contribute to increasing carbon sinks. To mitigate anticipated increase of water scarcity, the action plan calls for promoting the use of grey water, treated wastewater for expanding tree for irrigation and plantation of side roads, & desalinated water for household use, and implementing restoration programs for watersheds and establishment of flood protection structures along wadies beaches. Target to be achieved by 2025 is to restore at least 15 per cent of degraded ecosystems, focusing mainly on rehabilitation of terraced agriculture, and restoration & conservation of degraded watersheds, rangelands, forest & coastal wetlands, thereby contributing to climate change mitigation and adaptation and to combating desertification (Aichi Target15)

**Indicators**

- Extent and trends of restoration of degraded wetlands, coral reefs and coastal mangroves
- Extinction risk trends of coral and reef fish
- Trends in condition and vulnerability of ecosystems
- Extent and trends of rehabilitation of degraded terraces
- Extent and trends of application of ecosystem-based adaptation approach

**5.3.3.2 Combat Invasive Alien Species (Output 3.2)**

There is an urgent need to prepare a national policy to prevent the introduction of invasive alien species threatening ecosystems, and mitigate their negative impacts on forest and marine ecosystems & biological diversity in general. To this end, the NBSAP2 calls for develop and implement national & local strategies focusing on an integrated risk-based approach to controlling and managing intentional and unintentional introductions of these organisms. The starting point in this context is to conduct risk assessment on the impacts of invasive alien species on biodiversity & ecosystems, and based on which establish data base for the invasive species, and develop programs to monitor and alleviate the spread of alien species. An important priority in this regard is to implement eradication programmes for “Prosopis juliflora”, an invasive alien plant threatening wadies ecosystems and farmlands. Additionally, there is a need to establish specialized units to monitor invasive alien species, including establishment of quarantine units and endorsement of import & export laws regulating entry and exit of living organisms and controlling the intrusion of invasive alien species.

Target to be achieved: By 2025, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

**Indicators**

- Trends in the impact of invasive alien species on the functioning of wadies ecosystems and farmlands
- Trends in number of invasive alien species
- Trends in the environmental impacts of selected invasive alien species
- Number of species eradicated, controlled and contained

**5.3.3.3 Mitigating GHG Emissions (Output 3.3)**

As reported above, weak governance and institutional structures combined with wasteful and inefficient technologies are among the key capacity constraints that impede Yemen efforts targeted for emissions reduction and mitigation of climate change. Towards this end, the action plan calls for improving climate change mitigation in Yemen, through the shift towards greener technology and sustainable development. Greener economy is to be achieved by integrating environmental issues in the entire process of economic development, leading to reducing environmental impacts, emissions, and depletion of natural resources. Effectively, it aims at improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. Fundamentally, it entails green options such as the shift towards renewable energy sources, the promotion of smart agricultural and land use practices, and the introduction of bio-energy production especially from solid waste and wastewater in main cities.

The shift to renewable energy will be maintained through promoting and enforcing of renewable energy strategy, energy efficiency; and switching to lower carbon-content fuel & renewable energy production. To switch to lower carbon content fuel, the action plan proposes the shift to LPG fuel use in road transportation, natural gas in cement industries,

bakery-fired systems and power generation. Additional reduction in GHG emission from energy generation can be realized with the development of geothermal, biomass, wind and solar energy.

Promoting efficiency is also a key element to reduce GHG emissions, and this can be achieved through the introduction and enforcements of norms, benchmarks and standards; fuel switching to natural gas in energy generation and transportation; switching to renewable energy; promote bio-energy production from wastewater and solid waste; use of compact fluorescent lamp (CFL), application of efficient cooking systems, use of efficient refrigeration and appliances in household; increase of Liquid Petroleum Gas (LPG) use for cooking and improve biomass and LPG stoves performance; and switching to solar pumps in irrigation.

The promotion of smart agricultural and land use practices is to be achieved by multiple carbon sequestration activities such as the expansion of protected areas, restoration of “Blue Carbon” ecosystems (mangroves and sea-grass beds), reforestation to reduce emission from deforestation and forest degradation (REDD). In further entails innovative & friendly management practices to mitigate emission from land use, land-use change and forestry (LULUCF). The action plan also promotes recycling and new technologies with aim to introduce bio-energy production and reduce emissions from garbage & wastewater.

To resolve funding issues, it is proposed to declare National Climate Funds (NCF) and adopt nationally appropriate mitigation actions (NAMAs) to reduce GHG emissions from various sectors. This policy promotes Low emission measures and cleaner policy options which are essential to map the way towards greener economy and sustainable development. More importantly it will enable Yemen to tap to funding opportunities like the Green Climate Fund (GCF). To put this in place, it is proposed restructuring EPA and the Social Fund for Development (SFD) or both to host national climate Fund (NCF), making use of lessons learned in the establishments of the clean development mechanism (CDM). This will help putting in place an effective entity and funding mechanism capable of planning, accessing, delivering , monitor and report on international and domestic climate finance and climate issues. The introduction of renewable energy is anticipated to promote lower cost options in energy production and consumption, while at the same time minimizing the consequent impacts of energy pollution on the environment and public health. In addition, the shift to renewable energies will ensure higher population access to electricity, especially in the rural poor areas, thereby improving the quality of life of rural areas, reducing the use of fuel wood and the pressure on natural resources.

The activation of the Clean Development Mechanism (CDM) can be realized by involving private sector in this mechanism. This will facilitate development and application of efficiency standards for lighting and heating system, application of buildings energy-related codes, enforcement of appliance efficiency standards, and promotion of pilot projects on renewable energy, including bio-energy production especially from solid waste and wastewater of main cities.

Target to be achieved is: Energy resilience has been promoted and is manifested by 14% reduction of energy-related GHG emissions in 2020, and 37% in 2025 (Aichi 15) .

### **Indicators**

- Trend in primary energy consumption, oil production vs consumption, and imports
- Trend in energy/GDP ratio
- Emissions of GHG by sector and per capita
- Trends in fuel efficiency
- Percentage of renewable energy in energy production
- Proportion of emission reduction in energy production, as compared with 2015 emission

#### **5.3.3.4 Strengthening Preparedness Against Anthropogenic Waste & Hazards (Output 3.4)**

In the absence of financial, technical treatment and recycling capabilities, garbage & wastewater are directly discharged in the environment without treatment. Also in the absence of effective regulations, food industry and hospitals are operating without adequate consideration of their environmental impacts and large quantities of untreated solid and liquid waste are directly dumped in the environment. Towards this end, this output is designed to prevent ecosystems loss by reducing impacts of pollutants and contaminants on soils, water, plant species, and marine ecosystems through control of chemical pollution and eutrophication, including from land-based activities. Target to be achieved is “Target 12: By 2025, the use of agrochemical substances, pesticides and other land-based pollutants on land, aquatic and marine ecosystems have been reduced by 50 percent (Aichi Target 3)”. To produce this target, the action plan under this output calls for mitigating impacts of solid waste & wastewater from hospitals, industry, mining and manufacturing sectors on human being and their environment through improved design, introduction of green-technology, changing production processes, recycling hazardous/useful materials from waste, and producing non-wasteful products. High priority will be given to facilitating the transfer of less wasteful, no-waste and more ecologically acceptable technologies complying with best practices. Specific focus is to be given to the transfer of new techs for improved solid waste collection; reuse, recycling/composting and disposal systems. Similarly priority will be given to promotion of high technology on wastewater treatment and recycling targeted for reducing wastewater impacts on sensitive areas, ecosystems and species threatened by contamination. Emphasis is also delineated to mitigate the anthropogenic disasters of pollutants through the adoption of legal procedures advocating ecosystem conservation, imposing wastewater quality guidelines & standards on wastewater use, imposing the national criteria to protect ecosystems from the impact of different kinds of waste, implementing regulatory framework to control safe distribution and use of pesticides, and formulation and implementation of national emergency plans. Important plans to be implemented include contingency plans dedicated for protection & rehabilitation of contaminated basins in addition to oil pollution contingency plan to control & reduce sea-based sources of pollutants. Each plan will be identified and implemented based on survey and identification of sensitive areas, ecosystems and species threatened by contamination. It is also planned to monitor and control contamination of marine freshwater, agricultural lands and marine ecosystems via controlling agro-chemicals & fertilizers use, controlling sewage effluent discharge to ecosystems and control dumps of hazardous waste to ecosystems.

#### **Indicators**

- Trend and extent of agro-chemicals & fertilizers use
- Trend and extent of reuse and recycling of solid waste.
- Trend and extent of introduction of treatment and recycling of wastewater
- Number of regulations preventing industrial pollution introduced and enforced
- Extent of diffusion of recycling technology in production sectors
- Extent & trends of hazards and waste produced by production sectors

#### **5.3.4: Biodiversity & Poverty Mainstreaming Into Sectoral Development Plans (Outcome 4)**

Several driving forces are being identified to contribute to biodiversity loss. These include the distortion of macro-economic policy, unsustainable production and consumption patterns in economic and industrial sectors, lack of good governance in biodiversity management, including weak institutional, technical and scientific capacity. This status is further deprived by political and social causes, such as poverty and rapid population growth, uncontrolled migration and urbanization. Loss of biological diversity cannot be stopped and reversed

without policy and legislative reforms focused on mainstreaming biodiversity conservation, sustainability principles & biodiversity values into environmental and production sectors.

To this end the action plan in strategic Goal 4 is designed to develop and maintain restructured policies that are compassionate of participatory planning of natural resources, supportive of equitable sharing of biodiversity benefits and advocating the mainstreaming of biodiversity considerations into national development policies, plans, strategies and programmes, including national poverty reduction strategy and sectoral plans concerned with tourism, mining, urban and rural development, land-use planning, infrastructures and industry development.

To translate this goal into actions, the action plan recommends the promotion of green economy projects in planning processes at all sectorial levels. This approach will facilitate mainstreaming of biodiversity into developmental plans such as poverty reduction and provide holistic solution to most constraints provoking ecosystems loss. Evidently, it entails several innovative mainstreaming measures, clustered in five outputs/ oriented mainly for: (1) reform of environmental policy distortions targeted for mainstreaming ecosystems values into national accounting and decision makings (Output 4.1), (2) poverty mainstreaming (Output 4.2), (3) promotion of green technology (Output 4.3), (4) promoting integrated planning in land resources management (Output 4.4), and (5) sustainable tourism (Output 4.5).

#### **5.3.4.1: Reform of Policy Distortions (Output 4.1)**

To address the policy and legislation issues influencing biodiversity loss, the NBSAP2 calls for policy and legislative reforms with focus to mainstream biodiversity concepts and values into environmental sectors, namely into water, agriculture, fishery, forest and rangeland. Mainstreaming biodiversity values into environmental sectors will be achieved through three strategic options.

Strategic option 1 seeks to introduce a Payment scheme for Ecosystems Services (PES), which include policy measures for integrating biodiversity values into production sectors. The economic evaluation of ecosystems services is the entry point by which the key Ecosystems Services & benefits delivered by various ecosystems will be quantified in monetary terms, and according to which a Payment scheme for Ecosystems Services (PES) will be established and enforced. PES will ensure that resources generate income which contributes to government revenue. The introduction of PES scheme is anticipated to compensate fair costs for the services delivered by ecosystems and to enforce charges against the damage incurred while extracting ecosystems benefits. In order to put PES schemes in place, the NBSAP2 proposes internalizing the social costs at the production/industrial level through the enforcement of resource user fees based on different policy options, such as polluter-pays-principle (emission tax), tradable pollution/emission permits (TPPs) and selling of permits known as individual transferable quotas (ITQs) particularly as regards timber, fishery, pollution, and water abstraction

By enforcing PES, it is anticipated that natural resources is recognized as an income generating sector contributing to GDP and hence the policy makers start mainstreaming it into developmental plans. More importantly, the introduction of PES will force producers and consumers to use natural resources within their respective ecological limits, and subsequently integrate biodiversity/environmental issues in their production and consumption decision making.

Strategic option 2 seeks to mainstream ecosystems values & services through creation of markets for biodiversity products. This option will be put in place through enacting fishing quotas; commercialization of medicinal plants through certification and eco-labeling,

reformed water tariffs; cost- recovery schemes for water supply; creation and enforcement of a quota for fair and equitable use of water, marine, forest and land resources.

Finally, strategic option 3 seeks to harmonize policy distortion in land management, water & marine resources. Policy harmonization will be achieved via reform of land tenure, integrated planning of land resources & biological resources, and removal of harmful incentives & subsidies contributing to the loss of biodiversity, arable land, water & marine resources. Among harmful subsidies and incentives to be removed are fuel subsidies for water pumping, subsidies for agrochemical fertilizer, pesticides & herbicides use. As an alternative to removal of harmful subsidies, the action plan proposes promulgation of alternative regulations & incentives, such as the control of use of drinking water for qat irrigation and promulgation of relevant legal instruments including enactment of the fish law & by-law regulating fish harvesting; water law, procedures to conserve water resources; and develop forestry law & By-law for control of alien invasive and regulatory framework on safe distribution and use of pesticides. Additional legislation reform will focus on updating the environment protection law, upgrading of legal frameworks and strengthening law enforcement based on promulgation of by-laws for water law, the forest law, the land tenure law, agricultural land holdings registration, the fertilizers and fodder law, the plant pest and disease law and handling of pesticides law.

Targets to be achieved by 2025 are;

- The values of biodiversity & ecosystem services are recognized by decision makers & integrated into key environmental sectors (Aichi targets 2).
- Subsidies on water efficiency use are approved, subsidies on agro-chemicals & fertilizer are removed and fuel subsidies for water pumping are eliminated (Aichi: T3)
- Positive incentives for the conservation and sustainable use of biodiversity are developed and enforced(Aichi: T3)

**Indicators:**

- Number of production and development sectors integrating the values of biodiversity & ecosystem services into their developmental policies,
- Number of good subsidies & incentives advocating biodiversity conservation introduced and enforced
- Number of harmful subsidies phased out,
- Number of good practices & legal instruments introduced and enforced
- Number of environmentally perverse incentives removed.
- Extent of implementation of PES in the country.
- Extent of adoption of Ecosystem Approach by environmental agencies,

**5.3.4.2: Poverty Mainstreaming (Output 4.2)**

As repeatedly reported poverty is attributable to inability to access land, water, agro-biodiversity products, fishery, energy and genetic resources which are basic collective biodiversity assets. Poverty is further aggravated by inability to access education & health services combined with inability to access public employment opportunities, financing credits and Zakat. To address various forms of poverty casual drivers, the plan calls for alleviating poverty through enabling local poor access to productive resources, including financing credits, land, water, education, knowledge and information, as well as to public services, and

participation in planning & management of natural resources & basic services that would enable them to withstand against poverty, benefit from expanding employment and raise their standards of living. Meeting this objective requires promoting distributive justice of common public assets such as the state lands, zakat, public fund and financing credit. The distributive justice aims at ensuring equitable access to public assets through a holistic-integrated reform focused on reforms of land, zakat, social welfare fund, financing credit and employment policy, harmonization of public investment and decentralization in management of natural resources and planning, including management and delivery of basic services.

Land use reform aims at enabling rural poor, women, youth and landless communities to access the state and common lands at affordable price, while at the same time combating illegal land-confiscation of common land by influential citizens for no cost and without any lease agreement. Land use reform is to be achieved through such measures as regulating land endowment, decreeing and enforcing fair land tenure & land lease scheme and promoting fair land rents. Recognizing the widespread corruption, favoritism and injustice influencing land endowment, the reform of land endowment will further be geared towards halting land confiscation, prohibiting land donation as a bribe for rich people to force them voting for specific party. A prerequisite to all of these measures is to restore public land confiscated by individuals illegally, and to make it available for improving agricultural development, and for eradicating poverty levels amongst the affected poor groups, mainly among women, small scale farmers and sharecroppers, landless labor, nomadic herders and artisanal fishermen. Agricultural development is to be improved by enabling national investors to access lands based on long-term contractual arrangements with business communities combined with concrete investment proposals for increasing agricultural productivity in areas targeted by government environmental strategies. To eradicate poverty levels among vulnerable groups, the NBSAP2 calls for improving poor people access to productive resources, namely to credit services delivered by lending banks and Islamic social welfare known as the Zakat as a first step to enable them access to land and land ownership to improve their livelihoods. Improved access to productive resources is to be ensured based on reforming lending banks and Islamic financing assistance known as the Zakat.

To reform the Islamic Zakat, the NBSAP2 broadly calls for crafting an innovative financing mechanism which is to be formed by intertwining three funding sources, namely the tribal norms known as Ghurm (forfeiture), religious edicts known as the Zakat and the modern social welfare to form tri-partite partnership for financing poverty alleviation efforts among Yemeni disabled and jobless. The triple partnership will be effected via the integration of the three funding sources to form local Poverty Alleviation Funds (LPAFs) to act as a funding mechanism concerned with poverty alleviation initiatives for Yemeni disabled and jobless. The LPAFs will be formed through election at local levels under the oversight of districts local council and will be responsible for collection of revenues from the three sources to re-channel these resources to eligible individuals based on legal frameworks and fair eligibility criteria to be developed and approved by the cabinet. In addition, it is critical that the capacities of LPAFs members are adequately developed so as to be capable to collect revenue, account for the revenue and enforce eligibility criteria. The creation of LPAFs is not only critical for mobilizing adequate resources to enable poor communities to access and own common lands, but also vital for enabling poor communities & small entrepreneurs to secure capital and own assets such as agricultural land, fishing boats, equipment and facilities for producing and marketing dairy products, handicraft products and poultry products, in-house solar systems to meet daily needs of energy and bee hives to produce honey amongst others. To promote the reform of the Islamic Zakat, a proposal for legal frameworks for the LPAF and funding eligibility criteria will be developed and endorsed by the cabinet. Once the legal

framework is approved, four pilot areas/districts will be selected to create their local Poverty Alleviation Funds (LPAFs) applying the triple partnership amongst the tribal forfeiture, religious edicts known as the Zakat and the modern social welfare. The creation of the pilot LPAFs will be based on election among local stakeholders following local council law and applying the decartelization requirements stated in output 5.1 related to institutional restructuring. By completing this phase, the LPAFs created will be provided with initial funds to support a number of disabled and jobless creating and implementing small funding schemes based on concrete proposals approved by the elected management of LPAFs applying eligibility criteria for funding. In the pilot phase, feasibly funding areas will be directed to implement poverty alleviation activities stated under this output above and under output 2.4 on sustainable agriculture. Having completing the pilot phase, the triple partnership will be scaled up to cover the entire country local district making use of lessons learned from the pilot phase.

Similarly, the reform of lending banks, mainly the Agricultural and Cooperative Credit Bank (CACB), will enable poor communities & small entrepreneurs to obtain credits at affordable interest rates so as to use such loans to own similar assets to create small income generating schemes in agriculture, fisheries and forestry. Complementary poverty alleviation interventions are presented in output 2.2 on sustainable agriculture and are focusing mainly on improving food security among rural families by developing their self-capacity to generate and secure food based on aid from the Zakat and loan programs to promote in-house production of livestock, dairy, poultry and bee products, including promotion of in-house cultivation programs. The reform of CACB will be accomplished through improving lending criteria and bi-laws so as to prohibit provision of credits for individuals and entrepreneurs unless they offer documented guarantee to recover the loans provided.

To improve poor people access to water resources, the NBSAP2 calls for reforming water sector policy aiming at promoting equitable quotas for flood water distribution among upstream and downstream of watershed, enforcing affordable water tariffs for rural poor, development of nationally accepted and legally protected water rights and removing subsidies for water pumping for qat irrigation. Enabling low-income people to access other services and natural resources based on enacting fishing quotas; commercialization of medicinal plants and creation and enforcement of a quota for fair and equitable use of water, marine, forest and land resources.

To address the issue of government inability to create adequate employment opportunities for Yemini people, the action plan suggests a public administration reform aimed at rationalizing civil service administration to realize optimal size and to become more efficient and effective in undertaking its responsibility & achieving intended goals. The administration reform will be achieved through removal of ghost jobs with aim to create jobs for poor people, including youth and women. More importantly, to enable local poor access to other public resources, such as education and health care services, employment opportunities and public funding, the NBSAP2 adopts a win-win approach, that has the potential to create massive employment and economic opportunities while improving the basic social facilities and services utilizing national development funds and public investments. The approach is based on UNDP policy concept note titled “Setting the ground for Socio-economic Reform”. In line with this policy concept note & this action plan, it is proposed to reform current costly and nonproductive government contractual policy through promoting green auditing and promoting green procurement procedures that facilitate creating massive employment opportunities while improving the basic community services and facilities at the local levels. Creating massive employment opportunities in rural areas is to be achieved through several quick impact and



multi-dimensional interventions targeted for enhancing the capacities of basic services, particularly during rural roads construction; water and land development projects, such as construction of water harvesting systems, irrigation channels, agricultural terraces maintenance, and flood control projects; and construction of schools of health facilities. Beside creating massive employment and economic opportunities, the quick impact and multi-dimensional interventions has the potential to further prevent deterioration of community livelihoods, assets and services such as water, education and health, which are key elements of the Millennium Development Goals and of the UN Sustainable development goals. In addition, it ensures redirecting public investments for the benefits of the vulnerable poor and youth at risk, strengthening their resilience against anthropogenic and natural risks, restoring their livelihoods and productive capacity, while at the same time improving the basic community services and facilities. Potential funding windows for consideration include the access to national funds such as the Agriculture and Fishers Promotion Fund, the Youth Fund, the Skills Development Fund, the Social Net Fund ...etc. A quick review of the financial positions of 7 of these funds indicates an annual revenue generation of an average of \$361 million and \$435 million in the last 7 and 4 years respectively, showing increased trend in revenues. Another complementary option is to tap resources and build on the investment programs of the respective line ministries and agencies engaged in the relevant sectors of the community-driven actions. To enable local people access to this funding source it is required to promote decentralization in management and planning delivery of basic services as per the requirements stated in output 5.1 related to institutional restructuring.

To proceed with poverty mainstreaming activities, the NBSAP2 in its resource mobilization scheme (section 6.3.5.3) recommends to reallocate 1% of government allocations primarily budgeted for socio economic funds, and to redirect it for NBSAP2 implementation particularly for implementation of output 4.2 concerned with Poverty alleviation activities applying massive employment concept. In figure, the RMS estimated that an average of US\$ 361,349 can be secured annually from 7 national funds and redirected for Poverty Mainstreaming activities, applying the massive employment concept and promoting decentralization while implementing NBSAP2 activities related to the following outputs:

1. Socio-Ecosystems Resilience Against Natural Disasters (Output 3.1): (i) restoration of wetlands, mangroves & palms to protect fish breeding grounds and (ii) rehabilitation of terraced agriculture, restoration of degraded watersheds and dune and wadi bank stabilization.
2. Sustainable Management of Marine Living Resource (Output 2.3): implementation of adaptation measures, such as building dikes and sea walls to mitigate impacts of floods and sea level rise.
3. Restoration and Safeguarding Aquatic Ecosystems, Delivering Fresh Water (Output 2.4): implementation of water-spring protection schemes, building dams and water reservoirs, construction of traditional water conservation systems (storage tank/cistern), establishment of flood protection structures along wadies beaches, establishing water fog harvesting schemes, and construction of dams dikes.

Target to be achieved under this output is: Yemeni poor and vulnerable, including local communities, youth and women enabled to equitably access to water, marine, forest and land resources, thereby leading to reduction of population living under national poverty line by 15% in 2020, and by 30% in 2025 (Aichi targets 14 & 16)

**Indicators:**

- Extent of reduction of poverty level, assuming that 20.1% of people are currently under poverty level

- Proportion of people that have accessed drinking water
- Proportion of people that have accessed sanitation
- Number of people that have accessed common land, especially women and youth
- Trend and extent of employment
- Area of common land and Wagf land accessed by rural poor
- Proportion of people that have accessed the Local Poverty Alleviation Funds (LPAFs)
- Proportion of people that have accessed credits
- Number of good subsidies & incentives advocating poverty alleviation
- Number of pro-poor legal instruments introduced and enforced
- Number of anti-poor legal instruments removed.
- Trend and extent of access to productive assets
- Extent of replication of LDAFs in poverty mainstreaming

#### **5.3.4.3: Promotion of Green Technology (Output 4.3)**

As stipulated by the fifth national report to the CBD, current business community, manufacturing industry and development sectors are not adequately committed to sustainability and environmental excellence and their production activities are reported to be destructive, polluting & hazardous to biodiversity and ecosystems. This output aims at reducing adverse impacts of current production patterns on ecosystems through promotion of green economy and sustainable development strategies into industry, mining, manufacturing and energy production sectors. The enforcement of green economy will be met by through applying fiscal measures and economic incentives advocating sustainable production and consumption and adhering to environmental excellence. To this end, the action plan proposes an incentive scheme for the compliance of environmental excellence. This scheme is to ensure compliance with environmental excellence via several green policy options such as the diffusion of green-tech, EIA enforcement, prevention of pollution, efficient use of energy, control of hazards and waste and promotion of recycling. The enforcement of this scheme will be supported by the introduction of fiscal incentives and tax exemption for reducing the use of raw materials high carbon energy and waste water disposal. These measures will also promote the use of green technologies, and renewable, recycled and recyclable products among others. The enactment of incentives and tax exemption schemes will be realized through designating an entity along with establishing certification schemes by which environmental excellence as regard energy-efficiency, materials use -efficiency, and water-efficiency will be verified, registered and certified. This policy option will be put in place, making use of lessons learned from earlier UNDP-GEF project, which ended by official designation of the national entity in charge of registering CDM. In support to this, a monitoring system will further be established with aim to be in charge of environmental auditing & monitoring waste production levels and state of mitigation across all economic and development sectors. Again, the establishment of recommended monitoring system will be based on lessons learned while developing the Clearing House Mechanism (CHM) recently completed under GEF-UNDP national biodiversity planning project. In this context, the action plan proposes to improve the CHM so as to include systematic recording of wastewater, solid waste and GHG emissions released by production process at the enterprise level to be referred to while assessing & providing certification of environmental excellence. Targets to be achieved under this output are:

- By 2025, several business communities and public sectors, including ecotourism, mining, energy, industry and land use planning are benefiting from ecosystem services and have incorporated sustainability & biodiversity concerns into their national and local development plans and programmes, keeping the impacts of use of natural resources well within safe ecological limits (Aichi target 4).

- By 2025, incentives and subsidy schemes, supporting pollution free industries, industrial compliance, adoption of green technologies and use of recycled materials, developed and approved by cabinet.

#### **Indicators**

- Number of regulations preventing industrial pollution introduced and enforced
- Number of harmful subsidies phased out
- Extent of diffusion of green technologies by development sectors
- Extent of diffusion of recycling technology in production sectors
- Extent & trends of hazards and waste produced by production sectors
- Extent & trends of natural raw materials consumed
- Percentage of renewable energy in energy production
- Number of new development projects adhered to EIA procedures

#### **5.3.4.4: Integrated planning of land resources (Output 4.4)**

As repeatedly reported, most agricultural land and ecosystems are illegally exploited for residential and other urban usage, resulting in the loss of highly productive agricultural lands and ecosystems as well as the depletion of water resources. This situation has led to environmental, economic and social problems while exerting continual pressure on what is left of biodiversity & ecosystems delivering services & subsistence for the survival of Yemeni people. To halt the impacts of urbanization on biodiversity and local communities, this output aims broadly at minimizing impacts of uncontrolled urbanization on biodiversity loss by promoting sustainable land use planning & management. This aim is translated in the action plan into multiple actions, focusing on minimizing land & natural habitats conversion via restriction of land conversions of critical ecosystems for other uses and strict application of EIA and SEA while permitting and approval of land conversion combined with firm enforcement of land regulation, pricing, registration and ownership. Roads construction & infrastructures nearby sensitive ecosystems, particularly the key areas for breeding, feeding, and bird migration sites should be prohibited. Complimentary to these restrictions, the action plan pays attention to enhancing land policies and planning via promoting ecosystem approach, integrating biodiversity values & sustainability in road and infrastructure development policies and plans. The action plan also calls for integrating the planning of biodiversity and protected areas into the wider landscape with specific focus on broadening conservation zones of protected areas to include connectivity corridors and buffer zones into national and local land use plans.

Recognizing that there is an urgent need to increase the scope and coverage protected areas in order to meet the adopted Aichi target, it is therefore important to shift from PA management as defined by specific boundaries to broader landscape level. To this end, the NBSAP2 under Output 1.1 on expansion of protected areas coverage calls for promoting integrated planning approach with aim to increase PA coverage based on establishment of ecological corridors and creation of spatial corridors and connectivity between neighboring ecosystems. This approach will help create spatial corridors between marine ecosystems of the Gulf of Aden and Red sea, and hence leading to increase of PA coverage and thus meet the national designated target.

Target to be achieved under this output by 2025 is: “ Biodiversity values & the maintenance of key ecosystem services have been integrated into national & local land use planning based on developing and implementing a number of land-zones and land use management plans” (Aichi Target2).

#### **Indicators**

- Trends in new road constructed

- Trend in agricultural land converted to urban uses
- Change in percentage of land used for infrastructure

#### **5.3.4.5: Sustainable tourism (Output 4.5)**

This output is designed to achieve the conservation of biological resources based on integrating ecologically sustainable management practices into tourism and recreation sector with ultimate end to minimize the impact of tourism activities on biodiversity and natural habitats & keeping tourism levels within the carrying capacity of eco-sites. The attainment of this output will be realized through numerous policy options clustered in two activity groups respectively focused on improvements of management & planning capacities at site levels and strengthening EIA enforcement capacity.

Improving eco-sites planning will be realized through development and implementation of national tourism and local plans that are aligned with national biodiversity and protected area goals. These plans are to be prepared in a participatory manner by involving the private sector, NGOs and local communities in the development process as well as in mobilizing resources, implementing the plans and monitoring tourism impacts at sites levels. To strengthen eco-sites management, focus is to be given to minimizing tourists impacts on natural habitats, and this will be achieved through enhancing tourist awareness on garbage collection and disposal, monitor dumping of visitors' garbage's in protected areas and control of motorized recreational activities. Specific needs in this context, include delineating areas & facilities for solid waste disposal within eco-sites and delineating areas for other recreation activities such as taking photos, camping, foods taking, walking and parking, etc. Eco-tourism development in protected areas and buffer zones should be based on specific criteria, surveys of areas suitable for eco-tourism activities, impacts assessment of recreational activities in coastal areas and assessment of habitat vulnerability.

To enforce EIA, focus will be given to halting tourism infrastructure and road development, and prohibiting activities that are not complying to EIA requirements & approved by central authority. To meet these needs, it is a prerequisite to form a coordination committee attached to EPA at central level to approve infrastructure development within eco-sites and protected areas.

End terms target to be produced under this output is that “ Ecotourism sector is benefiting from ecosystem services and has incorporated sustainability & national biodiversity and protected area goals into national & local ecotourism development plans and programmes by 2025”.

#### **Indicators:**

- Number of national & local ecotourism development plans and programmes implemented that are consistent with national biodiversity and protected area goals
- Trends in awareness and attitudes of eco-sites visitors towards biodiversity assets
- Trends in public engagement in eco-site management & biodiversity protection
- Number of tourism infrastructure and roads development projects complying with EIA requirements

#### **5.3.5: Promoting Good Governance in Biodiversity Management (Outcome 5)**

Under this outcome, NBSAP2 seeks to promote good governance in biodiversity management by putting in place an harmonized institutional structure focused on promotion of co-management of natural resources, establishment of adequately mandated and empowered national institutions and mechanisms for coordinating the management of biological resources and strengthening their capacities in the planning, management and monitoring of biological

resources. This outcome addresses institutional weakness in biodiversity conservation and management, which is mainly attributed to overlapping mandates, inadequate funding to deliver policies, inadequate expertise in various biodiversity & ecosystem areas, and low public awareness of biodiversity values and issues, particularly under limited use and recognition of traditional knowledge, limited research on biodiversity issue & weak information base to inform environmental decision and prepare strategies and policies. Specifically, the NBSAP2 under priority outcome 5 calls for reversing institutional weakness through six strategic options, respectively geared towards restructuring environmental agencies and upgrading their legal frames, strengthening of natural resources planning and management capacities, enhancing environmental education and awareness, building human resources capacities, and resource mobilization for implementation of NBSAP2. For simplicity such strategic options are grouped under two outputs respectively dedicated for institutional restructuring (Output 5.1) and improvement of Public awareness, research and knowledge sharing (Output 5.2).

#### **5.3.5.1: Institutional Restructuring (Output 5.1)**

Output 5.1 on institutional restructuring aims at the rationalization of institutional frameworks for effective management & planning of biological resources. Under this output, the NBSAP2 proposes a number of measures and actions, respectively addressing capacity constraints at systemic, institutional and individual levels.

At system and institutional levels effort is to be paid for institutional restructuring and legislation reform for key environmental sectors. Restructuring of environmental agencies at central level will be realized through harmonizing the mandates of environmental agencies; enforcement of rationalized institutional frameworks of environmental agencies; creation of higher level inter-institutional mechanism to oversight and monitor implementation of environmental policies; and promotion of participatory & inclusive management and planning of natural resources, allowing greater involvement of private sector and NGOs in the management and planning of natural resources. Given that current policies governing the use of natural resources are highly centralized and not supportive of local community involvement, the NBSAP2 is therefore calling for promoting decentralization in management and planning for natural resources, including the delivery of water services. To facilitate shifting to a decentralized management, the NBSAP2 will, *inter alia*, create effective and viable community-based and district's managements of natural resources & delivery of water services, create mechanisms for inter-village coordination, and strengthen the management capacities of local administrations and mechanism through appropriate training in management and planning of natural resources. Legislation reform will focus on updating the environment protection law, upgrading of legal frameworks, removal of harmful incentives & subsidies contributing to biodiversity loss, and promulgation of positive incentives that support biodiversity conservation and sustainability. Specific details in this regard are articulated under Output 4.1 on Policy Reform above.

At the individual level, thugh priority is to be given to improving personal skills and performance through, training and learning systems and training and education programs to overcome shortage in the technical cadre and limited specialized staff in species identification,

monitoring trends of biodiversity and population dynamics, research and protected areas management among others. Specific attention will be paid to strengthening individual capacities in management of PAs, local water basins, wet lands and rangelands.

Target to be achieved is “in partnership with government, community-based management approach has been widely promoted to cover 50% of Yemen’s protected areas by 2020, and 100% by 2025, thereby leading to improved effectiveness of Yemen’s protected areas, along with promotion of traditional knowledge and practices on conservation and sustainable use of biological resources” (Aichi target 18).

**Indicators:**

- Extent of involvement of private sector, NGOs in the management and planning of natural resources.
- Number of community-based managements established in natural resources management
- Number of community-based managements established involved in delivery of water services
- Number of inter-village coordination mechanisms created
- Number of laws by-laws enacted.

**5.3.5.2: Improvement of Public awareness, research and knowledge sharing (Output 5.2)**

Generally, sound biodiversity planning is constrained by low awareness from the public and among decision-makers and relevant agencies attributable to weak information base, lack of information networks, shortage of Information Technology (IT), limited research capacity combined with lack of monitoring mechanisms associated with the absence of monitoring indicators for better understanding and planning biodiversity issues. This situation is further complicated by the lack of awareness and communication strategy and no integration of biodiversity issues into formal education programs and curricula, leading to poor public appreciation of biodiversity values. To this end, the NBSAP2 under this output seeks to enhance knowledge sharing, public awareness and research to better understand, plan and manage natural resources. To address these issues and better plan natural resources, the NBSAP2 adopts a combination of actions clustered under three groups, respectively delineated for improving information availability, rising environmental awareness of Yemeni society, and strengthening research capacity to deliver concrete scientific knowledge for environmental planning.

To address current information weakness, the NBSAP2 adopts a wide-range of measures, including the development and implementation of a Communications and Information Technology (ICT) strategy, strengthening the clearing-house mechanism at EPA to act as an information sharing platform between various national agencies, and the set-up of environmental communication units at EPA and active research centers to facilitate production and dissemination of awareness raising materials. To this end, each communication unit will be furnished with appropriate technologies for production and dissemination of environmental information and awareness and research products. In this context, adequate specialized training

will be delivered to media and communication units' personnel on newly introduced facilities, and on information processing, and production and dissemination of awareness materials. Specific training will be given to designing radio/TV programs, environmental campaigns and awareness raising educational materials addressing various aspects of biodiversity degradation.

Special priority is given for improving information availability for effective national & local planning and programming of natural resources & water services. Improving information availability will be realized by enabling local community (local council members & staff) at the district levels to establish and manage their own database systems as integral components of the central database. This intervention would facilitate real-time data generation, analysis and dissemination by local people, hence reducing workload on central authority & eliminating excessive cost incurred by government in conducting periodical surveys as they become outdated. This intervention would also provide district community with the necessary tool for their effective participation in decision-making of social service planning & delivery. Building the capacities of district's managements combined with the creation of districts database systems is expected to enable elected local councils and community-based management to assume their responsibility as regard to planning, management and execution of local development programs and delivery of water services at the district levels pursuant to their mandates spelled out by local council law no 4. Without this there is no chance to enact the local council law and the central authorities will remain fully responsible for planning and management of natural resources, with no role for local councils/communities, thus violating local council law.

In order to address the issue of low environmental awareness among various sectors of Yemeni society, the NBSAP2 contains a wide-range of policies and instruments, such as: developing a national strategy that addresses issues of environmental awareness; the effective integration of new biodiversity themes into the educational system, launching nationwide public campaigns and programmes for enhancing public awareness of different audiences, and expansion and creation of environmental clubs at schools and among youth groups. To integrate biodiversity themes into the educational systems, special attention will be given to introducing biodiversity courses into educational curricula of secondary schools, with specific focus on development of curriculum on biodiversity status, dynamics and driving forces and management strategies. Furthermore, strengthening public education on environment is an important element of action plan and will be based on review of curriculum, production of education/teaching materials and orientation of teachers towards biodiversity themes.

Awareness raising campaigns and programmes will target different audiences, including policy makers, farmers, students, business communities, local communities, women and youth amongst others. Key topic areas to be addressed include among others: promotion of traditional knowledge and innovative irrigation systems on water conservation, increasing public awareness on biodiversity degradation and its impacts on people livelihood, increasing decision makers and public awareness on the value of biodiversity & its service, improving media knowledge on producing and broadcasting biodiversity awareness raising programs,

and impact of current inappropriate production and consumption patterns on biodiversity and ecosystem loss.

To improve the capacity of research institutions in producing purposeful research, the NBSAP2 aims at directing research effort towards improving understanding of the natural resources capacity to deliver goods and services and support livelihoods of Yemeni people sustainably. To realize this objective, the action plan seeks to promote integrated research based on improved information base, skilled expertise, and improved clearing house mechanism (CHM) for monitoring biodiversity changes. Key research activities will be targeting the quantification of economic valuation of ecosystem goods and services; promoting sustainable use and management of forest, water and marine resources and visualization of the direct and underlying causes of biodiversity losses. Other major areas of research will focus on better understanding ecological processes and habitats; and introducing know-how, practices, and technologies for clean and responsible production and consumption.

Targets to be achieved by 2025 are:

- The values of biodiversity & ecosystem services are recognized by decision makers & integrated into key environmental sectors (Aichi target 1).
- Knowledge related to biodiversity values, functioning, status and trends, and the consequences of its loss, is improved (Aichi: T 9).

#### **Indicators**

- Number of environmental clubs created at schools and among youth groups
- Trends in public awareness and attitudes towards biodiversity conservation
- Trends in public engagement with biodiversity
- Trends in communication programmes and actions promoting social corporate responsibility

#### **5.3.5.3: Resource mobilization for NBSAP2 Implementation**

In Yemen, biodiversity issues are not considered among most pressing concerns compared with social issues such as poverty, health and education. Consequently, government financing for implementation of National Biodiversity strategies is generally being reported as inadequate and not exceeding 20% of total funding needs, indicating that the bulk of funding (80%) for biodiversity conservation initiatives is covered from international donor sources.

Generally, national expenditure on biodiversity conservation is approximately 0.7% of national expenditure. This funding inadequacy is further aggravated by weak focal point capacities to mobilize resources from international agencies associated with the low awareness level of national staff on potential international funding mechanisms and funding eligibility. These challenges are compounded by a weak information base for policy development, poor expertise in project and strategy formulation, lack of networking, and weak scientific and technical cooperation with international agencies.

In order to meet the country commitments as spelled out by 'the Aichi targets', the GOY developed NBSAP2 anchored with a resource mobilization strategy (RMS) for implementing the NBSAP2. The RMS recommends accessing to both internal and external financing sources to mobilize a total amount of US\$102.335 million estimated by stakeholders for NBSAP2 Implementation for the upcoming 10 years. Given the current biodiversity funding from domestic sources is only US\$1 million annually according to EPA, a financing gap of US\$92 million is estimated to be tapped into from international sources. Table depicts



potential donors for NBSAP2 activity budget from both domestic and international financing sources.

<i>Table 5: Potential donors for NBSAP2 activity budget</i>		
<i>Total Budget by outcomes/outputs</i>	<i>Budget (US\$)</i>	<i>Potential Donors/ Agencies</i>
<b>Outcome 1 : Biodiversity and Ecosystems Conservation</b>		
Output 1.1: Expansion of Protected areas network	7,000,000	PPP, park entrance fee, GEF, PES
Output 1.2: Conservation of rare and endangered species	1,800,000	GEF, Public budget, AF, PES
Output 1.4: Conservation of Genetic Resources and Biosafety	1,800,000	GEF, Public budget, AF
Total outcome 1	10,600,000	
<b>Outcome 2: Sustainable use of natural resources</b>		
Output 2.1: Sustainable Management of Forests and Rangelands	3,800,000	REDD+, GEF, AF, LDFC, PIF, SREP, PES
Output 2.2: Sustainable agriculture	9,000,000	Public Budget, AF, GCF, PIF,
Output 2.3: Sustainable management of marine living resources	12,400,000	User's fee, GEF, AF,
Output 2.4: Restoration and Safeguarding Aquatic Ecosystems, Delivering Fresh Water	9,100,000	AF, Netherland embassy, User's fees
Total outcome 2	34,300,000	
<b>Outcome 3: Reduction of Natural &amp; Anthropogenic Pressures Contributing to Biodiversity &amp; Ecosystem Loss</b>		
Output 3.1: Socio-Ecosystems Resilience Against Natural Disasters	7,800,000	AF, LCDF, GCF,
Output 3.2 : Combat Invasive Alien Species	2,850,000	GEF, Public Budget, AF
Output 3.3: Mitigation of GHG emission	4,350,000	GEF, MBI, SREP, Public Budget
Output 3. 4: Strengthening Preparedness Against Anthropogenic Waste & Hazards	3,350,000	REDD+, CIF, CERs, MBI, SREP, GCF
Total outcome 3	18,350,000	
<b>Outcome 4 : Biodiversity and Poverty Mainstreaming</b>		
Output 4.1: Legislation and policy reform	1,865,000	Public Budget, PES, AD
Output 4.2: Poverty Mainstreaming	3,600,000	NFs
Output 4.3: Sustainable consumption & production	4,300,000	Public Budget, User's fee and MBI
Output 4.4: Integrated planning approaches of land resources	11,250,000	FIP, AF, GEF, Public Budget
Output 4.5: sustainable tourism	5,600,000	Public Budget, User's fee and MBI, PPP
Total outcome 4	26,615,000	
<b>Outcome 5: Promoting Good Governance in Biodiversity Management</b>		
Output 5.1: Institutional Restructuring	5,700,000	GCF, FIP, PPCR
Output 5.2 Improvement of Public awareness, research and knowledge sharing	6,770,000	NGOs, Public Budget , SREP, PPCR
Total outcome 5	12,470,000	
Grand total	102,335,000	



Under the domestic funding, five potential funding windows of raising revenue have been identified and these are: increasing government budget for environmental/biodiversity, Public Private Partnership (PPP), Market Based Instruments (MBI), and in-kind NGOs contributions. As for increasing government budget for environmental conservation, it is acknowledged that currently the GOY has significant budget constraints in association with ongoing war. Therefore, only two plausible strategies are possible to increase the biodiversity budget. The first is to remove or reduce environmental perverse incentives (subsidies on agro-chemical, importation of grain, fuel and engine pump) and to reallocate the funds for NBSAP2 implementation and biodiversity protection. The second strategic option is to redirect 0.1% of government budget primarily allocated for socio economic funds for NBSAP2 implementation particularly for implementation of output 4.2 concerned with Poverty Mainstreaming and improving livelihoods and productive capacity of vulnerable poor, women and youth to withstand against anthropogenic risks, including economic shocks. It is estimated that this measure has the potential to secure an average of US\$ .36 million annually from 7 national funds, namely the Agriculture and Fishers Promotion Fund, the Youth Fund, the Skills Development Fund and the Social Net Fund, Disabled care & rehabilitation Fund, Heritage & cultural development Fund and Tourism Promotion Fund.

Another important funding source to be exploited is to allow private sector to jointly invest in partnership with government in economically viable nature based businesses mainly PA management, sustainable ecotourism, ecosystem management such as mangroves, coastal zones, etc. Incidentally, the private sector can raise revenues through loans which can be repaid by the viable nature based business. Revenue generated from the joint management can be used for NBSAP implementation. Payment for Ecosystem Services (PES) is another avenue that has the potential to raise sufficient revenue to enable NBSAP2 implementation. The PES is to compensate fair costs for the services delivered by ecosystems, and to enforce charges against the damage incurred while extracting ecosystems benefits, thereby leading to increasing budget allocation for NBSAP2 implementation. PES enforcement is to be effected through enforcement of resource user fees against the use of water, common lands, fishery harvesting and consumption of forest and rangeland products. The scheme will be put in place through enacting several policy options, such as polluter-pays-principle (emission tax), tradable pollution/emission permits (TPPs) and selling of permits known as individual transferable quotas (ITQs) particularly as regards timber, fishery, pollution, and water abstraction. Complementary measures to enforce PES may also include commercialization of medicinal plants through certification and eco-labeling; reformed water tariffs; cost-recovery schemes for water supply; creation and enforcement of quotas for fair and equitable use of water, marine, forest and land resources. Another PES measure is to enforce the polluter-pays principle in order to compensate environmental damage incurred by the use of imported coal for cement production, the use of subsidized fuel for water pumping and consumption of subsidized agrochemical, fertilizer, pesticides & herbicides in agriculture sector. Otherwise, the removal of such subsidies is environmentally most advocated, particularly if the polluter-pays-principle is not enforced. See Output 4.1 on policy reform in order to implement these measures.

Resource user fees is another potential financing source to support NBSAP2 implementation. It include fees for hunting and fishing licenses, park entrance fees, camping fees, lodging fees and vehicle fees amongst others. Currently, the EPA applies ecosystems charge park entrance fees, camping fees, lodging fees in six (6) PAs which were, prior to current war, attracting both international and local tourists. Thus resource user fees have the potential to raise huge resources for NBSAP implementation. Finally, it is important that efforts be geared towards mainstreaming biodiversity into national planning and strategies and also synergies between biodiversity strategies. This will ensure efficiency in resource use and

implementation of the strategies. Strategies for mainstreaming include implementation of EIA, Ecosystem approach, NRA, spatial planning and land use planning.

To facilitate smooth collection and management of resource user fees, PES and other charges, it is recommended that an Environmental Protection Fund (EPF) be created with representatives from various environmental sectors, mainly Ministry of Water and Environment (MWE), Environment Protection Authority (EPA), Ministry of Agriculture and Irrigation (MAI), Ministry of Fish Wealth (MFW) and Ministry of Planning and International Cooperation (MPIC). The EPF will be responsible for collection of revenues from various sources through their local branches and collected revenues should be deposited to the EPF, which in turn transfer it for NBSAP2 implementation as per the priorities identified in the action plan. To put resource user's fees and PES in place, a legal framework is to be developed and tabled to cabinet for adoption. In addition, it is critical that the capacity of local Institutions/governmental departments is adequately strengthened to be capable to collect revenue, account for the revenue, and undertake control exercises to monitor and enforce the charges.

Additionally, National NGOs have a momentous role to play in this exercise. Though NGOs have budget constraints and would be financially challenged to contribute to NBSAP2 implementation, they have the capacity to contribute in-kind by offering training, capacity building and public awareness on traditional knowledge, sustainable practices and information sharing. It is important that national NGOs be engaged to identify areas to which they can actively participate for NBSAP2 implementation. It is fundamental to note that domestic financing sources require a stable political climate for sectors such as tourism to flourish and contribute to income generation and PES.

The second source of resource mobilization is the international donor funding. It is estimated that currently international donor funding constitutes approximately 80% of biodiversity financing in the country. Possible donors include multilateral and bilateral sources such as GEF, UNDP, UNEP, World Bank Group (WBG), OECD member countries, including Netherlands, Italy amongst others. It is estimated that global biodiversity funds are in excess of US\$5 billion per year. Thus, this source of funding is crucial for NBSAP and must be pursued.

The Global Environment Facility (GEF) is for funding Biodiversity, climate change, international waters, land degradation, and Persistent Organic Pollutants (hereinafter POPs). In order to increase Yemen's competitiveness to international funding it is imperative that the country increases its accountability, due diligence and transparency. Regionally, funding from Neighboring Gulf countries is likely to be vital particularly under current biodiversity depreciation incurred by the ongoing war. Another feasible international donor sources to be accessed include 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). Financing area to be covered by these sources are presented below

The Adaptation Fund (AF) is to be accessed for financing Output 3.1 targeted at enhancing the socio- ecosystems resilience against anthropogenic and natural disasters. Key activities to be addressed include rehabilitation of terraced agriculture, restoration of fragile mountain ecosystems and restoration & conservation of degraded watersheds, rangelands, forest & coastal wetlands, which collectively contribute to climate change mitigation and adaptation and to combating desertification.

The Least Developed Countries Fund (LDCF) may be used for funding a revised National Adaptation Programs of Action as called upon by Output 2.3 on Sustainable management of marine living resource which calls for renewal & improvement of current protection plans such as National Adaptation Programme of Action (NAPA), recovery plans for key and threatened fish species, and the update and implementation of more integrated coastal zone management (ICZM) plans amongst others.

The Climate Investment Funds (CIF) along with its two separate trust funds being the Clean Technology Funds (CTF) and the Strategic Climate Fund (SCF) will be accessed in order to facilitate transfer of low-carbon technologies with a significant potential for long-term greenhouse gas emissions planned under Output 3.3 about Mitigation of GHG emissions.

Additionally, the GOY intends to access the Forest Investment Program (FIP), the Pilot Program for Climate Resilience (PPCR), and the Scaling-up Renewable Energy Program (SREP) attached to CIF to finance implementation of several interventions. Taping into FIP is to contribute to implementation of output 2.1 concerned with forest rehabilitation and sustainable management of forests, including protection of existing stocks of forest carbon. As far as the PPCR, it will be tapped into in order to continue implementation of current initiatives concerned with controlling impact of extreme weather and flood events, establishment of a satellite based early warning system and installing a Doppler Radar, and to monitor climate change, drought, desertification, wind erosion and flood rains and loss of agricultural lands, soils and terraces. Regarding the SREP, the RoY has already been identified as one of 8 countries eligible to access this program, and the Government is in the process of preparing investment plans with SREP funding and MDB support. Accessing this source and the Green Climate Fund (GCF) will help Yemen to implementing Output 3.3 devoted to mitigating GHG emissions and promoting low carbon development pathways in the energy sectors based on promoting solar, wind, bio-energy, and geothermal and hydropower, cooking and heating application including sustainable community forests and improved cook stoves. For tapping into the GCF, it is proposed to create the National Climate Funds (NCF) and adopt nationally appropriate mitigation actions (NAMAs) to reduce GHG emissions from various sectors. This will help putting in place an effective entity and funding mechanism capable of planning, accessing, delivering, monitoring and reporting on international and domestic climate issues and finance.

Performance-Based Payments for Reduced Emissions from Deforestation, Degradation and Forest Conservation is another important source for reducing emission from deforestation, degradation and forest Conservation in Yemen as it is targeted by Output 3.3 on mitigating GHG emissions via the promotion of smart agricultural and land use practices such as the expansion of protected areas, restoration of “Blue Carbon” ecosystems (mangroves), reforestation to reduce emission from deforestation and forest degradation (REDD). It further entails innovative & friendly management practices to mitigate emissions from land use, land-use change and forestry (LULUCF). Finally, Certified Emission Reductions (CERS) established under the Clean Development Mechanism (CDM) is another funding source to support implementation of activities related mitigating of GHG emissions planned under Output 3.3. Yemen has already designated a national authority for the CDM, and thus is eligible to access this source

By 2015, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan 2011- 2020 from all sources and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization should increase substantially from the current levels.

#### 5.3.5.4: Implementation, Monitoring and Review

As learned from the previous NBSAP, the country was lacking of coordination mechanism, monitoring mechanism, biodiversity indicators and reporting systems to help guiding all stakeholders to meaningfully participate in the NBSAP implementation process. As a result, accountability and responsibility towards biodiversity conservation were scattered among various environmental institutions, leading to ineffective and inadequate implementation of NBSAP, weak monitoring and reporting on biodiversity status, including the reporting to the CBD convention. National stakeholders during the development process of NBSAP2 have agreed to reverse this situation by creating an appropriate mechanism to monitor, review, and evaluate the state of implementation activities towards achieving the strategic goals and targets included in NBSAP2. The Mechanism is to ensure undertaking continuous monitoring of biodiversity status and trends, and producing periodic reporting, highlighting problems faced during implementation of the NBSAP2 programs and activities and proposing remedy actions to better ensure the attainment of goals and targets identified by NBSAP in each specific areas. This mechanism may include the following elements: (a) a multi-sectoral coordination body with representation of various environmental agencies; (b) information system containing biodiversity indicators for information exchange, monitoring, evaluation of the NBSAP2 implementation & biodiversity status; and (c) a reporting system on biodiversity status and progress of implementation of the NBSAP2 for international, national and local stakeholder communities. Primarily, it is proposed to materialize on infrastructural and institutional capacities available to EPA focal point to establish coordination mechanism and monitoring scheme at EPA, and to enhance its information base. To put this mechanism in place, it is proposed to restructure the EPA Management Board to act as coordination mechanism for biodiversity issues beside its current mandate as coordination body for environmental issues. Specific steps in this process include:

- Restructuring the EPA management Board to act as an NBSAP coordination body.
- Develop and enforce legislative framework and by- law for the functioning of EPA Board of directors
- Issue cabinet decree declaring the following representatives as members of the Board of directors of the coordination body of biodiversity issues
  - Ministry of Water and Environment, chairman
  - EPA Biodiversity Department, secretariat
  - EPA Climate Change Unit,
  - Environmental Protection Authority,
  - Ministry of Agriculture and Irrigation,
  - Union of Agricultural Cooperatives,
  - General Department of Forestry and Combating Desertification
  - Ministry of Tourism,
  - Social Fund for Development,
  - Public Works Authority,
  - Ministry of Finance,
  - National Women Committee,
  - Ministry of Planning and International Coordination,
  - Ministry of Oil and Mineral Resources,
  - Ministry of Electricity and Energy
  - Ministry of Fishery Wealth,
  - Local Communities of Aden Wetlands, Bura'a PA, Hawf PA,
  - Ministry of Information, Media
  - University of Sana'a, University of Hodiedah, University of Hadramout, University of Aden,
  - Agricultural Research and Extension Authority,

- Amend the by-law of the EPA Biodiversity Department and Build the management capacity of clearinghouse mechanism (CHM) website so as to be secretariat for Board of directors of the coordination body
- Improve the CHM website's performance, and make it accessible to all biodiversity partners through networking

In its capacity as secretariat for Board of directors of the coordination body, the Biodiversity Department in EPA will be responsible for updating biodiversity information of the CHM website, compiling reports on biodiversity status and trends, including reports on the status of NBSAP2 implementation to serve as a guide for future strategic planning, and contribute information towards Yemen's national reporting to the CBD. The department will develop initial biodiversity status reports annually and submit it to the coordination body as monitoring and evaluation tool on which the board will decide on remedy actions. During the NBSAP2 implementation up to end of planning period by 2025, the board will independently develop mid-term evaluation of NBSAP2 implementation by 2018. Progress in implementation will also be reported to the CBD through the 6th National Report by 2018, and the 7th National Report by 2024. A final independent evaluation of the NBSAP2 implementation will be developed in 2025, to highlight the status of Yemen's contribution towards the achievement of the Aichi Targets, including lessons learned to capitalize on while developing the NBSAP3.





## Annex 1: NBSAP2 Action Plan

Outcome 1: Biodiversity and Ecosystems Conservation				
Strategic goal 1: Conserving, restoring and maintaining the integrity of Yemen's eco-systems by maintaining adequate network of protected areas, restoring degraded ecosystems, conservation and rehabilitation of key endangered species, ex-situ conservation of rare and endangered plants species and genetic resources.				
Output 1.1: Expansion of Protected areas network				
Objective: To protect, recover and restore biological diversity through adequate and effective protected area networks, restoration of degraded ecosystems, and conservation of endemic and threatened species..				
Baseline threats (Causes & Impacts)	Planned Actions	Responsibility/ Collaborators PARTNERS	Budget	Potential funding
<ul style="list-style-type: none"> <li>•Forest loss,</li> <li>•Loss of woodland for firewood, timber and charcoal production</li> <li>•Loss of agro-biodiversity, including loss of farmlands, terraces and rangelands</li> <li>•Conversion of natural habitat to meet Agricultural expansion &amp; other development needs.</li> <li>•Soil loss.</li> <li>•Deforestation</li> <li>•Changes in fertility of soils</li> <li>•Loss of terraces and agro-systems</li> <li>•Removal of vegetation cover</li> <li>•Degradation of marine ecosystems, including:</li> <li>•Loss of wetland ecosystems</li> <li>•Mangrove loss</li> <li>•Destruction of coral reefs</li> <li>•Destruction of benthic habitats</li> <li>•Inundation of coasts &amp; erosion of coastal zone due to dams upstream and sediment reduction to coastal zone</li> <li>•Sea level rise</li> <li>•Loss of habitats of invertebrates species &amp; migratory species</li> <li>•Degradation of habitat;</li> <li>•Inadequate protected areas Coverage</li> <li>•Ineffective PA Management</li> </ul>	1. Assess the comprehensiveness, representativeness and adequacy of protected areas and identify protection gaps..	EPA/ MSRA, MEW, MAI, GDFCD	40,000	PPP, park entrance fee, GEF, PES
	2. Assess protected area management effectiveness and adopt standards and indicators to evaluate the effectiveness of protected area management.	EPA/ MSRA AREA and GDFCD	150,000	
	3. Declare more adequate & ecologically representative network of marine & coastal protected areas to cover 12% of Yemen territorial waters.	EPA/MEW	1,500,000	
	4. Declare more adequate & ecologically representative network of terrestrial protected areas to cover 7% of Yemen terrestrial land	EPA/MEW & MFW	1,000,000	
	5. Increase the area of planted forest, particularly mangrove forest.	EPA/ MEW, MAI, GDFCD	150,000	
	6. Promote restoration of marine ecosystem services by developing and implementing wetland and coral reefs restoration programs.	MFW/ EPA, MEW, MAI, GDFCD MFW	250,000	
	7. Expand efforts to conserve forest genetic resources.	AREA & GRC	150,000	
	8. Integrate protected areas into the broader landscape to limit habitat fragmentation & improve adaptation to climate change via integrated flood management and establishment of ecological corridors in the form of vegetated road side & stone walls along the Wadie courses between fragmented areas and protected areas to help spreading of wild species plant.	NWRA, MAI/ EPA, MOC & MEW,	50,000	
	9. Implement Conservation management plans for terrestrial areas that fully integrate ecosystem approach into sectoral planning	EPA/ MEW, MAI and GDFCD	50,000	
	10. Integrated coastal zone management plans to cover the entire coastal areas	EPA/ MEW& MFW	50,000	
	11. Increase national capacity to manage protected areas effectively & sustainably.	EPA/ MEW, MAI and GDFCD	50,000	
	12. Further promote community-based management of nature reserves	EPA, NWRA, MFW and GDFCD	1,000,000	
	13. Improve local community capacity in protected areas management	EPA, NWRA, MFW and GDFCD	50,000	
	14. Promote the implementation of systems and practices for restoration in accordance with the ecosystem approach.	EPA, NWRA, MFW and GDFCD	50,000	
	15. Promote restoration of marine ecosystem services by developing and implementing wetland, forest mangrove and coral reefs restoration programs.	EPA and MFW	1,200,000	

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	16. Establish environmental databases & networking between whole environmental sectors	EPA, NWRA, MSRA, MEW, MAI, GDFCD, MEE and MFW	1,200,000	
	17. Study and documentation of local communities traditional knowledge and practices in the conservation, restoration and use of land resources	EPA, MSRA MEW, MAI, GDFCD, MFW	60,000	
		Total	7,000,000	
Target 1: At least 5% (by 2020) and 7% (by 2025) of terrestrial and inland water areas, and 6% (by 2020) and 12% (by 2025) of coastal and marine areas will be under protection, effectively managed by local communities, and integrated into the wider landscape and seascape.				

<b>Outcome 1: Biodiversity and Ecosystems Conservation</b>				
<b>Strategic goal 1: Conserving, restoring and maintaining the integrity of Yemen's eco-systems by maintaining adequate network of protected areas, restoring degraded ecosystems, conservation and rehabilitation of key endangered species, ex-situ conservation of rare and endangered plants species and genetic resources.</b>				
<b>Output 1.2: Conservation &amp; protection of endemic, rare &amp; endangered species</b>				
<b>Objective: To conserve, protect &amp; rehabilitate key endemic, rare &amp; endangered taxa, including mammal and bird species .</b>				
Baseline threats (Causes & Impacts)	Planned Actions	Responsibility/ Collaborators PARTNERS	Budget	Potential funding
<ul style="list-style-type: none"> <li>• Limited Ex-Situ &amp; in-situ conservation initiatives</li> <li>• Extinction of endemic species</li> <li>• Lack of a national policy on ex-situ conservation addressing wild and domesticated or cultivated biological resources (plants, animals and microorganisms).</li> <li>• Absence of recovery and rehabilitation plan for threatened species.</li> <li>• Lack of control of importation and exportation of biological materials</li> <li>• Limited human and physical capacity on management of ex-situ conservation</li> </ul>	• Prepare and implement recovery and rehabilitation strategy for threatened species	EPA/ MSRA, MEW, MAI, GDFCD	50,000	GEF, Public budget, AF, PES
	• In-situ Conservation of rare and threatened breeds,	EPA/ MSRA AREA and GDFCD	270,000	
	• Resettlement of endangered species,	EPA/MEW	120,000	
	• In-situ conservation programs of key endangered flora,	EPA/MEW & MFW	170,000	
	• Ex-situ conservation programmes for endangered plants, mammals mammals & bird species	EPA/ MEW, MAI, GDFCD	300,000	
	• Restoration programs for their habitats such as the wetlands, forest mangrove and coral reefs.	MFW/ EPA, MEW, MAI, GDFCD MFW	200,000	
	• Research, mapping and surveys of endangered species and endemic plant species	AREA & GRC	250,000	
	• Strengthening institutional capacity for <i>ex-situ</i> conservation,	NWRA, MAI/ EPA, MOC & MEW,	50,000	
	• Develop data base on endemic and threatened species	EPA/ MEW, MAI and GDFCD	50,000	
	• Develop networking for information exchange between environmental sectors.	EPA/ MEW& MFW	50,000	
	• Updating Yemen red list for rare and endangered species	EPA/ MEW, MAI and GDFCD	50,000	
	• Vulnerability & impact study on rare, endemic and endangered species	EPA/ MEW, MAI, MFW, MSRA GDFCD, MLA	40,000	
	• Prepare and effect by-laws and regulations on protection of endangered and endemic species, including the control of poaching and illegal trade of endemic plant species.	EPA/ MEW, MAI, MFW, MSRA GDFCD, MLA	100,000	
			<b>1,800,000</b>	
Target 2: By 2025, 50 % of endemic, rare & endangered plants, mammal and bird species will be conserved (Aichi target12)				

Outcome 1: Biodiversity and Ecosystems Conservation				
Strategic goal 1: Conserving, restoring and maintaining the integrity of Yemen's eco-systems by maintaining adequate network of protected areas, restoring degraded ecosystems, conservation and rehabilitation of key endangered species, ex-situ conservation of rare and endangered plants species and genetic resources.				
<b>Output 1.3: Conservation and Equitable Use of Genetic Resources</b>				
<b>Objective: to minimise genetic erosion of cultivated plants &amp; domestic animals through improved ex-situ conservation capacity and improved biosafety management</b>				
Baseline threats (Causes & Impacts)	Planned Actions	Responsibility/ Collaborators	Budget	Potential funding
<ul style="list-style-type: none"> <li>• Lack of seed banks, gene banks, herbarium, and zoological or botanical centers</li> <li>• Lack of botanical garden for collecting and preserving rare and endangered flora</li> <li>• Lacks a law supporting the ex-situ conservation &amp; protection of wild and domesticated or cultivated biological resources (plants, animals and microorganisms)</li> <li>• Limited management capacity in collection, maintenance and reintroduction of plants and animal species in ex-situ programmes.</li> <li>• Lack of <i>in situ</i> and <i>ex situ conservation</i> of cultivated plant species</li> <li>• Poor knowledge &amp; understanding on distribution &amp; importance of genetic diversity</li> <li>• Lack of strategies on conservation and sustainable use of genetic diversity, including</li> <li>• Lack of recovery and rehabilitation plans for threatened species</li> <li>• Poor information &amp; understanding on the risks &amp; impacts of food imports, transfer of modern biotechnology and transfer of LMOs on agrobiodiversity. <ul style="list-style-type: none"> <li>▪ Nonoperational national biosafety framework,</li> <li>▪ Lack of national Biosafety by-law,</li> <li>▪ Lack of law and executive by-law on access to genetic resources.</li> <li>▪ Inadequate legislations to regulate the use and release of living modified organisms and the transfer</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Establish Biodiversity (terrestrial, Agricultural and Marine) National Genetic Resources Centers</li> </ul>	EPA/ MSRA, MEW, MAI, GDFCD	<b>250,000</b>	GEF, Public budget, PES, AF
	<ul style="list-style-type: none"> <li>• Develop and strengthen the capacity for <i>ex-situ</i> conservation through the establishment of gene banks, seed banks, national herbarium, natural history museum and botanical garden</li> </ul>	EPA/ MSRA AREA and GDFCD	<b>300,000</b>	
	<ul style="list-style-type: none"> <li>• Develop law in support of ex-situ conservation of wild and domesticated or cultivated biological resources</li> </ul>	EPA/MEW	<b>100,000</b>	
	<ul style="list-style-type: none"> <li>• Conduct research to improve knowledge &amp; understanding on distribution &amp; importance of genetic diversity</li> </ul>	EPA/MEW & MFW	<b>150,000</b>	
	<ul style="list-style-type: none"> <li>• Develop recovery and rehabilitation plan for threatened species, including flora</li> </ul>	EPA/ MEW, MAI, GDFCD	<b>250,000</b>	
	<ul style="list-style-type: none"> <li>• Develop guidelines for collection, maintenance and reintroduction of plants and animal species through ex-situ programmes.</li> </ul>	MFW/ EPA, MEW, MAI, GDFCD MFW	<b>50,000</b>	
	<ul style="list-style-type: none"> <li>• Develop national legislation and administration concerned with access and benefit-sharing of genetic resources,</li> </ul>	AREA & GRC	<b>100,000</b>	
	<ul style="list-style-type: none"> <li>• Develop and enforce regulations for controlling the use of Living modified organisms (LMOs)</li> </ul>	NWRA, MAI/ EPA, MOC & MEW,	<b>50,000</b>	
	<ul style="list-style-type: none"> <li>• Assess the risks of food imports, transfer of modern biotechnology and transfer of LMOs on agrobiodiversity, particularly on wild relatives and landraces of barley, wheat, sorghum, millet, lentil, and cowpea,</li> </ul>	EPA/ MEW, MAI and GDFCD	<b>50,000</b>	
	<ul style="list-style-type: none"> <li>• Control and manage the risk of importing LMOs on agrobiodiversity, particularly on important grain crops.</li> </ul>	EPA/ MEW& MFW	<b>100,000</b>	
<ul style="list-style-type: none"> <li>• Periodic updates of the National Biosafety Database or the Clearing House Mechanism (CHM)</li> </ul>	EPA/ MEW, MAI and GDFCD	<b>100,000</b>		

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<p>of biotechnologies.</p> <ul style="list-style-type: none"> <li>▪ Inadequate expertise in species identification</li> <li>▪ Weak institutional capacity for the management and monitoring of biotechnology and biosafety issues.</li> <li>▪ Inadequate quarantine units in airports and sea ports</li> </ul>	<p>Establish quarantine units in airports and seaports to monitor illegal transfers of LMOs).</p>	<p>EPA, MAI, MFW, MSRA , CA</p>	<p><b>300,000</b></p>	
		<p>Total</p>	<p><b>1,800,000</b></p>	
<p>Target 3: By 2020, 70% of the genetic diversity of Yemen cultivated plants species , &amp; domestic animals will be conserved in gene banks</p>				

Outcome 2: Sustainable Use of Natural Resource				
Strategic goal 2: Promotion of the sustainable management & harvesting of fresh water, forests, crops, fish, invertebrate stocks, indigenous livestock, wildlife and native genetic species of importance for people livelihoods, food security and health care for Yemeni People.				
Output 2.1: Sustainable use of forest biological diversity				
Objective: to promote the sustainable harvesting of forest products through promotion of rotational grazing scheme, introduction of forage alternative sources for animal grazing and provision of alternative sources of income for local livelihoods .				
Baseline threats (Causes & Impacts)	Planned Actions	Responsibility/ Collaborators	Budget	Potential funding
<ul style="list-style-type: none"> <li>• Unsustainable harvesting of forest products beyond the limits of the productive capacity of forest ecosystems</li> <li>• Genetic erosion;</li> <li>• Excessive hunting of wild life.</li> <li>• Over-exploitation of endemic species and endangered species</li> <li>• Uncontrolled exporting of indigenous livestock and native genetic species.</li> <li>• Accelerated forest loss, cutting trees, overgrazing, uncontrolled forest fires,</li> <li>• Lack of policies and legislations on forestry and rangelands.</li> <li>• Recession of traditional systems on use &amp; management of forests .</li> <li>• Recession of forestlands due to desertification, urbanization, land conversion &amp; soil degradation</li> <li>• Lack of forest management plans;</li> <li>• Lack of alternative sources of income for local communities</li> <li>• Reduced agricultural productivity, leading to increased food insecurity and reduced income generation;</li> <li>• Increased water scarcity and reduced water quality, leading to increased hardship on rural livelihoods;</li> <li>• Agricultural conversion</li> <li>• Alien invasive species</li> <li>• Increased dumping of pollution, including fertilizers and chemicals</li> <li>• Wetland &amp; mangroves pollution</li> <li>• Dumping of waste</li> </ul>	<ul style="list-style-type: none"> <li>▪ Establish livestock carrying capacity in proximity of the forests</li> </ul>	EPA/ MSRA, MEW, MAI, GDFCD	100,000	REDD+, GEF, AF, LDFC, PIF, SREP, PES
	<ul style="list-style-type: none"> <li>▪ Adopt rotational Grazing Scheme</li> </ul>	EPA/ MSRA AREA and GDFCD	150,000	
	<ul style="list-style-type: none"> <li>▪ Issue the harvest permits for commercial fuel-wood and timber harvesters on predefined sustainable annual allowable harvest;</li> </ul>	EPA/MEW	50,000	
	<ul style="list-style-type: none"> <li>▪ Develop and implement rational forest management plans;,</li> </ul>	EPA/MEW & MFW	200,000	
	<ul style="list-style-type: none"> <li>▪ Provide local communities with alternative sources of income from non-forest products such as cheese, dairy, honey, ecotourism and handy craft</li> </ul>	EPA/ MEW, MAI, GDFCD	1,200,000	
	<ul style="list-style-type: none"> <li>▪ Introduce forage alternative sources for camels; in addition, replant pilot and affected areas.</li> </ul>	MFW/ EPA, MEW, MAI, GDFCD MFW	300,000	
	<ul style="list-style-type: none"> <li>▪ Introduce permits for medicinal harvesters</li> </ul>	AREA & GRC	50,000	
	<ul style="list-style-type: none"> <li>▪ Introduce alternative sources of energy to prevent forest degradation from local communities fuel-wood harvesting.</li> </ul>	NWRA, MAI/ EPA, MOC & MEW,	250,000	
	<ul style="list-style-type: none"> <li>▪ Revive the traditional ways of fuel wood harvesting</li> </ul>	EPA/ MEW, MAI and GDFCD	50,000	
	<ul style="list-style-type: none"> <li>▪ Enact mechanism to monitor forest land use change</li> </ul>	EPA/ MEW& MFW	50,000	
	<ul style="list-style-type: none"> <li>▪ Promote local participation in eco-tourism activities</li> </ul>	EPA/ MEW, MAI and GDFCD	600,000	
	<ul style="list-style-type: none"> <li>▪ Develop forest policy &amp; law to promote sustainable use of non-timber forest products</li> </ul>	EPA, NWRA, MFW and GDFCD	100,000	
	<ul style="list-style-type: none"> <li>▪ Implement co-management of forests resources</li> </ul>	EPA, NWRA, MFW and GDFCD	200,000	
	<ul style="list-style-type: none"> <li>▪ Implement eradication programs to remove Prosopis juliflora an alien invasive species threatening forest ecosystems</li> </ul>	EPA, NWRA, MFW and GDFCD	1,000,000	
		Total	3,800,000	
Target 4: Reduce forest & rangelands harvesting by 15% in 2020, and by 30% in 2025				

Outcome 2: Sustainable Use of Natural Resources				
Strategic goal 2: Promotion of the sustainable management & harvesting of fresh water, forests, crops, fish, invertebrate stocks, indigenous livestock, wildlife and native species of importance for people livelihoods, food security and health care for Yemeni People.				
Output 2.2 : Sustainable agriculture				
Objective : To increase agricultural productivity and sustainability through the diffusion of green technology in irrigation, pest control and protection of soil erosion against flood				
Baseline threats (Causes & Impacts)	Planned Actions	Responsibility/ Collaborators	Budget	Potential funding
<ul style="list-style-type: none"> <li>• Overgrazing of rangelands &amp; neglect of sustainable traditional practices.</li> <li>• Overconsumption of fauna and flora, particularly wild and plant species</li> <li>• Over-exploitation of endemic species and endangered species</li> <li>• Uncontrolled exporting of indigenous livestock and native genetic species.</li> <li>• Lack of policies and legislations on Land use, including rangelands.</li> <li>• Over exploitation and use of limited ground water.</li> <li>• Wood harvesting for fuel and charcoal production as well as for construction.</li> <li>• Recession of traditional systems on land use.</li> <li>• Recession of agricultural and rangelands due to desertification, urbanization, land conversion, soil degradation, degradation of terrace &amp; abandonment of agricultural land</li> <li>• Improper use of agro-chemicals (pesticides, fertilizers, fruit ripening agents, etc.)</li> <li>• Rangelands overgrazing beyond the limits of the productive capacity of rangelands</li> <li>• Loss of genetic resources</li> <li>• Extinction of endemic species.</li> <li>• Reduced crop and livestock productivity.</li> <li>• Shortage in the legislative system organizing the trade use and management of wild life</li> </ul>	<ul style="list-style-type: none"> <li>▪ Sustainable management of agricultural land through integrated management of land and water resources, and green technology in efficient irrigation</li> </ul>	EPA/ MSRA, MEW, MAI, GDFCD	<b>1,000,000</b>	Public Budget, AF, GCF, PIF,
	<ul style="list-style-type: none"> <li>▪ Maintain soil productivity and conservation based on crop rotation, leaving crop residues and the proper use of fertilizers.</li> </ul>	EPA/ MSRA AREA and GDFCD	<b>200,000</b>	
	<ul style="list-style-type: none"> <li>▪ Rehabilitation of terraces to minimize runoff and reduce soil loss from flood rain</li> </ul>	EPA/MEW	<b>3,000,000</b>	
	<ul style="list-style-type: none"> <li>▪ Mitigate erosion &amp; protect marginal farm lands based on establishment of wind breaks, increase crop cover &amp; plantation of forages or trees.</li> </ul>	EPA/MEW & MFW	<b>2,000,000</b>	
	<ul style="list-style-type: none"> <li>▪ Implement Rehabilitation Programmes, involving afforestation, agroforestry, dune and wadi bank stabilization, shelters belts, greenbelts and windbreaks, and watershed management and protection</li> </ul>	EPA/ MEW, MAI, GDFCD	<b>2,000,000</b>	
	<ul style="list-style-type: none"> <li>▪ Improve the efficiency of fertilizer use by replacement of imported synthetic by organic fertilizer</li> </ul>	MFW/ EPA, MEW, MAI, GDFCD MFW	<b>100,000</b>	
	<ul style="list-style-type: none"> <li>▪ Control use of fertilizers, pesticides &amp; herbicides through regulations &amp; incentives</li> </ul>	AREA & GRC	<b>100,000</b>	
	<ul style="list-style-type: none"> <li>▪ Promote integrated pest management</li> </ul>	NWRA, MAI/ EPA, MOC & MEW,	<b>200,000</b>	
	<ul style="list-style-type: none"> <li>▪ Revive best traditional practices to control pest - such as cutting or uprooting noxious weeds, crop rotation, crop diversification, and timing of planting and harvesting dates</li> </ul>	EPA/ MEW, MAI and GDFCD	<b>200,000</b>	
			EPA/ MEW& MFW	
	Enforce the laws related to pesticides and fertilizers use			
		Total	<b>9,000,000</b>	
Target 5: By 2020, 50% of Yemen's agricultural lands will be managed sustainably, and by 2025 the sustainability principles will be covering the entire agricultural areas				

<b>Outcome 2: Sustainable Use of Natural Resources</b>				
<b>Strategic goal 2: Promotion of the sustainable management &amp; harvesting of fresh water, forests, crops, fish, invertebrate stocks, indigenous livestock, wildlife and native species of importance for people livelihoods, food security and health care for Yemeni People.</b>				
Output 2.3: Sustainable management of marine living resources				
Objective: Strengthen climate change resilience of marine ecosystems to ensure sustainable delivery of marine products to support Yemeni people livelihoods, including local poor & women .				
Baseline threats (Causes & Impacts)	Planned Actions	Responsibility/ Collaborators	Budget	Potential funding
<ul style="list-style-type: none"> <li>• Unsustainable harvesting of fish stocks and Invertebrates beyond resource capacity for renewal</li> <li>• Overuse of coastal and marine flora and Fauna.</li> <li>• Over grazing of mangroves for fuel-wood and feeding animals</li> <li>• Hunting marine turtles &amp; birds</li> <li>• Over-exploitation of endemic and endangered fish species</li> <li>• Cutting Wetland trees</li> <li>• Lack of ecosystem based approaches, recovery plans and measures for depleted species</li> <li>• Unknown stock capacity of fishery resources</li> <li>• Lack of indigenous knowledge practices on natural resources utilization.</li> <li>• Poor fishing practices.</li> <li>• Loss of several endemic birds</li> <li>• Illegal coral collection &amp; trading, particularly in Socotra</li> <li>• Illegal and unregulated fishing.</li> <li>• Lack of rehabilitation &amp; restoration plans for depleted and threatened species and vulnerable ecosystems</li> <li>• Declining productivity of fish stocks, especially lobster, cuttlefishes, shrimps and sharks.</li> <li>• Disappearance of fish species</li> <li>• Climate change impact due to drought, rain flood, higher temperature, sea level rise &amp; tsunami</li> </ul>	1. Establish sustainable harvesting and utilization of untapped marine resources.	MFW, MSRA	<b>100,000</b>	User's fee, GEF, AF,
	2. Adopt ecosystems-based approach for management fishery & marine resources.	MFW, MSRA	<b>200,000</b>	
	3. Prepare and implement a seasonal fishing ban on rock lobster, shrimp, and other commercial fish species.	MFW, MSRA	<b>200,000</b>	
	4. Establish additional marine Protected Areas, to meet Aichi targets.	MFW, MSRA, EPA	<b>1,000,000</b>	
	5. Establish no-take zones in key sensitive areas, especially in spawning and nursing areas; to protect breeding grounds & increase reef resilience;	MFW, MSRA, EPA	<b>100,000</b>	
	6. Control fleet size and fishing capacity.	MFW, MSRA	<b>50,000</b>	
	7. Promote alternative fishing techniques and gears & non-destructive to coastal/marine habitats (Coral reef, sea grass beds etc...)	MFW, MSRA	<b>1,000,000</b>	
	8. Control illegal and unregulated fishing.	MFW, MSRA	<b>100,000</b>	
	9. Regulate the Ecotourism.	MoT, YTPB, MFW, EPA, MFA	<b>50,000</b>	
	10. Prepare & implement recovery plan for key and threatened fish species & coral reefs	MFW, MSRA, EPA	<b>1,500,000</b>	
	11. Develop Implement fishing plans according to fish stock assessment.	MFW, MSRA	<b>200,000</b>	
	12. Monitoring program to regulate fishing methods, practices and techniques.	MFW, MSRA	<b>200,000</b>	
	13. Update National Adaptation Programme of Action (NAPA).	MFW, MSRA, EPA	<b>100,000</b>	
	14. Update & implement integrated coastal zone management (ICZM) plans that support marine PAs.	MFW, MSRA, EPA	<b>200,000</b>	
	15. Flood protection by building dikes and sea walls to mitigate impacts of floods, sea level rise and salt water intrusion.	MFW, MSRA, EPA	<b>2,000,000</b>	
	16. Conduct stock assessments of marine species	MFW, MSRA, EPA	<b>400,000</b>	



<ul style="list-style-type: none"> <li>• Loss of coastal ecosystems, wetlands &amp; mangrove loss due to costal intrusion &amp; sea level rise</li> <li>• Coral reef loss and bleaching</li> <li>• Coral Breakage by Storm Waves.</li> <li>• Coral Collecting for lime &amp; building material</li> <li>• Sedimentation through dredging, land reclamation and construction of infrastructure on coastal area\</li> <li>• Coastal urbanization, tourism &amp; Industrial Development</li> <li>• Deterioration of marine ecosystems producing protein, and contributes to Yemeni people livelihoods and well-being</li> </ul>	17. Replant mangroves & palms to protect fish breeding grounds & protect coastal zone against sea level rise	MFW, MSRA , EPA	<b>300,000</b>	
	18. Develop and implement coral reefs restoration programs	MFW, MSRA , EPA	<b>1700,000</b>	
	19. Establish artificial reefs along Arabian Sea coast, and other suitable places.	MFW, MSRA	<b>1,500,000</b>	
	20. Introduce forage alternative sources for camels.	MFW, MSRA , EPA, GDFCD, MAI	<b>300,000</b>	
	21. Banning coral collection & trading	MFW, MSRA , EPA, GDFCD, MAI, MFA	<b>50,000</b>	
	22. Establish legislation prohibiting destructive fishing methods that further damage coral-reef ecosystems and reduce reef resilience..	MFW, MSRA , EPA, GDFCD, MAI, MFA	<b>50,000</b>	
	23. Establish carrying capacities for mangroves & coral reefs, & keep harvesting within ecological limits	MFW, MSRA	<b>200,000</b>	
	24. Baseline assessments to measure the biological and meteorological variables relevant to coral bleaching, mortality and recovery	MFW, MSRA , CAMA	<b>300,000</b>	
	25. Conduct research programmes to understand the frequency and extent of coral bleaching and mortality event, including the tolerance limits and adaptation capacity of coral-reef species to increased sea-surface temperature;	MFW, MSRA	<b>300,000</b>	
	Implement alternative Program for coastal communities' livelihood during fish reproduction season	MFW, MSRA	<b>300,000</b>	
		Total	<b>12,400,000</b>	
<p>Target 6: By 2025, all Yemen fish stocks are managed and harvested sustainably through applying ecosystem based approaches, recovery plans, seasonal fishing ban of threatened species, banning of destructive fishing methods, control illegal and unregulated fishing and strict monitoring of fishing methods, practices and techniques</p> <p>Target7: By 2025, all pressures impacted by climate change and anthropogenic factors are mitigated and minimized, so that coral reefs, fish spp., birds, turtles and plants of marine ecosystems are maintained and functioning well</p>				

Outcome 2: Sustainable Use of Natural Resources				
Strategic goal 2: Promotion of the sustainable management & harvesting of fresh water, forests, crops, fish, invertebrate stocks, indigenous livestock, wildlife and native species of importance for people livelihoods, food security and health care for Yemeni People.				
Output 2.4: Restoration and Safeguarding Aquatic Ecosystems that Deliver Fresh Water				
Objective: Restore and protect water ecosystems to ensure adequate & safe water supply and sanitation for the Yemeni people, including the rural poor, women, and other vulnerable groups.				
Baseline threats (Causes & Impacts)	Planned Actions	Responsibility/ Collaborators	Budget	Potential funding
<ul style="list-style-type: none"> <li>• Depletion of water ecosystems</li> <li>• Degradation of watersheds</li> <li>• Depletion of underground aquifers &amp; Surface water ,</li> <li>• Erosion of Beaches of Wadies.</li> <li>• Overuse of water Resources</li> <li>• Free or low water price</li> <li>• Subsidies for agriculture and lack of water pricing</li> <li>• Incentives for Water Pumping</li> <li>• Decentralization</li> <li>• In appropriate water policies,</li> <li>• Over-exploitation of groundwater aquifers</li> <li>• Excessive use of drinking water for qat irrigation</li> <li>• Over-exploitation of groundwater aquifers</li> <li>• Poor irrigation practices</li> <li>• Population Growth</li> <li>• Increased rural-urban migration</li> <li>• Erratic annual rainfall.</li> <li>• Water use and provision by sectors</li> <li>• Alteration of hydrological regime</li> <li>• Urbanization, industry, Transport and tourism</li> <li>• Reduction of groundwater tables and surface water withdrawal for competing water needs, leads to water shortage and water conflicts</li> </ul>	· Restore water ecosystems through the development and implementation of IWRM Plans for groundwater Basins	NWRA, and MEW/ MAI	200,000	AF, Netherland embassy, User's fees
	· Establish flood protection structures along wadies beaches to control flood and erosion,	NWRA, and MEW/ MAI	1,500,000	
	· Promote sustainable harvesting of water resources	NWRA, MEW, MAI	100,000	
	· Develop and implement Water -Spring protection programs	NWRA, and MEW/ MAI	300,000	
	· Improve Water harvesting through renovation of traditional water conservation systems (storage tank/cistern) and construction in at least 10 mountainous areas	NWRA, AREA, MEW/ MAI	1,000,000	
	· Promote water harvesting through fog harvesting schemes in five highlands areas	NWRA, MEW& MAI	350,000	
	· Declare and enforce protection zones of degraded water aquifers	NWRA, MEW& MAI	150,000	
	· Build dams and water reservoirs, based on technical, economic and environmental feasibility	NWRA, MEW& MAI	1,500,000	
	· Promote water desalination in at least four coastal areas	NWRA, MEW, NWSA MAI	750,000	
	· Promote water efficiency for irrigation use through adoption of efficient irrigation techniques & expansion of rain-fed agriculture	NWRA, MEW, NWSA, AREA and MAI	500,000	
	· Promote reuse of retreated waste water for irrigation	NWRA, MEW, NWSA, AREA and MAI	500,000	
	· Promote spate irrigation and pressurized irrigation (drip, bubbler)	AREA and MAI	300,000	
	· Reduce fresh water pollution resulting from industrial effluents through effluent charges, soft loans, and grants to finance the purchase of wastewater treatment equipment and tradable emission permits.	NWRA, MEW,,NWSA, EPA and MAI	50,000	
	· Prohibit discharge of untreated solid and hazardous waste to sewage networks.	EPA/ MEW, MAI, MLA and MPWR	100,000	
	· Prepare & implement local community - watershed management plans that are gender balanced and responsive to climate change	NWRA, MEW,,NWSA, AREA and MAI	500,000	
	· Reform water abstraction Policy to ensure adequate provision of safe fresh water supply for to all Yemeni people, including women, local communities, and the poor and vulnerable.	NWRA, MEW,,NWSA, EPA, MAI, NGO	200,000	
· Ensure land ownership particularly for women, local communities, poor and vulnerable in watershed areas	NWRA, MEW, MAI, NGO & MLA	500,000		
· Involve local communities in basin management	NWRA and MEW	200,000		
· Implement individual tradable quotas for different sectors	EPA, NWRA, MSRA, MEW, MAI	100,000		

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		& MLA		
	· Provide incentives for water efficiency, including water pricing,	EPA, NWRA, MSRA, MEW, MAI & MLA	100,000	
	· Establish charges for over pumping of water for Qat	EPA, NWRA, MSRA, MEW, MAI & MLA	100,000	
	· Public awareness on water resource management as a common and economic good	EPA, NWRA, MSRA, MEW, MAI & MLA	100,000	
		Total	9,100,000	

Target8: Aquatic ecosystems have been restored and safeguarded so as to increase their capacities to deliver water services to about 68% of Yemeni population by 2020, and 85% by 2025

Outcome 3: Reduction of Natural & Anthropogenic Pressures Contributing to Biodiversity & Ecosystem Loss				
Goal 3: Building resilient ecosystems through strengthening disaster preparedness against anticipated climate change impact, mitigating ecosystem pollution from economic activities, mitigating impacts of energy GHG and control of invasive alien species				
Output 3.1: Community & Ecosystems Resilience Against Natural Disasters				
Objective: <b>Building the socio- ecosystems resilience against natural disasters through strengthening disaster preparedness, and renovation of and conservation of degraded ecosystems.</b>				
Baseline threats (Causes & Impacts)	Planned Actions	Responsibility/ Collaborators n	Budget	Potential funding
<ul style="list-style-type: none"> <li>▪ Climate change associated with high risks of rain-flood and drought</li> <li>▪ Weak capacity to adapt and manage natural disasters (Climate change, drought and desertification, wind erosion and sand dune encroachment).</li> <li>▪ Loss of soil fertility, landslides, dust storms and sand dunes encroachment.</li> <li>▪ Dust storms cause erosion of farm land</li> <li>▪ Loss of coastal ecosystems, deterioration of wetlands, coastal mangrove loss and intrusion of seawater into coastal groundwater; saline water intrusion due to Sea Level Rise (SLR),</li> <li>▪ Erosion of wadies beaches</li> <li>▪ Erosion of terraces</li> <li>▪ Recession of forestlands due to cutting trees, desertification, urbanization, land conversion, soil degradation overgrazing, and uncontrolled forest fires,</li> </ul>	1. Enhance monitoring of natural and human-caused hazards such as: floods & droughts through establishment of representative observations networks for meteorology, agro-meteorology and hydro-meteorology, establishment of weather and climate surface and upper air network, and installing Doppler Radar for enhanced precipitation measurement, severe weather and flood forecasting.	CAMA, NWRA, and MAI	<b>1,000,000</b>	PPCR Funded
	2. Establish satellite based early warning system to monitor drought, climate, weather & other natural- caused hazards.	CAMA, NWRA, and MAI	<b>1,300,000</b>	PPCR
	3. Promote restoration of terrestrial ecosystem services by developing and implementing terraces, rangelands and watersheds restoration programs	NWRA, MEW, MAI & NGOs	<b>500,000</b>	AF, LCDF, GCF,L and NDF
	4. Ensure investment programme for increasing carbon sinks, focused wetland & mangrove restoration & agro-forestry programs	NWRA, MEW, MAI & NGOs	<b>700,000</b>	
	5. Establish flood protection structures along wadies beaches and restore degraded watersheds and dune and wadi bank	NWRA,AREA, MEW/ MAI & MORC	<b>650,000</b>	
	6. Restore wetlands, mangroves & palms to protect fish breeding grounds		<b>600,000</b>	
	7. Rehabilitate terraced agriculture		<b>600,000</b>	
	8. Build protection structures, dikes & sea walls to mitigate SLR	NWRA, MEW& MAI	<b>1,000,000</b>	
	9. Expand tree plantation utilizing grey water and treated wastewater	NWSA, NWRA, MEW& MAI	<b>50,000</b>	
	10. Halt sand dune advancement via establishment of green belts & windbreaks to protect degraded land and increase green cover	NWRA, MEW& MAI & GDFCD	<b>500,000</b>	
	11. Enhance ecosystem natural adaptation to climate change impacts by establishing carrying capacities for mangroves, rangelands, and coral reefs, and compliance with sustainable harvest level	EPA, MEW, MAI, GDFCD, MFW & MSRA	<b>100,000</b>	
	12. National plan for integrated forests and natural rangelands management	EPA. GDFCD, and MAI	<b>100,000</b>	

<ul style="list-style-type: none"> <li>Increased desertification due to increased flood rains and loss of agricultural lands, soils and terraces</li> <li>Increased water scarcity and reduced water quality, leading to increased hardship on rural livelihoods</li> </ul>	11. Promote integrated management of groundwater basins & watersheds	NWRA, MEW, and MAI	<b>100,000</b>	
	13. Promote traditional practices of soil fertilization & soil moisture to reduce soil contamination, soil moisture loss and water evaporation,	AREA and MAI	<b>100,000</b>	
	14. Introduce drought-, heat- and salinity-tolerant varieties & low water using crops into farming systems	MSRA, AREA and MAI	<b>200,000</b>	
	15. Grazing strategies & land-use management, including crop selection & soil water managt	AREA and MAI	<b>100,000</b>	
	16. Update and implement the National Plan to Combat Desertification	NWRA, MEW, AREA, EPA and MAI	<b>100,000</b>	
	17. Develop emergency and disaster management plan	NWRA, MEW,,NWSA, EPA, MAI, NGO	<b>100,000</b>	
		Total	<b>7,800,000</b>	
<p>Target9: By 2025, ecosystem resilience and the contribution of biodiversity to carbon stocks have been enhanced via restoration of at least 15 per cent of degraded ecosystems(Wetl Mangrove, Forest and terraced agriculture ), thereby contributing to climate change mitigation and adaptation and to combating desertification</p>				

Outcome 3: Reduction of Natural & Anthropogenic Pressures Contributing to Biodiversity & Ecosystem Loss				
Goal 3: Building resilient ecosystems through <i>strengthening disaster preparedness against anticipated climate change impact</i> , mitigating ecosystem pollution from economic activities, <i>mitigating impacts of energy GHG</i> and control of invasive alien species				
Output 3.2 : Combat invasive alien species				
<b>Objective: Prevent the introduction of invasive alien species that threaten ecosystems, and mitigate their negative impacts on forest and marine ecosystems &amp; biological diversity.</b>				
Baseline threats (Causes & Impacts)	Planned Actions	Responsibility/ Collaborators	Budget	Potential funding
<ul style="list-style-type: none"> <li>• Spread of invasive species &amp; weak capacity to manage and control the invasive alien species.</li> <li>• Weak organizational capacity to evaluate and manage the invasive alien species.</li> <li>• None existence of specialized body for monitoring introduction and control of invasive alien species</li> <li>• Limited quarantine capacity to control intrusion of invasive alien species.</li> <li>• Lack of monitoring mechanism for the invasive alien species.</li> <li>• Lack of legislative frame work to control and organize the introduction of the invasive alien species.</li> <li>• Lack of curative and corrective measures to reduce the effect of invasive alien species on environment</li> <li>• Deterioration of native genetic resources</li> <li>• Invasion of agriculture land, irrigation channels, and water discharge routes on Wadi banks under massive spread of <i>Prosopis juliflora</i></li> <li>• Reduced agricultural (plant and animal) production.</li> <li>• Diversion of major wadies due to invasion of <i>Prosopis juliflora</i></li> <li>• Invasive species crowd out or replace native species that are beneficial to a habitat.</li> <li>• Invasive species damage fisheries resources</li> <li>• Lack of information on numbers, species, composition and the effect of alien invasive species.</li> </ul>	1. Develop and implement National & local strategies to prevent and mitigate the impacts of invasive alien species that threaten various ecosystems,	EPA, MSRA, MEW, MAI, GDFCD & AREA	200,000	GEF, Public Budget, AF
	2. Conduct Risk assessment on the impacts of invasive alien species on biodiversity & ecosystems,	EPA, MSRA, GDFCD & AREA	100,000	
	3. Strengthen quarantine capacity to control intended or unintended intrusion of invasive alien species.	Custom Authority in Airport and Seaport, MAI and MPH	300,000	
	4. Issue import & export regulating laws (entry and exit of living organisms).	EPA, MSRA, GDFCD, AREA MLA	100,000	
	5. Set up programs to monitor the spread of the invasive alien species.	EPA, MSRA, GDFCD & AREA	200,000	
	6. Establish specialized units to monitor invasive alien species.	EPA, MSRA, GDFCD & AREA	300,000	
	7. Promote eradication programmes of <i>Prosopis juliflora</i> an invasive alien species threatening ecosystems	EPA, MSRA, GDFCD & AREA	1,500,000	
	Establish data base for invasive species and define the most dangerous ones, impacting ecosystems .	EPA, MSRA, GDFCD & AREA	150,000	
Total			2,850,000	
Target10: By 2025, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.				

Outcome 3: Reduction of Natural & Anthropogenic Pressures Contributing to Biodiversity & Ecosystem Loss				
Goal 3: Building resilient ecosystems through <i>strengthening disaster preparedness against anticipated climate change impact</i> , mitigating ecosystem pollution from economic activities, <i>mitigating impacts of energy GHG</i> and control of invasive alien species				
Output 3.3: Mitigation GHG emission				
Objective: to improve climate change mitigation in Yemen, through promoting and enforcing of renewable energy strategy and energy efficiency; and reducing emissions through switching to lower carbon-content fuel & renewable energy production.				
Baseline threats (Causes & Impacts)	Planned Actions	Responsibility/ Collaborators	Budget	Potential funding
<ul style="list-style-type: none"> <li>Extensive use of high carbon content fuels, including coal,.</li> <li>Increased pollution of air, water and soil.</li> <li>Emerging diseases in plants &amp; rare endemic animals &amp; extinction of many of them.</li> <li>Spread of vector borne and water borne diseases such as malaria and respiratory and cardiovascular diseases</li> <li>Outdated national mitigation and adaptation plans for climate change.</li> </ul>	1. Switch to lower carbon content fuel in energy production & industry(feasibility studies)	EPA/ MSRA, MEW, MAI, GDFCD	200,000	REDD+, CIF, CERS, MBI, SREP, GCF
	2. Switch to Biomass energy, wind power, solar energy and low carbon content fuels (feasibility studies)	EPA/ MSRA AREA and GDFCD	150,000	
	3. Promote efficiency to reduce GHG emissions based on enforcements of norms, benchmarks and standards	EPA/MEW	100,000	
	4. Develop nationally appropriate mitigation actions (NAMAs) to reduce GHG emissions from various sectors.	EPA/MEW & MFW	100,000	
	5. Issue standards and regulation to encourage the use of energy-efficient appliances and technology in households, industry, business premises and transport.	ME,	200,000	
	6. Pilot Project to switch to solar pumps for irrigation.	MAI ME	300,000	
	7. Provide incentive to promote adoption of clean technologies by small and medium industries.		100,000	
	8. Establish Green Climate Fund (GCF)	EPA/ MEW,SDF	200,000	
	9. Implement nationally appropriate mitigation actions (NAMAs)	EPA, MEW, ME	1,000,000	
	11. Mitigate GHG emissions through carbon sequestration such as increased protected areas, restoration of “Blue Carbon” ecosystems (mangroves, sea-grass beds), reforestation	EPA, AREA, MSRA, AREA and GDFCD	1,000,000	
	12. Reduce emission forest degradation; land use, land-use change and forestry (LULUCF) based on better management practices;	EPA, AREA, MSRA, AREA and GDFCD, MAI	200,000	
	13. Reduction of emissions from garbage & wastewater through pilot recycling project.	EPA, Urban planning	500,000	
	14. Promote climate change and technology research with focus on climate profiles & modeling, development of GHG inventories and emission scenarios, & vulnerability and adaptation assessment for vulnerable sectors.	EPA, AREA, MSRA,NWRA and GDFCD	300000	
			Total	
<b>Target11: Energy resilience has been promoted and is manifested by 14% reduction of energy-related GHG emissions in 2020, and 23% in 2025</b>				

Outcome 4: Biodiversity and Poverty Mainstreaming into sectoral development plans				
<b>Strategic Goal 4: Developing and maintaining restructured policies that are supportive of equitable sharing of biodiversity benefits and advocating the mainstreaming of biodiversity and poverty considerations into national development policies, plans, strategies and sectoral plans.</b>				
Output 4.2 Poverty mainstreaming .				
Objective: to enable local poor access to productive resources, including credit, land, education, knowledge and information, as well as to public services, and participate in planning & management natural resources & basic services that would enable them to withstand against poverty, benefit from expanding employment and raise their standards of living.				
Baseline threats (Causes & Impacts)	Planned Action	Responsibility/ Collaborators	Budget	Potential funding
<ul style="list-style-type: none"> <li>• Limited public funding for rural water supply</li> <li>• Ownership dispute over flood water among upstream &amp; downstream of watershed,</li> <li>• Absence of legally protected water rights</li> <li>• Subsidy for water pumping for irrigation,</li> <li>• Absence of fair land tenure regulation,</li> <li>• Inability of women and youth to access the common lands such as the Wakf land.</li> <li>• Inadequate provision of education, healthcare, water and sanitation services to rural area</li> <li>• Limited public spending on basic services in rural area</li> <li>• Exclusion of local community in planning and management of basic services</li> <li>• Inadequate capacities of Elected District Local Councils in planning and managing natural resources &amp; basic services.</li> <li>• Lack of knowledge for planning natural resource and development projects at local level</li> <li>• Centralized databases planning natural resource development projects</li> <li>• Ineffective centralized procurement procedures for construction of basic services further</li> <li>• Lack of good governance and associated with corruption.</li> <li>• Inability of poor communities to access the welfare support and the Islamic Zakat</li> <li>• Inability of poor to access public employment opportunities</li> <li>• Inability of poor to access micro financing credits.</li> <li>• Limited government allocation for social welfare fund</li> <li>• Illegal involvement of political parties in collecting, distributing and management of the Zakat financial resources</li> <li>• Lack of good governance associated with corruption favoritism and injustice in managing Al-Zakat Financial support, social welfare, endowment and state lands, micro</li> </ul>	Carry out land use reform to enable poor access common land at affordable price	MOA, ZOA, MAI, MLAF, MoLAD	100,000	NDF, Public Budget,
	Regulate land-use by decreeing fair land tenure & land lease scheme	MOA, ZOA, MAI, MLAF, MoLAD	100,000	
	Restore public land confiscated by individuals illegally & put it available for agricultural development and poverty eradicating	MOA, ZOA, MAI, MLAF. SWA	100,000	
	Integrate the tribal norms known as Ghurm (forfeiture), religious edicts known as the Islamic Zakat and the modern social welfare to establish Local Poverty Alleviation Funds (LPAFs) to act as funding mechanism for poverty alleviation .	MLA, MLAF, SWA MSAW	100,000	
	Train LPAFs members on revenue collection, accounting for the revenue and enforcement of eligibility criteria.	EPA, MoLAD, MLAF, MEW, MAI, GDFCD	300,000	
	Develop/ endorse legal framework for LPAFs.	EPA, MoLAD, MLAF, MEW, MAI, GDFCD	70,000	
	Develop eligibility criteria for funding individuals from LPAFs.	EPA, MoLAD, MLAF, MEW, MAI, GDFCD	80,000	
	Establish 8 pilot LPAFs in Rural areas	EPA, MoLAD, MLAF, MEW, MAI, GDFCD	1,600,000	
	Establish monitoring scheme to ensure financing assistances provided by the LPAF to recipients are used for its intended purposes as agreed-upon by the LPAF and recipient.	EPA, MoLAD, MLAF, MEW, MAI, GDFCD	250,000	
	Reform Agricultural & Cooperative Credit Bank (CACB) to enable poor obtain credits at affordable interest rates to be used for creating small income generating schemes in agriculture, fisheries and forestry.	EPA, MoLAD, MLAF, MEW, MAI GDFCD	100,000	
	Develop lending criteria and bi-laws for CACB to prohibit provision of credits for individuals unless they offer documented guarantee to recover the loans provided.	EPA, MoLAD, MLAF, MEW, MAI GDFCD	100,000	
Enable poor to access water through enforcing equitable quotas for flood water distribution among upstream and downstream of watershed, enforcing affordable water tariffs for rural poor, development of nationally accepted & legally protected water rights and removing subsidies for water pumping for qat irrigation.	EPA, MoLAD, MLAF, MEW, MAI GDFCD	200,000		



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financing credits and employment opportunities created under civil service administration. <ul style="list-style-type: none"> <li>• Increase in the wage bill to meet the salaries of ghost employees in government institutions and army over the past 2 decades.</li> <li>• Inability of poor to access financing opportunities provided by lending banks</li> <li>• Injustice in distribution of loans to applicants</li> <li>• Use of financial resources of development funds to alleviate poverty.</li> </ul>	Enable poor to access other natural resources based on enacting fishing quotas; commercialization of medicinal plants and creation and enforcement of a quota for fair and equitable use of forest resources.	EPA, MoLAD, MLAF, MEW, MAI GDFCD	150,000	
	Public administration reform to remove ghost jobs & enable poor to access such jobs	EPA, MCSI, MoLAD, MLAF, MEW, MAI, GDFCD	200,000	
	Reform contractual policy through promoting green auditing .	EPA and MFW	100,000	
	Reallocate 1% of government budget allocated for national development funds to redirect it for creating massive employment opportunities in rural areas, while implementing construction activities planned under the NBSAP2	All	50,000	
		Total	3,600,000	
<b>Target13: Yemeni poor</b> and vulnerable, including local communities, youth & women enabled to equitably access to water, marine, forest and land resources, thereby leading to reduction of population living under national poverty line by 15% in 2020, and by 30% in 2025				

<b>Outcome 4: Biodiversity &amp; Poverty Mainstreaming</b>				
<b>Strategic Goal 4: Developing and maintaining restructured policies that are supportive of equitable sharing of biodiversity benefits and advocating the mainstreaming of biodiversity and poverty considerations into national development policies, plans, strategies and sectoral plans.</b>				
Output 4.4: Integrated planning approaches of land resources				
Objective: Minimize uncontrolled urbanization on biodiversity loss by mainstreaming biodiversity into broad landscapes applying integrated planning approach and promoting sustainable land use planning & management				
Baseline threats (Causes & Impacts)	Planned Actions	Responsibility/ Collaborator	Budget	Potential funding
<ul style="list-style-type: none"> <li>• Inappropriate land use.</li> <li>• Urban encroachment</li> <li>• Poor land use planning&amp; outdated urban plans</li> <li>• Increased urban immigration ,</li> <li>• Increased pressures of Industry development, road expansion &amp; Infrastructure development on environmentally sensitive areas such as farm land;. forest and green cover, flora &amp; fauna, wetlands &amp; coastal habitats, valleys beds and banks, wetlands and coastal areas</li> <li>• Energy, Oil and Gas production</li> <li>• Increased number of vehicles and Heavy tractors</li> <li>• Pollutant emissions</li> <li>• Chemical &amp; Medical Disposal,;</li> <li>• Solid waste production</li> <li>• Agricultural waste,</li> <li>• Inadequate Water services.</li> <li>• Inadequate sanitation services.</li> <li>• Soil and water Pollution</li> <li>• Domestic water consumption</li> <li>• Illegal settlements.</li> <li>• Inability to monitor land use change due to lack of new technology such as satellite and remote sensing</li> <li>• Uncontrolled rural development,</li> <li>• Increased urban immigration</li> <li>• None-compliance with environmental performance</li> </ul>	Integrate biodiversity into national and local land use planning based on the development and implementation of land use management plans,	EPA. MAI, MA, ZOA, MOLA	<b>100,000</b>	FIP, AF, GEF, Public Budget
	Incorporate protected areas, connectivity corridors and land use buffer zones as a core component of land use plans	EPA/ MWE	<b>600,000</b>	
	Develop & implement national policies, development plans, budgets and investment programs that are integrating biodiversity values, issues & sustainability into land planning, road and infrastructure development plans.	EPA/ MWE & MFW	<b>300,000</b>	
	Control illegal settlements & rural-urban migration	MA, ZOA, MFA	<b>200,000</b>	
	Improve maps for land registration and ownership, soil and plant cover.	EPA. MAI, MA, ZOA, MOFA & MORC	<b>500,000</b>	
	Reduce impact of urbanization on biodiversity & Protect areas based on mapping of biodiversity ecosystem services and strict application of EIA and SEA, while land use planning, permitting and approval;	EPA. MAI, MA, ZOA, MOFA & MORC	<b>500,000</b>	
	Implement population strategy	All agencies	<b>200,000</b>	
	Develop and implement land regulation, pricing and registration.	MAI, MOA, ZOA, MOFA & MORC	<b>150,000</b>	
	Enforce land use regulations.	All	<b>150,000</b>	
	Introduce remote sensing and satellite techniques to monitor land use change & land zoning	MOMC, MAI EPA, MORC, EPA MWE,	<b>1,000,000</b>	
	Offset biodiversity loss due to road development impacts;	EPA/ MOMC, MAI, MORC, MWE, and GDFCD	<b>500,000</b>	
	Prohibit Road construction & infrastructures nearby sensitive ecosystems, such as key areas for breeding, feeding, and migration sites;	EPA/ MOMC, MAI, MORC, MWE, and GDFCD	<b>100,000</b>	
	Minimize transportation through protected areas unless they are part of the protected area plan;	EPA/MEW, and GDFCD	<b>150,000</b>	
	Conserve wetlands as wildlife crossings to restore connectivity;	EPA/ MFW, MAI, MOMC GDFCD	<b>1,000,000</b>	
	Use native species for roadside vegetation;	EPA/ MAI, MOMC, MORC GDFCD	<b>500,000</b>	
Prohibit Road construction & infrastructures which alters hydrological regimes;	EPA/ MOMC, MORC, MWE	<b>100,000</b>		
Regulate the introduction of invasive alien species;	EPA, MAI, , MWE, NWRA and GDFCD	<b>200,000</b>		
Encourage Public Transport to minimize GHG emissions	EPA,MOT, MOLF	<b>500,000</b>		

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standards & environmental excellence • Wasteful production and consumption by of natural resources by national industry including mining and energy production • polluting industries, including Wasteful of natural resources	Subsidies for Traffic efficiency	EPA,MOT, MOLF	<b>700,000</b>	
	Promote low carbon technology in transportation	EPA,MOT, MOLF	<b>600,000</b>	
	Develop explicit national energy strategies, incorporating efficiency based on use of fuel of low carbon content, subsidies for use of renewable Energy and eliminating the energy subsidies except for the poor population	EPA,MOE, MOLF	<b>200,000</b>	
	Promote energy efficiency in the home, business premises and transport.	EPA,MOT, MOLF	<b>400,000</b>	
	Enforce Air quality Standards	EPA,MOE	<b>200,000</b>	
	Air Quality Monitoring	EPA, MORC, MOMC	<b>400,000</b>	
	Reduce households waste through recycling and reuse	EPA, MORC, MOMC	<b>2,000,000</b>	
	Total		11,250,000	
<b>Targets 14.1: By 2025, biodiversity values &amp; the maintenance of key ecosystem services have been integrated into national &amp; local land use planning based on developing and implementing land use management plans.</b>				

<b>Outcome 4: Biodiversity &amp; Poverty Mainstreaming</b>				
<b>Strategic Goal 4: Developing and maintaining restructured policies that are supportive of equitable sharing of biodiversity benefits and advocating the mainstreaming of biodiversity and poverty considerations into national development policies, plans, strategies and sectoral plans.</b>				
<b>Output 4.5: sustainable tourism</b>				
<b>Objective 1: Minimize tourism impact on biological resources based on integrating ecologically sustainable management practices into tourism and recreation sector.</b>				
Baseline threats (Causes & Impacts)	Planned Actions	Responsibility/ Collaborators	Budget	Potential funding
<ul style="list-style-type: none"> <li>• Construction of tourism infrastructure.</li> <li>• Roads development.</li> <li>• Inefficient management of touristic establishments and services and guest houses.</li> <li>• Visitors impact.</li> <li>• Pollution and Solid waste generation attributable to tourism.</li> <li>• Excessive use of water &amp; other resources.</li> <li>• Deforestation.</li> <li>• Electricity consumption attributable to tourism</li> <li>• Trees cutting</li> <li>• Negative impacts on endemic species.</li> <li>• Loss of biodiversity.</li> <li>• Lack of knowledge on eco-tourism attractions.</li> <li>• Insufficient level of professionalism and training in the tourism sector, including eco-tourism.</li> <li>• Poor environmental awareness and ecological education amongst populations.</li> <li>• Inadequate legislative framework and weak enforcement of eco-tourism legislation.</li> <li>• Weak local communities and private sector participation in <i>tourism management and investment in this sector.</i></li> </ul>	<ul style="list-style-type: none"> <li>• Assess impacts of recreational activities in coastal areas.</li> </ul>	EPA/ MSRA, MEW, MAI, GDFCD	<b>200,000</b>	Public Budget, User's fee and MBI, PPP
	<ul style="list-style-type: none"> <li>• Develop sustainable ecotourism strategies to halt biodiversity loss in established protected areas</li> </ul>	EPA/ MSRA AREA and GDFCD	<b>500,000</b>	
	<ul style="list-style-type: none"> <li>• Prohibit the construction of tourism infrastructure roads development by enforcing EIA</li> </ul>	EPA/MEW	<b>100,000</b>	
	<ul style="list-style-type: none"> <li>• Improve eco-sites management through promoting cooperation and participation of the private sector, NGOs and local communities in tourism investment and management.</li> </ul>	EPA/MEW & MFW	<b>100,000</b>	
	<ul style="list-style-type: none"> <li>• Prepare tourism management plan for all tourism sites</li> </ul>	EPA/ MEW, MAI, GDFCD	<b>1,000,000</b>	
	<ul style="list-style-type: none"> <li>• develop criteria for eco-tourism development in protected areas and buffer zones.</li> </ul>	MFW/ EPA, MEW, MAI, GDFCD MFW	<b>100,000</b>	
	<ul style="list-style-type: none"> <li>• Conduct surveys of areas suitable for eco-tourism, taking into account habitat vulnerability</li> </ul>	AREA & GRC	<b>500,000</b>	
	<ul style="list-style-type: none"> <li>• Prohibit &amp; monitor motorized recreational activities;</li> </ul>	NWRA, MAI/ EPA, MOC & MEW,	<b>50,000</b>	
	<ul style="list-style-type: none"> <li>• conduct studies on carrying capacity of eco-sites to ensure by tourism levels &amp; impacts are kept within carrying capacity of eco-sites</li> </ul>	EPA/ MEW, MAI and GDFCD	<b>500,000</b>	
	<ul style="list-style-type: none"> <li>• implement awareness raising programs targeted for visitors of protected areas to improve garbage collection and disposal .</li> </ul>	EPA/ MEW& MFW	<b>150,000</b>	
<ul style="list-style-type: none"> <li>• Delineate areas &amp; provide facilities for solid waste disposal for 20 eco-sites.</li> </ul>	EPA/ MEW, MAI and GDFCD	<b>1,200,000</b>		
	Delineate and established specific areas for recreation (e.g., taking photos, camping and foods selling ), in at least 10 ecosites	EPA, NWRA, MFW and GDFCD	<b>1,200,000</b>	
		Total	<b>5,600,000</b>	
<b>Targets 14.2: By 2020, Ecotourism sector is benefiting from ecosystem services and has incorporated sustainability &amp; biodiversity concerns into local ecotourism development plans and programmes.</b>				

Outcome 4: Biodiversity and Poverty Mainstreaming into sectoral development plans				
Strategic Goal 4: Developing and maintaining restructured policies that are supportive of equitable sharing of biodiversity benefits and advocating the mainstreaming of biodiversity and poverty considerations into national development policies, plans, strategies and sectoral plans.				
Output 4.1: Legislation and policy reform				
<i>Objective:</i> To incorporate values of key ecosystems goods and services into the decisions making while developing & implementing sectorial policies and legislations				
Baseline threats (Causes & Impacts)	Planned Actions	PARTNERS	Budget	Donors
<ul style="list-style-type: none"> <li>• Lack of policy guidelines to mainstream biodiversity issues &amp; Values issues into general planning and strategies at central and district levels</li> <li>• Inadequate policy framework for integrating biodiversity issues &amp; Values into the national/district development planning.</li> <li>• No integration of climate change &amp; resilience into national and local development plans and poverty reduction strategies</li> <li>• Inappropriate policies of natural resources,</li> <li>• Harmful subsidies &amp; incentives to biodiversity loss, include subsidies for excessive consumption of agrochemicals &amp; underground water.</li> <li>• Outdated laws and inadequate law enforcement</li> <li>• Unabated irrigation for Qat</li> <li>• Under-valuation of goods and services delivered by various eco-systems ,including free or low water tariffs for irrigation &amp; water supply</li> <li>• Imbalance water provision across-sectors</li> <li>• Disputes on water allocations of surface water leading to social</li> </ul>	<ul style="list-style-type: none"> <li>• Valuate biodiversity ecosystem services to integrate their values into National development plans and strategies,</li> <li>• Integrate biodiversity values &amp; sustainability principles and biodiversity conservation into production sectors based restructured policies and plans</li> <li>• Fully integrate water values into water and agriculture sector through reforming water tariffs for irrigation &amp; water supply</li> </ul>	EPA/ MSRA, MEW, MAI, GDFCD	160,000	Public Budget,PES, AD
	<ul style="list-style-type: none"> <li>• Create and enforce a quota for fair and equitable use of use water, marine, forest and land resources</li> </ul>	EPA/ MSRA AREA and GDFCD	170,000	
	<ul style="list-style-type: none"> <li>• Establish incentives scheme to encourage environmental excellence and Sustainable resources uses,</li> <li>• Strict application of EIA &amp; project appraisals for approving industry, mining, manufacturing and energy production projects</li> </ul>	EPA/MEW	400,000	
	<ul style="list-style-type: none"> <li>• Establish certification scheme for promoting sustainability and environmental excellence by development and production sectors</li> <li>• Remove harmful incentives &amp; subsidies contributing to the loss of biodiversity, arable land, water &amp; marine resources (including fuel subsidies for water pumping and subsidies for agrochemical, fertilizer &amp; agrochemical use)</li> <li>• Prohibit the use of drinking water for qat irrigation</li> </ul>	EPA/MEW & MFW	300,000	
	<ul style="list-style-type: none"> <li>• Enforce application of mitigation plans for mining, manufacturing and energy production projects to prevent soil and water contamination, invasive alien species, sedimentation, soil erosion, habitat disturbance</li> <li>• Impose monitoring and environmental audit procedures in industry &amp; production sectors</li> <li>• Develop effective national waste management plans to minimize hazardous effluents from industrial activities</li> </ul>	EPA/ MEW, MAI, GDFCD	235,000	
	<ul style="list-style-type: none"> <li>• Reduce wastewater &amp; solid waste impacts on biodiversity by establishing &amp; introducing proper waste disposal recycling systems into major industries</li> <li>• Reduce greenhouse gases and pollution based on promoting renewables &amp; introduction of green technology in industrial &amp; mining sectors;</li> <li>• Develop regulatory framework to enforce that monetary compensation is paid against unsustainable use of biodiversity benefits and services</li> </ul>	MFW/ EPA, MEW, MAI, GDFCD MFW	240,000	

<p>conflicts in irrigating agriculture land</p> <ul style="list-style-type: none"> <li>• Inequity in flood water distribution among upstream &amp; down-stream users, leading to loss of vegetable &amp; cereal production down-stream</li> <li>• Increased rural to urban migration due to increased poverty Duplicated environmental laws</li> <li>• Weak law enforcement, incomplete law framework</li> </ul>	<ul style="list-style-type: none"> <li>• Enforce application of restoration plans (such as top soil replacement and re-vegetation measures) for mining &amp; industrial activities</li> <li>• Enforce environmental legislations and laws.</li> <li>• Develop forestry laws, By-law for the control of alien invasive &amp; by-law regulating fish harvesting</li> <li>• Re- develop appropriate environmental policies and laws to promote local community involvement in the planning &amp; management of biological resources</li> <li>• Develop and implement regulatory framework to ensure appropriate and safe distribution and use of pesticides.</li> <li>• Develop policies and regulations for the safe introduction &amp; transfer of friendly environmental technologies.</li> </ul>	<p>AREA &amp; GRC</p>	<p>360,000</p>	
<p>Total</p>			<p>1,865,000</p>	
<p><b>Targets 15.1 : By 2025, Subsidies on water efficiency use approved, and subsidies on agro-chemicals &amp; fertilizer removed and fuel subsidies for water pumping eliminated</b>  <b>Target 15.2: Positive incentives for the conservation and sustainable use of biodiversity are developed and enforced</b></p>				

Outcome 4: Biodiversity & Poverty Mainstreaming				
<b>Strategic Goal 4: Developing and maintaining restructured policies that are supportive of equitable sharing of biodiversity benefits and advocating the mainstreaming of biodiversity and poverty considerations into national development policies, plans, strategies and sectoral plans..</b>				
Output 4.3: Sustainable consumption & production				
Objective: Reversing the adverse impacts of production patterns on ecosystems through mainstreaming sustainable production into policies, plans, programs of none environmental sector				
Baseline threats (Causes & Impacts)	Planned Actions	Responsibility/ Collaborator	Budget	Potential funding
<ul style="list-style-type: none"> <li>• Business community &amp; industry not adequately committed to sustainability and environmental excellence.</li> <li>• Wasteful production and consumption of natural resources by national industries including mining and energy production</li> <li>• Poor investment from the private sector in community-based biodiversity projects.</li> <li>• Polluting &amp; hazardous industries.</li> <li>• Lack of environmental performance standards</li> <li>• Lack of economic incentives for enforcing environmental performance standards.</li> <li>• Land use change for industry development</li> <li>• Pollution from industrial effluents.</li> <li>• Inefficient Water use by industry</li> <li>• Weak EIA enforcement for industrial activities</li> <li>• Lack of policy addressing air pollution, wastewater, and solid waste production from industrial sources.</li> <li>• Weak enforcement of standards regulating industrial activities.</li> <li>• Use of environmentally</li> </ul>	Integrate sustainability into industry, mining, manufacturing and energy production sectors based on provision of economic incentives for compliance with environmental performance standards & environmental excellence	EPA/ MSRA, MEW, MAI, GDFCD	<b>100,000</b>	Public Budget, User's fee and MBI
	develop mitigation plans for mining, manufacturing and energy production projects to prevent soil and water contamination, sedimentation, soil erosion, habitat disturbance	EPA/ MSRA AREA and GDFCD	<b>300,000</b>	
	Control wasteful consumption & production of manufacturing sector through provision of incentives and tax exemption for the use of lower raw materials; lower carbon content in energy, lower waste disposal in waste treatment facilities, use of green technologies, use of renewable, recycled and recyclable products	EPA/MEW	<b>200,000</b>	
	Impose monitoring and environmental audit procedures in industry& business sectors	EPA/MEW & MFW	<b>100,000</b>	
	Promote certification processes for the adoption energy-efficiency, materials-efficiency, and water-efficiency of practices, processes, and product		<b>100,000</b>	
	Establish an entity to be in charge of monitoring sustainability and environmental excellence in development and production sectors		<b>250,000</b>	
	Impose sustainability and environmental excellence on development and production sectors		<b>100,000</b>	
	Strict application of EIA & project appraisals for approving industry, mining, manufacturing and energy production projects	EPA/ MEW, MAI, GDFCD	<b>200,000</b>	
	Develop effective national waste management plans to minimize hazardous effluents from industrial activities	MFW/ EPA, MEW, MAI, GDFCD MFW	<b>150,000</b>	
	Reduce wastewater & solid waste impacts on biodiversity by establishing & introducing proper waste disposal recycling systems into major industries	AREA & GRC	<b>500,000</b>	
	Reduce greenhouse gases and pollutions based promoting renewables & introduction of green technology in industrial & mining sectors;	NWRA, MAI/ EPA, MOC & MEW,	<b>2,000,000</b>	
	Develop policies and regulations for the safe introduction & transfer of friendly environmental technologies.	EPA/ MEW, MAI and GDFCD	<b>150,000</b>	
Prohibit industrial & mining activities and road building nearby sensitive areas, such as wetlands, migration & nesting sites	EPA/ MEW& MFW	<b>150,000</b>		

unfriendly technologies				
		Total	4,300,000	
<b>Targets 15.3 : By 2025, Incentives and subsidy schemes, supporting pollution free industries, industrial compliance, adoption of green technologies and use of recycled materials approved by cabinet</b> <b>Targets 16: By 2025, several business communities and public sectors have developed and implemented plans for sustainable production and consumption of natural resources and have kept the impacts of use of natural resources well within safe ecological limits.</b>				



Outcome 5: Promoting Good Governance in Biodiversity					
Strategic Goal 5: Promoting good governance into biodiversity management through harmonized institutional structure that is adequately mandated, empowered, and advocating of participatory decentralized planning, management and monitoring of natural resources.					
Output 5.1: Institutional restructuring					
Objective: Rationalization of Intitution frameworks for effective Managemnt & planning of Biological Resources					
Baseline threats (Causes & Impacts)	Planned Actions	Responsibility/ Collaborator	Budget	Potential funding	
<ul style="list-style-type: none"> <li>• Inappropriate institutional setup for biodiversity conservation</li> <li>• Overlapping &amp; duplicated mandates among environmental agencies (EPA &amp;. GDFDC, water sector),</li> <li>• Lack of good governance under centralization</li> <li>• Weak inter-institutional coordination among environmental partners,</li> <li>• Limited public &amp; local community participation in biodiversity planning &amp; management of nature reserves &amp; water basins.</li> <li>• Lack of Partnerships with private sector &amp; NGOs.</li> <li>• Ineffective planning &amp; management of natural habitats and biodiversity conservation</li> <li>• Inadequate legal frameworks for environmental agencies (EPA, GDFDC and NWRA)</li> <li>• Inadequate local community management plans for protected areas &amp; regional water basins,</li> <li>• Inadequate legal frameworks for promoting decentralization &amp; local community involvement in the management of Nature reserves &amp; water basins</li> <li>• Inadequate government funding of conservation projects</li> <li>• Lack of good governance under centralization</li> <li>• Lack of resource mobilization strategy for the implementation of strategic plans</li> <li>• Insufficient staffing for PAs</li> <li>• Weak human capacity to manage PA &amp;, local water basins, wet lands and rangelands.</li> <li>• Inadequate expertise in species identification and monitoring trends in ecosystem health and population dynamics</li> </ul>	<ul style="list-style-type: none"> <li>• Review &amp; harmonize environmental agency mandate, legislative and institutional frameworks.</li> </ul>	EPA/ MSRA, MEW, MAI, GDFCD	400,000	GCF, FIP, PPCR	
	<ul style="list-style-type: none"> <li>• Establish an inter-institutional coordination entities for water, biodiversity, ecotourism and marine sectors to enhance management of biological resources and to ensure Law enforcement.</li> </ul>	EPA/ MSRA AREA and GDFCD	200,000		
	<ul style="list-style-type: none"> <li>• Prepare by-laws for the systematic functioning of the coordination bodies.</li> </ul>	EPA/MEW	200,000		
	<ul style="list-style-type: none"> <li>• Establish inter-institutional coordination mechanisms for disaster management.</li> </ul>	EPA/MEW & MFW	150,000		
	<ul style="list-style-type: none"> <li>• Create an adequate number of community-based management bodies to manage nature reserves, water basins, wetlands, rangelands &amp; fishing sites</li> </ul>	EPA/ MEW, MAI, GDFCD	2,000,000		
	<ul style="list-style-type: none"> <li>• Prepare by-laws for the systematic functioning of the community based management bodies.</li> </ul>	MFW/ EPA, MEW, MAI, GDFCD MFW	200,000		
	<ul style="list-style-type: none"> <li>• Develop a National Master plan for Work on Protected Areas , integrating protected areas into the wider landscape and incorporating issues related to sustainable livelihoods, climate change resilience and ecosystem services</li> </ul>	AREA & GRC	150,000		
	<ul style="list-style-type: none"> <li>• Develop a resource mobilization strategy to secure implementation of the NBSAP2</li> </ul>	NWRA, MAI/ EPA, MOC & MEW,	200,000		
	<ul style="list-style-type: none"> <li>• Gap assessment of manpower.</li> </ul>	EPA/ MEW, MAI and GDFCD	200,000		
	<ul style="list-style-type: none"> <li>• Prepare human development strategy and recruitment plans to fill the gaps in protected areas</li> </ul>	EPA/ MEW& MFW	200,000		
	<ul style="list-style-type: none"> <li>• Implement capacity building program for community based entities in PA management, monitoring of biodiversity loss, provision of ecotourism services &amp; conservation of ecosystems</li> </ul>	EPA/ MEW, MAI and GDFCD	1,500,000		
	Improve biodiversity indicators for monitoring and evaluation	EPA/ AREA,	50,000		
	Build the management capacity of clearinghouse mechanism (CHM)	EPA	100,000		
	Undertake mid-term evaluation of NBSAP2 implementation	EPA, board of director	50,000		
Develop the 6th National Report and the 7th National Report	EPA, board of director	50,000			
Conduct final independent evaluation of NBSAP2	EPA, board of director	50,000			

• Inadequate mechanisms for laws enforcement.	implementation			
		Total	5,700,000	
<p>Targets 17: In partnership with government, community-based management approach has been widely promoted to cover 50% of Yemen's protected area by 2020, and 100% by 2025, thereby leading to improved effectiveness of Yemen's protected areas along with promotion of traditional knowledge and practices on conservation and sustainable use of biological resources</p>				

Outcome 5: Promoting Good Governance in Biodiversity				
Strategic Goal 5: Promoting good governance into biodiversity management through harmonized institutional structure that is adequately, mandated empowered, and advocating of participatory decentralized planning, management and monitoring of natural resources.				
Output 5.2. Improvement of Public awareness, research and information sharing				
Objective: Enhance knowledge sharing & public awareness and outreach based on establishment of easily accessible information & technologies and science base, including clearing house mechanism and modernized ICT systems for information exchange				
Baseline threats (Causes & Impacts)	Planned Actions	Responsibility/ Collaborator	Budget	Potential funding
<p>Low public awareness of biodiversity values and issues</p> <p>Poor monitoring capacity to control illegal harvesting of fish and forest</p> <ul style="list-style-type: none"> <li>Lack of awareness and communication strategy</li> <li>Lack of communication and networking between EPA and Media.</li> <li>Weak capacity of the designated environmental communication body at EPA</li> <li>Lack the technology and facilities needed for production of awareness materials.</li> <li>None integration of biodiversity issues into formal education programs and curricular</li> <li>Notable absence of green press.</li> <li>Lack of environmental specialist working for media.</li> <li>Weak capacity to produce informative research, under lack the know- how and technologies</li> <li>Inaccessible centralized database system for developing community-driven plans.</li> <li>Poor monitoring capacity to control illegal harvesting of fish and forest resources</li> <li>Ineffective monitoring mechanism for biodiversity loss, resource depletion, ecosystem &amp; habitats loss &amp; extinction of endangered species</li> <li>Poor awareness, knowledge and research on critical habitat &amp; ecosystems, red list of threatened Species, alien invasive</li> <li>Ineffective monitoring mechanism for biodiversity loss, resource depletion, ecosystem &amp; habitats loss &amp;</li> </ul>	Introduce biodiversity courses into educational curricula of secondary schools.	EPA/ MOE, MOHE	3,600,000	NGOs, Public Budget, SREP, PPCR
	Expand establishment of schools environmental clubs	EPA/ MOE, MOHE	200,000	
	Train students and teachers of schools environmental clubs on various aspects of biological diversity conservation	EPA/ MOE, MOHE	200,000	
	Develop and implement a Communications and Information Technology (ICT) strategy	EPA/ MOE, MOHE, MOI	100,000	
	Design, publish and broadcast radio/TV programs on biodiversity and promotion of traditional knowledge on innovative irrigation systems, water conservation, and the cost of environmental degradation on agriculture and livelihood.	MOE, MOHE, MOI EPA MEW, MAI,	300,000	
	Conduct training on innovative water conservation methods particularly for farmers and also training sessions for young farmers on innovative management strategies such as water harvesting through fog harvesting schemes.	MFW/ EPA, MEW, MAI, GDFCD MFW,	1,000,000	
	Increase decision makers and public awareness on the value of biodiversity & its service through public awareness campaigns.	AREA MFW EPA, MEW, MAI, GDFCD MFW	100,000	
	Train media networks on producing and broadcasting awareness raising programs related to biological diversity and its conservation.	EPA/ MOI	200,000	
	Train staff of media and communication units on data acquisition, processing and production and dissemination of awareness materials.	EPA/ MOI	20,000	
	Develop awareness of the impact of biodiversity-related production and consumption patterns & on the loss of biodiversity and the goods and services it provides.	EPA MOI, AREA MFW MEW, MAI, GDFCD MFW	100,000	
	Produce 'hands out' educational materials on biological diversity for government agencies, land managers, landowners and specific industries that rely on some component of biological diversity.	EPA/ MOI	200,000	
	Develop clearing-house mechanism as an information base and information sharing platform and networking between government, research and educational institutions, industry, NGOs and individuals related to ecosystem loss, including loss of fauna, flora	EPA, MEW, MAI, GDFCD MFW	150,000	

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extinction of endangered species	spp., rare and endangered species, fisheries, marine & water resources.			
	Promote research on direct and underlying causes of biodiversity losses and <b>status and trends of biodiversity production patterns, including their impacts of biodiversity loss.</b>	EPA,AREA, MEW, MAI, GDFCD. MFW	300,000	
	Promote research on sustainable use and management of Forest, water and Marine resources, including research economic valuation of ecosystem goods and services	EPA,AREA, MEW, MAI, GDFCD. MFW	300,000	
	Total	6,770,000		
<p>Targets 18: By 2025, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.</p> <p>Targets 19: By 2025, stakeholders and decision makers are adequately aware of biodiversity <b>value</b> and taking positive action to conserve and use biodiversity sustainably</p>				

<b>Annex 2: State of Alignment of National Targets with Aichi Targets of CBD Strategic Plan (2011-2020)</b>	
<b>AICHI Targets</b>	<b>NBSAP2 Targets</b>
Aichi Target1: By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.	Targets 19: By 2025, stakeholders and decision makers are adequately aware of biodiversity value and taking positive action to conserve and use biodiversity sustainably(Aichi target 1).
Aichi Target2: By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.	Targets13 : By 2025, the values of biodiversity & ecosystem services have been recognized by decision makers & integrated into key development sectors, poverty reduction strategies, and national & local land use management plans, including land-zoning (Aichi Target2)
Aichi Target3: By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio-economic conditions.	Target 16: By 2025, subsidies on agro-chemicals & fertilizer removed and fuel subsidies for water pumping eliminated; and incentives and subsidy schemes, supporting, sustainable use of biodiversity, water efficiency use, pollution free industries, industrial compliance, adoption of green technologies and use of recycled materials approved by cabinet (Aichi Target3 & Target 8:) Target 12: By 2025, 50 per cent of agrochemical substances, pesticides and other land-based pollutants on land, aquatic and marine ecosystems have been reduced (Aichi Target3)
Aichi Target4: By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.	Target 15: By 2025, several business communities and public sectors, including ecotourism, mining, energy, industry and land use planning are benefiting from ecosystem services and have incorporated sustainability & biodiversity concerns into their national and local development plans and programmes, keeping the impacts of use of natural resources well within safe ecological limits (Aichi target 4).
Aichi Target5: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	Target 4: Reduce forest & rangelands harvesting by 15% in 2020, and by 30% in 2025 (Aichi Target5)
Aichi Target6: By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.	Target 6: By 2025, all Yemen fish stocks are managed and harvested sustainably through applying ecosystem based approaches, recovery plans, seasonal fishing ban of threatened species, banning of destructive fishing methods, control illegal and unregulated fishing and strict monitoring of fishing methods, practices and techniques (Aichi Target6)
Aichi Target7: By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity..	Target 5: By 2020, 50% of Yemen's agricultural lands will be managed sustainably, and by 2025 the sustainability principles will cover the entire agricultural lands (Aichi Target7)
Aichi Target8: By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.	Target 12: By 2025, 50 per cent of agrochemical substances, pesticides and other land-based pollutants have been reduced
Target 9: By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.	Target 10: By 2025, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment(Aichi Target9).

<b>Continued Annex 2: State of Alignment of National Targets with Aichi Targets of CBD Strategic Plan (2011-2020)</b>	
<b>AICHI Targets</b>	<b>NBSAP2 Targets</b>
Target 10: By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems i.....mpacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.	Target 7: By 2025, all pressures impacted by climate change and anthropogenic factors are mitigated and minimized, so that coral reefs, fish spp., birds, turtles and plants of marine ecosystems are maintained and functioning well ( this correspond to Aichi Target 10)
Target 11: By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.	Target 1: By 2020, at least 5%(by 2020) and 7% (by 2025) of terrestrial and inland water areas, and 6% (by 2020) and 12% (by 2025) of coastal and marine areas will be under protection, effectively managed by local communities, and integrated into the wider landscape and seascape(Aichi target11).
Aichi Target12: By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.	Target 2: By 2025, 50 % of endemic, rare & endangered plants, mammal and bird species will be conserved (Aichi target12)
Target 13: By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.	Target 3: By 2020, 70% of the genetic diversity of Yemeni cultivated plants species , & domestic animals will be conserved in gene banks (Aichi 13)
Target 14: By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.	Target 8: Aquatic ecosystems have been restored and safeguarded so as to increase their capacities to sustainably deliver water services to about 65% of Yemeni population by 2020, and 85% by 2025 (Aichi 14) Target 14: Yemeni poor and vulnerable, including local communities, youth and women enabled to equitably access to water, marine, forest and land resources, thereby leading to reduction of population living under national poverty line by 15% in 2020, and by 30% in 2025 (Aichi targets, 14 & 16)
Target 15: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.	Target 9: By 2025, ecosystem resilience and the contribution of biodiversity to carbon stocks have been enhanced via restoration of at least 15 per cent of degraded ecosystems(Wetlands, Mangrove, Forest and terraces ), thereby contributing to climate change mitigation and adaptation and to combating desertification (Aichi Target15) Target 11: Energy resilience has been promoted and is manifested by 14% reduction of energy-related GHG emissions in 2020, and 23% in 2025 (Aichi 15)
Aichi Target16: By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable	See target Targets14

Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.	
Target 17: By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.	Done while developing NBSAP2
Aichi Target18: By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.	Target 17: In partnership with government, community-based management approach has been widely promoted to cover 50% of Yemen's protected area by 2020, and 100% by 2025, thereby leading to improved effectiveness of Yemen's protected areas along with promotion of traditional knowledge and practices on conservation and sustainable use of biological resources (Aichi 18).
Aichi Target19: By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.	Target 18: By 2025, knowledge, the science base and technologies. Including the traditional knowledge relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied (AichiTarget 19).
Aichi Target 20: By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties	Target 20: By 2016, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan 2011- 2020 from all sources and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization should increase substantially from the current levels (Aichi 20).

**Annex3: List of Participants to Consultation workshops**

No	Name	Organization
1	Mohammed Shamsan	MWE
2	Sulaiman Alqatabri	MOPIC
3	Dr. Nabil Al-Hushaibri	MAI
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7	Abdul-Rahman H. Al-Shehari	EPA
8	Gamal A. Naser	Marine Specialist, Aden
9	Walid Ali	UNDP
10	Murad A. Sultan	EPA
11	Ali Adimi	UNDP
12	Hilal A. Al-Riashi	EPA
13	Dr. Mansour Al-Aqil	AREA
14	Intesar Shaker	NWC
15	Mohmaed Shamsan	MWE
16	Ahmed S. Milqat	EPA
17	Hussain N. Al-Afari	EPA
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19	Majeda S. Abboud	EPA
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22	Dr. Hana Raseed Ahmed	MoFW
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24	Mutibb Alsadawi	EPA
25	Nabil Hushaiberee	MAI
26	Abdulmalik Sulh	EPA
27	Sulaiman Al-Qataberee	MoPIC
28	Abdul-Ilah Al-Suraihi	EPA
29	Khaled T. Al-Asbahi	EPA
30	Dr. Abdulwalee Al-Khulaidee	Flora Expert, AREA
31	Salah Al-Muradi	EPA
32	Ahmed Al-Aromi	EPA
33	Nori Gamal	MWE
34	Fuad Rajeh	EPA
35	Muna Al-Watari	EPA
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37	Mutibb M. Al-Hamzy	EPA
38	Sinan Al-Sharafi	EPA
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40	Mahdi Q. Al-Rymi	EPA
41	Mohammed A. Al-Afram	EPA
42	Ashraf Ahmad Al-Mansouri	Livestock Specialist
43	Nathem Al-Turaik	EPA



44	Dr. Abdul Wahed Othman Mukered	Biodiversity Expert, AREA
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48	Mr. Mohammed Abdullah Saad	Marine Biodiversity, MSRA
49	Amin Aljunaid	EPA
50	Majed A. Altamimi	EPA
51	Mr. Salim Mohsen Fadhle	MSRA
52	Abdul-Rahman Almuradi	EPA
53	Dr. Mohammed Moghram	Legal Consultant, University of Sana'a
54	Tawfiq A. Hassan	EPA
55	Mr. Ali Mohammed Al-Dhameri	Specialist in Desertification
56	Dr. Hisham Mohsen Al-Saqqaff,	University of Aden
57	Makki A. Alqura'a	EPA
58	Dr, Muhammed Abdul Kareem Al-Mansoob	Sana'a University
59	Abdul-Hakiem Rajeh	EPA
60	Omar Ba-a'ashn	EPA
61	Dr. Abdul Rahaman Haider	Desertification Expert , AREA
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63	Yaser Al-Ghobair	EPA – Hodeida Branch
64	Dr. Khalil Abdul-Ghani	NWRA
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66	Dr. Ala'a Al-Dien Y. Abdullah	General Department of Forests, MAI
67	Abdul-Wahab Wahshan	General Department of Forests, MAI
68	Ahmed Yahia Ali	General Department of Forests, MAI
69	Khaled Al-Buraihi	Central Statistics Organization (CSO)
70	Huda Own	National Women Committee
71	Suaad Alsadah	National Women Committee
72	Prof. Dr. Omar H. Al-Saqaf	Consultant, Sana'a University
73	Prof. Dr. Abdul-Karim Nasher	Consultant, Sana'a University
74	Amien Al-Shami	Environmental NGO
75	Eng. Mohammed G. Al-Nasier	Environmental NGO
76	Abdulla Al-Uthn	NGO
77	Ashwaq A. Al-Khazan	'Local Communities Development' Corporation
78	Ali Al-Saqaf	'Local Communities Development' Corporation
79	Mua'athe Al-Maqtari	Bab Almandab Studies Center
80	Anwar Al-Hemiari	Protected Area
81	Galal H. Ali	Utma Cooperative Association
82	Arwa Al-Sharjabi	Saba TV Channel
83	Bakiel A. Ahmed	Media Center
84	Mohmed Al-Mulaikee	GIS specialist, Taiz University
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86	Abdul-Wahab Wahshan	GDFDC

87	Gamal Al-shaghsee	Media
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93	Salwa Hasn	Women NGO Aden
94	Bin Shehab	Women Group Hawf PA
95	Ahmed Ali Alia	Women NGO Aden
96	Samia Abdulla	Women Group, Haf PA
97	M. Salem BaKurait	NGO environmental protection Hawf PA
98	Mohmed Ahmed Maouda'a	Automa PA, NGO
99	Said Ali Ahmed	Youth NGO, Hodiedah
100	Wafa al Eryanee	UNDP Prog officer
101	Mr. Maohmood Shedaiwa	Director Climate Chang project
102	Anwar Abdul Aziz	EPA climate change Unit

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