Republic of Yemen
Ministry of Water and Environment
Environment Protection Authority
(EPA)

Yemen's Sixth National Report To Convention On Biological Diversity (CBD)

Convention on Biological Diversity

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UNDP

Aden
March, 2019

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Yemen's Sixth National Report

To Convention On Biological Diversity (CBD)

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Technical review: Martin Cadena

Aden
March, 2019

Foreword

I have great pleasure in launching Yemen's Sixth National Report (Y6NR) to the Convention of Biological Diversity (CBD) in fulfilment of reporting obligations spelled out by Article 26 of the convention.

The sixth report is launched under critical conditions in Yemen, and these are manifested by the accelerated loss of biodiversity and the excessive extraction of scarce water due to the escalation of the war, and the subsequent increase in the number of internally displaced persons, the high levels of unemployment, the high levels of poverty among them and the inability of the Government to halt the overall pressures that threaten biodiversity, particularly under notable lack of financial resources to halt ongoing environmental and conflict-related damage. This implies that the Y6NR has been prepared in a context of acute political, social and economic challenges, wide societal disparities, and a growing demand for real participation by citizens and stakeholders. To this end, the Y6NR has been prepared through a participatory process to assure meeting the national demand, and also meets the reporting guidelines contained in annex to CBD/COP/DEC/XIII/27 and CBD/COP/DEC/XIII/28.

The adoption of participatory approach while developing theY6NR has not only enhance the ownership of the report among different environmental actors, but also improve the robustness of the Y6NR by incorporating national and global indicators into the report, and by enabling stakeholders to validate and verify the data incorporated.

As a robust and evidence-based report, the Y6NR assess the implementation of Yemen's NBSAP based on a total of 37 qualitative and quantitative biodiversity indicators, highlighting Yemen's progress towards achieving national targets, and the subsequent contributions to Aichi international biodiversity targets (ABTs), and to the international Sustainable Development Goals (SDGs). Further, the Y6NR is a data driven, assess the implementation of Yemen's NBSAP in five sections outlined as follows:

- Section I: Information on the targets being pursued at the national level;
- Section II: NBSAP implementation measures taken, assessment of their effectiveness, associated obstacles and scientific and technical needs;
- Section III: Assessment of progress towards each national target;
- Section IV: A description of the national contribution to the achievement of each Aichi Biodiversity Target ; and
- Section V: Updated biodiversity country profile.

In short, the Y6NR presents the state & trends of biodiversity and its components, impact of national action taken to achieve the national & ABT targets, and constraints encountered in the implementation of the NBSAPII and needs to address these constraints.

Therefore, We hope that this modest effort will be beneficial for all sectors concerned with biodiversity at the national or international level (decision makers, stakeholders,… etc.) as well as the scientific research sector.

The **6NR** was not, according to what we hoped, for several important factors that affected the Environmental work over the past years and the current difficult situation in our country, which put the Environment and its components at the direct and indirect impact of the depletion and degradation of many habitats and pressure on Natural resources, most notably the lack of financial resources, all of which undoubtedly have a significant impact on Environment.

However, **Environment Protection Authority (EPA)** has been striving seriously to work hard and to engage in partnership at the national, regional and international levels in order to remedy the situation and to develop appropriate and practical solutions in order to enhance the means of Protection and Preservation.

We would like to thank **Convention on Biological Diversity (CBD)**, and **Global Environmental Facility (GEF)** as donors for support to preparation and implementation of 6NR, as well as the **UNDP** project team, also, initial review for draft and final report by **Ms. Zuzana Tollrianova**, and technical review by **Mr. Martin Cadena** from UNDP Project Team, and thanks to National Coordinator **Mr. Ali Abdulbari Al-Adimi**, who made a great effort in preparing the sixth National Report.

We are pleased to stress that **Environment Protection Authority (EPA)** is aware of the importance of mutual work internally and externally with the various sectors taking into account not to neglect the functions and powers of **EPA** for the promotion of Environmental work and to reap the benefits as Conservation and Protection.

Environment Protection Authority (EPA).

Source : Rapid Assessment and Prioritization of Protected Area Management on Socotra Island Terrestrial Protected Areas , [1] Dec 2017, Senckenberg – UNEP/GEF – EPA

2Source: data on WB Project from : http://projects.worldbank.org/search?lang=en&searchTerm=&countrycode_exact=RY on 4/5/2017: Data on other projects retrieved from relevant Projects documents

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ACRONYMS :

ANP	**The Alliance of Nature Protectors**
AREA	Agricultural Research and Extension Authority
ABTs	Aichi international biodiversity targets
BUR	Biennial Update Reports
BD EA	Biodiversity Enabling Activities
BIP	Biodiversity Indicators Partnership
CAMA	Civil Aviation and Meteorology Authority
CDM	Clean Development Mechanism
NCFs	The Climate Funds
CSP	Concentrated Solar Power
ICT	Communications and Information Technology
CHM	Clearing house mechanism
CBNRM	The community based natural resources management
CO2	Carbon dioxide
CSP	Concentrated Solar Power
CCU	Climate Change Unit
CBD	Convention of Biological Diversity
CBO	Community Based Organization
COP	Conferences of the Party
CFL	Compact florescent Lamp
CSO	Central Statistic Organization
EIA	Environmental impact assessment
EPA	Environment Protection Authority
DAS	The Department of Agricultural Statistics
4th DPPR	The 4th Socio-Economic Development Plan for Poverty Reduction
FAO	Food Agriculture Organization
FIS	The Food Insecurity Scale
PEC	Public Electricity Corporation
FNC	First National Communication
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Green House Gases
GIS	Global Information Systems
GWH	Giga Watt Hours
GDFCD	The General Department of Forestry and Combating Desertification
GARWS	The General Authority of Rural Water supply
GOY	Government of Yemen
ha	Hectares

HFO	Heavy Fuel Oil
IPCC	Intergovernmental Panel on Climate Change
IYB 2010	The International Year of Biodiversity
IWRM	Integrated Water Resource Management
IUCN	The international Union for Conservation of Nature
IAS	Invasive alien species
SDGs	International Sustainable Development Goals
KBA	Key Biodiversity Area
Kg	kilogram
Km	Kilometer
KWH	Kilo Watt Hours
LNG	Liquefied Natural Gas
LPG	Liquid Petroleum Gas
LULUCF	Land Use, Land-Use Change, and Forestry
LMOs	Living Modified Organisms
MSW	Municipal Solid Waste
MAI	Ministry of Agriculture and Irrigation
MoF	Ministry of Finance
MEE	Ministry of Electricity and Energy
MSY	The Maximum Sustainable Yield
MAT	Mutually Agreed Terms .,
MoLAD	Ministry of Local Administration
MEE	Ministry of Electrify and Energy
MW	Mega Watt
MPIC	Ministry of Planning and International Cooperation
MoT	Ministry of Tourism
MSRA	Marine Science Research Authority
MWE	Ministry of Water and Environment
NAPA	National Adaptation Programme of Action
NG	Natural Gas
NAMA	Nationally Appropriate Mitigation Actions
NBSAP II	National Biodiversity and Action plan 2
NSREEE	National Strategy for Renewable Energy and Energy Efficiency
NT	National Target
NGO	None Governmental Organization
NWRA	National Water Resources Authority
NASS)	The National Agriculture Sector strategy
NFSS	The National Fisheries Sector Strategy
NWSA	The National Water and Sanitation Authority
NWSSIP	National Water Sector Strategy and Investment Program

NCF	National Climate Fund
PA	Protected Area
PARE	Authority for Rural Electrification
PES	Payment scheme for Ecosystems Services
PV	Photovoltaic
N2O	Nitrogen
NOx	Nitrogen Oxides
REDD	Reforestation to reduce emission from deforestation and forest degradation
SLR	Sea Level Rise
6NR	The sixth national report
SNC	Second National Communication
SHS	Solar Home Systems
SFNC	The Sustainability Foundation for Natural Conservation
SWM	Solid Waste Management,
SFD	The Social Fund for Development
SPC	Sustainable Production and Consumption
SGBP	The Socotra Governance and Biodiversity
Qat	Catha edulis
CO2	Carbon Monoxide
TNC	Third National Communication
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
ROY	Republic of Yemen
WED	The World Environment Day
WB	World Bank
WG	working group
YTPB	Yemen Tourism Promotion Board
YPC	Yemen Petroleum Corporation .
YGC	Yemen Gas Corporation
BUR	The Yemen First Biennial Update Report

Yemen's Sixth National Biodiversity Report To the Convention Of Biological Diversity(CBD)

INTRODUCTION

As a country party to the CBD, Yemen is committed to submit national reports to the Conference of the Parties on measures taken for the implementation of the Convention, and their effectiveness in meeting the objectives of the Convention. This has been clearly expressed in Article 26 of the Convention, and according to Decision XIII/27 of the COP 13 , the Government of Yemen has to prepare & submit its Sixth national report to the CBD by the deadline of 31 December 2018.To this end, the Government received a financial support from the Global Environmental Facility's (GEF) Biodiversity Enabling Activities (BD EA) targeted for the preparation of the sixth national report(6NR). It its capacity as implementing agency of Yemen component of the project, the UNDP is being guiding lengthy process targeted for the preparation of Yemen's Sixth National Reports (6NR) to the Convention of Biological Diversity (CBD). This process has ended up by developing a the Yemen's Sixth National Report (6NR).

The Yemen's Sixth National Report sheds the light on Yemen's progress towards meeting the Global Aichi Targets as spelled out by equivalent national target given by National Biodiversity Strategy2 (NBSAP2) . The NBSAP2 set 17 National targets (NT)to be met by 2020 or 2025. The target identified in the NBSAP2 represents the strategic priorities for of Yemen & also consistent with global Aichi Target (ABT).

Summary on Development Process & Findings

The assessment is structured to cover 20 outcomes, whereas each of which is related to one of the following the global biodiversity thematic areas:

1. Biodiversity awareness
2. Biodiversity mainstreaming
3. Incentives and subsidies
4. Sustainable production and consumption
5. Habitat fragmentation and degradation
6. Sustainable fisheries
7. Sustainable resource management
8. Pollution
9. Invasive alien species
10. Vulnerable ecosystems
11. Protected areas
12. Species and extinctions
13. Genetic diversity
14. Ecosystem services
15. Climate resilience, sequestration and restoration
16. Access and benefit sharing
17. NBSAPs

18. Traditional knowledge
19. Science and research
20. Resource mobilization

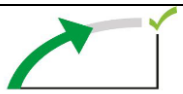
The assessment report is spilt into 4 sections, dedicated respectively for rational behind the selection of the national biodiversity targets(section I), assessment of measures effectiveness (section II), progress assessment towards national target (Section III), national contributions toward the ABTs & SDGs (Section IV), and updated biodiversity country profiles (Section V). Broadly, Overall assessment, has been made, applying participative stocktaking approach pursuant to recommendations of article 10 of the CBD. The participatory process was realized by engaging around 60 key stakeholders in two consultation workshops, by which they exchange adequate information on the state of NBSAP implementation, and finalized two key assessments, namely focused on assessing effectiveness of NBSAP implementation, and assessment of progress towards each national target.

The assessment of measures effectiveness has been made by describing the adequacy & effectiveness of national measures undertaken to produce each outcome, numerating obstacles met and recommended remedy actions to further accelerate the production of intended outcomes within the time frame identified by the NBSAPII. The overall assessment of measures effectiveness has been made through the adoption of the Sixth National Report (6NR) guidelines and reporting templates recommended by the Conference of the Parties (COP 13) in its Decision XIII/27. This include, involving biodiversity stakeholders in undertaking the assessment applying the below listed rating recommended by the by the CBD in the technical reporting guidance version 14 February, 2018:

1. Measure has been effective
2. Measure has been partially effective
3. Measure has been ineffective
4. Unknown

As conclude by the assessment, 26 percent of total measures identified in the NBSAPII have been completed, while the vast majority, being 74 per cent have not yet started. In terms of effectiveness, the table shows that out of 17 outcomes cover by Yemen NBSAP, 4 have been assessed as partly effective, compared with 13 outcomes which have been recognized as ineffective.

Similarly, the assessment of Yemen's Progress towards meeting NT has been made based on the five-point scoring system recommended by the technical reporting guidance
version 14 February, 2018 produced by the CBD. This scoring system is shown in table S1 below.

Table S1: Five point scale of progress, adapted from Global Outlook	Sympol
On track to exceed target (we expect to achieve this before its deadline)	
On track to achieve target (if we continue on our current trajectory we expect to achieve the target by 2020)	
Progress towards target but insufficient (unless we increase our efforts the target will not be met by its deadline)	
No significant overall progress (overall, we are neither moving towards the target nor moving away from it)	
Moving away from target (things are getting worse rather than better)	

As indicated in table 3.2, out of 17 national targeted pursued one target has been achieved, additional three are on track, another three are showing progress but at in sufficient rate, nine targets with reported isignificant progress, and one target is moving away from target (things are getting worse rather than better).

Section I: Information on the targets being pursued at the national level

This section presents a target by target reasoning behind the development & adoption of Yemen National biodiversity targets, including highlights on development process followed by national stakeholders while designing and approving the targets during NBSAP development.

The section also explains the extent of linkage of each target to global national target as spelled out by the Strategic Plan for Biodiversity 2011-2020. The report in term of its content is structured in line the Guidelines for preparing the 6NR adopted in Decision XIII/27. However, the report content is pending the stakeholders' feedback and approval which is expected to take place during the inception consultation workshop scheduled very soon.

Global Biodiversity Theme1: Biodiversity awareness improved

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

Equivalent National Target(s): NT19 - By 2025, stakeholders and decision makers are adequately aware of biodiversity value and taking positive action to conserve and use biodiversity sustainably.

Rational

Low public awareness of biodiversity values and issues hampers the effective use 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 Environment Protection Authority (EPA) as regard production and dissemination of environmental information and awareness products. The EPA communication unit 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 and their staff are not adequately furnished to access biodiversity information owing to the lack of communication and networking technologies

Mainstreaming Process of ABT target into national Strategies

For being highly interlinked targets, the national targets19, 17 & 18 were developed coherently by one WG, applying participative and consensus-based approach pursuant to recommendations of article 10 of the CBD. A detail on the scope of this consultation process along with information about stakeholders contributed to this process is presented by end of this report under Global Biodiversity Theme 18 on the traditional knowledge. This section sheds the light on scope and content of NBT 1 on Biodiversity awareness, while the content of NT17 on promotion of community-based management, and NT18 on improvement of biodiversity information are presented by end of this report.

The adopted NT19 as given by the NBSAPII calls for enhancing stakeholders and decision makers awareness on biodiversity value so as to take positive action advocating biodiversity conservation and the use of biodiversity sustainably. Therefore, the NT19 is typically the same as the global ABT1 and is also address the issue of low environmental awareness among various sectors of Yemeni society.

In order to achieve the Equivalent National Target T19, the national stakeholders proposed a wide-range of strategies, including the development & implementation of environmental awareness strategy, the effective integration of new biodiversity themes into the educational system, and expansion and creation of environmental clubs at schools and among youth groups. The intended development of communication and awareness strategies should target 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. More details on implementation measures actually perused, assessment of their effectiveness, associated obstacles and scientific and technical needs to achieve this national target are presented in section 2 of the 6NR.

Global Biodiversity Theme 2: Biodiversity Mainstreaming

ABT 2 - By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning

processes and are being incorporated into national accounting, as appropriate, and reporting systems.

Equivalent National Target(s) :T14.1: 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 & land use management plans.

Rational

According to ecosystem valuation study, total estimated value of key ecosystem in the country is estimated at approximately USD 287,829 million, 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). 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 value portion of forest ecosystem services and functions is undervalued by decision makers while developing poverty reduction strategies and national development plans, leading to misuse of natural resources with subsequent loss of ecosystem & ecosystems services. One of the factors contributing to the overlooking of ecosystem values and forest loss is attributed to policy failure in the sectors of forest, energy, water, national land use. The policies in forest, energy and water sectors encourage the utilization of fuelwood, the medicinal values of forests, ground water against no cost, while national land use policy is advocating urbanization at the expense of environmentally sensitive areas. Such harmful policies are directly contributing to the overlooking of ecosystem values, leading to misuse of natural resources with subsequent loss of ecosystem & ecosystems services. For instant, under current urban policy, 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 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. 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. It is therefore

important that efforts be geared towards integration of the ecosystem values in deriving national income accounts and at all levels of decision making.

Mainstreaming Process of ABT target into national Strategies

To address the underlying drivers behind biodiversity loss, the nation stakeholders- during the NBSAP development- held number of participatory stakeholder meetings by which they reached a consensus on the scope & content of a national target, addressing the underlying causes behind biodiversity & ecosystems loss, and also responding to the global ABT target. The participatory consultation meeting of the NBSAPII ended up by adopting the National Target 14.1, which is fully oriented to national priorities, but not fully incorporating all features addressed by the global ABT2. Specifically, the target integrates biodiversity values into NBSAPII, and yet there is a need to get it integrated into poverty reduction strategies and into national accounting systems.

For being nationally oriented target, the National Target 14.1 is structured to reverse national priority issues contributing to the continuing urbanization incurred by prevailing unsustainable land use planning & management. To this end, the target is designed to promote policy reform in the sectors of energy, forestry, water and land use with specific focus to integrate the ecosystem values while developing sectoral strategies in these areas.

Further, the target seeks minimizing the impacts of uncontrolled urbanization on biodiversity loss by promoting sustainable land use planning & management. To achieve sustainability in land planning, specific focus should be geared towards promoting ecosystem approach, integrating biodiversity values & sustainability while development of road and infrastructure development 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. Please note that section two of the 6NR provides details on measures implemented nationally in order to integrate biodiversity values into national planning. Main environmental stakeholders contributed to the development of national target include: EPA, MWE, MAI, NWRA, GDFDC, Ministry of Electrify and Energy (MEE), MFW, NGO, local groups, and Private Sectors Representatives .

Global Biodiversity Theme 3: Incentives and subsidies

ABT3 - 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.

Equivalent National Target(s) :T15: 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:)

Rational

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.

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.

Mainstreaming Process of ABT target into national Strategies

In order to address policy distortions contributing to biodiversity loss, the national stakeholders have been called to come together in three participatory consultation workshops targeted for reforming harmful to biodiversity as specified by the global ABT3. The consultation processes have been completed during the development of NBSAPII (2014 & 20015) and ended up by adopting the national targets 12 & 15 which are collectively targeted for removing harmful incentives & subsidies in environmental sectors, indicating the compliance with ABT3. Additionally, the targets are also responsive to national priority needs and this is manifested by mainstreaming biodiversity concepts and values into environmental sectors, namely into water, agriculture, fishery, forest and rangeland,. As proposed by the national stakeholders, the mainstreaming of biodiversity values into environmental sectors will be achieved through three implementing innovative strategies respectively dedicated for introduction of Payment scheme for Ecosystems Services (PES), mainstreaming ecosystems values & services through creation of markets for biodiversity products, and harmonization of policy distortions in land management, water & marine resources. Specific measures undertaken to implement these strategies are discussed in section 2.

The removal of harmful incentives & subsidies as recommended by the global ABT3 has been considered by another national strategies namely by the 4th DPPR & the National Agriculture Sector strategy (NASS), National Water Sector Strategy and Investment Program (NWSSIP), and the National Fisheries Sector Strategy (NFSS), whereas all of which adopt measures devoted for removal of incentive policies. For instant, the NASS call for gradual reduction in diesel subsidies to increase the cost of pumping groundwater.

The adoption of two targets has been concluded by facilitating a nationwide societal Participatory approach from the Ministry of Agriculture and Irrigation (MAI); Ministry of Water and Environment (MWE); Ministry of Fishery Wealth (MFW); Environment Protection Authority (EPA); Ministry of Planning and International Coordination (MoPIC); National Water Resources Authority (NWRA); National Water and Sanitation Authority; General Authority of Rural Water supply(GARWS); the General Department of Forestry and Combating Desertification (GDFCD); Agricultural Research and Extension Authority (AREA); Civil Aviation and Meteorology Authority (CAMA); Ministry of Tourism, National Women Committee, Sana'a University; Taiz Research Centre; NGOs; private sector, Woman & youth

groups; EPA Climate Change Unit, Focal Pints of the UNFCCC, UNCBD & UNCCD; Aden Wetlands, Bura'a PA, Hawf PA, Local Communities.

Global Biodiversity Theme 4.1: Sustainable Production and Consumption

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

Equivalent National Target(s): T16: 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.

Rational

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.

Mainstreaming Process of ABT target into national Strategies

To reduce adverse impacts of current production patterns on ecosystems, the T16 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 promotion 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.

Global Biodiversity Theme 4.2 : Sustainable tourism

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

Equivalent National Target(s): T 14.2 : By 2025, Ecotourism sector is benefiting from ecosystem services and has incorporated sustainability & biodiversity concerns into local ecotourism development plans and programmes

Rational

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.

Mainstreaming Process of ABT target into national Strategies

To address the impacts of unfavorable tourism and approve a national target for tourism sector, the national stakeholders proceeded with similar participatory approach that have been adopted throughout the development process of all national targets included by the NBSAPII. To proceed with this consultation process, a working group of experts was formed during NBSAPII development with representation from the Ministry of Tourism (MoT), Yemen Tourism Promotion Board (YTPB), the Department of Ecotourism of MoT, Ministry of Culture (MoC), Ministry of Water and Environment, the Environment Protection Authority (EPA), and the Ministry of Interior. The consultation process at this level concluded by adopting the target 14.2, which was then discussed and approved at the plenary level, and subsequently integrated into the NBSAPII.

As stated in the national target 14.2, the ecotourism sector is committed to incorporate sustainability & biodiversity concerns into local development plans and programmes while benefiting from ecosystem services. This implies the compliance to global ABT in ecotourism sector. However, full compliance to ABT4 is emphasized in the Target 16 which integrates sustainability concept into other development sectors including the mining; oil and gas; manufacturing industry; infrastructure & road; energy production; and urban planning, & this is discussed under pervious target.

Beside the compliance to ABT4, the national target 14.2 is structured to meet national priorities related the conservation of biological resources based on integrating 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. To achieve this target & keep tourism impacts within carrying capacity of eco-sites, numerous actions were undertaken nationally and these presented in section II of the 6NR. The said section also presents assessment of measures effectiveness, associated obstacles and scientific and technical needs to and achieve the national target.

Global Biodiversity Theme 5: Habitat Fragmentation and Degradation

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

Equivalent National Target(s): T 4 : Reduce forest & rangelands harvesting by 15% in 2020, and by 30% in 2025

Rational

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.

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 2001to 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[3]. 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 identified in mangrove destruction is camels. In addition, anthropogenic activities such as fuelwood harvesting are other primary causes of deforestation of mangroves.

Mainstreaming Process of ABT target into national Strategies

To minimize habitats deteriorating associated with unsustainable harvesting of forest and rangelands, the nation stakeholders- during the NBSAP development- formed specialized working group with mandate to propose a national target for forest and rangelands, applying an inclusive participatory method among them. The experts members of the working group based on extensive review of current management practices in forest & rangelands have drafted and presented the national target to the plenary meeting for further discussion and final approval. The plenary meeting further applied participative stocktaking exercise, which ended by approving the national target4 in a final versions. Key stakeholders participated in the working group were representatives from General Department of Forestry and Combating Desertification (GDFCD)and Agricultural Research and Extension Authority(AREA) in collaboration with Ministry of Agriculture and Irrigation (MAI), National Water Resource Authority (NWRA) , Ministry of Water and Environment (MWE), local councils, local communities and local NGOs.

The national target 4 calls for promoting the sustainable harvesting of forest products through the promotion of innovative practices in forest and rangeland management, strengthening planning and institutional performance, provision of alternative sources of income for local livelihoods, & & control of Alien invasive species. To mainstream the ABT target into the NBSAPII, the national target 4 is designed to promote several mainstreaming approaches, including 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. More details on how these approaches are put in place are presented in section 2 of the 6NR. Section 2 of the 6 NR also presents implementation

[3] Republic of Yemen, DAS of Ministry of Agriculture and Irrigation, 2012.

measures taken to promote these approaches, including assessment of their effectiveness, associated obstacles and scientific and technical needs to and achieve the national target.

Global Biodiversity Theme 6: Sustainable Management of Marine Living Resource

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

Equivalent National Target6 : 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

Equivalent National Target7: National 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)

Rational

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.

Marine & coastal ecosystems loss is characterize 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.

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. 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_2) in the atmospheric, leading to increase in CO_2 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.

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.

Mainstreaming Process of ABT target into national Strategies

In order for Yemen to curb the various threats contributing to marine biodiversity loss, the national stakeholders have been called to come together in two participatory consultation processes targeted for mainstreaming the sustainability principles as called upon by ABT 6 and climate change resilience as spelled out by ABT 7 into National environmental strategies, namely into the NBSAP & the National Fisheries Sector Strategy (NFSS).

The NBSAP consultation process completed through three stakeholders workshops- during 2014 & 20015- which collectively ended up by adopting the national targets 6 & 7 which are respectively concerned with promoting sustainability principles & climate change resilience in management of Marine ecosystems. The national target6 is highly consistent with ABT 6 and also addresses unsustainable national priority issues such as over exploitation of marine resources, habitats modification, marine pollution, ineffective policy & management and alien invasive species. To promote sustainability principles into marine sector, the NBSAP stakeholders broadly proposed a mix of innovative approaches, including establishing carrying capacities for mangroves and coral reefs, applying ecosystems-based approach for management of fishery & marine resources and implementing a seasonal fishing ban on catching rock lobster and other marine species. Please note that section two of the 6NR provides details on measures implemented nationally along with assessment of their effectiveness in achieving the innovative approaches stated above.

The national target 7 is highly consistent with ABT 10 and also responds to national priority issues such as weak ecosystems & community resilience against anticipated climate, 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. To achieve national target7, the national stakeholders proposed strengthening 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 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.

The consultation process of fishery strategy was held from 16th-17th January 2011 at the Mercure Hotel in Aden with participants (138) representing key stakeholders concerned with development of targets 6 & 7 from: Ministry of Fish Wealth (MFW) and Marine Science Research Authority (MSRA) in collaboration with Ministry of Agriculture and Irrigation (MAI), Ministry of Water and Environment (MWE), local authorities, CBO's, NGOs, fishermen communities, fisherwomen, fish cooperatives, national institutions, academia, representatives from the private sector, external development partners and donor community. The participatory processes adopted while developing fishery sector strategy ended up by mainstreaming both of ABT 6 & 7 into the NFSS through the promotion of sustainability climate resilience concept into the fishery sector with specific focus on Promoting resource sustainability & conservation; building the resilience of the communities based on adaptation interventions, and improved community livelihoods with a focus on empowerment of youth and women.

Global Biodiversity Theme 7: Sustainable Agriculture

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

Equivalent National Target(s): T 5 : 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

Rational

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.

Mainstreaming Process of ABT target into national Strategies

To address unsustainable practices facing agricultural sector, mainstreaming sustainability principles has been committed in several national & sectoral socio economic strategies, including the national biodiversity strategy, the 4th DPPR & the National Agriculture Sector strategy (NASS). The NBSAPII through the adoption of the sustainability principles in target 5 is closely aligned to the ABT 7. Additionally, the national target 5 is structured to address the issue of unsustainable agriculture via the diffusion of green technology in irrigation; the introduction of environmentally sound methods and practices into farming and rangeland management; the promotion of smart traditional practices; and improving agricultural land production to address livelihoods and local food security. Similarly, both of the 4th DPPR & the National Agriculture Sector strategy implicitly mainstreams sustainability principles into agricultural sector through number of policy options , including the raising of agricultural land production through research focused on plant varieties; efficient water use in irrigation based on the introduction of modern methods in irrigation and promotion of rain-fed agriculture combined with improved water harvesting.

The mainstreaming of the global ABT7 into the NBSAPII, the 4th DPPR & the National Agriculture Sector strategy (NASS) was realized based on an inclusive, participative and consensus-based approach as explained under protected area target 11. However, it worth recalling that all strategies have been developed through extensive review of pervious environmental strategies like: the National Food Security Strategy, National Water Sector Strategy and Investment Program (NWSSIP), MAI irrigation strategy, Climate Change Impact Assessment on Agriculture and Water Sectors, and the Agriculture Sector Strategy included in the recently developed Fourth DPPR. The review of these documents enabled stakeholders build upon experience & lessons learnt from strategies development that had been followed in the past.

Stakeholders concerned with development & implementation of this target include representatives from the Ministry of Agriculture; Ministry of Water and Environment; Environment Protection Authority; National Water Resources Authority; Sana'a University; Taiz Research Centre; NGOs; private sector, Woman & youth groups; Focal Pints of the UNFCCC, UNCBD & UNCCD; and Agricultural Research and Extension Authority among others.The involvement of local community groups enabled them integrate community-based management approach into planning systems of Yemen protected areas.

Global Biodiversity Theme 8 : Ecosystem Pollution

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

Equivalent National Target(s): T 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

Rational

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

Mainstreaming Process of ABT target into national Strategies

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, large quantities of untreated solid and liquid waste are directly dumped in the environment with sever impacts on vulnerable people and fragile ecosystems. In order to mitigate the impact of ecosystems pollution, specialized working group on ecosystem pollution was formed during NBSAPII development. The working group was formed with a mandate to conduct a participatory stocktaking exercise targeted for drafting the national target 12, addressing national priorities and also aligned to the global Aichi Target 8. The expert members of the designated working group conducted extensive review and stocktaking of national strategies, and based on which they proposed and forwarded an initial draft of the target to the plenary meeting for their validation. The participants to the plenary meeting further applied participative stocktaking exercise, by which they reached a consensus on refined scope, content and timeline of the national target 12. Key stakeholders participated to the plenary meeting were representatives of media , civil society; universities and scientific research centers; Woman & youth groups; local communities; local authorities; private sectors and central authorities representing agriculture, fishery, water, land-use management tourism, energy sectors.

As concluded by the national stakeholders, the National Target12 is structured 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 combined with introducing innovative waste management strategies to hospitals, industry, mining and manufacturing sectors. Key strategies to be introduced includes the promotion green-technology, recycling hazardous/useful materials from waste, and producing non-wasteful products. These strategies are proposed to be applied at both national & local levels. More details on implementation measures undertaken, assessment of their effectiveness, associated obstacles and scientific and technical needs to mitigate ecosystems pollution and achieve this national target are presented in section 2 of the 6NR.

Global Biodiversity Theme 9: Control of Invasive Alien Species ,

ABT 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.

Equivalent National Target(s): T 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

Rational

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 umber 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 Apies mellifera jemenitica as a result of spreading of the Varroa mite pest. 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.

Mainstreaming Process of ABT target into national Strategies
To prevent and mitigate the impact of alien invasive, the National Target 10 was adopted and integrated into the NBSAPII applying a participatory approach following the recommendation of article 10 of the convention.

The NT10 is responsive to NBT 9, and also addresses national priorities trough the development and implementation of 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. More details on implementation measures undertaken, assessment of their effectiveness, associated obstacles and scientific and technical needs to mitigate ecosystems pollution and achieve this national target are presented in section 2 of the 6NR.

Global Biodiversity Theme 11: Protected Areas

ABT 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.

Equivalent National Target(s): T 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.

Rational

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 Target11(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 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.

Mainstreaming Process of ABT target into national Strategies

For its national importance, the global ABT 11 was fully committed by NBSAPII & was also partly incorporated into the 4th Socio-Economic Development Plan for Poverty Reduction(4th DPPR) as well as into several sectoral strategies such as the National Agriculture Sector strategy (NASS), 2012- 2016, the National Water Sector Strategy and Investment program (NWSSIP), national fisheries sector strategy (NFSS) .The mainstreaming into the into the NBSAPII is echoed by the adoption of national biodiversity

Target1, which is closely aligned to the global ABT 11. Further, the national target1 is structured to address five broad national priorities concerns related to: conserving, restoring and maintaining the integrity of Yemen's eco-systems by declaring 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.

The mainstreaming of the global ABT11 into the NBSAPII was realized based on an inclusive, participative and consensus-based approach, allowing various stakeholders from different backgrounds and related sectors to be part of the entire development process.

This participatory consultation process was extensively exercised by national stakeholders not only for designing taget1, but also throughout the design and planning the entire national targets included to the NBSAPII. To facilitate this process, a working group (WG) of experts was formed during NBSAPII development with aim to set up national PA target that is aligned with global Aichi target11, and also responds to broader national priorities.

However, the national stakeholders noted that conservation aspects and needs for protection of ecosystems, threatened species (ABT12)and genetic resources (ABT13)are highly interlinked and cannot be addressed independently. Given this fact, the stakeholders in the plenary meeting agreed expanding the mandate of PA WG to include the responsibility of developing the national targets for threatened species and genetic diversity as well. In this way, the three national targets were developed coherently and effectively, and this is reflected in minimizing duplication in the scopes, content and coverage of the three targets

More importantly, this action led to mainstreaming the ecosystem approach not only in in PA management but also in safeguarding of threatened species and conservation of genetic diversity.

The adoption of participatory & inclusive approach facilitated maximizing use of available resources of all actors towards meeting common goals, thereby avoiding any duplicated efforts particularly while addressing issues of cross-cutting aspects. Additionally, the adoption of participatory approach facilitated a nationwide societal partnership in planning natural resources and this resulted in securing adequate information base for designing a sound national target that reflect the interest of overall partners involved in the process. More importantly, the public-community partnerships, particularly with local community led to increasing government- public trust, ownerships and good governance, in particular with regard to transparency, accountability, cost effectiveness, and efficiency of natural resources.

Key stakeholders contributed to the working group were representatives from the National Water Resources Authority; Environment Protection Authority; Ministry of Fish Wealth; Ministry of Agriculture; Ministry of Tourism; Agricultural Research and Extension; Focal Pints of the UNFCCC, UNCBD & UNCCD; local community groups of Aden Wetlands, Bura'a PA, Hawf PA; and Authority and Woman & youth groups. Similarly, the involvement of experts from Focal Pints of the UNFCCC, UNCBD & UNCCD facilitated their contribute in reviewing and assessing previous National biodiversity targets , and hence developing a revised national target that is aligned with the global ABT11related to four strategic areas 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.

Global Biodiversity Theme 12: Species and extinctions

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

Equivalent National Target(s): T 2 : By 2025, 50 % of endemic, rare & endangered plants, mammal and bird species will be conserved

Rational

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)

Mainstreaming Process of ABT target into national Strategies

In response to biodiversity loss, the National Target 2 was developed by national stakeholders during the preparation of NBSAP II. As spelled out by NBSAP II, the target was structured so as to be the equivalent national target to ABT 12, and also is a country driven target and this is clearly manifested by focusing on key national priorities related to the 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. More details on implementation measures actually perused, assessment of their effectiveness, associated obstacles and scientific and technical needs to achieve this national target are presented in section 2 of the 6NR.

Global Biodiversity Theme 13 : Conservation of Genetic Resources

ABT 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.

Equivalent National Target(s): T 3 : Target 3: By 2020, 70% of the genetic diversity of Yemen cultivated plants species , & domestic animals will be conserved in gene banks.

Rational

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 occuring 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.

Mainstreaming Process of ABT Target Into National Strategies

This target 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 measures clustered under four mainstreaming process of ABT13 target into national Strategies , 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, More details on implementation measures actually perused, assessment of their effectiveness, associated obstacles and scientific and technical needs to achieve this national target are presented in section 2 of the 6NR.

Global Biodiversity Theme 14.1 Restoration and Safeguarding Aquatic Ecosystems, Delivering Fresh Water

ABT 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.

Equivalent National Target(s): T 8: 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

Rational

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^3 in 1990 to 87 m^3per 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^3/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 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^3 (1.1 billion m^3 of groundwater and 1 billion m^3 surface water) while water consumption stands at 3.565 billion m^3, reflecting a groundwater depletion rate of 1.465 billion m^3 (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.

Mainstreaming Process of ABT Target Into National Strategies

According to Article 10 of the Convention , the mainstreaming of the global ABT14 into the NBSAPII was realized based on participatory processes at local & national levels allowing engagement of relevant Government stakeholders along with water sector partners public, private sectors local communities to play role reviewing pervious environmental strategies with aim to develop the equivalent national target that is country driven & also aligned to global ABT14. The recommended CBD process has also been perused independently while developing of the 4th DPPR & Water Sector Strategy (NWSSIP). Specific stakeholders contributed to such processes include Ministry of Water and Environment (MW`E), NGOs, National Water Resource Authority (NWRA), Ministry of Agriculture and Irrigation (MAI), Ministry of Local Administration (MoLAD), Agricultural Research and Extension, Authority(AREA), Civil Aviation and Meteorology Authority(CAMA), Community Based Organizations (CBOs), Climate Change Unit (CCU) at EPA, & General Department of Forestry and Combating Desertification (GDFCD).

The results concluded from the participatory review and assessment of national environmental strategies shows that one of which is fully aligned to the global ABT 14 and three of which are partly related to this target, but without committing certain target. Specifically, the NBSAP consultation process ended up by adopting the target 8 is directly related to ABT 14 and this is clearly manifested by calling for the restoration & safeguarding of aquatic ecosystems with aim to ensure adequate, safe & sustainable water supply to about 68% of Yemeni population (including the rural poor, women, and other vulnerable groups) by 2020, and 85% by 2025. To achieve this target, the NBSAP stakeholders broadly proposed numerous measures clustered under 7 national priorities 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. More details on implementation measures actually perused, assessment of their effectiveness, associated obstacles and scientific and technical needs to achieve this national target are presented in section 2 of the 6NR.

Similarly, the participatory processes adopted while developing both of the 4th Five Year Socio-Economic Development Plan for Poverty Reduction (4th DPPR) & the National Water Sector Strategy and Investment program (NWSSIP) ended up by mainstreaming five key priority areas of importance to implementation of the global ABT14. This include promotion of

integrated management of water resources; reduction of ground water depletion & pollution; use of new tech in irrigation; water conservation to expand water supply; and women involvement in water resources management and environment protection.

Global Biodiversity Theme 14.2: Poverty Mainstreaming (Output 4.2)

ABT 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.

Equivalent National Target(s): T 13: Yemeni poor 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 (Aichi targets 14 & 16)

Rational

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.

Mainstreaming Process of ABT Target Into National Strategies

To address various forms of poverty casual drivers, the NT 13 adopted by national stakeholders, applying a participative stocktaking exercise. This consultation process ended up by adopting the target 13 which is directly related to ABT 14 and is also addressing national poverty issues 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 NT 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.

Global Biodiversity Theme 15 : 51.1 Climate Resilience through Sequestration and Restoration

ABT 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.

Equivalent National Target(s): T 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 terraced agriculture), thereby contributing to climate change mitigation and adaptation and to combating desertification

Rational

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[4] 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[5]). 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 **drought**s 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 displacement of thousands of residents in Al Mahwit Governorate.

The international disaster database EM-DAT[6] 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).

[4] 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.

[5] 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.

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

Yemen experiences on average 1 to 5 Dust Storms with visibility of less than 1 km per year[7]. 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[8].

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[9].

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.

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.

[7] Middleton, N. J. (1986). A Geography of Dust Storms in South-West Asia. *Journal of Climatology*, 6: 183–196.

[8] Prof. William Sprigg, personal communication

[9] V&A studies developed under National Adaptation Programme of Action (NAPA, 2009)

Mainstreaming Process of ABT target into national Strategies

Under warmer climate, 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.

In response to climate change impact, two national process perused and were respectively delineated for NBSAPII development and formulating of the National Adaptation Programme of Action (NAPA). To proceed with NBSAP development, the EPA as a national focal point to the CBD invited about 200 persons from various governmental sectors and societal groups to attend three consultation workshops targeted developing national targets for Yemen NBSAP II, including this target. The national stakeholders in a plenary meeting has agreed to entrust the responsibility of this target to specialized working group on climate change applying a participative stocktaking exercise. The designated working group after extensive review of national strategies completed its work by drafting the national target 9, address national priority concerns and also aligned to the global Aichi Target 15. The draft target was then presented to the plenary meeting where it was further refined & approved by all participant. Key stakeholders participated to the plenary meeting were representatives of media , civil society; universities and scientific research centers; Woman & youth groups; local communities; local authorities; private sectors and central authorities representing agriculture, fishery, water, land-use management tourism, energy sectors.

The national target 9 (which aligned to ABT 15) calls for enhancing the socio- ecosystems resilience against natural disasters through strengthening disaster preparedness, renovation, and restoration and conservation 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. Renovation of degraded ecosystems will be achieved through number of restoration programs, 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. More details on implementation measures perused, assessment of their effectiveness, associated obstacles and scientific and technical needs to achieve this national target are presented in section 2 of the 6NR.

To formulate Yemen NAPA, a similar participatory planning approach was followed and that was in line recommended by the (Least Developed Countries Expert Group) LEG's Annotated Guidelines. The objective of this approach was to build awareness about climate risks and to solicit stakeholder's' feedback on urgent and immediate adaptation needs to be included to the NAPA report. To finalize this process, a series of consultations workshops conducted with key stakeholders from local, provincial and national levels, including stakeholders from local

communities and vulnerable groups such as women, farmers and fishermen, public representatives, academia and research institutions, and NGOs. Through such a comprehensive county-wide consultation process the NAPA stakeholders identified 95 adaption measures addressing the adverse impacts and threats of climate change, including identifying and developing the most urgent and immediate adaptation needs to adapt to such threats. Specifically, it contains a comprehensive range of climate change adaptation strategies devoted for mitigating the climate change impacts on agriculture, water and marine sectors, with specific focus to reduce water scarcity, and others improve agricultural production under erratic rains and changing climatic conditions. In the coastal areas it calls for integrated coastal zone management and improving monitoring capacities against anticipated sea level rise and extreme weather events.

Global Biodiversity Theme 51.2 Mitigating GHG Emissions

ABT 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.

Equivalent National Target(s): T 11 : Energy resilience has been promoted and is manifested by 14% reduction of energy-related GHG emissions in 2020, and 23% in 2025

Rational

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[10], 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, 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.

[10] National GHG inventory for the republic of Yemen, EPA, 2000

As stipulated by the 2nd 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.

Mainstreaming Process of ABT Target Into National Strategies

Energy resilience has been recognized and incorporated into two national strategies, notably the NBSAPII and the National Strategy for Renewable Energy and Energy Efficiency (NSREEE). In the NBSAPII, the ABT15 is being mainstreamed through the adoption of the national target 11, which focuses on promotion of Energy resilience as a complimentary part to mainstreaming of ecosystem resilience addressed by the pervious national (NT 9). The national target 11 as spelled out by NBSAPII calls for promoting energy resilience with aim to reduce energy-related GHG emissions by 23% in 2025. Key strategies to achieve the intended target include the adoption of nationally appropriate mitigation actions (NAMAs) with specific focus on shifting towards greener technology, shift towards renewable energy sources, the promotion of smart agricultural and land use practices, bio-energy production from solid waste and wastewater, restructuring EPA and the Social Fund for Development (SFD) or both to host national climate Fund (NCF), and activation of the Clean Development Mechanism (CDM). More details on implementation measures taken, assessment of their effectiveness, associated obstacles and scientific and technical needs to achieve this national target are presented in section 2 of the 6NR. To approve this target, the national stakeholders proceeded with similar participatory approach that was pursued while adopting the target 9 on climate resilience. Key stakeholders contributed to the

specialized working group on GHG Mitigating were representatives of the various government ministries including, Planning and International Cooperation, Public Electricity Corporation, Ministry of Water & Environment, Ministry of Industry and Trade, the Women's National Committee, Ministry of Local councils, Oil and Mineral Development, Environmental Protection Authority, Ministry of Finance, YPC and YGC.

In the National Strategy for Renewable Energy and Energy Efficiency (NSREEE), the NBT 15 is being mainstreamed through the introduction of renewable energy based on five potential policy options: i) the introduction of 100 MW of Concentrated Solar Power (CSP) systems into existing national grid by 2025;ii) the integration of 400 MW of Wind farms power plants into existing national grid by 2025;iii) the integration of 200 MW of geothermal power plants into national generation mix by 2025;iv) installation of 6 MW of biomass power plants using landfill gas; and the promotion of as; and v) the promotion of individual solar home systems (SHS) in rural areas to cover 110 000 rural.

Global Biodiversity Theme 18.1: Promotion of Community-based Management

ABT 18 - By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.

Equivalent National Target(s): T17: 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 .

Rational

Biodiversity planning & management is reported to be ineffective, and this is attributable to institutional weakness, influencing the performance of national agencies and local agencies. Key drivers contributing to institutional weakness include: exclusion of local community in natural ecosystems management, lack of effective information & research base for biodiversity planning & monitoring, and low public awareness of biodiversity values. Exclusion of local community in protection of natural ecosystems is constrained by
lack of good governance under tight centralization management triggered by weak inter-institutional coordination among environmental partners at local level, limited public & local

community participation in biodiversity planning & management of nature reserves & water basins, inadequate government funding of conservation projects, and incomplete legal frameworks for promoting decentralization & local community involvement. 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.

Other drivers contributing to institutional weakness is attributed to low public awareness of biodiversity values and this issue have been cited as the most predominant drivers provoking institutional weakness. Casual drivers responsible for low public awareness of biodiversity values are discussed above under taget1 concerned with enhancing biodiversity values. Additionally, casual drivers behind ineffective information & research base are discussed under next target delineated for enhancing knowledge & the science base on various aspect including biodiversity values.

Mainstreaming Process of ABT Target Into National Strategies

For being highly interlinked targets, the national targets(NT) on Biodiversity awareness(NT19); promotion of community-based management (NT 17); & improvement of information base (NT18) were developed coherently by one WG, applying participative and consensus-based approach pursuant to recommendations of article 10 of the CBD. The adaptation of this inclusive approach enabled national and local partners facilitating technical co-operation and information sharing process by which they address the casual drivers behind institutional weakness, low public awareness, and ineffective information & research base in coherent manners, thereby avoiding any duplication in the content of the designated targets.

This section sheds the light on scope, coverage and content of NT17 on promotion of community-based management, while the sections 1 & 17 present the content of NT19 and NT18 respectively.

The adopted NT 17 calls for the promotion of participatory & inclusive management, via the shift to a decentralized management & to community-based management to cover 50% of Yemen's protected area by 2020, and 100% by 2025.

To meet this target, the national stakeholders proposes number of measures clustered for addressing institution weakness at both central and local levels . At central level effort is to be paid for institutional restructuring and legislation reform for key environmental sectors, focused on harmonization of mandates 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.

At local level, effort is given for promotion of participatory & inclusive management, via the shift to a decentralized management via creating effective and viable community-based district's managements of natural resources, including the delivery of water services and strengthening inter-village coordination mechanisms. Complimentary to this, thigh priority is to be given for strengthening management capacities of local administrations through appropriate training in management and planning of PAs, local water basins, wet lands, and rangelands. More details on implementation measures actually perused, assessment of their effectiveness, associated obstacles and scientific and technical needs to achieve this national target are presented in section 2 of the 6NR.

Key stakeholders contributed to the designated WG group on institutional weakness were representatives from the Environment Protection Authority; National Water Resources Authority; Ministry of Fish Wealth; Ministry of Agriculture; Ministry of Tourism; Agricultural Research and Extension; local community groups of Aden Wetlands, Bura'a PA, Hawf PA; and Authority and Woman & youth groups. Having approved in principle the national targets by the working group, the finding of the WG was then presented to the plenary meetings where it was revised, enriched and approved in final form.

Global Biodiversity Theme 18 & 19 : Knowledge improved, shared and applied

ABT 19: By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.

Equivalent National Target(s) T18 : 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.

Rational

Ineffective planning & monitoring of natural resources is attributed to low level of information base on biodiversity ecosystems values combined with inadequate capacity to produce informative research.

Low level of information base is attributable to lack of effective system for sharing biodiversity information and lack of databases, which is evidently manifested by weak monitoring capacity of trends of biodiversity & ecosystems loss, which in turn attributable to weak capacity in collection storage, analysis of biodiversity data, the absence of new techniques, GIS and computerized tools

for storing, analyzing and processing of data and mapping of biological resources. Other factors contributing to Low level of information base include the deficit in qualified technical local staff specialized in species identification and research and this deficit is attributable to the absence of training and education programs.

Inadequate capacity to produce informative research is attributed to the lack of know- how, practices and technologies to undertake such responsibilities combined with the 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.

Mainstreaming Process of ABT target into national Strategies

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.

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 introducting know- how, practices, and technologies for clean and responsible production and consumption. More details on implementation measures perused,

assessment of their effectiveness, associated obstacles and scientific and technical needs to achieve this national target are presented in section 2 of the 6NR.

Conclusions

A participative stocktaking exercise on biodiversity planning took place and national biodiversity targets developed in response to the global Aichi Target. The participatory process was realized by engaging and enabling a total 200 persons from various governmental sectors and societal groups in the designing, approving and integrating 18 national targets into the NBSAPII . The current national targets mainstreams key aspects and considerations recommended by the CBD's Strategic Plan for 2011-2020, including gender, poverty, livelihoods, sustainable finance of NBSAP, and communication and outreach plan current NBSAP. Further, the revised national targets integrates biodiversity conservation and sustainable use of eco system services as well as the ecosystem values, climate change and ecosystem-based adaptation and resilience measures into the revised NBSAP.

Section II. Assessment of Measures Effectiveness

This section highlights progress made towards the attainment of each designated international biodiversity outcomes identified by the Aichi Biodiversity Target (ABT) based on assessing the adequacy & effectiveness of national measures undertaken to produce each outcome, numerating obstacles met and recommended remedy measures to further accelerate the production of intended outcomes within the time frame identified by the NBSAPII. In line with the CBD reporting guiltiness, the assessment covers 20 biodiversity outcomes of global ABT, whereas each of which is related to one of the following the global biodiversity thematic areas:

1. Biodiversity awareness
2. Biodiversity mainstreaming
3. Incentives and subsidies
4. Sustainable production and consumption
5. Habitat fragmentation and degradation
6. Sustainable fisheries
7. Sustainable resource management
8. Pollution
9. Invasive alien species
10. Vulnerable ecosystems
11. Protected areas
12. Species and extinctions
13. Genetic diversity
14. Ecosystem services
15. Climate resilience, sequestration and restoration
16. Access and benefit sharing
17. NBSAPs
18. Traditional knowledge
19. Science and research
20. Resource mobilization

The overall assessment of measures effectiveness has been made through the adoption of the Sixth National Report (6NR) guidelines and reporting templates recommended by the Conference of the Parties (COP 13) in its Decision XIII/27. This include, involving biodiversity stakeholders to conduct the assessment applying the below listed rating recommended by the by the CBD in the technical reporting guidance version 14 February, 2018:

1. Measure has been effective
2. Measure has been partially effective
3. Measure has been ineffective
4. Unknown

To facilitate this process, a reputable environmental NGO has been hired to develop a working methodology in the form of a questionnaire with aim to enable biodiversity stakeholders during

two workshops establish information base needed for the formulation of the Sixth National report, including this section. The designated NGO conducted two workshops, during which the stakeholders, including women was enabled to fill the questionnaire and & assess the extent of measures effectiveness towards the production of each thematic biodiversity area or outcomes stated above. The promotion of participatory approach guided by the designated NGO has led engaging of around 60 key stakeholders in two consultation workshops, by which they exchange adequate information on the state of NBSAP implementation, including the effectiveness of national measures undertaken to produce each outcome, numerating obstacles met and recommended remedy measures to further accelerate the production of intended outcomes within the time frame identified by the NBSAPII. The findings of the participatory consultation process was then was used as input data for formulation of the Sixth National Report by a national consultant. The findings of effectiveness assessment is summarized by table 1.

Table 1: Summary assessment on measures Effectiveness of Focal Biodiversity outcome

Focal Biodiversity outcome	Effectiveness Assessment	Description
1. Biodiversity awareness	Partially effective	29 percent of total measures identified in the NBSAPII have been completed, while the vast majority, being 71 per cent have not yet started
2. Biodiversity mainstreaming	Ineffective	1 percent of total measures identified in the NBSAPII have been completed, while the vast majority, being 99 per cent have not yet started
3. Incentives and subsidies	Ineffective	10 per cent of priority measures identified in the NBSAPII have been completed, an additional 23 per cent have been initiated, while 67 per cent have yet to be launched
4. Sustainable production and consumption	Ineffective	23 per cent of priority measures identified in the NBSAPII have been partly completed, while 77 per cent have yet to be launched once the current war comes to end
5. Habitat fragmentation and degradation	Ineffective	7 per cent of measures identified in the NBSAPII have been completed, and additional 29 per cent have been partially initiated
6. Sustainable fisheries	Ineffective	16 per cent of measures identified in the NBSAPII have been partially completed, while the vast majority, being 84 per cent have not yet started because of ongoing war
7. Sustainable Agriculture	Partially effective	60 per cent of measures identified in the NBSAPII have been partially completed, while the remaining, being 40 per cent have not yet started
8. Pollution	Ineffective	33 percent of activities identified in the NBSAP have been partly initiated under this outcome, while the vast majority, being 67 per cent have yet to be launched
9. Invasive alien species	Ineffective	25 per cent of measures identified in the NBSAPII have been partially completed, while the remaining, being 75 per cent have not yet

		started owing to lack of funding under ongoing war
10. Vulnerable ecosystems	Assessed Under pollution, Sustainable production & marine outcomes	
11. Protected areas	Ineffective	29 per cent of measures identified in the NBSAPII completed , compared with 71 per cent of NBSAP measures which have not yet started
12. Species and extinctions	Ineffective	Unfortunately no single action of those identified by NBSAP2 has been initiated under this component
13. Genetic diversity	Ineffective	less than 1 per cent of measures identified by the NBSAPII has been implemented
14. Ecosystem services 14.1: Poverty Mainstreaming	Ineffective	less than 1 percent of activities identified in the NBSAP has been implemented , while the vast majority, being 99 per cent have yet to be launched
14. Ecosystem services 14: Restoration and Safeguarding of Ecosystem Services, Delivering Fresh water	Ineffective	57 per cent of measures identified in the NBSAPII have been partially completed, while the remaining, being 43 per cent have not yet started
15. Climate resilience: 15.1 Adaptation	Ineffective	22 per cent of measures identified in the NBSAPII have been partially implemented, while the vast majority, being 88 per cent have not yet started due to of ongoing war
15. Climate Resilience (mitigation)	Partly effective	25 per cent of measures identified in the NBSAPII have been partially completed, while the remaining, being 75 per cent have not yet started owing to lack of funding under ongoing war
16. Access and benefit sharing	Not perused	
17. NBSAPs	ON track : Fully done	100 % Achieved
18. Traditional knowledge 18.1: Promotion of Community-based Management	Partly effective	Only 12% of the measures outlined in the NBSAP have been partly completed
19. Science and research	Assessed Under Awareness out come	
20. Resource mobilization	Not perused	

As conclude by the assessment, 26 percent of total measures identified in the NBSAPII have been completed, while the vast majority, being 74 per cent have not yet started. In terms of effectiveness, the table shows that out of 17 outcomes cover by Yemen NBSAP, 4 have been assessed as partly effective, compared with 13 outcomes which have been recognized as ineffective. Table1 presents effectiveness assessment for each Focal Biodiversity outcome , and details on effectiveness assessment are presented in the following part of these section.

1. Biodiversity Awareness, research and information improved

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

ABT 19: By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.

Assessment rating : Partially Effective

Equivalent National Target(s) T19: By 2025, stakeholders and decision makers are adequately aware of biodiversity value and taking positive action to conserve and use biodiversity sustainably.

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.

The stakeholders assessment of progress made towards improving public awareness recognizes that the government has demonstrated significant success so far among children, youth and women groups.
The NBSAP interventions among these groups have had a number of notable successes, translated in the creation of 8 women NGOs and more than 120 self-managed environmental school clubs in at least 4 key cities beside Hwaf, Bura'a, Aden wetlands & Socotra protected areas. Since the establishment of environmental schools club and Women NGOs, they have been actively engaged in planning awareness raising activities. Key achievements made by the school clubs in cooperation with women groups, EPA & UNDP funded programs includes: the voluntary organization of multiple awareness raising initiatives, such as: the progressive celebration of the National the National Environment Day since 2010, continuous celebration of the annual anniversaries of the World Environment Day since 20113, & the nationwide celebration of the International Year of Biodiversity (IYB 2010), including the effective contribution to the biodiversity convey which has passed from Sana'a crossing Hodiedah, Mokha and khokha to end up in Aden city. This last event was devoted for enhancing the awareness of approximate 19379 people, being 13079 students, 5500 general public and 800 from fishery communities living in the cities it goes through. In this activity student groups were actively involved in series of environmental events, including Biodiversity exhibition, cleaning campaigns, tree plantations campaigns, painting competitions, display of songs and plays and environmental quiz and games, among others. Of most important activity undertaken throughout the celebration of IYB were lecturing-awareness programmes and were targeting respectively a total of 13079 of school students and 800 persons local fishery community. Significant quantities of awareness materials, publications and & kits have been published and distributed widely during the convey and this include the following materials:

- 1432 copies of 2010 IYB Celebration Booklet (Arabic(816) and English(616)
- 1032 copies of a Booklet on Yemen Protected Areas.
- 1032 copies of Booklet on Yemen Biodiversity.
- 1032 copies of Al-Haswa Protected Area Guide.
- 616 copies of a Booklet on Waterfowl in Yemen.
- 1012 copies of Brochure on Bura'a Protected Area
- 4000 copies of a leaflet on Bura'a Protected Area
- 711 copies for one poster on Bura'a Protected Area
- 1995 copies of Environmental Maps, quiz and games
- 2930 of commemorative t-shirt plus 2930 caps emboss

Environmental clubs & women groups contributions to other Biodiversity awareness events have been remarkable in terms of the people they targeted, and in terms of awareness material distributed. However, these efforts have not been fully documented. In one event targeted for the celebration of environment national day (21 February 2013), they managed mobilizing a total of 3335 male and female from 51 schools to successfully organize tree plantation and cleaning campaigns which have led to cleaning about 11 tons of sea beaches garbage in addition to planting a total of 1000 trees in different areas in AL-Hudiedah. Through this event, the students has successfully distributed a total of 1000 brochures on the importance of environment conservation and sustainable natural resources management.

Beside the awareness raising activities of school children, the EPA called more than 300 participants, being representatives from the private sector, media and civil society organizations, universities and scientific research centers, local authorities, trade unions and women's organizations, youth and decision makers to attend green economy conference in June, 2012. The conference through 17 technical papers presented a number of green options feasible for enhancing economy performance in the RoY. These include: greening power generation, solid waste recycling, carbon trading & Clean Development Mechanism (CDM), rainwater harvesting, greening cities of Yemen via grey water reuse panting side roads of cities, sustainable use of marine resources for improving local community livelihood. Through this conference, a total of 1000 copies of a booklet on conference proceedings plus 500 copies of information booklet of the conference and 1000 CDs on the conference scope and themes were widely distributed during the conference and thereafter. More importantly, environment school clubs contributed significantly to this initiative through dissemination of 1000 copies of a booklet on student's paintings, highlighting green economy issues. Other major students' contribution to this event was completed through involving a total of 270 male and females students, split in three separate groups in organizing three separate environmental exhibitions targeted for displaying handicraft products made from solid waste as well as for displaying children paints on environmental issues and green economy.

Total measures undertaken by youth & women groups have led to enhancing local people awareness and appreciation of biodiversity values, and thus they became aware & willing to participate in conserving & use of natural assets sustainably. However, measures undertaken remains incomplete & limited to some protected areas namely to Socotra, Aden wetlands, and Bura'a national park, for which the implementation of overall awareness activities can be rated to be partially effective, with anticipated regional societal variation in the people awareness of biodiversity values.

Even though of notable success in enhancing biodiversity awareness among various population groups, awareness on biodiversity values among decision makers remained poor, partly because of limited studies on biodiversity values, and partly because they have become inaccessible since the break of the Arab spring in 2011 and the subsequent war in 2014. Other key obstacles hindering the enhancement of biodiversity awareness among population are attributable to none delivery of key NBSAP priority activities such as: Lack of communications and information technology (ICT) strategy; lack of biodiversity courses within educational curricula of secondary schools; lack of effective information base and networking between government on ecosystem loss, including loss of endangered species; and weak research capacity on economic valuation of ecosystem goods and services and underlying causes of biodiversity losses.

In order to address underlying causes of biodiversity loss, there is a need for developing a coherent communication, education and public awareness strategy targeted for expanding development of youth clubs and women NGO, and building their capacities in execution of awareness raising initiatives & biodiversity protection in all environmental sectors & at both central & local levels. Additionally, more effective measures to achieve this target should focus on improving people awareness of biodiversity values across the society based on valuation studies addressing various aspects of ecosystem services. This later action is expected to result in mainstreaming the costs and benefits of the conservation and sustainable use of biodiversity in decision-making.

Based on the foregoing analysis, it can be said that only four measures, being 29 per cent of total measures identified in the NBSAPII have been completed, while the vast majority, being 71 per cent have not yet started. This explicitly implies that implementation of measures planed under this outcome has been partially effective, which in turn resulted into poor decision makers awareness on biodiversity value, and the subsequent undervaluing of biodiversity services while estimating the national account.

2. **Biodiversity Values Integrated**

ABT 2 - By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.

Equivalent National Target(s): T14.1: 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 & land use management plans

Assessment rating : Ineffective

Most of Yemen ecosystem products such as the fuelwood, medicinal plants of forests, fish and underground water are derived and traded against no charge. Additionally, the values of these services are not taken into account when estimating GDP, nor while developing poverty reduction strategies and national development plans, leading to misuse of natural resources with subsequent loss of ecosystem & ecosystems services. To minimize ecosystem loss incurred by such harmful policies, the NBSAPII identified over 21 measures *to* mainstream biodiversity values into national & local land use planning and contribute to the delivery of Equivalent National Target 14.1.

By far**,** Yemen has only implemented two measures, being 1% of priority measures identified by the NBSAPII, implying low level of implementation of NBSAPII measures proposed to achieve this target. To this end, the measures undertaken nationally, up to date, are viewed by national stakeholders to be ineffective, and this ineffectiveness were verified based on the national indicators proposed by the NBSAPII for achieving this national target. Indicators identified by the NBSAPII include: Number of development sectors integrated the values of biodiversity & ecosystem services into their developmental policies, umber of subsidies & incentives advocating biodiversity conservation enforced, and number of harmful subsidies phased out.

To assess the level of change made due to implementation of NBSAPII measures, the national stakeholders have referred to the sated indicators, and based which they assess the state of changes that have occurred in support of achieving Biodiversity Integration as called upon by the target. Stakeholders analysis shows that no changes are captured in number of subsidies & incentives advocating biodiversity conservation, nor in numbers of harmful subsidies phased out. Additionally the development sectors have failed to integrated the values of biodiversity & ecosystem services into their sectoral strategies. This fact is clearly reflected by non-integration of biodiversity values & concern into national development plans, poverty plans, climate plans, water sector plan, watershed basin plans, coastal zone management plan, national accounting, transportation and mining industries. Nevertheless, the development of Yemen Ecosystem Valuation study is viewed by national stakeholders to be valuable information sources for quantifying key Ecosystems Services & benefits delivered by various ecosystems in monetary terms, and then establishment and enforcement of Payment scheme for Ecosystems Services (PES).

Ineffective implementation of NBSAPII measures is attributable to umber of drivers, including the current escalating war, limited technical capacities, lack of national studies

biodiversity values, lack of financial support and market distortion advocating water pumping, & overuse of agrochemical fertilizer, pesticides & herbicides use.

Key needs to improve implementation performance include: technical support and capacities for undertaking economic evaluation of natural resources and biodiversity' expand biodiversity valuation studies to cover all ecosystems and services; remove harmful incentives & subsidies contributing to the loss of biodiversity, arable land, water & marine resources; integrate biodiversity values into national planning processes & national finance accounts through creation of markets for biodiversity products, reformed water tariffs, and cost- recovery schemes for water supply;

ABT3.Incentives Reformed

ABT3- 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.

Equivalent National Target(s) :T15: 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:)

Assessment rating : Ineffective

Yemen ecosystems are highly impacted by negative incentives and subsidies advocating over use of natural assets, and accelerating the loss of ecosystems & ecosystems services. To minimize ecosystem loss incurred by such harmful policies, the NBSAPII identified over 21 priority measures delineated mainly *to* incentive reform, which is the ultimate end of the Equivalent National Targets 15 & 12 .

Information derived from the stakeholders workshops conducted in support of the 6NR development indicated that 10 per cent of priority measures identified in the NBSAPII have been completed, an additional 23 per cent have been initiated, while 67 per cent have yet to be launched.

Key activities which have been implemented include the valuation of key biodiversity ecosystem services, and the promotion of local community involvement in the planning & management of Nature reserves. Key activities which have been partly initiated include: Partial application of EIA while approving projects implemented by some production sectors, development & partial application of renewable energy strategy, the introduction of solar energy to household and commercial sectors, and partial reform of fuel subsidies advocating water pumping for Qat.

Given that activities & such reforms have been undertaken under war conditions, their impacts on biodiversity loss has not reduced, but rather increased owing to multiple drivers, incurred by the escalating war. Some of the factors contributing to this, and attributed directly to the war include: (i) Lack of public funding for biodiversity protection; (ii) increased groundwater mining under damage and absence of public water supply; (ii) increased reliance on water pumping to grow qat & enhance people income in compensation to none-delivery of public salaries owing to government inability to produce and export petroleum products under ongoing war; and (iv) increased deforestation to meat energy needs owing to increased people inaccessibility to public electricity and to all other energy sources, especially when cooking fuel, and generation fuel became scarce owing to interrupted supplies of fuels associated with the rapid spread of black markets, selling diesel, gasoline, cooking LPG, and kerosene at an affordable prices mainly for poor families and people who are no longer receiving salaries to pay for fuel. Other more driving factors include: limited technical capacities, lack of national studies on biodiversity values, lack of financial support and market distortion advocating water pumping, & overuse of agrochemical fertilizer, pesticides & herbicides use.

To this end, overall progress made in implementing NBSAP measures under this component was rated by stakeholders to be ineffective, and this ineffectiveness can be verified by modest changes in number of subsidies & incentives advocating biodiversity conservation, and in numbers of harmful subsidies phased out.

Additionally the development sectors have failed to integrated the values of biodiversity & ecosystem services into their sectoral strategies. This fact is clearly reflected by non-integration of biodiversity values & concern into national development plans, poverty plans, climate plans, water sector plan, watershed basin plans, coastal zone management plan, national accounting, transportation and mining industries. Nevertheless, the development of Yemen Ecosystem Valuation study is viewed by national stakeholders to be valuable information sources for quantifying key Ecosystems Services & benefits delivered by various ecosystems in monetary terms, and then establishment and enforcement Payment scheme for Ecosystems Services (PES).

Key needs to improve implementation performance include: expand biodiversity valuation studies to cover all ecosystems and services; remove harmful incentives & subsidies contributing to the loss of biodiversity, arable land, water & marine resources; integrate biodiversity values into national planning processes & national finance accounts through creation of markets for biodiversity products, reformed water tariffs, and cost- recovery schemes for water supply; comprehensive review of incentives and subsidies to determine their impacts on biodiversity, and technical support needed to provide alternative livelihood opportunities to farmers and fishermen affected by the removal of subsidies.

4. Sustainable Production and Consumption(SPC)

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

Equivalent National Target(s): T16: 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
Target 10: By 2025, Ecotourism sector is benefiting from ecosystem services and has incorporated sustainability & biodiversity concerns into local ecotourism development plans and programmes.

Assessment rating : Ineffective

Information derived from the stakeholders workshops conducted in support of the 6NR development indicate that 23 per cent of priority measures identified in the NBSAPII have been partly completed, while 77 per cent have yet to be launched once the current war comes to end.

This implies that the measures undertaken nationally, up to date, are ineffective, and this ineffectiveness can verified based on the national indicators proposed by the NBSAPII for assessing national target achievement. Indicators identified by the NBSAPII include: 1) Number of new development projects adhered to EIA; 2)extent of diffusion of green technologies; 3) percentage of renewable energy in energy production; 4) extent of diffusion of recycling technology in production sectors; 5) extent & trends of hazards and waste produced by production sectors; 6) extent & trends of natural raw materials consumed, 7) number of regulations preventing industrial pollution enforced; and 8) number of harmful subsidies phased out.

Stakeholders analysis, applying above-mentioned indicators, shows that minor advances have been achieved under this target, and this is reflected by partial enforcement environmental impact assessment(EIA) to new development projects in mining, energy, and cement industry; diffusion of solar energy into households commercial sector; the growing business community initiatives in recycling & reuse of plastic garbage; and the gradual increase of diesel prices for water bumping. Additionally, stakeholders analysis on promoting the sustainability into environmental strategies shows a mixture of success & failures. Success is manifested by incorporating sustainability & biodiversity concerns into environmental strategies, specially into fishery, water, agriculture, energy and tourism sectors, and failure is clearly seen in modest implementation levels of these strategies beside none mainstreaming sustainability into production sectors such as, mining, transportation, industries., and land use planning.

Ineffective implementation of NBSAPII measures reported by stakeholders is attributable to umber of underlying obstacles, including the current escalating war; limited technical

capacities; limited funding , limited human resources capacities; lack of adequate scientific research capacities associated with limited information; lack of synergies among government & business community; low awareness level of biodiversity issues; and limited incentives for biodiversity conservation and sustainable use.

Key needs to improve implementation performance include: a) gather data and establish national statistics to validate indicators and track progress on targets on sustainable production and consumption; b) develop geospatial map of areas that are critically important to maintain the safe ecological limits of productive systems, especially in regards to water depletion, land degradation, habitat loss, and forest harvested ; establish a partnership among government & business community; and c) establish & enforce incentives and tax exemption schemes to encourage business community shift towards sustainable production and consumption and adhering to environmental excellence. If total needs are granted, it is likely to result in improving implementation effectiveness, leading to mainstreaming sustainable production and consumption into several business communities and public sectors, implying the achievement of the equivalent national target 16.

5. Habitat loss halved or reduced

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

Equivalent National Target(s): T 4 : Reduce forest & rangelands harvesting by 15% in 2020, and by 30% in 2025

Assessment rating : Ineffective

To minimize habitats deteriorating associated with unsustainable harvesting of forest and rangelands, the NBSAPII trough the this outcome calls for promoting the sustainable harvesting of forest products through the promotion of innovative practices in forest and rangeland management, strengthening planning and institutional performance, provision of alternative sources of income for local livelihoods, & control of Alien invasive species.

Information obtained from recent stakeholders workshops on preparation of 6NR indicate that only five measures have been initiated under this outcome . Out of which, the introduction of LPG in replacement of fuel wood into rural and urban areas is viewed by national stakeholders as the most effective measure completed by now. It has resulted into significant reduction of fuel-wood harvesting beside the restoration of green cover & degrading forest. However, it worth–mentioning that, the recent war has again accelerated the use of fuelwood in association of lack of LPG, leading to a retardation of forest areas recovered earlier due to LPG introduction. Unfortunately, there is lack of spatial & temporal data on status, extent and trends of Yemen forest. However, recent survey shows that

Beside LPG introduction, another four measures have partially initiated under this outcome and these are: 1) the eradication campaigns of alien invasive species in three conservation sites ; 2) the promotion of co-management of in 4 forests areas; and 3) engagement of 6 local communities groups in promoting eco-tourism activities in 4 conservation areas , and 4) the revival the traditional ways of fuel wood harvesting. Of these activities, the eradication campaigns of alien plant & birds species is the most important one contributed partially to the promotion of sustainable harvesting of forest, and subsequently to attainment of this outcome. In Socotra Island, it has led to full eradication of the Indian House Crew from whole invaded areas in the archipelago, leading to securing safe breeding habitats for other birds species. Plants species eradication programs have resulted into partial removal of alotropis procera and Argemone mexicane alien species form Socotra combined partial removal of Prosopis juliflora alien invasive from Alheswa wet land & Bura'a national park.

Based on the foregoing analysis, it can be concluded that hat 7 per cent of measures identified in the NBSAPII have been completed, and additional 29 per cent have been partially initiated, while the vast majority, being 64 per cent have not yet started because of ongoing war. This implies that the measures undertaken nationally by far are much below than what has planned by NBSAPII, however in order to decide on effectiveness level of measures undertaken, the stakeholders referred to both the global indicators recommended by COP Decision VIII/28 for ABT5- where applicable- and to national indictors recommended by NBSAPII for equivalent national target 4. By applying national indicators, the stake holders concluded that the measures undertaken by far are ineffective, and this is simply because the measures undertaken have not led to notable change in in extent of areas of forest, grasslands , mangroves, wetlands, and fuel-wood harvesting. On applying the global indicators, the stake holders further noted that the measures undertaken have not led to increased trends in the abundance and distribution of plant species.

Ineffective implementation of NBSAPII measures reported by stakeholders is attributable to umber of underlying obstacles, including the current escalating war; lack of forest survey & inventories; continuing illegal logging; high reliance on fuelwood to compensate the lack LPG incurred by ongoing war; lack of spatial & temporal data on forest area and deforestation rate; lack of spatial & temporal data on the status, trends and distribution of plant species; lack of GIS systems for monitoring forest cover loss; limited funding for forest conservation; and lack land use plans.

Key needs to improve implementation performance include: a) Technical and scientific support to develop forest cover maps, GIS systems for monitoring forest land use change, conduct forests survey; b) Study to establish livestock carrying capacity for forests; and c) develop forest policy combined with land use plans. If total needs are granted, it is likely to result in improving implementation effectiveness, leading to minimizing habitat and forest loss, and hence to the achievement of the equivalent national target 4(which corresponds to ABT4).

Aichi Biodiversity Target 6: Sustainable management of aquatic living resources

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

Equivalent National Target6 : 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

Assessment rating : Ineffective

Yemen's fish stocks are reported to be harvested unsustainably, causing multiple threats to marine & coastal resources such as fisheries, marine turtles, birds and other marine flora and fauna. To reverse this situation the NBSAPII under this outcome was designed to promote the sustainable harvesting of Yemen fish stocks through 26 measures, clustered under four groups, respectively focused on: promotion of new innovative practices; regulation against unsustainable fishing; renewal & improvement of current protection plans such as National Adaptation Programme of Action (NAPA), recovery plans for key and threatened fish species, combined with restoration interventions of key threatened fish species, coral reefs, and mangroves.

Information obtained from stakeholders workshops on preparation of 6NR indicate that the management of Yemen fish stocks is not yet fully sustainable, & this clearly manifested by the continuing destructive fishing practices, 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. More evidently, the existing marine protected areas do not fully represent the range of nationally significant and representative habitats and species (mangroves, turtle nesting and feeding, breeding seabirds).

Nevertheless, Yemen is making significant progress ,through at an insufficient rate, in promotion of Ecotourism , promotion of ecosystems approach, implementation of restoration programs, and development of protection plans. In ecotourism, local communities have been enabled to effective partners in delivery y of Eco-tourism services in 6 marine conservatories. From the point of view of stakeholders, the promotion of eco-tourism services enabled local community to engage in conservation work and generate returns from the eco-tourism services rendered, capitalizing on traditional and indigenous practices for sustainable use and management of the resources, leading changing local people attitudes to towards biodiversity conservation. To promote innovative practices, the community based natural resources management (CBNRM) approach for management fishery & marine resources has been widely introduced in 4 conservatories within Socotra

Archipelago. The CBNRM is viewed by national stakeholders as the most effective measures completed by now. The CBNRM approach enabled the local community to shift from site management approach to ecosystems approach, allowing for the protection and management of natural habitats including species such as dragons' blood, frankincense, aloe, lobster, shark, coral reef and other important natural resources. Yet, there is strong need to replicate the CBNRM approach to cover management the entire marine habitat, and this is not achievable at the moment because of lack of funding; and lack of scientific expertise and experience specially under current escalating war. As for implementation of restoration programs, it was limited in scope and coverage to restoration of coral reefs in Roosh and Dihamri marine conservatories within Socotra Archipelago, and was accomplished by engaging local communities in coral reef protection & promoting sustainable fishing practices through anchoring and installing 14 buoys in and outside Roosh and Dihamri marine protected areas. Finally, collaborative Work between the EPA & five environmental associations is going on to declare Al-Azizee & Ras Amarn Islands as two new Protected areas in Aden very soon.

Based on the above discussions, it can be concluded that hat 4 key interventions, being 16 per cent of measures identified in the NBSAPII have been partially completed, while the vast majority, being 84 per cent have not yet started because of ongoing war. This implies that the measures undertaken nationally by far are ineffective & much below than what has planned by NBSAPII. However in order to decide on effectiveness level of measures undertaken, the stakeholders referred to national indictors recommended by NBSAPII for equivalent national target 6. By applying national indicators, the stake holders concluded that the measures undertaken by far are ineffective, and this is simply because the measures undertaken have led to slight progress in Trends in PA management involving local communities, but have not led to notable change coastal & marine protected areas coverage; and trends in area of degraded coastal and marine ecosystems restored or being restored

Additionally, the stakeholders further noted that the measures undertaken have not led to increased trends in the distribution of selected species, nor in trends of extinction risk of species, and number of species which are/are not being fished sustainably

The general underlying causes of unsustainable fisheries include weak law enforcement; lack of funding (for research, management, monitoring, & surveillance); and lack of scientific expertise and experience in marine environmental management; lack of national action plans for corals, mangroves, turtles and breeding seabirds ; poor knowledge & awareness on the value of marine ecosystem & its goods and services along with the subsequent lack of political well.

Key needs to improve implementation performance include: a) surveys for corals, mangroves, turtles and breeding seabirds; b) Establish carrying capacities for mangroves & coral reefs, & keep harvesting within ecological limits; c) strict monitoring of fishing methods, practices and techniques and d) recovery plans for corals, mangroves, d) build capacities for ecosystem-based fishery management; e) funding to expand marine protected area; f) develop geospatial maps of areas that are critically important to sustain fisheries, including mangrove restoration. If total needs are granted, it is likely to result in improving

implementation effectiveness, leading to minimizing habitat destruction and species loss, and hence to the achievement of the equivalent national target 6.

Aichi Biodiversity Target 7: Sustainable Agriculture

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

Equivalent National Target(s): T 5 : 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

Assessment rating : Partly Effective

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 under this outcome calls to increase agricultural productivity and sustainability through a total of 10 priority measures, respectively focused on: Sustainable management of agricultural land through integrated management of land and water resources, rehabilitation of terraces, promote integrated pest management, mitigate erosion & protect marginal farm lands, rehabilitation of degraded rangelands, diffusion of green technology in irrigation, enforce the laws related to pesticides and fertilizers use, improve the efficiency of fertilizer use, regulation of pesticides handling, revive best traditional practices to control pest.

Beside the NBSAP2 development, the government approved the National Agriculture Sector Strategy (NASS- 2012-2016), which is an additional instrument advocating sustainable agriculture. Since the Government approval of NASS in 2012, there has been major progress in this outcome implementation, and this is manifested by mainstreaming the sustainability principles to agricultural sector through number of innovative practices such as : the renovation of 10 conventional water reservoirs (Kareef) in the highlands, rehabilitation of 17 beaches of wadies in downstream of watersheds, rehabilitation of 8 small scale agricultural terraces, and promotion of spate irrigation and pressurized irrigation (drip, bubbler) along with

Based on the above discussions, it can be concluded that 6 key interventions, being 60 per cent of measures identified in the NBSAPII have been partially completed, while the

remaining, being 40 per cent have not yet started. This implies that the measures undertaken nationally by far tends to be partly effective, however this is not the case when they are viewed in the national context and when they are assessed as compared with specific indicators. In order to determine if sustainable agriculture has been achieved, the national stakeholders agreed to assess progress towards this goal as compared with baseline status, applying national indicators stated by NBSAPII. Assessment indicators Identified by NBSAPII include: Extent of agricultural area managed sustainably , extent of crop & water productivity, extent of crop import, extent of food security , the extent of the use of good agricultural practices, extent and trends of fertilizer/pesticide import. However it worth-noting that solid assessment of progress effectiveness cannot be made based on the suggested indicators, unless concrete baseline information is available to refer to when validating these indicators. Unfortunately, Yemen is currently lacking spatial data overlays of sustainable management maps for agriculture, aquaculture and forestry operations; land use; land cover; habitat intactness; key biodiversity areas. Other informative spatial data which is lacking include:

- Natural resource productivity
- Land cover/land cover change (e.g. vegetation maps, forest cover)
- Natural resource management intensity (e.g., cattle density per hectare, agricultural intensity) and
- Sustainable management (e.g. maps of certified sustainable agricultural, forestry,

For these reasons, the results of analyses regarding the achievement sustainable resource management is being made based on experts' & stakeholders judgment.

By applying national indicators and experts judgement, the stakeholders concluded that the measures undertaken by far are partly effective, and this is simply because the measures undertaken have not led to adequate diffusion of sustainability principles across the entire agricultural areas. To date, the largest portion of Yemen's agricultural areas are managed unsustainably, and this is partly because of the continuing subsidization of irrigation water for Qat production, & partly due to subsidized pricing for agrochemicals along with free or low price of irrigation water.

Key obstacles hindering the attainment of this outcome include: a) limited funding for rehabilitation of terraces, b) illegal logging, c) lack of geospatial information on sustainably managed agriculture & forestry, d) Lack of land-use plans, e) weak law enforcement related to pesticides and fertilizers use, f) lack of scientific documentation of traditional practices on management of land and water resources, g) and lack of survey of conditions of terraced agriculture

Key needs to improve implementation performance include: a) Establish carrying capacities for rangelands b) funding to protect terraces ; c) remove harmful incentives & subsidies contributing to the loss of arable land & water resources; d) support customary sustainable use and delegate land management responsibility to local communities; e) enhance local farmer knowledge about the biodiversity conservation, and engaging them in conservation planning process; f) promote integrated landscape planning to ensure

provision of ecosystem services; and g) develop geospatial map areas under sustainable agriculture and forestry. If total needs are granted, it is likely to result in improving implementation effectiveness, leading to minimizing habitat destruction and species loss, and hence to the achievement of the equivalent national target 7.

Aichi Biodiversity Target 8: Pollution reduced:

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

National 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.

Assessment rating : Ineffective

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 outcome 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.
To produce this outcome, it is designed to mitigate the impacts of solid waste, wastewater & other land-based pollutants on vulnerable land, aquatic and marine ecosystems through implementation of 9 priority measures targeted for: 1) Controlling agro-chemicals & fertilizers use,2) controlling sewage discharging to ecosystems, 3) control dumps of hazardous waste to ecosystems, 4) promotion of high technology on wastewater treatment and recycling, 5) imposing wastewater quality guidelines & standards on wastewater use, 6) imposing national criteria to protect ecosystems from the impact of different kinds of waste, 7) implementing regulatory framework to control safe distribution and use of pesticides;8) formulation and implementation of national emergency plans dedicated for protection & rehabilitation of contaminated basins in addition to oil pollution contingency plan to control & reduce sea-based sources of pollutants, and 9) conduct survey of sensitive areas, ecosystems and species threatened by contamination.

The progress review made by stakeholders concluded that only 3 activities, being 33 percent of activities identified in the NBSAP have been partly initiated under this outcome, while the vast majority, being 67 per cent have yet to be launched. Key action which have been initiated include: 1) Promoting use organic fertilizers to control of soil erosion and other environmental degradation ;2) setting and enforcing standards for agriculture fertilizer use; 3) and development program for improved reuse of treated wastewater and reuse of gray water including brackish water.

Stakeholders assessment of the effectiveness of actions undertaken to reduce ecosystem's' pollution shows the reported progress is assessed to be ineffective & is below expectation spelled out by the NBSAPII. Evidences supporting this conclusion is reflected by the ***lack of*** recycling of solid waste and wastewater under lack of diffusion of recycling technology in production sectors associated with increased production of hazards and waste from these sectors**,** ***and*** lack of regulations preventing industrial pollution**.** Pollution level incurred by the continuing use of agro-chemicals & fertilizers remains harmful to key ecosystem services, particularly to Agricultural lands and underground water. However, it worth-noting that effective assessment is being hindered by lack geospatial maps of pollution hotspot.

Key obstacles behind the continuing ecosystems pollution and depletion are attributed to escalation of war combined with limited public funding , expertise and technical capacity to develop and implement national emergency plans dedicated for protection & rehabilitation of contaminated basins in addition to oil pollution contingency plan to control & reduce sea-based sources of pollutants on vulnerable land, aquatic and marine ecosystems. Additionally , the continuing war further aggravated the state ability to control illegal marine waste from passing vessels & its inability to rehabilitate the recently damaged costal sewage systems incurred by the war.

Key needs to improve implementation level, include: a) develop and enforce water and air quality guidelines; b) diffusion of recycling technology to enhance treatment and recycling of sewage and industrial waste water; c) formulation and implementation of national emergency plans dedicated for protection & rehabilitation of contaminated basins in addition to oil pollution contingency plan to control & reduce sea-based sources of pollutants; and d) develop geospatial maps of pollution hotspots; & conserve and restore red sea mangrove to increase carbon stock.

Aichi Biodiversity Target 9: Invasive alien species (IAS) prevented and controlled

ABT 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.

Equivalent National Target(s): T 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

Assessment rating : Ineffective

Invasive alien species (IAS) are being recognized as key threats to Yemen's ecosystems, habitats & species, with subsequent impact on the ecosystems capacities deliver biodiversity services, particularly those of importance for suppling food, fish, water &

wood commodities . To address the threats of IAS in Yemen, the NBSAP2 sets out 8 key measures to be undertaken for reversing IAS impact and hence producing this outcome.

By now, a total of 2 of the measures outlined in the NBSAP have been partly implemented and these are related to: strengthening quarantine facilities of Aden and Hodeida and airports, and implementation of eradication programmes of alien invasive. Eradication programmes undertaken include : the eradication of the Indian House Crew from whole invaded areas of Socotra archipelago, the eradication of alotropis procera and Argemone mexicane alien species form several sites within Socotra archipelago, removal of eradication 3 ha of cactus Opuntia dellenii threatening Bura'a Park biodiversity; and the cultivation of two hectares of Hyphana thebaica in replacement of alien Prosopis juliflora removed from Al-Heswa wetland. Yet, the eradication programmes for "Prosopis juliflora remains limited to small areas in three conservation sites, while this invasive alien plant are still threatening many wadies ecosystems and farmlands throughout Yemen lowlands . Additionally, Yemen still lacking of data base on IAS combined with lack of monitor systems of invasive alien species. More importantly, agricultural quarantines in the main gates remains ineffective, and this is aggravated by none endorsement of import & export laws regulating entry and exit of living organisms and controlling the intrusion of invasive alien species.

To sum up, only 2 key interventions, being 25 per cent of measures identified in the NBSAPII have been partially completed, while the remaining, being 75 per cent have not yet started owing to lack of funding under ongoing war. This indicates that the measures undertaken nationally by far are much below than what have been target by NBSAPII. However in order to assess effectiveness level of measures undertaken, the national stakeholders agreed to assess progress towards this goal as compared with baseline status, applying national indicators stated by NBSAPII. Assessment indicators Identified by NBSAPII include: Extent of the impact of invasive alien species on the functioning of wadies ecosystems and farmlands, extent in number of invasive alien species, trends in the environmental impacts of selected invasive alien species, and number of species eradicated, controlled and contained. By doing so, the national stakeholder confirmed that the measures undertaken by far are ineffective, and this is because the measures undertaken have led to minor change in number and distribution of IAS threatening ecosystems, but many of which are threatening the functioning of wadies ecosystems and farmlands. More evidently, extent of eradication is not yet covering all IAS threatening ecosystems, and extent of IAS & and their pathways not yet identified, mapped and prioritized. However more accurate assessment of progress made under this outcome still hampered by lack of spatial data on invasive alien species distribution ; pathways; and habitat intactness

Key obstacles contributing to the continuing 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

Key needs to enhance implementation performance include: 1) develop lists of alien species that are known to be invasive and make them available at entry gates; 2) identify, map and

prioritize IAS & and their pathways; 3) develop and implement plans for eradication or control of prioritized IAS; 4) develop contingency plans for controlling transboundary pests and diseases, in particular fall armyworm; 5) Improve quarantine capacities to control transboundary plant pests and diseases through the supply of instruments and tools needed for detection and identification; and develop data base on invasive alien species distribution ; pathways; and habitat intactness

Aichi Biodiversity Target 11: Protected areas

ABT 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.

Equivalent National Target(s): T 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.

Assessment rating : Ineffective

Before NBSAP2 development, national biodiversity conservation, planning and management has been recognized to be ineffective owing to three key constraints . Firstly, protected areas were not ecologically representative, and not managed within wider landscapes and seascapes. Secondly, Protected areas (PAs) were not managed based on management plans targeted to achieve sustainability and specific conservation objectives. Thirdly, Protected areas management was poorly coordinated with weak or poor involvement of local community and the subsequent exclusion of local community livelihoods. To this end, this outcome was designed to reveres baseline situation through 17 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.

Since the NBSAP2 development in 2015, some of 5 measures have so far been partially initiated in Yemen, this include: 1) the promotion of community-based management in PA, 2) promotion of community-based management plans, 3) the improvement of local community livelihoods, 4) partial restoration of degraded ecosystems, and 5) the promotion of community based natural resources management (CBNRM) approach in Socotra.

Among actions undertaken, the shift to community based management has been recognized as the most successful. It has led to creation of 7 community-based management associations, which are currently active in managing terrestrial & marine protected areas of Jabal Bura, Aden Wetlands, Homhel, Skand, Rosh, Tatwah, & Dhamery. The adoption of this management pattern has led to increased societal responsibility towards protected

areas, and this has been translated into enforcement of conservation law, policies, and practices, leading in turn promotion of sustainable management & use of natural resources. To promote community-based planning, the EPA first developed a guideline on systematic formulation of protected area management plan, and based on which organized a training workshop for the members the established associations on development of management plan, applying instructions stipulated by the guideline. This training ended up by having 7 drafts of community-based management plans, highlighting biodiversity threats and planed actions for conservation and protection of 7 conservatories namely for Jabal Bura, Aden Wetlands, Homhel, Skand, Rosh, Tatwah, & Dhamery Protected Areas. These managements plans were then presented to relevant local communities in separate local workshop by which each individual communities have approved its own management plan, applying inclusive and participatory approach as recommended by the guideline.

The local community involvement in the development & implementation of management plans has led to mainstreaming local community needs into local plans, and this has in turn led to improving local community livelihoods through enabling them accessing and benefiting from goods and services delivered by Yemen's protected areas.

Among other activities pursued under this outcome are the restoration of degraded ecosystems such as terraces, wadi bank and rangelands, whereas the achieved results in this regard are discussed under ABT 15 on Climate resilience. Similarly, progress made as regard the promotion of community based natural resources management (CBNRM) approach is presented under ABT6 on sustainable management of aquatic living resources.

To sum up, even though of substantial improvement in management effectiveness through the shift to community-based management & planning, the terrestrial & marine protected areas coverage remained much below the intended target of the NBSAP2, and this is reflected by decreeing 11 conservation sites as protected areas, whereas 4 of which still lacking management plans & management bodies,

Yet, the existing coverage of Yemen Protected areas are not representative to all habitats and species, such as underground water basins, sea grass beds, salt marshes, lakes and bays, sandy and rocky beaches, mountainous rangelands, terraces & and irrigated valleys, turtle nesting and feeding sites, breeding seabirds habitats, coral reefs, freshwater ecosystems, and coastal wetlands. Additionally, protection coverage of Yemen wetlands & mangroves was limited to Aden wetland and Kamaran Island respectively, implying that the largest areas of the red sea mangrove remains unprotected. More evidently, the reported achievement under this outcome is viewed as partially effective, and this is obviously noted by partial implementation of 5 key interventions, being only 29 per cent of measures identified in the NBSAPII, compared with 71 per cent of NBSAP measures which have not yet started.

The reported poor progress under this outcome is mainly attributable to number of key obstacles impacting the implementation performance and this include: 1) lack of funding for expanding networks of PAs so as to become more representative of ecoregions of terrestrial & marine, and coastal areas; 2) the domination of site planning approach instead of integrated PA planning approach within wider land- and seascape; 3) weak

capacity to promote application of Ecosystem Approach; 4) lack of assessment study on effectiveness of PA management; 5) poor community- capacity on development of management plans for some protected areas, where community-based planning is lacking ; 6) lack of community-based bodies in at least four PAs; 7) lack of geospatial data & Maps for all PAs.

Major future needs to improve implementation effectiveness should be paid for expansion protected areas with specific focus on enhancing representativeness of current protected area networks to fill protection gaps of nationally significant habitats and species, such as underground water basins, sea grass beds, salt marshes, lakes and bays, sandy and rocky beaches, mountainous rangelands, terraces & and irrigated valleys, turtle nesting and feeding sites, breeding seabirds habitats, coral reefs, freshwater ecosystems, and coastal wetlands. Other effective conservation needs may also include the abandonment of the current planning approach of PA as isolated sites, and to shift to integrated planning modality particularly for land use. If this approach is put in place , it is likely 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. Further, the planning of protected areas within the broader landscapes the application of the Ecosystem Approac is likely to limit habitat fragmentation & improve adaptation to climate change. Again, putting this approach in place is likely to promote 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.
Finally, additional needs to improve implementation effectiveness may also include: 1) undertake assessment study of PA management effectiveness with aim to improve governance; 2) expand community-based planning to cover all protected areas; 3) expand community-based involvement in PA management to cover all protected areas; and 4) develop geospatial data & Maps for all PAs.

Aichi Biodiversity Target 12: Reducing risk of extinction

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

Equivalent National Target(s): T 2 : By 2025, 50 % of endemic, rare & endangered plants, mammal and bird species will be conserved

Assessment rating : Ineffective

Yemen's key endemic taxa, mammal and bird species are endangered & 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. Therefore, this outcome is structured to conserve endemic, rare & endangered plants, mammal and bird species through implementing a total of 13 policies and instruments focused on recovery and rehabilitation of endemic 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 among others.

Unfortunately no single action of those identified by NBSAP2 has been initiated under this component, for which the underlying threats of species extinction as identified by NBSAP2 remained unchecked, and the extinction risks for many taxonomic groups is anticipated to further accelerate particularly under lack actions to control illegal wildlife hunting & trade, lack of ex-situ conservation of threatened species, and lack of geospatial maps & data to assess areas of critical extinctions. Additionally, PAs are lacking for recovery and rehabilitation strategy and action plans to mitigate extinction of endemic and threatened species, for which there is no resettlement of endangered species combined with lack of in situ and ex situ conservation programmes for key mammals, bird species & endangered flora. Also, current extent of PAs are advocating site protection with little effort is given for conservation & restoration of threatened species in the neighboring corridors, where endemic species are unsustainability exploited for domestic use or for international trading.

Key needs to improve implementation effectiveness, include: strengthening institutional capacity for *ex-situ* conservation, developing a data base on endemic and threatened species, updating Yemen red list of rare and endangered species; develop spatial maps of key biodiversity areas important for avoiding extinctions; undertaking risks assessment studies to tackle the drivers of biodiversity loss and extinctions; developing species recovery plans; reduce habitat loss degradation and fragmentation, and restore degraded habitats of endangered species such as the wetlands, forests, mangroves and coral reefs; and implementing sustainable land use practices to reduce pressure on species habitats

Aichi Biodiversity Target 13: Safeguarding genetic diversity

ABT 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.

Equivalent National Target(s): T 3 : Target 3: By 2020, 70% of the genetic diversity of Yemen cultivated plants species , & domestic animals will be conserved in gene banks.

Assessment rating : Ineffective

Under the increased deterioration of Yemen 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, this outcome is designed to include a total of 12 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.

Except of the for the establishment and strengthening of genetic resources units, gene banks, and seed banks in Agricultural Research & Extension Authority (AREA), no more measures have been under taken to produce this outcome. Key needs to accelerate implementation of this outcome include the 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. Further needs, include improving research capacity of AREA in assessing the threat and risks on national biodiversity due to importation of LMOs, food import and and the intrduction of biotechnology. Additionaly, thre is urget needs for enforcing regulatory and administrative frameworks for both controling the impacts of LMOs transfer and regulating equitable use and access of genetic resources. Specific need in this context sould be geard 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, and improving information exchange through periodic updates of biosafety Clearing House Mechanism (CHM).

Based on the above discussions, the outcome implementation is viewed to be ineffective, and this is reflected by implementing less than 1 per cent of measures identified by the NBSAPII for the attainment of this outcome. The reported poor progress under this outcome is generally, attributable to multiple obstacles, including: lack of ex-situ actions for protection of genetic diversity; lack of geospatially maps on wild crop relatives; weak research capacity in risk assessment, and weak capacity to monitor the impact of importing LMOs and food. Other underlying obstacles include: the continuing war combined with the subsequent underfunding for conservation activities. To this end, the poor progress under this outcome resulted in no change in the extent of genetic diversity of cultivated plants, farmed and domesticated animals, and wild relatives. Further, the extent of production of local crops is reported to be decreasing. In 2009, cereals production was 756,000 Tons, representing 15.2% of the national demand[11] . Currently, total cereal production in 2017 is estimated at 450 000 tones, more than 40 percent below the previous year's harvest and the five-year average2 [12]. This trends is likely to continue, and the

[11] The 2nd National MDG Report, Core Report Team 2010

[12] Source : Reference http://www.fao.org/nr/aquastat accessed Dec-2018

species loss is likely to intensify in the future, unless the persistent war is halted and rigorous measures are taken to implement overall interventions identified by the NBSAP2 for this outcome.

ABT 14: Poverty Mainstreaming

ABT 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 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", assuming that 20.1% of people are under poverty level in 2014.

Assessment rating : Ineffective

Poverty is among major issues addressed by NBSAP2. The Poverty component of Yemen NBSAP aims at alleviating poverty level of Yemeni people through implementation a total of 16 key interventions delineated for improving the livelihoods of marginalized and vulnerable groups such women, youth and children, small farmers, landless people, nomadic herders and artisanal fishers, through improved 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. Key policies identified by NBSAP to reach this goal are wide nagging and focused on reforming policy distortion that hinders the local poor access to productive resources 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. To perform the intended reforms, the government effort was limited to initiating Public administration reform targeted to removing ghost jobs & enabling poor to access such jobs. Nevertheless, this initiative has not come to end because the break of internal conflict & the subsequent escalating war.

To sum up, the progress review made by stakeholders concluded that the implementation performance of this outcome is ineffective, & this evidently reflected by implementing only one intervention, being less than 1 percent of activities identified in the NBSAP, while the vast majority, being 99 per cent have yet to be launched. Therefore, key needs to improve implementation performance of this outcome should be given to accelerating

implementation of none delivered activities of the NBSAP and this include , inter alia, the following : Regulate land-use by decreeing fair land tenure & land lease scheme; establish Local Poverty Alleviation Funds (LPAFs) to act as funding mechanism for poverty alleviation; reform Agricultural & Cooperative Credit Bank (CACB) to 1enable poor obtain credits at affordable interest rates to be used for creating small income generating schemes in agriculture, fisheries and forestry; Enable poor to access water through enforcing equitable quotas for flood water distribution among upstream and downstream of watershed; enable poor to access other natural resources based on enacting fishing quotas; and creation & enforcement of a quota for fair and equitable use of forest resources, and 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

Aichi Biodiversity Target 14: Restoration and Safeguarding of Ecosystem Services, Delivering Fresh water

ABT 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.

Equivalent National 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)

Assessment rating : Ineffective

Yemen ecosystems of important to people livelihoods & to environment protection are wide ranging, including underground water basins, 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. Of these ecosystems, water ecosystems is being recognized of most important ecosystems delivering water services for drinking, irrigation and other sectoral use.

Currently, groundwater wells and springs provides agricultural sector with its total needs amounting to 92% of extracted water annually, and also supplies households & industrial sectors with water needs amounting to 8 percent of extracted water annually. Nevertheless, water delivery is by now inadequate, and this is manifested by lowering the water tables by 2 and 6 meters annually in some basins, leading to the depletion of water resources. On an average, the depletion rate in Yemen is about 138% of the replenishment rate; however in some critical aquifers, it varies between 250% and 400%.

Water extraction is largely dominated by agriculture, but also characterized by disparity in water supply amongst urban and rural population. According to national statistics 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 m³ (1.1 billion m³ of groundwater and 1 billion m³ surface water) while water consumption stands at 3.565 billion m³, reflecting a groundwater depletion rate of 1.465 billion m³ (170%) a year (CSO 2010). Overexploitation of groundwater has resulted notable reduction of per capita annual share of fresh water combined with disparity in water supply amongst urban and rural population. The per capita availability of water amounting to 87 m^3per year in 2010, compared to 1250 m3/capita/year in the MENA region. According to national statistics about 81% of urban population have access to safe drinking water compared with 21 % of rural population, implying significant disparity in water supply amongst urban and rural population.

More drastically, 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.

To address issues hindering sustainable management of water ecosystems, the NBSAP2 is structured to implement numerous policy measures clustered in 5 categories respectively focused on: 1) improvements of of water resources planning and management, 2) policy reform to eliminate harmful subsidies, 3) conservation of degraded water ecosystems, 4) improvement of irrigation efficiency, and 5) mitigation of water pollution.

To assess state of implementation of planed measures, the national stakeholders conducted three consultation workshops in 2018, by which they reached national consensus on overall NBSAP2 implementation, including implementation of this outcome. According to 2018 stakeholder's review, a varied progress has been made in implementation of activities planned under each pillar of this outcome, and the following paragraphs summarizes stakeholder's findings derived under each category:

Key measures being implemented under institutional category, good governance has been promoted trough creation of NWRA and resulted in better coordination between the various institutions and stakeholders at national level, however the situation at local level remains far from ideal.

Under policy reform components, there have been noticeable improvements in water policies, resulted in development the National Water Sector Strategy and Investment program (NWSSIP), which mainstreams the sustainable management of water resources via the adoption of five national priorities respectively dealing with: Integrated management of water resources; reduction of ground water depletion & pollution; use of new tech in irrigation; water conservation to expand water supply; and women involvement in water resources management and environment protection. However the implementation level of these measures remains weak and was limited to the development & implementation of integrated water sources management plans (IWRM) for 3 groundwater Basins. Yet, other key basins remain without IWRM, implying the continuation of over extraction of underground water resources and the subsequent depletion of water ecosystems. More drastically, the depletion of water ecosystems is anticipated to continue at higher rate because of policy failures to remove subsidies for water pumping for Qat combined with failure to impose cost recovery scheme, and implement individual tradable quotas for different sectors.

As for implementation of conservation activities planned under NBSAP2, significant progress has been made and is reflected by the construction of several storage dams in the highlands, construction of 5 spate water diversion structures in the main wadis, renovation of 10 traditional water conservation systems (storage tank/cistern) in 10 highland areas, and establishment of fog harvesting schemes in five highlands areas. Spate water diversions constructed alongside some of the main wadis is likely to enhance spate water management and water distribution along wadis, but there is no data available to quantify the resulted impact of these interventions. The established cisterns along with the promotion of fog harvesting systems contributed to water supplies for remotely highlands villages, leading to reduction of work load among women while fetching water from long distance . The construction of storage dams enhanced storage of rainfall water for irrigation and for domestic use, and also contributed to recharge of sub-aquifers. Again these measures have been limited in coverage and so are inadequate achieve and maintain sustainable management of depleting water resources.

To improve irrigation efficiency, the Ministry of Agriculture and Irrigation (MAI) has introduced a range of irrigation efficiency and watershed management innovations. This include the 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.

Based on the above discussions, it can be concluded that 9 key interventions, being 57 per cent of measures identified in the NBSAPII have been partially completed, while the remaining, being 43 per cent have not yet started. This implies that the measures undertaken nationally by far tends to be effective, however this is not the case when they are viewed in the national context and when they are assessed as compared with specific indicators. in order to determine if sustainable agriculture has been achieved, the national

stakeholders agreed to assess progress towards this goal as compared with baseline status, applying national indicators stated by NBSAPII. Assessment indicators Identified by NBSAPII include: Extent and trend of degraded water ecosystems conserved, Number of integrated water resource management (IWRM) plans groundwater basins ,Number of people with access to safe water nationally, Extent and trend of rural-urban gaps in water supply, Extent of harmful subsidies phase out, Number of degraded water aquifers declared as protection zones, Extent and trend of local community involved in management of groundwater basins, Extent of use of efficient irrigation techniques. However it worth-noting that solid assessment of progress effectiveness cannot be made based on the suggested indicators, unless concrete baseline information is available to refer to when validating these indicators.

Unfortunately, Yemen is currently lacking spatial data to testify the proposed indicators, for which, the status of achieving the sustainable management of water resource is being made based on experts' & stakeholders judgment. By dos so, it can be concluded that the measures undertaken by far are ineffective, and are below expectation spelled out by the NBSAPII. Evidences supporting this conclusion are reflected in none change in extent & trends of the following environmental parameters: 1) degraded water ecosystems conserved,2) rural-urban gaps in water supply,3) harmful subsidies phase out, and 4) use of efficient irrigation techniques. Further, the number of integrated water resource management (IWRM) plans groundwater basins remained unchanged, and the number of people with access to safe water nationally have not improved.

More drastically , no single water ecosystems are reported to improve due to implementation of abovementioned measures. Conversely all water ecosystems are reported to be degrading, particularly under lack of coping measures & the continuing water mining. In this context, the highlands groundwater basins (for Sana'a & Taize) are reported to be at critical risk, whereas the water tables are declining at a rate 2 to 6 m/year, leading to aggravated competition of pumping between urban and rural. Currently, It is estimated that there are 52 000 to 55 000 active wells in Yemen. The volume of the water that is pumped every year from these wells is about 1.5 km3. About 800 water well drilling rigs are in use that are owned by individuals or companies which generally do not have any permits despite government legislation limiting the drilling of wells. Recently, the National Water Resources Authority started a programme of registrations & licensing for the water well drilling companies; the records show that in May 2005 only 70 rigs were licensed and only 1 000 wells were registered and licensed (FAO AQUASTAT Yemen, 2004).

Despite the importance of degraded water basins for their wellbeing, the women, local communities, the poor and vulnerable groups have not been capacitated to be effective partners in management & conservation of groundwater basins. For this reason, the continuing depletion of water ecosystems has led to reduced access to safe potable water, causing ,in turn, financial burdens on rural poor, particularly on women. Additionally, it has led 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 has not mitigated, leading to multiple diseases in rural and urban areas such as cholera, bacterial dysentery, infectious hepatitis, salmonellosis, and typhoid, especially among women, local communities, and the poor and vulnerable. Key drivers behinds the continuing ecosystems depletion are attributed to inadequate measures taken by now to protect and restore ecosystems depletion, failure to declare and enforce protection zones of degraded water aquifers, lack of Water Management Action Plan for basins at district level. Therefore, depletion of water ecosystems is likely to continue unless an immediate remedial measures are taken.

The reported poor progress under this outcome is mainly attributable to multiple obstacles, including: inadequacy of ground-water assessment, limited availability and weak access to data, insufficient monitoring systems and networks for data collection, and insufficient skilled personnel. Further, most of the prevailing legislation, rules and regulations have become outdated and irrelevant to control, protect, and sustain all aspects of the water sector. The situation is further complicated by the lack of political will and inadequate capacity to enforce issued water legislation. Other underlying obstacles are related to progressive decrease in funding from international sources combined with the lack of awareness of biodiversity importance among decision makers with the subsequent underfunding of water sector from government source. Additionally, low public awareness is further aggravated by lack of information base that contributes to policy, decision-making and awareness-raising.

Key needs to improve implementation performance of this outcome include: 1) provide incentives for adoption of innovative practices advocating efficient water use & sustainable production and consumption; 2) raising awareness programs focused on sustainable consumption of water resources; 3) remove of subsidies for water pumping for Qat, and impose cost recovery scheme for water consumption; 4) develop monitoring scheme to track status of ecosystems delivering water services, including development of effective data base to validate indicators & track progress towards sustainable consumption of water resources, 5) and develop geospatial map of critically threatened water basins; 6) use of traditional knowledge on water conservation; 7) conservation of degraded water ecosystems; and 8) raising public awareness towards conservation water resources.

Aichi Biodiversity Target 15: Climate resilience: 15.1 Adaptation

ABT 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.

Equivalent National Target(s): T 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 terraced agriculture), thereby contributing to climate change mitigation and adaptation and to combating desertification

Assessment rating : Ineffective

As per climate scenarios, Yemeni people particularly rural poor are expected to be most vulnerable to declining access to water, agricultural land, rangelands, forest & coastal wetlands under warmer climate. In response to this impact, the NBSAP2 sets out 18 key measures to be undertaken for producing this outcome, aiming at enhancing the socio-ecosystems resilience against climate change impact.

By now, a total of 4 of the measures outlined in the NBSAP have been partly implemented and these are related to: (iii) restoration & maintenance of terraces, (ii) restoration of rangelands; (iii) protection of Wadi beaches, (iv) and promotion of integrated management of groundwater basins & watersheds.

According to 2017 Progress Report of *Enhanced Rural Resilience in Yemen (ERRY) Programme*[13], three small scale interventions have implemented to restore degraded ecosystems such as terraces, wadi bank and rangeland of Hajjah, Hodeidah, Lahj and Abyan governorates. Restoration interventions undertaken by the ERRY entail building protective walls for the rangelands, including rehabilitating/constructing of irrigation canals in 20 sites in Hodeidah, building protective walls against floods to protect agricultural terraces in 8 small sites In Haja, and Constructing 17 protective gabions walls for wadi bank stabilization in Abyan & Lahaj.

Despite the importance of measures completed by now for combating desertification and adaptation to climate change, they are not adequate in coverage & scope to produce the designated outcome related to enhancing Yemen ecosystems resilience against climate change. Yet, only 4 key interventions, being 22 per cent of measures identified in the NBSAPII have been partially implemented, while the vast majority, being 88 per cent have not yet started due to of ongoing war. This implies that the measures undertaken nationally by far are much below than what has planned by NBSAPII. However in order to assess effectiveness level of measures undertaken, the stakeholders decided to apply national indictors recommended by NBSAPII for national target 9, which corresponds to ABT15. Assessment indicators identified by NBSAPII include: i) Extent and trends of restoration of degraded wetlands, coral reefs and coastal mangroves; ii) extinction risk trends of coral and reef fish; iii) trends in condition and vulnerability of ecosystems; i v) extent and trends of rehabilitation of degraded terraces; v) extent and trends of application of ecosystem-based adaptation approach.

By applying the proposed indicators, the national stakeholder confirmed that the measures undertaken by far are ineffective, and this is clearly demonstrated by noting that the measures undertaken to rehabilitate degraded terraces have not led to significant change in extent and trends of degraded terraces, and this is because of the continuing land conversion for settlement and the continuing overgrazing associated with lack of forestation & watershed protection programs. More evidently, the extinction risk trends of coral and reef fish is continuing particularly under absences of coping measures to control illegal destructive fishing by foreign boats.

Key casual factors behind ineffective implementation of climate resilience activities include: absence of an institutional structure aimed at integrating climate change issues into

[13] A three Year Jointly funded by the European Union (EU).

national plans; lack of national and adaptation plans for corals, mangroves, turtles and wetlands; lack of data or capacity to map carbon stocks of forest cover or carbon sequestered in association restoration activities ; poor knowledge & awareness on the value of ecosystem & its goods and services; and lack funding for restoring and safeguarding degraded watersheds, rangelands, forest & coastal wetlands.

Key needs to improve implementation performance of this outcome include: 1) Identify restoration opportunities for highly degraded ecosystems that provide essential ecosystem services, 2) implement afforestation programmes to increase carbon sequestration; 3) promote integrated landscape management approaches; 4) accelerate comprehensive adaptation plans; and 5) identify and geospatially map opportunities for restoration.

Aichi Biodiversity Target 15: Climate resilience: 15.2 Mitigating GHG Emissions ABT 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.
Equivalent National Target(s): NT 11 : Energy resilience has been promoted and is manifested by 14% reduction of energy-related GHG emissions in 2020, and 23% in 2025, as compared with 2015.

Assessment rating : Partly effective

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[14], energy related emissions are the most dominant, contributing 62.1% to total national GHG emissions. The remaining 34.9 % is generated by non-energy sectors; namely the agriculture process, waste production and industrial processes at a share of 28.4%, 5.8% and 3.7 % respectively. Of the total GHG emissions share (62.1 %) released by the energy sector, the majority of emissions results from fossil fuel consumption for power generation, transportation ,industry and other sectors at a share of 20%, 28%, 14% and 38% respectively. These emissions are mainly due to consumption of LPG, Kerosene and diesel in residential, commercial and agriculture sectors.

Yemen electricity production and supply are characterized by low transmission and distribution efficiency, reflected in progressive increase of energy losses amounted to 37.93% in 2010 and 46.37% in 2013[15]. Further, Yemen has the lowest access rate to electricity (i.e. 40 percent of the population) compared to the regional rate of around 85 percent. The majority of Yemen's supply of electric energy is depending on fossil fuels including Mazot, Diesel, and recently Natural gas, causing progressive increase of GHG emissions. Inefficient and inadequate power production and supply is attributable to number of factors, including the use of antiquated technology combined with lack of use of

[14] National GHG inventory for the republic of Yemen, EPA, 2012, developed in 2017 under third National communication

[15] PEC Annual reports, produced by the Public Electricity Corporation (PEC), 2010 to 2014,the last one is not yet published ..

renewable energy associated with high cost of renewable technology, lack of policies conducive to renewable energy development, and intensive reliance on fossil fuel use with anticipated CO2 emission rate. Under such inefficient generation, transmission and distribution, the Yemeni people not only receiving small portion of daily energy needs, but also experiencing high pollution rate with negative environmental and climatic impacts in association with increased reliance on fossil fuel accompanied. 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.

To address the GHG emission issue, this outcome was designed to implement a total of 12 measures targeted 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 among others.

In its effort to alleviate GHG emissions, the Government of Yemen is being implementing the mitigation interventions identified by NBSAP2, and this effort has led by far to : 1) Implementation of Ma'rib natural gas generation plant phase I and II Ma'rib; 2) nationwide introduction of individual solar home systems (SHS) into rural & urban households; 3) the shift towards LPG in transportation and in replacement of Biomass energy; 4) and shift to solar pumps for irrigation in of diesel pumping.

Under this outcome, only 4 key interventions, being 25 per cent of measures identified in the NBSAPII have been partially completed, while the remaining, being 75 per cent have not yet started owing to lack of funding under ongoing war. This may indicate poor implementation rate, however when assessing implementation effectiveness in terms of impacts of measures undertaken, one can observe that implementation effectiveness improve significantly.

This fact is clearly manifested by assessing the impacts of shifting to natural gas in energy production and the diffusion of SHS into the country households. The impact assessment of the first is given by the assessment report titled "Yemen First Biennial Update Report[16]". Which concluded that the introduction of Ma'rib-I, 341 MW open-cycle gas turbine power pl**ant** into the national grid led to avoidance of emissions from steam plant burning of HFO (Heavy Fuel Oil) amounting to 568 Kton CO2 eq annually. It also concluded that the implementation of the Ma'rib-II, 420 MW open-cycle gas turbine power plant is claiming emission reductions of 680 Kton CO2 eq annually. Unfortunately, both projects have not been registered as CDM projects, simply because the country climate finance readiness is generally far weak and so it was unable to tape to CDM financing potential.

The impact assessment of the second intervention is given by the assessment report titled " Rapid Survey Report of Installed Solar Systems In Districts of Capital Sana'a & its Sub-Rural Districts [17]". The survey concluded that: the shift of Yemeni society to SHS energy was found to be a successful coping strategy, through which they were able to withstand against the disastrous impact of the war, and subsequently secure the energy necessary for their survival. In other word, the coping strategy adopted has directly resulted in strengthening the resilience of Yemeni society against war, and this fact is clearly manifested by achieving impacts due to installation of SHS[18] in two Governorates, the side box provides facts on achieving these impacts.

A Success Story: A Resilient Society Emerged In Return of **SHS Diffusion**

This is clearly manifested by the achieving the following results:

- Households' energy access to SHS increased from less 0.3% in 2014 to nearly 86% of the entire urban population in 2017, implying that only 14% of the urban remained without access. More impressively, the rural SHS access rate has jumped from only 1.0% in 2014 to nearly 95% of the entire rural population in 2017, indicating that only 5% of the rural population remained without access

- Out of dirty war clean energy created, displacing significant quantity of fossil fuel-based energy amounted to 103,317 MWh, which is equivalent to fossil fuel displacement in urban areas amounted to 92,502 MWh, and amounted to 10,815 MWh rural areas.

- Significant carbon emissions avoided as a result of SHS diffusion, totaled to **75** K tons CO2 eq in 2017, with the largest quantity of which amounted to 67 CO2 eq was saved by urban households and the remaining amounted to 8 CO2 eq was saved by rural households.

- More importantly, emission reduction due to installation of solar PVs in 2017 was nearly 9.52 folds higher than total emissions generated by the traditional energy sources, namely from the grid electricity, gasoline-based generators, diesel-based generators and kerosene. This implies that the energy conserved by SHS not only sequestered the total emission incurred by these sources, but also cleaned up about 10 times the emission incurred by these sources.. However, when LPG emission was added, emission reduction of SHS only represents 28% of carbon produced from all traditional sources.

16 The Yemen First Biennial Update Report of May 2017, & was prepared under the third National Communication

17 The Rapid Survey Report of Installed Solar Systems In Districts of Capital Sana'a & its Sub-Rural Districts of May 2018, & was prepared by Dar Al-Khadarah for Studies Consultations and Services under the third National Communication

18 The survey covered 400 households, splitting into 300 urban 300 households and 100 rural households, respectively from 10 districts of Sana'a capital & 4 rural districts of Sana'a Governorate

Of key lessons learnt from the shift of Yemeni society to solar energy is that the societal mobilization is most important capital in promoting and implementing green development strategies and achieving its intended targets more timely, less costly and more effectively than the government can do. This fact is evidently manifested by recalling that the Government strategy (REEE) committed increasing SHS to 110,000 rural households only by 2025, while the survey reveals that the Yemeni society has already installed in three years times about 246,969 households SHS in two governorates only, indicating that SHS access at the national level should have exceeded the government target at least by ten folds. Rough calculation made by the developer of the survey indicates that total rural households would be nearly 1,652,686 rural households if the survey is scaled up to cover the whole country. Further, the REEE committed to delivering 366 GWH though installing a total capacity 100 MW of CSP stations across the country by 2025, while the society is already receiving about 103 GWH only from two governorates from individual SHS, and it is anticipated that total annual energy received from SHS would be nearly 548 GWH per year if the survey is scaled up to cover the whole country.

To assess the effectiveness of shifting towards LPG in transportation in replacement of diesel & Gasoline use, experts believe that this measure should have led to significant reduction in forest loss associated with GHG emission saving due to displacement of diesel & Gasoline use in this sector. However, precise quantification of this impact needs to survey fuels use in transport sector. Similarly, the shift towards LPG instead of wood in rural areas is anticipated to contribute significantly to restoring and safeguarding forest ecosystems. Again, a precise assessment of this impact needs technical support to establish data base & to undertake the following surveys:

- Countrywide survey on the prevailing traditional biomass consumption practices.
- National Inventory on forestation, afforestation, tree plantation and removal.
- Household energy survey

To sum up, the shift to renewable is limited to solar sources and there is long way to go for full application of other feasible green options such geothermal, biomass, wind and solar energy for sectors other than the households sector. More evidently to fully produce this outcome, the country has to prepare for promotion of energy efficiency beside the many other greening opportunities like: the promotion of 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 etc.

Key obstacles hindering this shift include the lack of funding to sponsor application of these options particularly under current inability to access international findings associated with lack of expertise & knowledge on new tech transfer. Other obstacles hindering the attainment of this outcome include: the lack of restoration& afforestation programs targeted for increasing biodiversity contribution to carbon sequestration, lack of geospatial mapping for restoration activities undertaken by Yemen up to now.

Needs to improve effective application of SHS in Yemeni include: development of environmentally conducive policy that is community-based; enacting incentive scheme advocating SHS application; awareness rising program on solar energy application; implementation of government & donor-financed SHS/SWH program, focused on dissemination of SWH to cover the entire country; and financing SHS survey to covers the whole country. To resolve funding issues, there is needs for technical support to restructure the EPA or Social Fund for Development (SFD) so as to serve as National Climate Funds (NCF) for sponsoring mitigation initiatives. 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. Other major needs to improve implementation effectiveness & achieve this outcome, of funding to sponsor application of these options particularly under current inability to access international findings associated with lack of expertise & knowledge on new tech transfer.

Aichi Biodiversity Target 18: Community based Management

ABT18: 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.

National 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.

National 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).

Assessment rating : Partly Effective

Even though the country is significantly progressing in shifting towards community based management, there is insufficient progress rate as regard the implementation of planed measures under this outcome. Specifically, a total of 7 key measures, being 44 per cent of actions identified in the NBSAP have been completed, and additional 19 per cent have been initiated, while the remaining 37 per cent have yet to be launched. Of key measures satisfactorily completed by far are: the creation & enforcement of site community-based management bodies to manage nature reserves; the development & update of 6 community-based management plans for PAs, the development & enforcement of by-laws for the systematic functioning of two community based management bodies**;**

the development & enforcement of entry fees scheme for 2 nature reserves; building capacities of 6 community based entities as regard PA management and provision of ecotourism services & conservation of ecosystems . Among the activities completed, the shifting from decentralized management & planning of Nature reserve to community-based management is considered the most important in terms of its impact in safeguarding the natural resources. This has been observed in in the nature reserves of : Jabal Bura, Aden Wetlands, Homhel, Skand, Rosh, & Tatwah, Protected Areas. The shift to decentralized management of natural resources in these nature reserves has led to increasing societal respect for protected areas by surrounding communities, leading to enforcement of law and minimizing degradation of many protected areas.

Yet, the measures undertaken nationally are much below than what has planned by NBSAPII, & this is evidently observed by none attainment of the following key measures: 1) Promoting private sector involvement in delivery of water services; promotion of community-based management in rangelands, ware resources and fisheries; 3) and promotion of integrated planning based on ecosystem approach to address impact of surrounding areas.

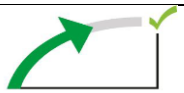
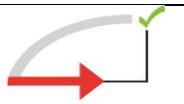
Key obstacles to improve implementation effectiveness include: lack of political will and support to implement the PA action plans, inadequate local capacity to act, combined with institutional weaknesses, loss of traditional knowledge on biodiversity conservation, poor knowledge & practice on ecosystem-based management, and lack of synergies between local and the national levels.

To address challenges facing protected area management, the NBSAP2 calls for minimizing impacts of urbanization on biodiversity loss through implementation a total of 25 Key measures targeted mainly for promoting ecosystem approach, integrating biodiversity values & sustainability while development of road and infrastructure activities, and promotion of integrating planning of biodiversity and protected areas so as to broaden conservation zones of protected areas to include connectivity corridors and buffer zones into protected areas management plans. By now, a total of 3, being 12% of the measures outlined in the NBSAP have been partly completed, and were limited to prohibition of road construction & infrastructures inside protection reserve; transportation control within protected areas; and application of EIA while land use planning, permitting and approval of development project inside protected areas. Yet, the measures undertaken to halt urbanization encroachment are viewed to be ineffective to control illegal settlements; control agricultural land conversion to urban development; and to minimize external pressures of surrounding areas.

III. Progress Assessment Towards National Target

This section presents the findings of stakeholders assessment on progress towards meeting the Global Aichi Targets as spelled out by equivalent national target given by National Biodiversity Strategy2 (NBSAP2) . The NBSAP2 set 17 National targets (NT) to be met by 2020 or 2025. The target identified in the NBSAP2 represents the strategic priorities for of Yemen & also consistent with global Aichi Target (ABT).

The assessment has been made for each National, obeying the Sixth National Report (6NR) guidelines and reporting templates recommended by the Conference of the Parties (COP 13) in its Decision XIII/27. This include, involving biodiversity stakeholders to conduct the assessment applying the five-point scoring system recommended by the technical reporting guidance version 14 February, 2018 produced by the CBD. This scoring system is shown in table 3.1 below.

Tabale3.1: Five point scale of progress, adapted from Global Outlook	Sympol
On track to exceed target	
On track to achieve target	
Progress towards target but insufficient	
No significant overall progress	
Moving away from target (things are getting worse rather than better)	

To proceed with assessment applying the prosed score system, a reputable environmental NGO has been hired to develop a questionnaire with aim to enable biodiversity stakeholders during two workshops conducting the assessment, applying participatory approach that is inclusive and consensus based. However, in order to help them apply the proposed scoring system, the NGO & the designated national coordinator for the preparation of 6NR, furnished the stakeholders with multiple assessment indicators necessary for undertaking the assessment systematically. The assessments indicators have been gathered through accessing wide range of national & international sources including among others the following:

1. CBD Secretariat Information portal and tools

https://www.cbd.int/nr6/default.shtml

2. Technical Reporting Guidance

http://nbsapforum.net/sites/default/files/6NR%20Technical%20Guidance%20--%20FR.pdf

3. Technical Review Framework

http://nbsapforum.net/sites/default/files/6NR%20Technical%20Review%20framework%20FR_1.pdf

4. 6NR Technical Webinar Series

https://www.youtube.com/playlist?list=PL8vwCyAB16RoQ------l2- 1MGrm7CgGIg6KL

5. NBSAP Forum accessed At nbsapforum.net

http://nbsapforum.net/sites/default/files/6NR%20Technical%20Guidance%20-%20EN.pdf

6. Data Tracking Tool : https://www.cbd.int/nr6/

7. UN Biodiversity Lab: www.unbiodiversitylab.org

8. Biodiversity Indicators Partnership (BIP): www.bipindicators.net

9. FAOSTAT (http://faostat3.fao.org/home)

10. OECD Producer and Consumer Support Estimates database (http://www.oecd.org/tad/agricultural-policies/producerandconsumersupportestimatesdatabase.htm)

11. CITES (https://cites.org/eng)

12. IUCN Red List of Threatened Species (http://www.iucnredlist.org)

13. FAO's Global Forest Resources Assessment (http://www.fao.org/forest-resources-assessment/en)

14. www.bipindicators.net or at : http://bipdashboard.natureserve.org/metadata/ocean-healthindex

The designated NGO conducted three workshops, during which the stakeholders, including women were enabled to assessment indicators to the proposed scoring scheme, and reach consensus among them on the state of meeting Yemen biodiversity targets identified by National Biodiversity Strategy2 (NBSAP2). The findings of stakeholders' assessment is summarized by table 3.2 . As indicated in table 3.2, out of 17 national targeted pursued one target has been achieved, additional three are on track, another three are showing progress but at in sufficient rate, nine targets reported insignificant progress, and one target is moving away from target (things are getting worse rather than better). A target by target assessment is presented in the following parts of this section.

Table 3.2: Summary Assessments of Achieving the National Targets : Strategic Goal A				
	Assessment of National Target Achievement			
ABT	Focal Biodiversity Area /National Target	Target assessment	Assessment Indicators	Level of confidence
	1.Biodiversity awareness NT19: By 2025, stakeholders and decision makers are adequately aware of biodiversity value and taking positive action to conserve and use biodiversity sustainably. 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.		The creation of the Alliance of Nature Protectors (ANP), local environmental lobbyists Group, 9 Women NGOs, & over 120 environmental schools clubs are good indicators on enhanced awareness among people	Based on partial evidence
	2. Biodiversity mainstreaming NT14.1: 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 & land use management plans		The ecosystem valuation study is viewed as major step towards mainstreaming biodiversity values into national & local land use plans	Based on limited evidence
	3. Incentives and subsidies NT15: 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		Increased trend of chemicals fertilizer use from 0.48 Tons in 2002 to 1.09 tons 2013, indicating lack of use of organic fertilizer & the continuation of subsidies on chemicals & fertilizer	Based on limited evidence
	4. Sustainable production and consumption T16: 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 NT 15.3: 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.		1- Increased trend of National GHG emissions from 19,346 Gg CO_2 eq in 1995 to 37,889 Gg CO_2 eq in 2012 2- Increased trend of Fossil-fuel energy consumption from 197 Petajoules in 2000 to 344 Petajoules in 20013 3- Renewable energy share to total final energy consumption remained mostly constant at a share of 1 % for the period 2000 to 2014 4- Increased trends of MSW dumping rom 1105 k ton in 2003 to 1520 k tons in 2014, 5- Only 40% of generated MSW collected, & out of which only 6.7 % recycled 6- Modest increase of wastewater	Based on limited evidence

			treatment capacity from 132 MCM/yr in 2010 to 135 MCM/yr in 2015. Out of 2010 waste water production only 35% treated	

Table 3.2: Summary Assessments of Achieving the National Targets : Strategic Goal B				
	Assessment of National Target Achievement			
ABT	Focal Biodiversity Area /National Target	Target assessment	Assessment Indicators	Level of confidence
	5. Habitat fragmentation and degradation NT 4 : Reduce forest & rangelands harvesting by 15% in 2020, and by 30% in 2025		1- Carbon stocks of Yemen forest for the period of 2012 to 2017 remained at 5.16 million tons 2- Forest area remained at 547 K ha for the same period, as a result of continuing forest harvesting	Based on partial evidence
	6. Sustainable fisheries NT6 : 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		1-Human stressors such as pollution, climate change, shipping and fishing on Yemen biodiversity and ecosystems has increased at a mean annual rate of 3.35% over the period 2008-2013 2- Ocean Health Index for Yemen was 65.9 in 2016, & the index has changed at an annual rate of 1.89% over the period of 2012-2016.	Based on limited evidence
	7. Sustainable **Agriculture** T5 : 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		1- Total cereal production in 2017 is more than 40 percent below the previous year's harvest and the five-year average. 2- cropland has declined from 1,150 kha in 2012 to 1,546 Kha in 2016	Based on limited evidence
	8. Pollution N 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		1- Increased trend of chemicals fertilizer use from 0.48 Tons in 2002 to 1.09 tons 2013, indicating lack of use of organic fertilizer & the continuation of subsidies on chemicals & fertilizer 2- Modest increase of wastewater treatment capacity from 132 MCM/yr in 2010 to 135 MCM/yr in 2015. 3- Out of total country wastewater production, only 35% is treated 4- Increased trends of MSW dumping rom 1105 k ton in 2003 to 1520 k tons in 2014, 5- out of Total Country MSW generation, only 40% are collected, & out of which only 6.7 % are recycled	Based on partial evidence
	9. Invasive alien species NT 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		1-Because of lack of measures on management & prevention of IAS introduction, more than 10 of exotic species have been recently introduced to Socotra . 2-Eradication progrms was limited to 5 species only	Based on limited evidence

	10. Vulnerable ecosystems NO National target Adopted in NBSAPII, however Ecosystem pressures addressed under 3 targets: NT 6 focused on pressures on Marine ecosystems, NT4 addresses pollution pressures on ecosystem, and NT 5 addresses production sectors pressures	See NT4, 5 And 7	No equivalent national target Adopted in NBSAP II, however Some pressures addressed under NT4, 5 And 7	NA

Table 3.2: Summary Assessments of Achieving the National Targets : Strategic Goal C				
	Assessment of National Target Achievement			
ABT	Focal Biodiversity Area /National Target	Target assessment	Assessment Indicators	Level of confidence
	11. Protected areas NT 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.		1- Currently, only 0.67% of Yemen terrestrial ecosystems are protected, 2- Only 0.47% of Yemen's coastal and marine ecosystems are protected, 3- During 1980-2018, the mean percentage of each KBA covered by Protected Areas in Yemen changed at an annual rate equivalent to 2%. 4- Protected Area Representativeness Index for Yemen was 0.023 in 2000, & has enhanced insignificantly over the period of 2000-2016 at an annual rate of 1.22% to reach 0.028 in 2016 5- Connectedness Index for Yemen was 0.3581 in 2012, and has changed from 2010 to 2012 at an annual rate of 0%, implying that PAs are not managed without giving due regard to the importance of corridors and interconnectivity of PAs and to external threats	Based on comprehensive evidence
	12. Species and extinctions NT 2 : By 2025, 50 % of endemic, rare & endangered plants, mammal and bird species will be conserved		During 1993-2018, the Yemen Red List Index was 0.93 in 1993, & has changed at negative an annual rate of -0.27% to reach 0.88 by 2018,	Based on limited evidence
	13. Genetic diversity T 3 : Target 3: By 2020, 70% of the genetic diversity of Yemen cultivated plants species , & domestic animals will be conserved in gene banks.		1- Wheat genetic production progressively declining from 250,264 tons in 2012 to merely 124,950 tons in 2015, being almost 50% percent less than the 2012 estimates. 2- AS a result average cereal import has increased from 4228 K tons between 2012/13 to 4250 between 2006/17	Based on limited evidence

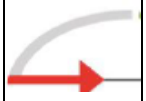
Table 3.2: Summary Assessments of Achieving the National Targets : Strategic Goal D				
	Assessment of National Target Achievement			
ABT	Focal Biodiversity Area /National Target	Target assessment	Assessment Indicators	Level of confidence
	14. Ecosystem services 14.1: Poverty Mainstreaming T 13: Yemeni poor 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, assuming that 20.1% of people are under poverty level in 2014.		In 2018 some 75 % of the Yemen population of 29.3 million (i.e. 22.2 million people) are in need of humanitarian assistance, including 11.3 million people who are in acute need and urgently require immediate assistance to survive – an increase of 1 million since June 2017.	Based on limited evidence
	14. Ecosystem services 14: Restoration and Safeguarding of Ecosystem Services, Delivering Fresh water 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		1 Yemen is not likely to reach the 65% target by 2020, as identified by NBSAP2. 2- Actually, the population water access showed negative trends from 62.2 % in 2005 to 59.3 percent in 2017 3- Renewable water resources remained 2.1 Km^3 from 2005 up to end 2017. 4- Per capita annual share of available water resources reduced from 196 m^3 in 1990 to 87 m^3per year in 2010, to 78.26 m^3 per capita per year in 2014	Based on partial evidence
	15. Climate resilience: 15.1 Adaptation T 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 terraced agriculture), thereby contributing to climate change mitigation and adaptation and to combating desertification		1- Above-ground biomass in forest per hectare remained at 13.99 tons for the period of 2000 to 2015, implying that carbon stock of forest has not changed over the said period 2- Carbon stocks of Yemen forest for the period of 2012 to 2017 remained at 5.16 million tons 3- Forest area remained at 547 K ha for the same period, as a result of continuing forest harvesting	Based on limited evidences
	15. Climate Resilience (mitigation) NT 11 : Energy resilience has been promoted and is manifested by 14% reduction of energy-related GHG emissions in 2020, and 23% in 2025, as compared with 2015.		The diffusion of individual solar home systems (SHS) beside the introduction of Ma'rib-I & Ma'rib-II open-cycle gas turbine power plants have led to total annual emission reduction amounting to 1647 Kton CO2 e, being 7% of 2012 energy-related GHG emissions	Based on limited evidences
	16. Access and benefit sharing No Equivalent national target	NA	No equivalent national target Adopted in NBSAP II	NA

Table 3.2: Summary Assessments of Achieving the National Targets : Strategic Goal E				
	Assessment of National Target Achievement			
ABT	Focal Biodiversity Area /National Target	Target assessment	Assessment Indicators	Level of confidence
	17. NBSAPs		Fully Achieved	on partial evidence
	18. 1 **Promotion of Community-based Management** NT17: 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 .		The Protected Area Connectedness Index for Yemen was 0.3581 in 2012, and has changed from 2010 to 2012 at an annual rate of 0%, implying that PAs are not managed without giving due regard to the importance of corridors and interconnectivity of PAs and to external threats	
	19. Science and research NT18: 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.	In Yemen NBSAP this target is integral part of Biodiversity awareness, see ABT1	Assessment is given Under ABT1	
	20. Resource mobilization No equivalent national Target	NA	No equivalent national target Adopted in NBSAP II, however, assessment on Resource mobilization given under Biodiversity profile	

3.1 Target By target Assessment

Biodiversity awareness, research and information Improved
ABT 1 - By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.

ABT 19: By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.

Equivalent National Target(s) T19: By 2025, stakeholders and decision makers are adequately aware of biodiversity value and taking positive action to conserve and use biodiversity sustainably.

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.

Yemen is Progressing but at an insufficient rate

During the reporting period, the GoY has perused several measures that have been oriented for enhancement of biodiversity awareness across the Yemeni society. Of key results achieved are the creation and activation of 8 Women NGOs & over 120 environmental schools clubs in key cities protected areas. In Aden, the established Al Hassawah Environmental Women Society has worked with five environmental associations, namely the Sustainability for Natural Conservation (SFNC), the Ras Omran Marine Turtles Protection Society, Environmental Friends Society, and Yemen Society for Natural Resource Sustainability & successfully formed the Alliance of Nature Protectors (ANP). The ANP acts as a local environmental advocacy & lobbyists Group, and is being recognized as a lead active body advocating biodiversity protection through the promotion of awareness raising initiatives. Recently, the ANP through the provision of technical support to EPA has persuaded local authority to declare Al-Azizee & Ras Amarn Isalnd as two new Protected areas. Earlier the same group in cooperation with local media & had persuaded local authorities to halt conversion of part of Aden wetlands for other economic activities.

Further, the environmental schools clubs in Aden Hodiedah & Socotra are being frequently mobilized to contribute with government agencies in organization of awareness raising events, particularly those oriented for the celebration the National Environment Day, water day & the World Environment Day (WED) plus others. The established youth and women groups have been recognized as the most active contributors to environmental awareness events, and this is

clearly manifested in the continues design and execution of awareness campaigns, organization of environmental exhibitions, and producing & dissemination of awareness materials during these events.

To sum up, the assessment of progress made under this target shows significant improvement on biodiversity awareness has been achieved among local NGOs, Women Groups and students' and other lobbyist groups. This achievement has been translated to the establishment of 120 environmental clubs, 8 women's groups, and many other lobbyist groups combined with increased trends in their engagement in organizing biodiversity awareness activities & biodiversity protection. Yet, the decision makers appreciation of biodiversity values remained poor, leading to exclusion of biodiversity values while developing national strategies & estimating national account. This implies that the progress rate made under this target has been inadequate to mobilize decision makers towards shifting to national policies, that are advocating conservation & use biodiversity resources sustainably. This means that Yemen is progressing but at an insufficient rate to achieve intended national target by 2025. To achieve the intended target, rigorous effort should be made towards enhancing people awareness through improved education system, improved information base on biodiversity value and coherent communication, education and public awareness strategy.

As concluded by section II, the progress towards implementation of actions identified for the attainment of NT19/18 has been viewed to be partly effective. Therefore, Yemen has made some progress, but insufficient to motivate decision makers to take positive actions advocating mainstreaming biodiversity values into national policies & plans pursuant to NT 19 & 18. This implies that Yemen's performance is by far lagging below the intended expectations identified by national target 19 related improvement of biodiversity Awareness. As three are few assessment indicators on this target, the assessment concluded here has been made based on availability of partial evidences given by four biodiversity indicators, respectively illustrating the creation of the Alliance of Nature Protectors (ANP), establishment of local environmental lobbyists Group, and creation of 9 Women NGOs & over 120 environmental schools clubs.

Biodiversity Values Integrated

ABT 2 - By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.

Equivalent National Target(s): T14.1: 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 & land use management plans

No Significant Progress Made

Ecosystem services

As per Yemen ecosystem valuation study, some ecosystem services, such as forest, rangeland, wetland, marine & mangroves have been partly valuated monetarily, thus they can be relatively weighted within the natural capital asset & within wider national financial accounting. Table 3.3 shows that forest land is most dominant contributors to national GDP at a share of 90.06 percent. However, it worth-noting that the assessment tends to be biased because it does not include wide-range of ecosystems such as underground water basins, sea grass beds, salt marshes, lakes and bays, sandy and rocky beaches, terraces & and irrigated valleys, turtle nesting and feeding sites, breeding seabirds habitats, and coral reefs. Further work is critically needed to map and categorize ecosystem service provision in Yemen. Nevertheless, the ecosystem valuation study, concluded that total value of key ecosystems in the country is estimated at approximately USD 287,829 million, whilst the country's GDP is estimated at approximately USD 20,000 million per year, implying that the ecosystem value is ten times the value of GDP.

Table 3.3 : Economic value of key ecosystems

Key ecosystem	Economic value (USD Million)	Share Natural Capital Assets
Forest	260,787	90.6%
Rangeland	12,146	4.2%
Wetland	13,873	4.8%
Marine	541	0.2%
Mangroves	482.9	0.2%
Total	287,829	100.0%

Additionally, the study concluded 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), for which most of the ecosystem products such as the fuelwood, the medicinal values of forests, ground water & fisheries are utilized against no cost, leading to unsustainable harvesting of these resources.

In short, Yemen has not made significant progress on integrating biodiversity values & the conservation of key ecosystem services into national strategies & relevant sectoral plans and policies as called upon by the national target 14.1(NT 14.1). Yet, biodiversity values is not yet considered by the 4th Socio-Economic Development Plan for Poverty Reduction(4th DPPR), nor by overall sectoral strategies and local plan. This implies that Yemen is not likely to achieve intended national target by 2025, unless rigorous policy shift

is made towards integrating biodiversity values into national and local development and poverty reduction strategy, sectoral plans and local land use plans.

As concluded by section II, the progress towards implementation of actions identified for the attainment of NT 14.1 has been viewed to be ineffective. This in turn implies that Yemen's performance is by far lagging below the intended expectations identified by national target 41.1 related to biodiversity mainstreaming . Even though an evidence-based approach has followed to reach this conclusion, the level of confidence of the assessment of this target remains limited, owing to lack of monitoring & adequate indicators to produce assessment of this target that is indicators-based and fully responsive to the CBD reporting requirements.

Incentives Reformed

ABT3- 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.

Equivalent National Target(s) :T15: 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:)

No Significant Progress Made

Because of low delivery level of activities planned under this target, the progress rate made to achieve National target15(NT15) is viewed as inadequate to eliminate subsidies harmful to biodiversity, nor to effect friendly environmental subsidies such as the promotion of green economy and mainstream biodiversity values & concern into national development plans poverty plans.

The progress made towards mainstreaming biodiversity concerns into national policies has been assessed to be inadequate to broaden integration of biodiversity aspects to cover all destructive development sectors such as the mining; oil and gas production; manufacturing industry; tourism; infrastructure & road.
The manifestation on inadequacy of Yemen mainstreaming efforts is illustrated in

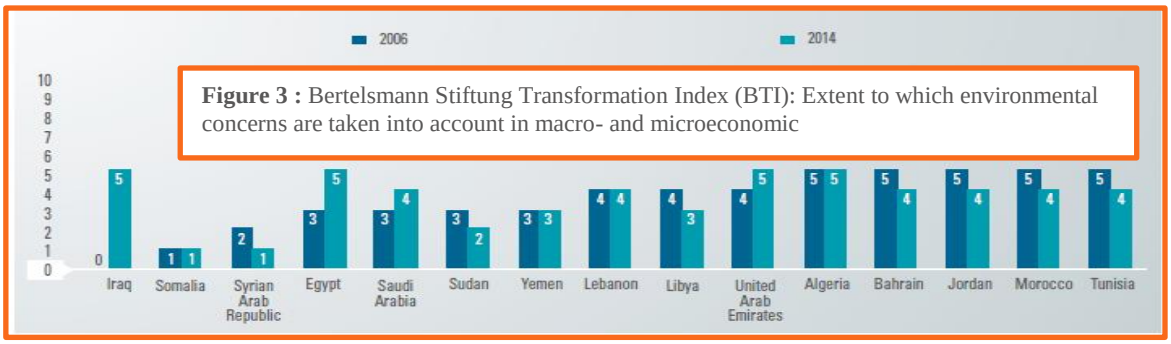


Figure 3 : Bertelsmann Stiftung Transformation Index (BTI): Extent to which environmental concerns are taken into account in macro- and microeconomic

figure3 derived from Arab Sustainable Development Report[1], 2015. The figure shows that biodiversity mainstreaming into national and sectoral strategies is rated at 3, being of lowest scores among the 15 Arab countries included in the BTI assessment study[2]. This means that environmental concerns are adequately taken into account in macro- and microeconomic policies, and as a result many harmful incentives & subsidies continue to deteriorate biodiversity loss, including loss of arable land, water & marine resources.

In the light of ineffective implementation of NBSAP actions identified to achieve fifteenth national target (15NT), Yemen's progress has been assessed to be insignificant to meet the expectation identified by NT4 by 2020. However, it worth recalling that the confidence level of this assessment has been made based on limited evidences, couple with lack of assessment tools & lack of monitoring system in place. The lack of monitoring systems is attributable to lack of biodiversity indicators, particularly on current extent of harmful incentives (including subsidies) to biodiversity e.g. agriculture, fisheries, forestry, mining, petroleum, and trends in agricultural export subsidies. Under such inadequacy of monitoring system, the assessment of this target has been made based on one indicator, showing extent and trends of chemicals fertilizer use as illustrated by figure 3.8 [3] presented above .

[1] Source: Arab Sustainable Development Report, 2015, which derived it Bertelsmann Stiftung, BTI. Available from http://www.bti-project.org/ (accessed 2 November 2015).

[2] Source: Arab Sustainable Development Report, 2015, which derived it Bertelsmann Stiftung, BTI. Available from http://www.bti-project.org/ (accessed 2 November 2015).

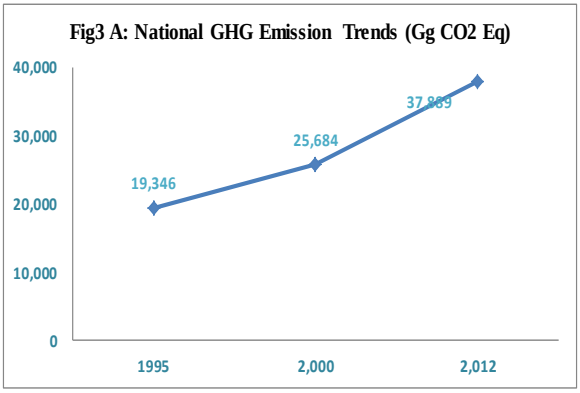
[3] Source : World Development Indicators (WDI)

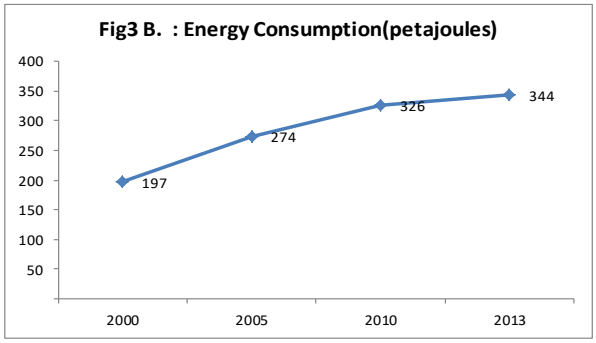
Sustainable Consumption

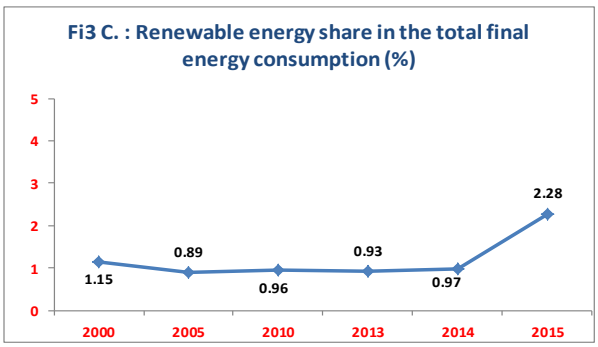
ABT 4 – By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for SPC and have kept the impacts of use of natural resources well within safe ecological limits.
Equivalent National Target(s): T16: By 2025, several business communities 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
Target 15.3: 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.

No Significant Progress Made

Review of stakeholders concluded that only 23 per cent of priority measures identified in the NBSAPII have been partly completed, implying that modest progress have been made by the production sectors towards keeping the impacts of use of natural resources well within safe ecological limits. Specifically, the production sectors such as tourism, mining, energy, industry, agriculture, transport and waste sectors have not contributed much towards incorporating sustainability & biodiversity principles into their national and local development plans and programmes. In other words, the current production pattern across all production sectors remained destructive, polluting & hazardous to biodiversity and ecosystems.



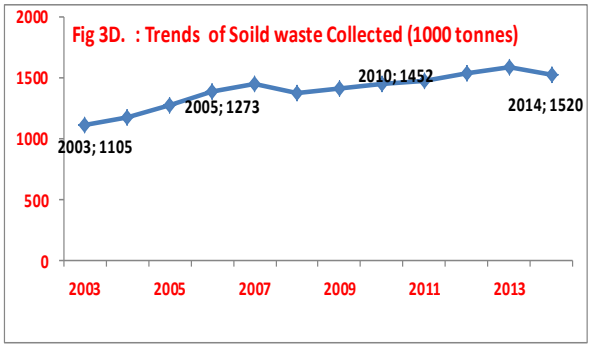




To assess to which extent the production sectors have been wasteful, national indicators on extends & trends of carbon release, solid waste disposal, dumping of hazardous waste, wastewater dumping into the natural environment, use of renewable energy, and recycling technologies were developed & used for the assessment.
Carbon indicator as articulated by Figure 3A shows that total GHG emissions (excluding LULUCF Sector) has reported progressive increase over time. Specifically, total Yemen's GHG emissions have grown

from 19,346 Gg CO_2 eq in 1995 to 25,684 Gg CO_2 eq in 2000 and reach about 37,889 Gg CO_2 eq in 2012[4]. The reported increase of GHGs has been merely attributable to lack of mitigation strategies, extensive use of high carbon content fuel for energy and inadequate application of renewables in four socio economic sectors namely in the energy, agriculture, waste sector and cement industry.

Figure 3 A , B & 1C confirm that the progressive high carbon release & pollutants into the atmosphere has been incurred by extensive use of fossil fuel with high carbon contents combined with modest application of renewable Energy. While, fossil-fuel energy consumption has increased from 197 Petajoules in 2000 to 344 Petajoules in 20013 (Fig 3b) [5], renewable energy share to total final energy consumption for the entire period 2000 to 2014 remained mostly constant at a share of 1 percent (Fig 3 c) [6].



The indicator of solid waste disposal (fig3d) also demonstrate a progressive increase of dumping of solid waste into natural environment, against no significant parallel increase in in solid waste recycling of solid waste. Actually, the MSW collection in 2014 was 1520 k tons, being only about 40% of generated waste, implying that millions of tons or 60% of the generated wastes have remained uncollected and disposed into open environment, with anticipated severe health impact to people and ecosystems.

Again, the reported increase of hazardous municipal wastes is *the direct results of increased population and rapid growth in development sectors, particularly in* industry; oil exploration, road transportation; fishing; tourism; and agriculture. Further, the increase of municipal wastes is attributable to number of casual drivers, including lack of effective and comprehensive strategy for waste management sector, lack of Disposal schemes within production sectors & industry, and poor involvement of the various production sectors in SWM, and the absence of in-country contractors that recycle, handle hazardous, and non-hazardous waste , and mixed waste. Under this last constraints, it was reported that out the collected solid wastes only 6.7 % recycled[7],

Similarly, under current improper wastewaters management and ineffective implementation of NBSAP wastewater activities, wastewater treatment capacity has reported modest increase from 132 MCM/yr in 2010 to 135 MCM/yr in 2015. Out of 2010 production only 35% treated while the remaining untreated wastewater discharged to underground aquifer, arable land, marine & in the water courses of Wadies, causing progressive increase

[4] Yemen First Biennial Update Report(BUR), Under the United Nations Framework Convention on Climate Change, MAY 20017

[5] **http://unstats.un.org/unsd/energy/yearbook/default.htm, derived from World Energy Balances, IEA (2017)**

[6] **http://unstats.un.org/unsd/energy/yearbook/default.htm, derived from World Energy Balances, IEA (2017)**

[7] Country report on the solid waste management in YEMEN, GIZ April 2014

contamination of these ecosystems, leading to the reduction in ecosystems productivity and hence the delivery of their services.

To sum up, the assessment of progress made under this target shows that many wasteful practices are still dominating within the production sectors, for which the production sectors have remained wasteful, causing excessive dumping of solid waste into natural environment; increased discharge of waste water to underground aquifer, arable land, and marine ecosystems; extensive carbon release into the atmosphere in association high reliance on fossil fuel energy; and overuse of chemical fertilizers, pesticides, and insecticides. Therefore, the progress rate made under this target is viewed as inadequate to keep the impacts of use of natural resources well within safe ecological limits by 2025. This means that Yemen is not likely to achieve intended national target by 2025, unless renewed effort is made towards incorporated sustainability & biodiversity values into national and local development plans of production sectors. Specific efforts are necessary to renew these sectors commitments towards promoting green technologies, use of recycled materials and compliance to environmental excellence.

Yemen is lacking the effective statistical capacity and tools to assess progress made towards the achievement of the sixteenth national target (16 NT) comprehensively, thus the assessment of this target has been made based on partial evidences provided by the national statistics as regard: increasing trend of carbon release(Figure3A), increasing trend of fossil fuels use (figure3B) associated with limited use of renewable energy (Figure3c), and increasing trends of solid waste dumping into natural environment (figure 3d). To better enhance assessment level of this target, there is a priority needs to improve statistical capacity of Yemen's clearinghouse mechanism (CHM) through incorporating all missing biodiversity indicators into the CHM website, so as to help undertaking comprehensive assessment of this target in future. Biodiversity indicators that currently missing include inter-alia: on trends on domestic material consumption, material footprint (MF), indicators on SPC mainstreaming into national policies, water footprint, and change in water use efficiency over time. This is critically important step to produce evidence-based assessment & to put in place an effective monitoring system for this target, recalling that current monitoring system is considered to be inadequate to produce precise accounting of progress of this target pursuant to the reporting guideline of 6NR.

ABT5: Habitat loss halved or reduced

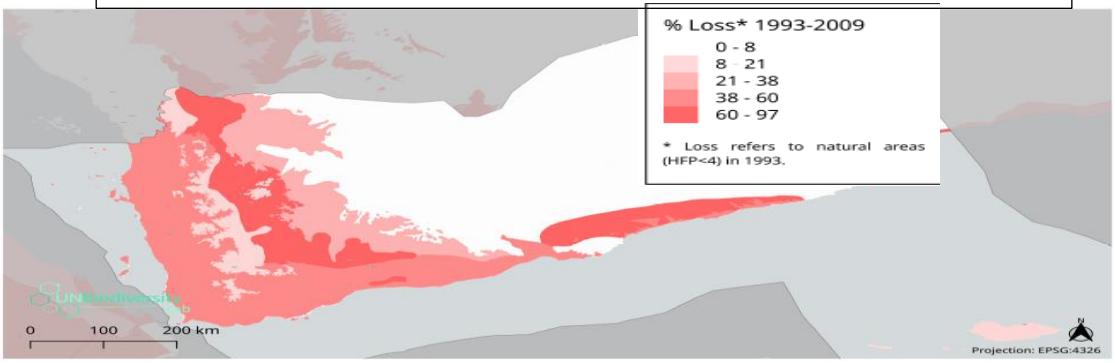
ABT 5- By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.

Equivalent National Target(s): T 4 : Reduce forest & rangelands harvesting by 15% in 2020, and by 30% in 2025

No Significant Progress Made

Owing to progressive population growth, increased poverty, and unchecked urbanization over the period 2093 to 2009, pressures on marginal lands have increased, accelerating the over-exploitation of woodlands resources, leading to reduction in area covered by

Map1: Loss of Natural areas within ecological areas of Yemen, 1993 -2009



woodlands and shrublands. An eloquent demonstration of the disastrous effects of woodlands loss is given by map 1, which was derived from the UN Biodiversity Lab (UNBL) [8].

As given in the Map1 , woodland areas is being degrading over the period 1993 to 2009, whereas the largest degradations amounted to 60% to 97% have occurred in the Central Highlands/ Wadis and in Al-Mahara eco-regions. Natural degradations have also occurred in the escarpment and western mountains as well as in coastal plains in the range of 38% to 60%.

After the initiation of NBSAP implementation, the forest & rangelands harvesting rate has also continued to increase as a result of unsustainable utilization of natural resources, combined with the low progress made in implementation of measures planned under this component. Specifically, the forest & rangelands harvesting rate has not been reduced in accordance with the predefined target of the NBSAP2, but conversely the harvest rate tends to continue increasing, implying that Yemen is not likely to meet the 15% by 2020 if current trend of harvesting continue.

This conclusion is confirmed by results of two assessment data source, namely the Rapid Survey Report of Installed Solar Systems In Districts of Capital Sana'a & its Sub-Rural Districts, and statistical data given by UNDAT, 2018.

The Rapid Survey of installed Solar Systems[9] shows that fuelwood consumed of the aggregated households of urban and rural areas in 2014 totaled at about 1,335,744 tons , and increased to more than

Table 3.4 : Fuelwood/ Charcoal Consumption	
2014	2017
Tot Ton per year	Tot Ton per year
1,335,744	1,888,232

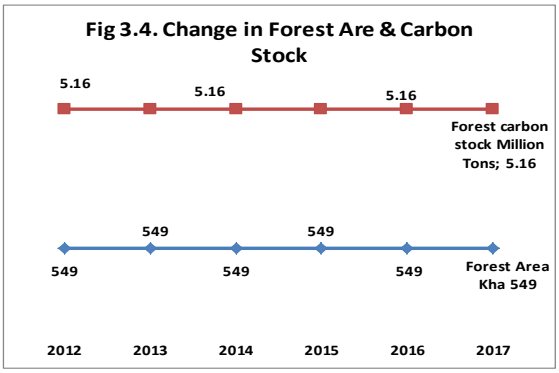
[8] www.unbiodiversitylab.org.

[9] The Rapid Survey Report of Installed Solar Systems In Districts of Capital Sana'a & its Sub-Rural Districts of May 2018, & was prepared by Dar Al-Khadarah for Studies Consultations and Services under the third National Communication

1,888,232 tons in 2017, table3.4.

This increase was attributable to increasing number of households accessing fuelwood under lack of mitigation action combined with escalating war from around 17,516 households, being 6% of overall households in 2014 to about 23,062 households or 8%of overall households in 2017.

Beside the continuing wood removal reported by the solar survey, statistical data given by the UNDATA[10] of 2015 as given by figure 3.4, shows that the carbon stocks of Yemen forest for the period of 2012 to 2017 remained at 5.16 million tons as direct result of none change in forest area under lack of plantation implementation programs and the continuing wood removal for meeting households energy.



In the light of ineffective implementation of NBSAP actions identified to achieve the fifth national target (4NT), Yemen's progress has been assessed to be insignificant to meet the expectation identified by NT4. However, it worth noting the assessment level of this target has been made based on limited evidences, couple with lack of assessment tools & lack of monitoring system in place. The reported lack of monitoring systems is manifested by lack of numerous biodiversity indicators such as : proportion of important terrestrial aquatic ecosystems covered by protected areas, progress towards sustainable forest management, trends in extent of natural habitats other than forests, wetland extent, trends in the degradation of forest, biodiversity habitat index, and proportion of degraded land over total land area among others. Under such inadequacy of monitoring system, the assessment of this target has been made based on limited evidences, utilizing only two indicators, showing trends of carbon stocks of Yemen forest(Figure 3.4) & trends of forest area(map1) .

Therefore, in order to better develop evidence-based assessment report, there is strong need to tackle current monitoring inadequacy and to reverse the weakness of statistical capacity through securing sufficient fund for enhancing statistical capacity with specific focus to improve the technical capacity of manpower of EPA CHM unit with aim to enable them compiling reports & evidence-based indicators so as to get it integrated into the CHM website to be used for future strategic planning, and reporting on biodiversity status, including the reporting to the CBD.

10 Data source: UNDATA, accessed on DEC 2018 combined with data derived from FAO, Global Forest Resources Assessment 2015

<u>Aichi Biodiversity Target 6:</u> Sustainable Management of Marine Living Resource

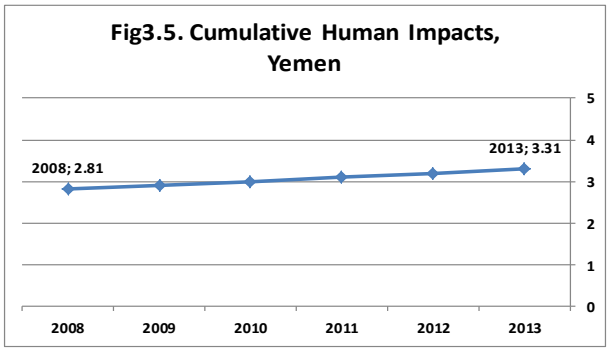
ABT 6 - By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts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

Equivalent National Target6 : 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

Equivalent National Target7: National 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.

NO Significant Progress Made

Because of low delivery level of activities planned under this target, the progress rate made under this area is viewed as inadequate to meet the intended target by 2020. This partly because of the continuing overharvesting marine resources, and partly due to continuing anthropogenic pressures on marine ecosystems & Species. To verify this conclusion it was referred to 2 international assessment indicators, namely the human impacts on marine ecosystems & ocean health. Indcator1 is given by Figure5 & was derived from data available at the website of Biodiversity Indicators Partnership (BIP) [11].

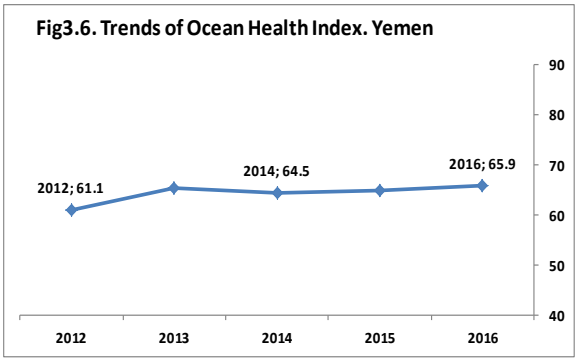


The indicator as given by the graph visualizes & predicts anthropogenic stressors such as pollution, climate change, shipping and fishing on biodiversity and ecosystems. Particularly, it shows that the cumulative human impacts on marine ecosystems for Yemen was 3.31 in 2013[12] and the score impact has changed at a mean annual rate of 3.35% over the period 2008-2013.

[11] **www.bipindicators.net** or at : http://bipdashboard.natureserve.org/metadata/cumulative-humanimpact

[12] http://bipdashboard.natureserve.org/metadata/cumulative-humanimpact

Indcator2 is depicted by figure 3.6 & was derived by the Ocean Health Index Science & was downloaded from the website of Biodiversity Indicators Partnership Dashboard13. The index measures the state of the world's oceans based on how well they are able to sustainably provide the benefits and services that people need and desire. Particularly, the figure 3.6 shows that the Ocean Health Index for Yemen was 65.9 in 2016, & the index has changed at an annual rate of 1.89% over the period of 2012-2016.



Because of ineffective implementation of NBSAP actions identified to achieve the sixth national target (6 NT), Yemen's current progress has been assessed to be inadequate to achieve the sustainable fisheries by 2020 as targeted by NT6. This finding of the assessment has been concluded based on limited evidences, combined with of lack of monitoring system in support of the target assessment. The limited evidences in support of this target assessment is reflected by merely incorporating two assessment indicators, which have been delineated to highlight human stressors on marine ecosystems (Figure 3.5), and Ocean Health Index(figure 3.6).The lack of monitoring system to support the assessment of this target is manifested by none availability of numerous biodiversity indicators, including enter-alia: Trends in certified sustainable fisheries, proportions of depleted stocks, trends in population and extinction risk , proportion of fisheries on threatened species, trends in target and bycatch species, and number and coverage of fish stocks with adaptive management systems/ plans.

Aichi Biodiversity Target 7: Sustainable Agriculture

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

Equivalent National Target(s): T 5 : 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

Yemen is Progressing but at an insufficient rate

[13] **www.bipindicators.net** or at : http://bipdashboard.natureserve.org/metadata/ocean-healthindex.

Evident supporting this is given by the continuing reduction of cereal production associated with a progressive decline of cultivated area. According to FAO statistical data presented in table 3.5, total cereal production in 2017 is estimated at 450 000 tons[14], more than 40 percent below the previous year's harvest and the five-year average.

Table 3.5Trends of Yemen Cereal Production

Yemen

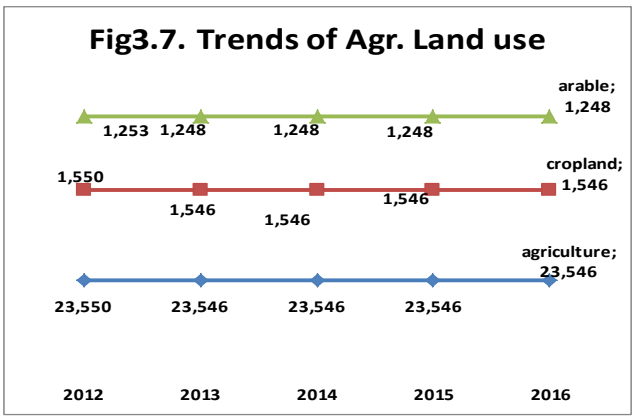
Cereal production

	2012-2016 average	2016	2017 estimate	change 2017/2016
	000 tonnes			percent
Sorghum	371	394	200	-49
Wheat	204	220	150	-32
Millet	76	87	50	-43
Others	94	91	50	-45
Total	745	792	450	-43

Note: percentage change calculated from unrounded data.
Source: FAO/GIEWS Country Cereal Balance Sheets

On average, total domestic cereal production covers less than 20 percent of the total utilization (food, feed and other uses). Further, the total cereal production showed a negative trend between 2016 and 2017,amounting 43%, implying reduction of land available for food production associated with the depletion of the water resources.

As per data from FAO Aquastat database, the continuing drop of crop production coupled by slight decrease of cropland from 1,550 kha in 2012 to 1,546 Kha in 2016, figure3.7 [15].



Some of the factors contributing to this include: (i) inability to control plant and animal pests and diseases; (ii) increasing production of *qat (Catha edulis)* as a cash crop, which reduces the amount of land available for food production and contributes to the depletion of the water table;(iii) limited public resources allocated to the sector. Other more structural factors include: (v) diminishing natural resources, in particular groundwater mining (following uncontrolled extraction and inefficient water management practices) and the degradation of land (following deforestation, lack of terrace maintenance, soil erosion and soil salinity); (viii) the effects of climate change and variability; and (ix) inequitable access to arable land.

As concluded by section II, the progress towards implementation of actions identified for the attainment of NT 5 has been viewed to be partly effective. Therefore, Yemen has made some progress, but insufficient to broaden sustainability to cover 50% of Yemen's

[14] Source : FAO/GIEWS (global information and early warning system on food and agriculture) country balance cereal sheet, http://www.fao.org/nr/aquastat

[15] Source : Reference http://www.fao.org/nr/aquastat accessed Dec-2018

agricultural lands by 2020, as called upon by NT5. As three are no local monitoring system & indicators on this target, the reported assessment concluded here has been made based on availability of limited evidences in the form of two biodiversity indicators respectively highlighting a negative trends of cereal production(table 3.5[16]) and negative drop of cropland (figure3.7 [17]). The lack of local monitoring system & indicators has constrained undertaking of a comprehensive assessment in particular because of lack of numerous assessment indicators such as : Trends on the proportion of agriculture under sustainable practice, areas of agricultural land under organic production, areas of agricultural land under conservation agriculture, proportion of agricultural under productive and sustainable agriculture, and trends in genetic diversity of cultivated plants among others. To better quantify the assessment level of this target effort should be geared towards strengthening the CHM unit of EPA focal point through technical and financial assistance with ultimate aim to create a systematic biodiversity database for monitoring status and trends of biodiversity elements.

Aichi Biodiversity Target 8: Pollution reduced:

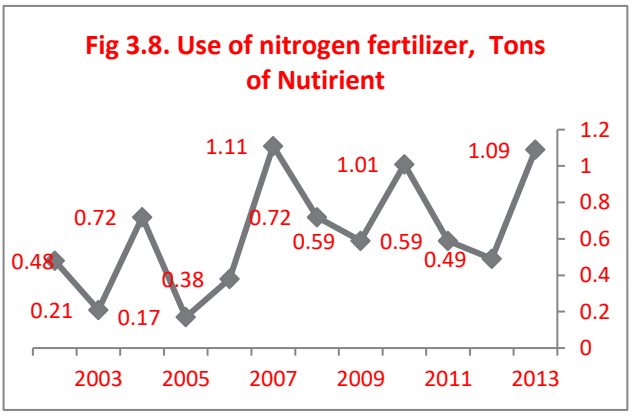
ABT 8 : By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.

National 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

NO Significant Progress Made

During the war time, no significant progress made to address ecosystem contamination.

Therefore, the pollution level incurred by the continuing use of agro-chemicals & fertilizers remained harmful to key ecosystem services, particularly to agricultural lands and underground water. As per national data, chemicals fertilizer use reported increased trend of from 0.48 Tons in 2002 to 1.09 tons 2013, indicating lack of use of organic fertilizer



Source : FAO/GIEWS (global information and early warning system on food and agriculture) country balance cereal sheet, http://www.fao.org/nr/aquastat [16]

Source : Reference http://www.fao.org/nr/aquastat accessed Dec-2018 [17]

& the continuation of subsidies on chemicals & fertilizer, see figure 3.8 [18]. Additionally, out of total country wastewater production, only 35% is treated while the remaining 65% is discharged untreated into wadies, aquifers & coastal areas causing high damage to these ecosystems. Similarly, the country overall production of MSW is progressively increasing, against low collection & recycling capacities, under which only 40% of generated MSW are collected, & out of which only 6.7 % are recycled. This implies that the largest quantity amounting of 60% of the country MSW generated is disposed untreated to open environment with severe impact on water, land & marine ecosystems. Given that the generated MSW contains fertilizers, pesticides, agrochemicals & hospital wastes, such a hazardous materials seep into groundwater aquifers causing excessive pollution that exceed the capacity of ecosystems to maintain water quality. The continuing discharge of untreated municipal and industrial wastewater and agro-chemicals, agro-chemicals and other industrial chemicals into water aquifers & coastal areas leads to reduction in water availability, causing ,in turn, financial burdens on rural poor, particularly on women. Further, The continuing discharge of untreated MSW & wastewater 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. To this end, more work & renewed efforts are required to reduce waste diffusion & reduce impacts of pollutants and contaminants on soils, water, plant species, and marine ecosystems in accordance with intended target of the NBSAP2, see indicators under ABT 4.

As concluded by section II, the progress towards implementation of actions identified for the attainment of NT12 has been viewed to be partly effective. Therefore, Yemen's current performance to achieve the 50 percent reduction of pollutants by 2025 is assessed to be is far-reaching if current trend of progress is continuing. This assessment has been made based on availability of partial evidences, illustrated by five biodiversity indicators respectively highlighting increased trend on MSW (figure 3d), increased use of chemicals fertilizer use (figure 3.8), modest increase of wastewater treatment capacity, limited treatment capacity, and limited recycling capacity of MSW (see table 3.2) . In order to develop an assessment report that is based on comprehensive evidence, it is essential to furnish the EPA CHM unit with numerous biodiversity indicators needed for the assessment This include enter-alia: Trends in emissions, NOX; SOX; POPs; mercury; trends in pesticide use; index of coastal eutrophication and floating plastic debris density; mortality rate attributed to household and ambient air pollution; mortality rate from unsafe water; trends in extinction risk and populations driven by pollution; water quality index for Biodiversity; trends in nitrogen deposition, and proportion of bodies of water with good ambient water quality.

Aichi Biodiversity Target 9: Invasive alien species (IAS) prevented and controlled

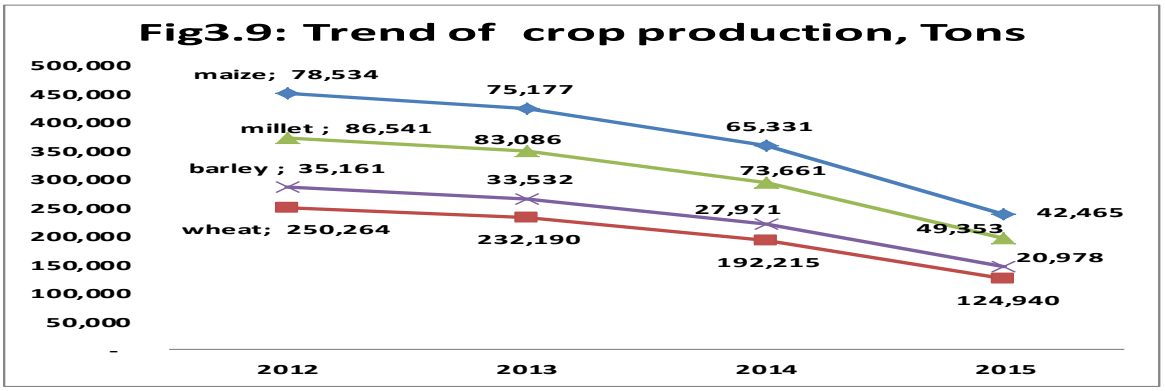
ABT 9 - By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

[18] Source : World Development Indicators (WDI)

Equivalent National Target(s): T 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

NO Significant Progress Made

Under unchecked introduction of Invasive Alien Species (IAS), Many IAS are progressively invading Yemen eco-systems, causing destruction of invaded ecosystem coupled with adverse environmental and economic impacts. For instant, spread of mesquites plants (Prosopis juliflora) remained a continuing threat to the functioning of many eco-systems such as the agricultural lands, irrigation canals, drainages lines and downstream beaches of wadies. Additionally, the current unstable situation in Yemen and the subsequent sharp drop in the Government's funding allocations for the monitoring and control of plant pests and diseases & controlling introduction of homogenous high



yielding varieties have had dramatic environment and economic impacts. Specifically, uncontrolled introduction of homogenous high yielding varieties has resulted in notable deteriorating in yield and quality of local crop varieties such as wheat, barley, maize and millet.

According to UNDATA database shown in fig 3.9, local breeds of wheat, barley, maize and millet have reported progressive declining trends in yields for the years from 2012 throughout 2013/2014 up to 2015, figure 3.9 [19]. For instant, wheat production has reduced from 250,264 tons in 2012 to merely 124,950 tons in 2015, being almost 50% percent less than the 2012 estimates. However, it worth-noting that this drop is attributable not only to introduction of homogenous high yielding varieties, but also to underlying causes such as the climate change combined with the escalating war associated with frequent occurrence of droughts and flash floods among others.

Also Yemen remained under risk of desert locust attacks particularly if we know that the country is currently lacking for regular monitoring, surveillance and timely response and action to mitigate anticipated locust impact. Under such a weak monitoring capacity, the country remained highly vulnerable to the invasion of undesirable introduction of multiple plant pests and diseases such as desert locust and tomato borer, red palm weevil and wheat rust. The country remained

[19] Source : Reference UNDATA database, accessed Dec-2018

threatened by the fall of armyworm, which first surfaced in Africa in 2016 specially if we know that Yemen had exposed before to introduced diseases the armyworm incurred by introduction of citrus nurseries. If monitoring capacity remained unchecked, fall of armyworm could further spread over large of area of crop, causing notable reduction of crops availability with severe impact on smallholder farmers.

Even though of lack of monitoring systems for IAS "Livestock are a primary source of income for smallholder farmers under a mixed farming system, particularly sheep, goats, cattle, camels and poultry. The ongoing conflict has decimated livestock herds for many farmers, especially among displaced pastoral and agro-pastoral households. Limited veterinary services, and scarcity and high cost of animal vaccines and drugs, are causing the spread of endemic diseases such as *peste des petits ruminants*, sheep and goat pox, foot-and-mouth disease and lumpy skin disease. Furthermore, the shortage and soaring prices of animal feed has led to poor livestock productivity with high levels of animal mortality. Also, the industrial poultry sector, the major provider of protein and income to poor people (through chicken meat and eggs), is under serious threat as all vaccines and feed for poultry need to be imported"[20].

To sum up, in accordance with Yemen's biodiversity indicators, the condition of IAS impact on local breeds, and progress towards meeting the intended target demonstrated that local varieties loss had not yet been halted, and is requiring a critically renewed and sustained effort in order to reach the intended by 2025, Specific needs in this regard discussed in section II.

As concluded by section II, the progress towards implementation of actions identified for the attainment of NT10 has been viewed to be ineffective. Therefore, Yemen's current performance is unlikely to prevent IAS introduction by 2025 if current trend of progress is continuing. This finding, however, has made based on limited evidences given by merely two indicators, highlighting respectively the continuing IAS introduction into Socotra PAs under lack of control measures, and limited eradication measures taken nationally. In order to improve assessment level of this target, effort should be paid for compiling and incorporating numerous biodiversity indicators into the CHM unit of EPA. This include: trends in IAS identification and prioritization, trends in IAS distribution and populations, trends in the eradication of priority IAS, trends in extinction risk and population changes driven by IAS impacts, trends in impacts of IAS on ecosystems, trends in the numbers of IAS introduction and establishment events, and trends in the implementation of policy responses preventing the introduction and establishment of invasive alien species.

[20] Source : FAO/GIEWS (global information and early warning system on food and agriculture), http://www.fao.org/nr/aquastat

Aichi Biodiversity Target 11: Protected areas

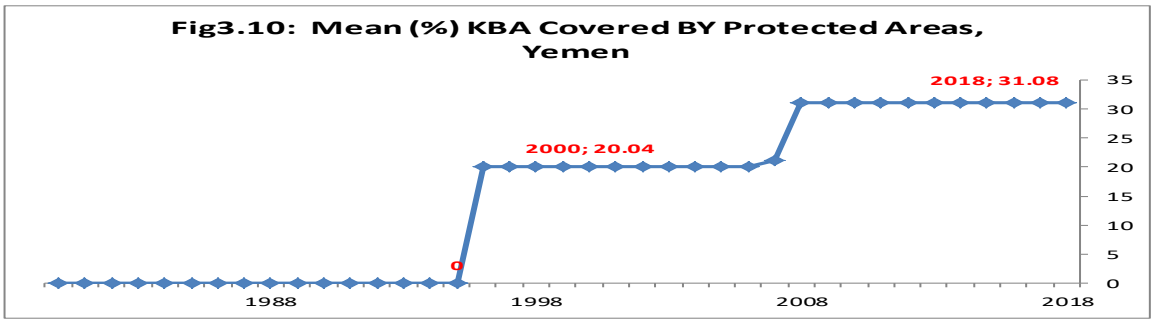
ABT 11 - By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected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

Equivalent National Target(s): T 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.

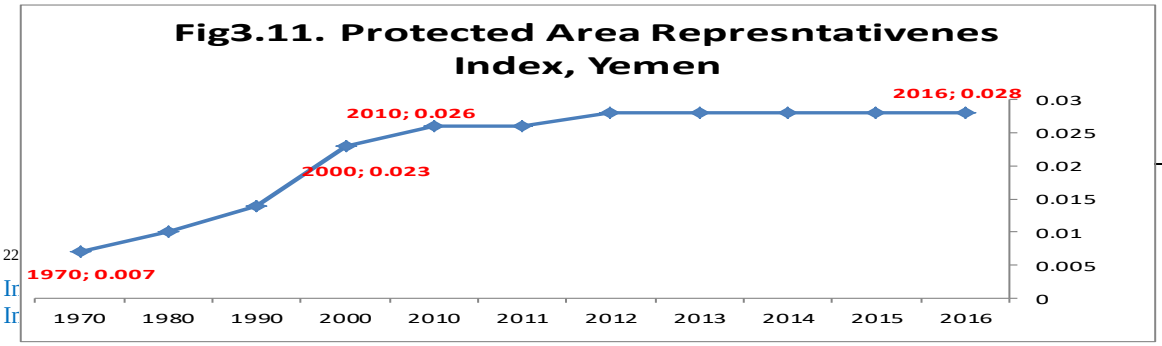
Yemen is Progressing but at an insufficient rate .

Currently, only 0.67% of Yemen terrestrial ecosystems are protected, being much below the NBSAP 7 per cent target of 2025. Similarly, only 0.47%[21] of Yemen's coastal and marine ecosystems are protected, being much below the NBSAP 12 per cent target of 2025. To further verify adequacy of Yemen Protected Area Coverage, the Biodiversity Indicators Partnership Dashboard(BIP)[22] indicators were accessed, & an assessment indicator on protection of Yemen Key Biodiversity Area (KBA) was downloaded & used for this assessment.

The indicator was developed based the date of establishment of Protected Areas in the *World Database on Protected Areas*. The indicator as given by the Figure3.10 shows



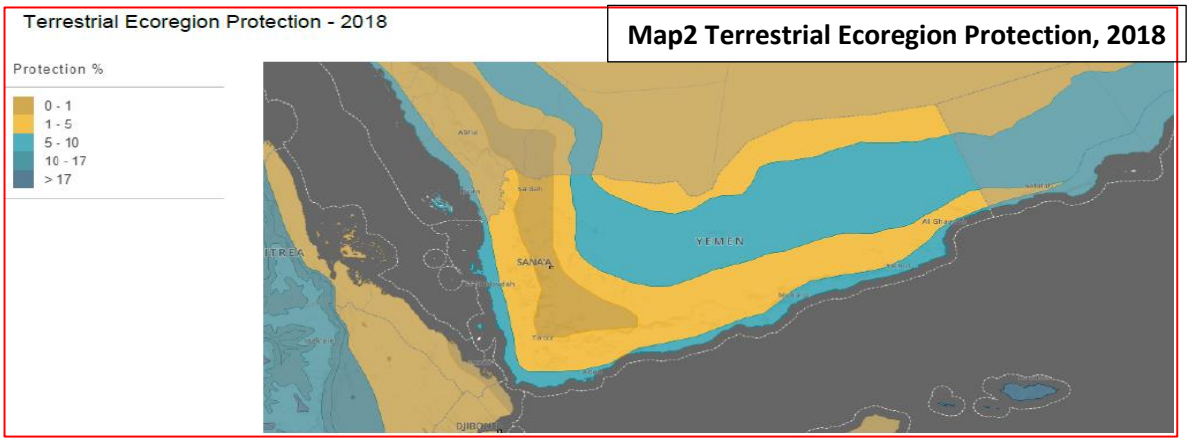
trends in the mean percentage of each Key Biodiversity Area (KBA) that is covered by Yemen terrestrial and freshwater biodiversity Protected Areas. During 1980-2018, the mean percentage of each KBA covered by Protected Areas in Yemen changed at an annual



rate equivalent to 2%.

Above data shows that Yemen current protected areas coverage is not only below the designated NBSAP2 target, but also are not yet representative to all habitats and species, such as underground water basins, sea grass beds, salt marshes, lakes and bays, sandy and rocky beaches, mountainous rangelands, terraces & and irrigated valleys, turtle nesting and feeding sites, breeding seabirds habitats, coral reefs, freshwater ecosystems, and coastal wetlands. To verify representativeness level of Yemen's PA, reference was made to two international data sources, namely UN Biodiversity Lab (UNBL) and the Biodiversity Indicators Partnership Dashboard(BIP).

Data derived from the UN Biodiversity Lab (UNBL) [23] is given by Map2, & shows representativeness status of Yemen protected area system. The map shows calculated



Map2 Terrestrial Ecoregion Protection, 2018

protection coverage of terrestrial ecoregions within Yemen is broadly less than 10% and not ecologically representative, noting however that this is for aggregated ecoregions.

Data of the Biodiversity Indicators Partnership Dashboard(BIP), assess PA representativeness in terms of the Protected Area Representativeness Index. The index was developed to shows trends in the protection of terrestrial biodiversity through the integrating information from a global protected areas database with modeled fine-scaled spatial variation in biodiversity composition. The trends in the protection of Yemen terrestrial biodiversity is shown in Figure3.11, which was downloaded from the Biodiversity Indicators Partnership Dashboard(BIP)[24]. The Figure shows the Protected Area Representativeness Index for Yemen was 0.023 in 2000, & has enhanced insignificantly over the period of 2000-2016 at an annual rate of 1.22% to reach 0.028 in 2016, see figure3.11 above.

[23] www.unbiodiversitylab.org.

[24] www.bipindicators.net or at : http://bipdashboard.natureserve.org/metadata/parepresentativeindex , which derived from Commonwealth Scientific and Industrial Research Organization (CSIRO).

From above discussion, Yemen's protected areas are slightly contributing to safeguarding Yemen's biodiversity, even though they are key component of Yemen NBSAP2. Besides of being at low coverage, current protected areas are not ecologically representative nor integrated into the wider landscape and seascape. Further, current protected areas are rarely reported to have effective & enforced management plans. Therefore, a more ecologically coherent network is highly needed in order to improve PAs representativeness & to achieve the intended target on time. Assessment on effectiveness of PA management, including PA connectivity is shown under ABT 18 & 19 on community-based planning & management.

Given the ineffective assessment concluded by section II as regard the implementation measures identified for the attainment of protected area outcome, Yemen is not likely to achieve protection of 17 per cent of terrestrial lands & 10 percent of marine ecosystems by 2025, unless current performance improve substantially. The manifestation on accuracy of this assessment is given by adequate indicators provided by the UN Biodiversity Lab (UNBL)[25], the Biodiversity Indicators Partnership Dashboard(BIP)[26] indicators , and http://www.protectedplanet.net. This indicators include: proportion of Yemen terrestrial ecosystem protected[27], proportion of Yemen marine ecosystem protected[28], the mean percentage of each KBA covered by Protected Areas[29] (Figures 3.10) the Protected Area Representativeness Index for Yemen[30] (figure 3.11), spatial representativeness of Yemen protected area system(Map2- UNBL)[31], and connectedness Index for Yemen[32] (Figure 3.15). Therefore, in the light of adequate information secured from international sources, one can conclude that the assessment of this target has been made based on comprehensive evidence, even though these data are not available local and monitoring system is lacking . In this context, it worth –noting that current information base and monitoring systems, is fragmented & poorly coordinated, for which information derived locally is incompatible, unreliable, inaccurate and inconsistent for managing and monitoring natural resources. This situation is aggravated by limited funding, lack of technical capacity and trained manpower to maintain and operate established monitoring systems sustainably. To this end, more work & renewed efforts are required to tackle these constraints, and subsequently ensure the development of assessment report that is highly responsive to the CBD reporting requirements as spelled out by the guideline of 6NR .

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[25] www.unbiodiversitylab.org.

[26] www.bipindicators.net or at : http://bipdashboard.natureserve.org/metadata/paconnectednessindex, & was derived from Commonwealth Scientific and Industrial Research Organization (CSIRO)

[27] http://www. protectedplanet.net.

[28] http://www. protectedplanet.net.

[29] Indicators downloaded from the Biodiversity Indicators Partnership Dashboard(BIP) on www.bipindicators.net or at : http://bipdashboard.natureserve.org/metadata/protection-keybiodiversity-areas

[30] Indicators downloaded from the Biodiversity Indicators Partnership Dashboard(BIP) on www.bipindicators.net or at : http://bipdashboard.natureserve.org/metadata/protection-keybiodiversity-areas

[31] www.unbiodiversitylab.org.

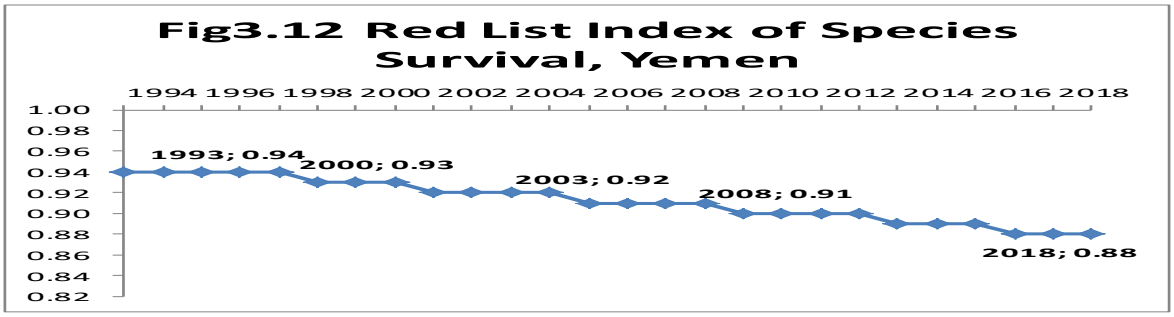
[32] www.bipindicators.net or at : http://bipdashboard.natureserve.org/metadata/paconnectednessindex, & was derived from Commonwealth Scientific and Industrial Research Organization (CSIRO)

Aichi Biodiversity Target 12: Reducing risk of extinction

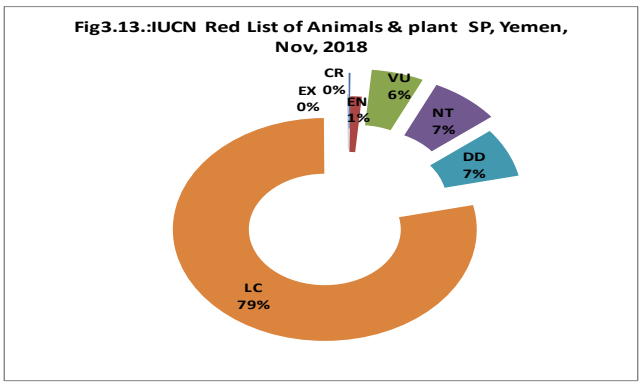
ABT 12 - By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.
Equivalent National Target(s): T 2 : By 2025, 50 % of endemic, rare & endangered plants, mammal and bird species will be conserved

No significant progress Made

Because of complete lack of measures targeted for prevention and safeguarding available species, the last remaining refuge of Yemen's endemic taxa, mammal and bird species remained endangered & vulnerable to extinction. As per red list index[33], overall Yemen's mammals, birds, plants, and amphibians shows a downwards trend, implying declining



aggregate survival probability of the country's species.. During 1993-2018, the Red List Index was 0.93 in 1993, & has changed at negative an annual rate of -0.27% to reach 0.88 by 2018, see Figure3.12.



The Yemen IUCN Red List, a statutory list that contains 2608 known animal & plant species of importance to Yemen biodiversity, of which 79 percent are least concern, 6 percent vulnerable, 7 percent are near threatened, and 1 percent are endangered, figure 3.13.

Given that the implementation of NBSAP actions identified for production of NT2 has been assessed in section II to be ineffective, it is unlikely to conserve 50 % of endemic endangered species by 2025 if current trend of progress is continuing. However, it worth noting this conclusion has been derived based on availability of partial evidences in the form of two biodiversity indicators, respectively highlighting Yemen Red List Index (Figure3.12[34]), and trends in the number and type of species extinctions (Figure3.13[35]).

[33] International Union for Conservation of Nature (IUCN), can be accessed at http://www.iucn.org/ and BirdLife International (2018), can be accessed at http://www.birdlife.org/

International Union for Conservation of Nature (IUCN), can be accessed at http://www.iucn.org/ and BirdLife [34] International (2018), can be accessed at http://www.birdlife.org/

Additionally, comprehensive assessment of this target has been constrained by lack of local monitoring system, coupled with lack of indicators on : trends in extinctions prevented by conservation action, trends in Living Planet Index, species protection Index for species in decline, and Wild Bird Index. among others. To better quantify the assessment level of this target effort should be geared towards compiling & incorporating missing indicators into the CHM unit of EPA so as to be accessed for future monitoring of status and trends of biodiversity and future reporting, including the reporting the CBD.

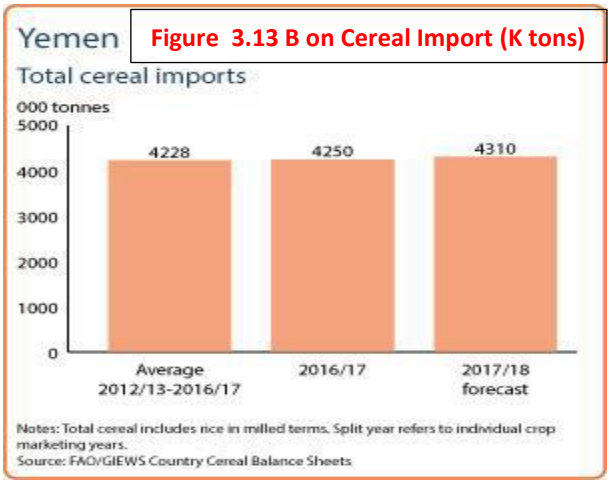
Aichi Biodiversity Target 13: Safeguarding genetic diversity

ABT 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.

Equivalent National Target(s): T 3 : Target 3: By 2020, 70% of the genetic diversity of Yemen cultivated plants species , & domestic animals will be conserved in gene banks.

No significant progress Made

Because of non-delivery of most activities planned under this target, the conservation rate of Yemen's cultivated plants species remained much below the 2020 target identified by the NBASP2. This implies that the decline of national genetic landraces such as barley, wheat, sorghum, cereals, vegetables, fodder, cash crops and fruits is continuing, causing high reliance on import to meet the food needs of Yemnin people and fooder for their livestock with notable threat in food security. This impact is confirmed by FAO statistics[36] accessed in Dec-2018.



According to the agriculture Census of FAO, the total cultivated area has declined from 3.14 percent of national total area in 2002 to merely 2.93% in 2017. As a result, the country remained highly dependent on import to meet its domestic food need, and this reflected by import data of FAO, which shows that average cereal import has increased from 4228 K tons between 2012/13 to 4250 between 2006/17, see figure 3.13B. Further, according to the 2018 humanitarian needs overview, approximately 17.8 million Yemenis are estimated

[35] International Union for Conservation of Nature (IUCN), can be accessed at http://www.iucn.org/ and BirdLife International (2018), can be accessed at http://www.birdlife.org/

[36] Source : Reference http://www.fao.org/nr/aquastat accessed Dec-2018

to be food insecure[37], a 5 percent increase over the 2017 estimates. This figure includes 8.4 million people who are considered to be "severely food insecure and at risk of starvation", about 24 percent more than in 2017.

Given that the implementation of NBSAP actions identified for production of NT3 has been assessed in section II to be ineffective, it is unlikely to conserve 70 % of genetic diversity of Yemen cultivated plants species by 2025 if current trend of progress is continuing. This result of the assessment has been concluded based on availability of limited evidences, given by of two biodiversity indicators, respectively highlighting derived from FAO statistics[38] and are related to : trends of cultivated area(figure3.7), trends of wheat production(table 3.5) and trend of cereal import(figure 3.13B). In order to improve assessment level of this target, effort should be given to compiling and incorporating numerous biodiversity indicators into the CHM unit of EPA . This include: rends in genetic diversity of cultivated plants, trends in genetic diversity of farmed and domesticated animals, red list index: wild relatives, species habitat index: wild relatives, species protection index on wild relatives, and trends in genetic diversity of socio-economic & culturally valuable species

Global Biodiversity Theme 14.1: Poverty Mainstreaming

ABT 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.

Equivalent National Target(s): T 13: Yemeni poor 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, assuming that 20.1% of people are under poverty level in 2014.

Yemen is moving away from target

Because of escalating war and the subsequent ineffective progress made in implementation of NBSAP measures identified for poverty mainstreaming, the Yemeni Government failed to enable poor people accessing natural resources, thereby leaving the vast majority of Yemeni people under escalating poverty. Specifically, Yemen is not moving to achieve the 15% reduction in poverty level among Yemeni people by 2020, but conversely the poverty situation is getting worse, mainly because of continuing escalation of war. This result was confirmed by the FAO analysis[39] conducted while developing Yemen Plan of Action on

[37] Source : FAO/GIEWS (global information and early warning system on food and agriculture) country balance cereal sheet, http://www.fao.org/nr/aquastat

[38] Source : Reference http://www.fao.org/nr/aquastat accessed Dec-2018

[39] Source: FAO. 2018.Yemen, Plan of Action –Strengthening resilient agricultural livelihoods (2018–2020). Rome. 68 pp.

Strengthening resilient agricultural livelihoods. According to this source, the war resulted in increased levels of poverty, food insecurity, undernutrition and malnutrition, water shortages and land degradation. In 2018 some 75 percent of the country's total population of 29.3 million (i.e. 22.2 million people) are in need of humanitarian assistance, including 11.3 million people who are in acute need and urgently require immediate assistance to survive – an increase of 1 million since June 2017. Vulnerable populations in 107 out of 333 districts are facing heightened risk of famine and require integrated response efforts to avert a looming catastrophe.

"Some of the factors contributing to this, and attributed directly to the crisis, include: (i) limited availability and high cost of agricultural inputs; (ii) low availability and high cost of animal feed; (iii) inability to control plant and animal pests and diseases; (iv) increasing production of *qat (Catha edulis)* as a cash crop, which reduces the amount of land available for food production and contributes to the depletion of the water table; (v) an emigrating workforce; and (vi) limited public resources allocated to the sector. Other more structural factors include: (vii) diminishing natural resources, in particular groundwater mining (following uncontrolled extraction and inefficient water management practices) and the degradation of land (following deforestation, lack of terrace maintenance, soil erosion and soil salinity); (viii) the effects of climate change and variability; and (ix) inequitable access to arable land".

Gender mainstreaming

Rural poor living nearby Yemen's protected particularly women and children suffer from high malnutrition levels attributable increased poverty associated with inability to access fresh vegetables and fruits, cultivated land, drinking water, medicinal biodiversity products, and fishery resources which are collectively the consequence of biodiversity deterioration. This situation is further escalated by lack of partnerships with local communities' namely with women/men communities in addressing livelihoods & conservation of natural resources, particularly under lack of women/men groups, low awareness, knowledge & experience on methods techniques on how to access, manage & use natural resources.

To address poverty among poor women/men within and nearby protected areas, the government managed implementing two initiatives, respectively target for enabling local communities(women & Men) to act in conservation management and livelihoods issues in Socotra Island & in Aden wetlands.

In Aden wetlands enabling and poverty mainstreaming initiative has been promoted by EPA in cooperation with UNDP Programme on Sustainable Natural Resources Management(2009-2013), and this collaborative effort has ended up by enabling one men group and one women group to exist and interact in mainstreaming biodiversity conservation & poverty issues, while managing Aden wetland protected area. The two NGOs, have been recognized as officially

designated body responsible of the management of AL-Heswa PA, and they perform their responsibility through 10 males and two females. Further, AL-Heswa Women group have been recognized as catalyzing body concerned with promoting women livelihoods through enhanced access and marketing of environmental friendly products such the handicrafts, basketry, vinegar, honey, traditional clothes and milk products among other. To further enhance the local NGOs' performance in biodiversity protection in Aden, four environmental associations, namely the Ras Omran Marine Turtles Protection Society, Environmental Friends Society, Al Hassawah Environmental Women Society and Yemen Society for Natural Resource Sustainability have recently established the Alliance of Nature Protectors (ANP) with aim to serve as a local environmental advocacy & lobbyists Group within Aden city. Currently, the ANP trough cooperation with UNEP & EPA has designed & implemented wide range awareness advocacy initiatives, including organization of environmental exhibitions, cleaning campaigns to remove garbage from sea shores of Aden, and establishment and building capacities of school environmental clubs among others.

To promoting enabling and poverty mainstreaming activities in Socotra, the Government in cooperation with UNDP/ GEF Socotra Governance and Biodiversity(SGBP), has enabled local poor mainly women/men to access productive resources & participate in planning & management of natural resources, thereby leading to enhancing ownership of local communities beside enhancing their livelihoods & strengthening their resilience to withstand against poverty. The manifestation of enhancing local community participation & capacities is reflected by the creation of a total of 7 women groups across Socotra Island, and enabling them along with previously established men groups to access the SGBP fund with aim to mainstream poverty and conservation principles into Socotra nature reserve. Clearer indicators on improving women livelihoods is given by UNDP Assessment report [40] on achievements of the SGBP related to NGO support in Socotra Archipelago. The reports shows that a total of 295 women have been trained on establishment & management of home-gardens, and then enabled to access & utilize UNDP/GEF fund for establishing a total of 295 self- owned home-gardens across the Island. According to the report, and based on beneficiaries point of view, the established home-gardens of Socotra have the capacity to deliver to Socotran family and local markets with significant quantities of tomatoes, eggplants, sweet potato, radishes, okra, pistachios, and melons, which are viewed by national experts as a significant sources for

[40] Source: Assessment report on achievements of the GEF/UNDP project (SGBP) related to NGO support in Socotra Archipelago, Dec, 2019

meeting home consumption needs, enhancing household incomes and contributing to strengthening food security levels among Socotran families.

As per the finding of the said report, fruit production of each home garden helps each individual owner to gain an average monthly income from the sale of crop products amounting to 56,0000 YR, in addition amount of 9,000 YR of crop products consumed by family, bringing monthly average income of each family to about 64,000 YR, which nearly equivalent to the average salary received by government employee across the country. Broadly, a total beneficiaries of home gardens initiatives across the island were estimated 5861 persons, of whom 53% were from women as compared with 47% from men. This rate of beneficiaries of conservation & livelihood activities in Socotra clearly shows reduced gap between women and men, implying that poverty mainstreaming activities in Socotra have been gender-responsiveness, whereas each societal segment benefited from funding of conservation & livelihood activities nearly at an equal basis .

AS for mainstreaming biodiversity conservation in Socotra , both men and women NGOs have been involved in implementation of at least 4 projects on conservation & sustainable use, of which 2 focused on conservation of the dragon blood trees, one project focused on cultivation of frankincense trees in home gardens, and one project on conservation & promotion of the use of medicinal and aromatic plants. Total beneficiaries of above mention conservation activities were about 5551 persons, of whom 52% were female and the rest are male. Again this indicator shows that gender disparity between men & women at protected area level has reduced significantly, implying that biodiversity mainstreaming activities in Socotra have been viewed as gender-responsiveness, whereas both men & women have benefited from funding of conservation activities at nearly equal basis .

The Government in cooperation with UNDP/ GEF Socotra Governance and Biodiversity(SGBP), has enabled Socotra Women to enhance their income & create jobs based on improvement of chees production, handicrafts production utilizing palm tree , wool production , and salt productions. To this end, a total of four Socotra women groups have been enabled to access the SGBP funds and utilize it to establish four small local business schemes, that supply a total of 3467 beneficiaries with significant quantities of chees, handicrafts, wool, and salt products across the Island. Of total beneficiaries income generating activities about 52% are female and the rest 48% are male, implying that both men & women have accessed income-generation activities at nearly equal basis .

To sum up, the Government through implementation poverty & gender mainstreaming activities has partly managed ensuring equal access to the basic

necessities among men and women at protected area level, even though the country performance at national level has been assessed to be much lagging behind the intended NBSAP target National Target 13, calling for reduction of population living under national poverty level by 15% in 2020. For this end, particular efforts must be devoted to tackling poverty and unemployment, reducing gender disparities and addressing inequalities at all levels through 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" [41] .

Because only 1 percent of activities identified in the NBSAP has been implemented, current performance to is viewed to be inadequate to achieve the national target13. As three are no local monitoring system & indicators on this target, the reported assessment stated here has been made based on limited evidences derived from FAO analysis[42] on Strengthening resilient agricultural livelihoods, and were related trends on poverty level and trends on food security. The lack of local monitoring system & indicators has constrained the undertaking of comprehensive assessment in particular because of lack of numerous assessment indicators such as : Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Scale (FIES); percentage of population using safely managed drinking water services; trends in safeguarded ecosystems that provide essential services; red list index for species used for food and medicine; pollinating species; living planet index of utilized species; species habitat index for species that provide essential services; better life Index; mountain green cover index; PA coverage for important mountain biodiversity; and trends in the restoration of ecosystems that provide essential services.

To improve the assessment level of this target effort should be geared towards improving the monitoring system of the CHM unit of EPA so as to include all biodiversity indicators to be used for future biodiversity monitoring and reporting. Additional effort should be given to improving spatial data & maps of ecosystems providing essential ecosystem services, such as water, food,

[41] Source: National Biodiversity Strategy & Action Plan (NBSAP Ii) EPA,.2015. Yemen.

Source: FAO. 2018.Yemen, Plan of Action –Strengthening resilient agricultural livelihoods (2018–2020). Rome. 68 pp. [42]

livelihoods, disaster risk reduction, and the extent of their ecological integrity, threat and protection.

Aichi Biodiversity Target 14: Restoration and Safeguarding of Ecosystem Services, Delivering Fresh water

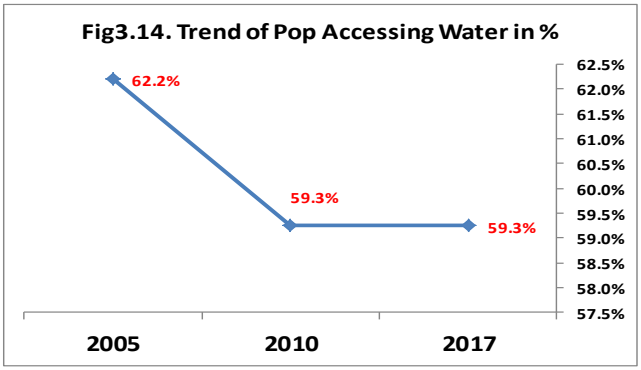
ABT 14 - By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities and the poor and vulnerable.

Equivalent National 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)

No significant progress Made

Before the NBSAP 2 development, water supply was in adequate to meet urban and rural population. Specifically, about 81% of urban population had access to safe drinking water compared with 21 % of rural population. Recently, after three years of NBSAP implementation, no significant improvement in water availability or in water access has been witnessed, and this is attributable to ineffective implementation performance incurred by inadequate implementation rate of NBSAP activities planned under water component, coupled with the escalating war associated with frequent occurrence of droughts and flash floods. Accordingly, the population's water access has not currently improved, & it is not likely to reach the 65% target by 2020, as identified by NBSAP2.

Actually, the population water access showed negative trends from 62.2 % in 2005 to 59.3 percent in 2017[43], see Fig3.14.

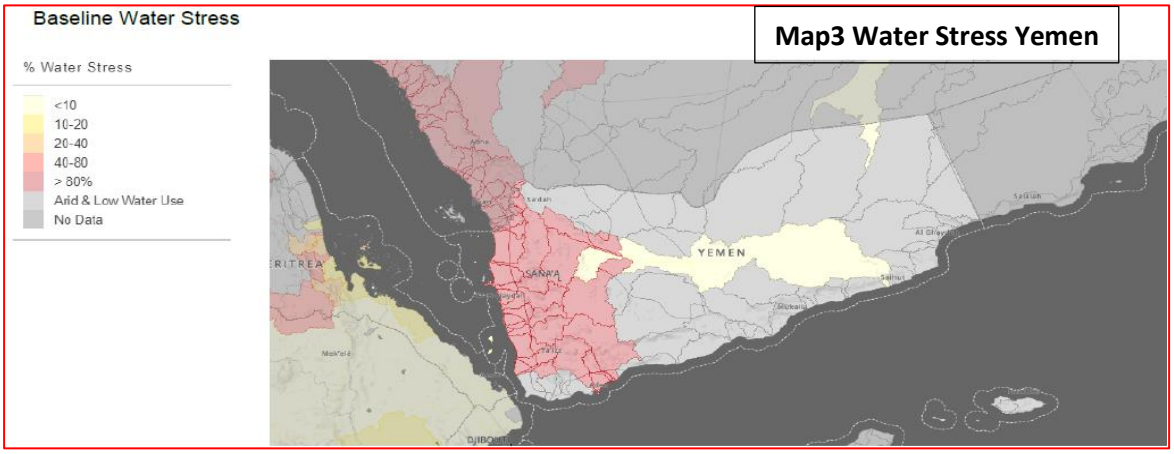


The declining water access is reported to be attributable to none change in total renewable water resources under inadequate conservation programs targeting the protect & safeguarding of already depleting groundwater. According to FAO statistics, the renewable water resources was 2.1 Km^3/year in 2005 & remained at this level up to end 2017[44]. The availability of water resources under unchecked rapidly growing population has resulted in notable reduction of per capita annual share of available water resources from 196 m^3 in

[43] Source: UNDDATA, Dec, 2018
[44] Source: http://www.fao.org/nr/aquastat accessed in Dec-2018

1990 to 87 m^3per year in 2010, to 78.26 m^3 per capita per year in 2014[45]. It is anticipated that groundwater reserves are likely to be mostly depleted within 20 to 30 years, irrespective of climate change, reducing agricultural output by up to 40 percent. Poor sanitation brought about by the crisis is also having an effect on water quality – already at risk from salinisation due to over-extraction and inefficient water management practices.

Most of the water withdrawn was groundwater (from wells and springs), resulting in groundwater depletion as withdrawal exceeded the annual groundwater recharge.



Map3 Water Stress Yemen

As given by the Map3 water stress on the groundwater levels remained critical in highly populated governorates such as Taiz' Hodiedah, Ibb and the capital city Sana, where more 43 percent of the population lives. In these areas, which are mainly located in the western part; more than 80% of ground water is mined[46] to meet the increasing needs of such populated zones. Under unchecked population growth coupled with increased impact of climate change & drought, the largest part of the population lives in the Yemen Mountain area in the western part of the country, where rainfall is still significant, as compared with eastern part, were rainfall is not high & population density is low. Therefore, water stress in with eastern part remained generally between 10 to 40 percent.

As concluded by section II, the progress towards implementation of actions identified for the attainment of the fifth national target (5NT) has been viewed to be ineffective. This in turn implies that Yemen's performance is by far lagging below the intended expectations of the NT5, and it is not likely to increase water access to cover 65% of Yemen population by 2020(NT5) if current trend of progress is continuing . However, it worth noting the assessment level of this target has been made based on availability of partial evidences, illustrated by four national indicators, respectively highlighting decreasing trends of population water access[47] (figure 3.14), none change of renewable water resources[48], negative trend of per capita annual share of water resources[49], and varied spatial water

[45] Source: http://www.fao.org/nr/aquastat accessed in Dec-2018

[46] Source: UN Biodiversity Lab at: www.unbiodiversitylab.org

Source: UNDDATA, Dec, 2018 [47]
Source: http://www.fao.org/nr/aquastat accessed in Dec-2018 [48]
Source: http://www.fao.org/nr/aquastat accessed in Dec-2018 [49]

stress (map3). Further, the assessment of this target has not been made based on comprehensive evidence, but rather based on limited evidence, utilizing four indicators stated above. To have assessment that is based on comprehensive evidence, more work & renewed efforts are required in order to improve the monitoring system of the CHM unit of EPA so as to include biodiversity indicators that are prerequisite to produce assessment of this target that is based on comprehensive evidences. This include among others the following indicators: percentage of population using safely managed drinking water services, extent of safeguarded water ecosystems that deliver fresh water, and trends in the restoration of water ecosystems that provide essential services.

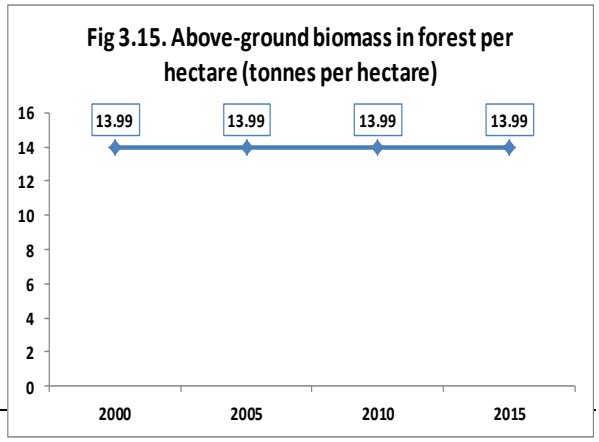
Aichi Biodiversity Target 15: Climate resilience: 15.1 Adaptation

ABT 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.

Equivalent National Target(s): T 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 terraced agriculture), thereby contributing to climate change mitigation and adaptation and to combating desertification

No significant progress Made

Because of non-delivery of more than 88 percent of activities planned under this target, the degrading ecosystems such the wetlands, mangrove, forest and terraced agriculture, seagrass and coral reefs remained highly none-resilient against climate change impact, implying that the carbon stocks of these habitats are declining. Good indicators confirming this conclusion is shown by figure 3.15, which was derived from the website of SDG Indicators[50].



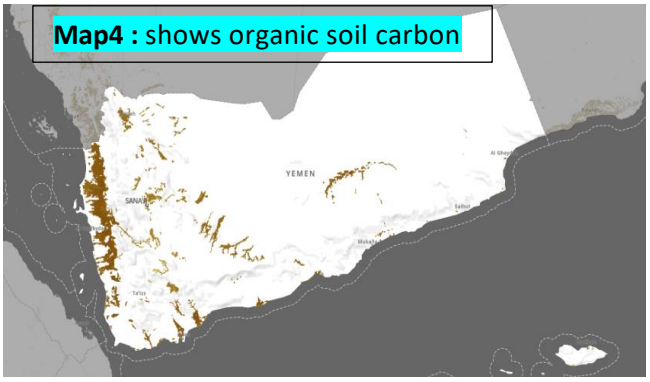
The figure shows that above-ground biomass in forest per hectare remained at 13.99 tons for the period of 2000 to 2015,

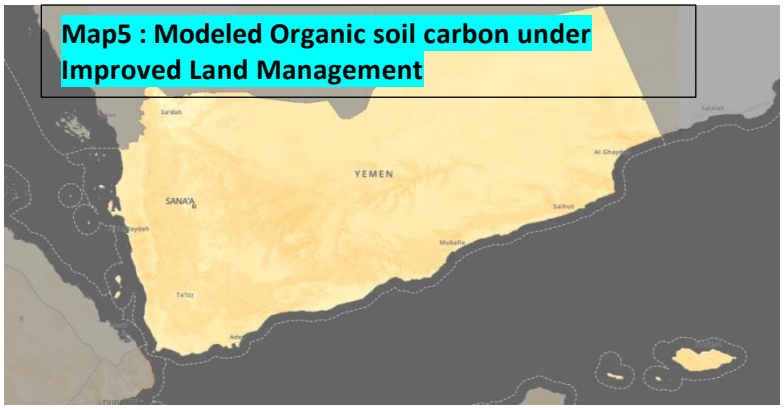
[50] SDG Indicators access at https://unstats.un.org/sdgs/indicators/database/ , data was derived from FAO, Global Forest Resources Assessment

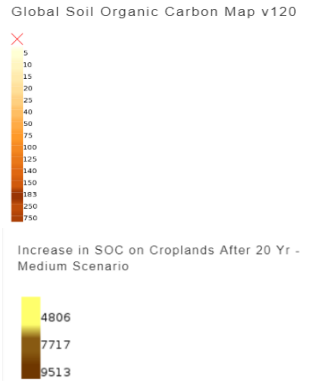
implying that carbon stock of forest has not changed over the said period. This result indicates that forest area & carbon stocks has not changed since the country adopted the Strategic Plan for Biodiversity 2011-2020. This finding is also consistent with results concluded before under ABT 5 section on forest, see fig 3.4 . The reported unchanged stagnant extinction risk trends of coral and reef fish is continuing particularly under absences of coping measures to control illegal destructive fishing by foreign boats

This implies ecosystem resilience against climate changed remained weak not only for forest but also for all habitats, and this is attributable to none delivery of NBSAP restoration activities targeted for carbon sequestration activities such as the expansion of protected areas, restoration of "Blue Carbon" ecosystems (mangroves, sea-grass beds, & coral reefs,), and reforestation to reduce emission from deforestation and forest degradation (REDD) among others.

Most evidently, there is lack of restoration activities targeted for of degraded wetland, terraced agriculture, and rangelands, for which the extent and trends of carbon stocks of these habitats are expected to be declining in association with habitats loss & the subsequent increased emissions of carbon dioxide, methane and other greenhouse gases. However, no indicators, national data or maps on carbon sequestration rate or avoided emissions are available to quantify carbon stock or carbon sequestered due to restoration of rangelands & terraces. To fill this gap, the UN Biodiversity Lab on website[51] was accessed, and two maps related to restoring degraded







ecosystems and enhancing ecosystem resistance to climate change were derived. The map shows organic soil carbon in Yemen (Map4) and modelled potential increases in organic soil in cropland (e.g. carbon sequestration) after 20 years under improved land management practice (MAP5).

[51] www.unbiodiversitylab.org

As for implementation of restoration activities, stakeholders review demonstrated that the restoration of at least 15 per cent of degraded ecosystems(Wetlands, Mangrove, Forest and terraced agriculture), had not yet been achieved, and is requiring a critically renewed and sustained effort in order to reach the intended by 2025, Specific needs in this regard discussed in section II.

To assess the level of assessment conference of national target9 on enhancing ecosystem resilience, reference is made to assessment results concluded by section II as regard the implementation effectiveness of actions taken to restore and safeguard Yemen's key ecosystems concerned with delivery of key ecosystem services. This assessment shows ineffective delivery of interventions planned for restoration of degraded ecosystems, leading to insignificant progress towards the achievement of national target9 (NT9) concerned with restoration of at least 15 per cent of degraded ecosystems in Yemen. The result of none attainment of NT9, can be verified based on availability limited evidences, illustrated by three national indicators, respectively highlighting trends of carbon stocks (figure 3.15) trends of above-ground biomass in forest per hectare[52] (figure 3.14), trends of carbon stocks of Yemen forest[53] (figure 3.14), and trend of forest area (figure 3. 4) . The reported limitation of data and monitoring gaps, are limiting the production of comprehensive assessment that covers all aspects of eco-systems resilience & restoration of such as: 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.

Aichi Biodiversity Target 15.2: Climate Resilience (mitigation)

ABT 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.

Equivalent National Target(s): NT 11 : Energy resilience has been promoted and is manifested by 14% reduction of energy-related GHG emissions in 2020, and 23% in 2025, as compared with 2015.

On track to achieve target

Yemen is committed to transition towards green economy, and promotes sustainable development paths. This has been clearly expressed in the national report to the Rio+20

[52] SDG Indicators access at https://unstats.un.org/sdgs/indicators/database/ , data was exported from FAO, Global Forest Resources Assessment

[53] SDG Indicators access at https://unstats.un.org/sdgs/indicators/database/ , data was exported from FAO, Global Forest Resources Assessment

conferences in Rio de Janeiro in June 2012 and the 4th Five Year Socio-Economic Development Plan for Poverty Reduction (4th DPPR). Also, energy resilience has been recognized and incorporated into two national strategies, notably the NBSAPII and the National Strategy for Renewable Energy and Energy Efficiency (NSREEE). In the NSREEE & NBSAPII, Yemen is committed to being a low carbon economy and has ambitious targets to achieve the national target 11, which focuses on promotion of Energy resilience.

In its effort to implement the NBSAP, the Government has undertaken three priority measures that helped putting Yemen on track to achieve this target. Specifically the nationwide diffusion of individual solar home systems (SHS) beside the introduction of Ma'rib-I & Ma'rib-II open-cycle gas turbine power plants have been recognized as the most important interventions mitigating GHG emission incurred by the energy sector. The implementation of the three interventions have led to total annual emission reduction amounting to 1647 Kton CO2 e[54], whereas 34% of which is due to the introduction of the Ma'rib-I, 341 MW open-cycle gas turbine plant, 41% is due to the introduction of Ma'rib-II, 420 MW open-cycle gas turbine plant, and 24% is attributable to the diffusion of SHS. Total emission reduction of the three sources represents 7% of 2012 energy-related GHG emissions, implying that Yemen was progressing towards meeting the 14% NBSAP target. Nevertheless, things has collapsed upon the break of 2014 war. It has caused the damage of the Ma'rib-I open-cycle gas turbine plant and the Ma'rib-II, 420 MW open-cycle gas turbine plant, leading to complete closure of the two power plants & triggering the people inaccessibility to public electricity.

However, the SHS still operational & is effectively delivering its services to householders sustainably. Further, the diffusion SHS is viewed as most important energy sources that enabled Yemeni society to withstand against war impact & is feasible to contribute to Yemen transition towards energy resilience & low carbon development paths.

Table 3.6: Electricity Savings & CO2 Emission Reduction Associated with diffusion of Solar Photovoltaic (PV) Systems into Unban/rural households of the Capital Sana'a & its Sub-Rural Districts(Sana'a Governorate)

	Unit	2014	2017
Population Access rate	%	3%	87%
Tot Annual Energy	MWH per year	13	103,317*
Annual Emission Saving	k ton CO2 eq	NA	75**
SHS Installed	#	8,459	246,969
Note*: Rough calculation made by the Author indicates that total annual energy saving would be nearly			

[54] Yemen First Biennial Update Report issued by Environment Protection Authority (EPA) in support with UNDP GEF PIMS Project no. 5204

548,366 MWH per year if the survey is scaled up to cover the whole country

Note** : Rough calculation made by the Author indicates that annual emission saving would be nearly 399 k ton CO2 eq if the survey is scaled up to cover the whole country

Assessment information which confirm that Yemen is moving towards resilient energy is given in table3.6, derived from the assessment report titled " Rapid Survey Report of Installed Solar Systems In Districts of Capital Sana'a & its Sub-Rural Districts [55]".

As revealed by the table, more resilient society is evolving as a result of diffusion of SHS, This is reflected in the increase number of households accessing SHS from 8,459, being 3% in 2014 to about 246,969 households, being 87% of both urban and rural households. As a result, total annual household consumption of solar energy jumped from 13 MWH in 2014 to more than 103,317 MWH in 2017. Energy of Solar House System (SHS) has changed from being the least contributors to households energy in 2014, to become the second most important suppliers in 2017. In terms of CO2 emission reduction, the table shows that the amount of carbon dioxide emissions that could be saved through installation of 246,969 SHS is 75 K ton CO2 eq in 2017 , and this CO2 emissions would have been released if the amount 103,317 MWH per year of solar energy were generated by isolated diesel generators. Indeed, this reduction in CO2 emission was due to energy conservation amounted to 103,317 MWH per year, and was generated through total installations amounted to 246,969 units of solar PV of an average size of 284 Wp in 2017.

Even though of progress achieved, full attainment of 14% reduction of energy-related GHG emissions by 2020 remains conditional on promotion of all green options identified by NSREEE, this include the promotion of Wind energy, Concentrated Solar Power (CSP) systems, the geothermal energy, biomass power energy and the promotion of energy efficiency.

As concluded by section II, the progress towards implementation of actions identified for the attainment of the eleventh national target (NT11) has been viewed to be partly effective. This in turn translated in putting Yemen on track to achieve the target, provided that the ongoing diffusion of solar energy are further supported by promotion of wide range renewables such as wind energy, Concentrated Solar Power (CSP) systems, the geothermal energy, biomass power energy and the promotion of energy efficiency. This finding has been concluded based on limited evidences, given merely by two indicators, respectively highlighting the increased diffusion of individual solar home systems (SHS), and introduction of Ma'rib-I & Ma'rib-II open-cycle gas turbine power plants, which collectively have led to total annual emission reduction amounting to 1647 Kton CO2 e, being 7% of 2012 energy-related GHG emissions. To ensure precise accounting and reporting of the overall effectiveness of Yemen mitigation measures pursuant to the

55 The Rapid Survey Report of Installed Solar Systems In Districts of Capital Sana'a & its Sub-Rural Districts of May 2018, & was prepared by Dar Al-Khadarah for Studies Consultations and Services under the third National Communication

UNFCCC reporting standards. It is urgently needed to strengthen the climate Change Unit CCU and EPA focal point through technical and financial assistance with ultimate aim to upgrade the CCU to act as institutional arrangements for measuring, reporting, verification of mitigation impact incurred by mitigation projects. Further, the monitoring system of the CHM unit of EPA needs to be furnished with biodiversity indicators that are prerequisite to produce assessment of this target that is based on comprehensive evidences. This include among others the following 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; and percentage of renewable energy in energy production

ABT 18: 18.1: Promotion of Community-based Management

ABT 18 - By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.

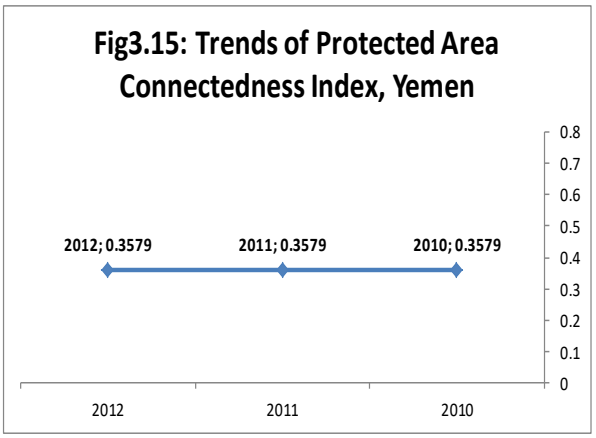
Equivalent National Target(s): T17: In partnership with government, community-based management approach has been widely promoted to cover 50% of Yemen's protected area by 2020, and 100% by 2025, thereby leading to improved effectiveness of Yemen's protected areas along with promotion of traditional knowledge and practices on conservation and sustainable use of biological resources .

National 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).

Yemen is on track to achieve target

Even though the country is on track to achieve the shift towards community based management target by 2020, there is insufficient progress as regard the promotion of integrated planning to account for the Impact of the surrounding non-protected landscape.

To assess terrestrial protected areas connectivity to the surrounding non-protected landscape which contains primary vegetation (habitat), the Biodiversity Indicators Partnership Dashboard(BIP)[56] indicators were accessed, and from which an assessment indicator on connectivity of Yemen PAs was downloaded & used for this assessment. The indicator is known as the Protected Area Connectedness Index and shows changes in connectivity among terrestrial protected areas and areas containing primary vegetation (habitat) in the surrounding non-protected landscape. It integrates information from remotely-sensed forest change and land cover change datasets with a global protected area database. The data derived from this sources is given by Figure 3.15.



The figure shows that the Protected Area Connectedness Index for Yemen was 0.3579 in 2012, and has changed from 2010 to 2012 at an annual rate of 0%. This implies that 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. Therefore, these PAs remains vulnerable to high threat from neighbouring areas, and in order to minimize this impact a more ecologically coherent network & planning are highly needed with specific focus on improving PAs connectivity and planning & management effective representativeness, with ultimate end to achieve the intended target on time. This situation is further escalated by lack of effective & enforced management plans in most PAs. Almost six out of 11 terrestrial & marine protected areas are recognized to have effective & enforced community management bodies and management plans, while the remaining have not yet initiated such planning process. This implies that Yemen has already effected community-based management approach in about 50% of Yemen's protected area as targeted to be achieved by 2020. Nevertheless, more efforts are needed to complement the protected areas approach with other measures that tackle pressures on biodiversity neighbouring landscapes, as identified by Target 9 on integrated land use planning. Further, PA representativeness needs to be broaden to cover all ecosystems, and traditional knowledge and practices on conservation and sustainable use of biological resources needs to be promoted in order to fully achieve the designated target.

[56] www.bipindicators.net or at : http://bipdashboard.natureserve.org/metadata/paconnectednessindex, & was derived from Commonwealth Scientific and Industrial Research Organization (CSIRO)

Section IV: Description of the national contribution to the achievement of each global ABT targets of the Sustainable Development Goals(SDG)

This section describe Yemen's contribution towards the achievement of each global ABT, and to the extent possible describe Yemen contributions towards the Sustainable Development Goals (SDGs). Given that Yemen's targets are identical to the ABT, most of information described here has been already illustrated in section III and are cross-referenced into this Section in order to further confirm Yemen contribution to the global targets.

ABT 1: Biodiversity Awareness

Despite the significant improvement of biodiversity awareness among local NGOs, Women Groups, students' and lobbyist groups, the decision makers appreciation of biodiversity values remained poor, leading to none- mainstreaming of biodiversity values into national strategies, local pans & national account. Specific indicators on enhanced awareness among people has been reflected in the establishment of 120 environmental clubs, 9 women's groups, and many other lobbyist groups combined with increased trends in their engagement in organizing biodiversity awareness activities & biodiversity protection. Indicators on lagging of biodiversity awareness among decision makers is manifested by limited decision makers efforts towards mainstreaming biodiversity value into national policies. This implies that citizen contributions to Achieving ABT1a/b is more important than decision makers' contributions, but either segments remained unaware of biodiversity value, owing to inadequate valuation studies on biodiversity. This in turn implies that total societal awareness and efforts remained inadequate to holt biodiversity loss.

ABT 2: Biodiversity Mainstreaming

Except for the development of ecosystem valuation study, Yemen has not made significant progress on integrating biodiversity values & the conservation of key ecosystem services into national strategies & relevant sectoral plans and policies as called upon by the ABT2 & equivalent NT 14.1. Specifically, biodiversity values is not yet considered by the 4th Socio-Economic Development Plan for Poverty Reduction(4^{th} DPPR), nor by sectoral strategies such as the National Agriculture Sector strategy (NASS), the National Water Sector Strategy and Investment program (NWSSIP), and national fisheries sector strategy (NFSS). Failure to integrate biodiversity values into the 4^{th} DPPR implies that Yemen is not yet contributing to the ABT 2a, nor to the SDG 15.9 on integration of biodiversity values into national planning, poverty reduction. Additionally, Yemen has not made any efforts to mainstream biodiversity values into overall national planning processes, including national accounting (ABT 2c) and into national reporting systems(ABT 2d).

Thus, until some rigorous efforts undertaken to ensure that environmental costs and benefits are integrated in economic decision making at both national and local planning,

then ecosystems will continuously be riddled with uncountable unsustainable and myopic consumption patterns and practices. Current evidence on the continuing deprecation of ecosystem is manifested by continuing uptake of biodiversity products such as fuelwood, water, fish, and medicinal genetic species from the nature, against no price, thereby leading to over harvesting of fishes, over-mining of underground water, excessive use of native genetic species & extensive wood harvesting for fuel and charcoal production. Underestimation of ecosystem value has been verified by Yemen ecosystem valuation study, which shows that total value of key ecosystems in the country is estimated to be ten times higher than the value of GDP. Nonetheless, most of the ecosystem values such as value of fuelwood, the medicinal values of forests, ground water & fisheries are not taken into account when estimating GDP and the national income accounts integrated into national & sectoral strategies. Thus, the value of ecosystem services and their products are estimated at no value by decision makers and publicly, thereby leading to unsustainable harvesting of these resources and loss of biodiversity.

ABT 3 Incentives and Subsidies

Owing to insignificant progress made to achieve the fifteenth national target (15NT) on removal of incentive & subsidies, Yemen's contributions towards achieving the ABT3 been assessed to be limited. This conclusion is clearly manifested by extent and trends of chemicals fertilizer use as illustrated by figure 3.8 [57] presented in section III. The figure shows increased trend of chemicals fertilizer use from 0.48 Tons in 2002 to 1.09 tons 2013, indicating the continuing harmful impact of chemicals fertilizer use incurred by none removal of subsidies, advocating import of agro-chemicals & fertilizer. This in turn implies that Yemen's contributions to the ABT3a on elimination of subsidies harmful to biodiversity is still very modest. Further, the government has not yet decreed positive incentives, that support water efficiency use, pollution free industries, industrial compliance, adoption of green technologies and use of recycled materials, which means no enough effort has been made to contribute to the ABT 3b on encouraging application of positive incentives.

ABT 4 : Sustainable Production & Consumption (SPC)

Given the ineffective implementation of measures taken to achieve the sixteenth national target (16 NT) on sustainable production and consumption, Yemen's contributions towards achieving the ABT4, and to the corresponding sustainable development goals (SDG) have been assessed to be insignificant. This fact is clearly manifested in section III via four indicators on extends & trends of carbon release, fossil fuels, solid waste disposal, and use of renewable energy. Figure3A shows increasing trend of carbon release & pollutants into atmosphere attributable to progressively increasing reliance on polluting fossil fuels use (figure3B) associated with limited use of renewable energy (Figure3c). The limited use of renewable energy implies limited contribution to SDG 7.2 on increase renewable energy, while the increasing trends of carbon release, fossil fuels use and solid waste

[57] Source : World Development Indicators (WDI)

disposal indicates that Yemen is poorly contributed to ABT 4, which calls for keeping the impacts of these pollutants within safe ecological limits of natural resources. Additionally, fig3d demonstrates a progressive increase of dumping of solid waste into natural environment, implying insignificant contribution to SDG 12.5on Reduction of generation of MSW. More evidently, water stress rate in the form of freshwater withdrawal remained high, implying low contribution to SDG target 6.4 on increase water use efficiency, see this impact map3 in section III. Finally, the production sectors such as tourism, mining, industry, transport and waste sectors have not contributed much towards ABT4 & (SDG 12.1) as regard incorporating sustainability & biodiversity principles into their national and local development plans and programmes.

ABT 5 Forest Degradation:

In the light of insignificant progress made to achieve the fourth national target (4NT) on sustainable forest management, Yemen's contributions towards achieving the ABT5, and the corresponding sustainable development goals (SDG) have been viewed to be limited. This conclusion is clearly highlighted by two indictors elaborated by map 1 and figure 3.4 presented in section III. Contrary to what has been called upon by ABT5, Yemen's forest areas- as given by Map 1- are being degrading over the period 1993 to 2009. Similarly, the SDG Target 15.1 calls for increasing percentage forest area as compared with total land area, while Figure 3.4 shows that that the carbon stocks[58] of Yemen forest for the period of 2012 to 2017 remained at 5.16 million tons as direct result of none change in Yemen forest land. Thus, Yemen's performance still lagging below the requisite level of ABT 5, SDG Target 5.1 & 51.2 on sustainable forest management.

ABT 6: Sustainable Management of Marine Living Resource

Because of insignificant progress made to achieve the sixth national target (6 NT) on harvesting fish stocks sustainably, and the seventh national target (7NT) on mitigating climate change impact marine ecosystems, Yemen's contributions towards achieving the ABT6, and to the corresponding sustainable development goals (SDG) have been assessed to be inadequate. This conclusion is clearly demonstrated in section III via two indicators delineated respectively for cumulative human stressors on marines ecosystems, and for Ocean Health Index (figure 3.6). The first indicator as given in Figure 3.5 shows that increasing trend of the cumulative human stressors on Yemen marine ecosystems at a mean annual rate of 3.35% over the period 2008-2013. This indicator explicitly confirms that marine resources are not sustainably harvested, owing to increased trends of pollution other anthropogenic stressors. Thus, Yemen's current performance still lagging below the intended level of ABT 6, and also is not progressing adequately to meet the SDG Target 14.1 as regard the prevention and reduction of marine pollution. The second in indicator the ocean health index has changed at an annual rate of 1.89% over the period of 2012-2016.

[58] Data source: UNDATA, accessed on DEC 2018 combined with data derived from FAO, Global Forest Resources Assessment 2015

ABT 7 Sustainable Management of Agriculture

With Reference to section III on progress assessment of national target 5, one can observe that Yemen is Progressing, but at an insufficient rate to achieve the intended target. Therefore, Yemen's current performance still lagging behind the intended level of ABT 7 & SDG 2.4, which both aim at achieving sustainable management of agricultural areas. To this end, it worth-referring again to table 3.5 and & figure3.7 in section III. The table 3.5 illustrates that total cereal production in 2017was more than 40 percent below the previous year's harvest and the five-year average[59]. Further, the total cereal production showed a negative trend between 2016 and 2017,amounting 43%, implying reduction of land available for food production associated with the depletion of the water resources. On the other hand, figure3.7 shows a continuing drop of crop production coupled by slight decrease of cropland from 1,550 kha in 2012 to 1,546 Kha in 2016, figure3.7 [60].

ABT 8: Pollution reduced:

Because of insignificant progress made towards the achievement of national target 12 on pollution reduction, Yemen's current performance, is by far, much below the expectation to contribute significantly towards achieving the ABT8, and achievement of the relevant sustainable development goals (SDG). The manifestation of this conclusion is articulated by figure 3d on MSW, figure 3.8 on chemicals fertilizer use, & by qualitative national data on wastewater generation. Again figure3d and on MSW (municipal solid waste) shows increased trends of MSW dumping rom 1105 k ton in 2003 to 1520 k tons in 2014, implying poor contribution to SDG 12.5 related to reduction of MSW. As for figure 3.8, it highlights increased trends of chemicals fertilizer use over the period of 2002 to 2013 , indicating slow progress towards meeting ABT 8, concerned with bringing pollution to levels that are not detrimental to ecosystem function by 2020. Finally, the qualitative national data on wastewater generation shows modest increase of wastewater treatment capacity from 132 MCM/yr in 2010 to 135 MCM/yr in 2015. To sum up, the continuing discharge of untreated MSW & wastewater 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.

ABT 9: Invasive alien species (IAS) prevented and controlled

Except for modest progress made in eradication of Invasive alien species(IAS), Yemen's progress lagged behind as regard other sub-targets of ABT 9, namely as regard prioritization of IAS(ABT 9a) , prioritization of IAS pathways (ABT 9b), and prevention of IAS introduction(ABT 9d). To verify Yemen's progress towards meeting ABT9, reference is made to two assessment indicators. The first one has been derived from UNDATA database[61] & is presented in fig 3.9 in Section III. This indicator confirms the declining

[59] Source : FAO/GIEWS (global information and early warning system on food and agriculture) country balance cereal sheet, http://www.fao.org/nr/aquastat

[60] Source : Reference http://www.fao.org/nr/aquastat accessed Dec-2018

[61] Source : Reference UNDATA database, accessed Dec-2018

trends in yields of local breeds as a result of introduction of homogenous high yielding varieties. The second indicator has been derived by the rapid assessment of protected areas management effectiveness of 6 terrestrial nature sanctuaries of Socotra Island, Dec 2017. The indicator shows that new IAS(plants or animals) have been introduced during the last 5 years into three nature sanctuaries within Socotra Island, namely into Detwah Homhil & Neet. As listed by table 4.1, more than 10 of exotic species have been introduced the past 5 years, and their introduction is attributable to lack of specific national measures geared for managing & preventing IAS introduction. This implies that trends in the numbers of IAS introduction is increasing, & Yemen's current progress performance still inadequate to contribute effectively to ABT 9d & to the SDG 15.8on prevention of IAS introduction.

Table 4.1: Exotic species introduced over the last 5 year into three nature sanctuaries with Socotra Island[62].

PAs	Detwah	Homhil	Neet
New plants or animals introduced	*Gossypium*, Lime, *Thespesia*, *Cocos* and *Catharanthus*	*Ziziphus mucronata*, *Cocos*, *Terminalia catappa*, *Thespesia populnea*, *Pancratium maximum*, and sudden diseases in animals	Some exotics around the two wells in the village Tuha, and Mhaktefat

The exotic tree *Calotropis procera* was recorded in Homhil and Neet, a known dangerous invasive which has a high likelihood to become a known invasive/pest species on Socotra under lower grazing pressures, in need of close monitoring and eradication outside fenced areas[63] (Habrová *et al*., 2014).

To sum up, in accordance with Yemen's biodiversity indicators, the condition of IAS impact on local breeds, and progress towards meeting the intended target demonstrates that local varieties loss had not yet been halted, and is requiring a critically renewed and sustained effort in order to reach the intended by 2025, Specific needs in this regard discussed in section II.

ABT 10: Ecosystem pressures

The manifestation of continuing pressures on ecosystem are presented across this section in two topic areas, namely addressing sustainable use on consumption, pollution, progressive increase of alien invasive. Indicators on sustainable use on consumption shows increasing trend of carbon release into atmosphere (Figure3A) and increasing trends of fossil fuels use (figure3B). These indicators collectively imply poor contributed to ABT 4. Additionally, the indicators on limited use of renewable energy (Figure3c), implies limited contribution to SDG 7.2 , which calls for increase use renewable energy.

Indicators on Pollution, include increased trends of MSW(figure3d), increased trend of chemicals fertilizer use(Figure 3.8) and increased wastewater generation. These trends imply poor contribution to SDG 12.5 related to reduction of MSW, slow progress towards

[62] Source : Rapid Assessment and Prioritization of Protected Area Management on Socotra Island Terrestrial Protected Areas , Dec 2017, Senckenberg – UNEP/GEF – EPA

[63] Source : Habrová, H., Nemec, P. & Steflova, G., 2014. Eradication of the Introduced and Potentially Invasive Species of *Calotropis procera f*rom Socotra. Tropentag, September 17-19, 2014, Prague, Czech Republic, Abstract Book. Available online at http://www.tropentag.de/2014/abstracts/links/Habrovaacute_b4waVJ1c.pdf

meeting ABT 8 on reduction pollution combined with the continuing pressures on biodiversity & ecosystems. This further confirms that multiple anthropogenic pressures on other vulnerable ecosystems have not been minimized, implying that the attainment of target ABT10b is far reaching.

ABT 11: Expansion of protected areas network

To assess the state of Yemen's contribution to ABT11, and to SDG15, cross-referenced is made to Yemen's indicators presented in Section II provided by http://www.protectedplanet.net. These indicators show that Yemen terrestrial protected area represents only 0.67% of Yemen terrestrial lands as compared with 17 per cent of terrestrial lands targeted by ABT 11a. This finding also confirms that Yemen is lagging behind the SDG 15.1 on conservation, restoration, sustainable use of Terrestrial ecosystems' services. Similarly, current coverage of coastal and marine ecosystems is only 0.47%[64] as compared with 10 percent targeted by both of the ABT 11b and SDG 14.5. Also reference is made to national indicators illustrated by Figures 3.10 and 3.11 beside map2 presented in section III. The Figures 3.10[65] shows that the mean percentage of each KBA covered by Protected Areas in Yemen has changed at an annual rate equivalent to 2% during 1980-2018. The figure 3.11 shows the Protected Area Representativeness Index for Yemen was 0.023 in 2000, & has enhanced insignificantly over the period of 2000-2016 at an annual rate of 1.22% to reach 0.028 in 2016[66] . Additionally Data exported from the UN Biodiversity Lab (UNBL) [67] as given by Map2 shows representativeness status of Yemen protected area system spatially. The map shows calculated protection coverage of terrestrial ecoregions within Yemen is broadly less than 10% and not ecologically representative, implying that current representativeness of Yemen protected area network is not adequately forming an ecologically representative network in accordance with the ABT 11d. More information on the extent, governance types, including PA Management Effectiveness are presented below under ABT 18 & 19 on Traditional Knowledge & Community-based management, & under ABT 14 part two focuses on safeguarding freshwater ecosystems.

In short, Yemen is Progressing but yet slightly contributing to the ABT11, and to SDG15 as regard the extent of protected areas coverage & ecological representativeness, for which a more ecologically coherent network is highly needed in order to put Yemen "on track" to contribute effectively to the attainment of the ABT11, and to SDG15.

ABT 12: Species and Extinctions

To quantify the level of Yemen's contribution to ABT12 and to relevant SDG15.5 , reference is made to two national indicators on Yemen red list index & level of species extinctions.as presented in Figure3.12 & figure 3.13 in section III. Figure 3.12 on Yemen

[64] http://www. protectedplanet.net.

[65] Indicators downloaded from the Biodiversity Indicators Partnership Dashboard(BIP) on www.bipindicators.net or at : http://bipdashboard.natureserve.org/metadata/protection-keybiodiversity-areas

[66] Indicators downloaded from the Biodiversity Indicators Partnership Dashboard(BIP) on www.bipindicators.net or at : http://bipdashboard.natureserve.org/metadata/protection-keybiodiversity-areas

[67] www.unbiodiversitylab.org.

red list index[68] shows a negative annual rate decline amounting to -0.27%, whereby the survival of Yemen's species has dropped from 0.93 in 1993 to reach 0.88 by 2018. This implies that the extinction of known threatened species has not been prevented pursuant to what has been targeted by the ABT12a & to the SDG **15.5.** Figure 3.13 shows that the Yemen IUCN Red List contains 2608 known animal & plant species of importance to Yemen biodiversity, of which 79 percent are least concern, 6 percent vulnerable, 7 percent are near threatened, and 1 percent are endangered.

ABT 13 Genetic Diversity

Because of insignificant progress made towards the achievement of national target3 on conservation of genetic diversity, Yemen's current performance, is by far, lagging below the expectation to contribute significantly towards achieving the ABT13 , and achievement of the SDG 2.5 on maintaining genetic diversity for agriculture. The manifestation of this conclusion is elaborated by the agriculture Census of FAO, table 3.5 and figure3.7 presented in section III. FAO statistics[69] highlighted a decline in total cultivated area from 3.14 percent of national total area in 2002 to merely 2.93% in 2017. In turn, this decline resulted in significant drop of total cereal production in 2017, amounting to 40 percent less the previous year's harvest and the five-year average[70], table 3.5. This conclusion is further validated by fig 3.9, which shows local breeds of wheat, barley, maize and millet have shown declining trends in yields over the period 2012 to 2015. A solid example on this given by wheat production, which has reduced from 250,264 tons in 2012 to merely 124,950 tons in 2015, being almost 50% percent less than the 2012 estimates. Another evidence in this context is given by figure 3.13B, which shows that average cereal import increase[71] from 4228 K tons between 2012/13 to 4250 between 2006/17. Again this trend has been attributable to decrease of cropland from 1,550 kha in 2012 to 1,546 Kha in 2016[72]. The reported progressive decline in lcoal genetic crops has not only lowered Yemen's contribution to the intended ABT 13a & to SDG Target 2.5, but also has worsen food insecurity of Yemen population. To this end, approximately 17.8 million Yemenis are estimated to be food insecure[73] in 2018, a 5 percent increase over the 2017 estimates. This figure includes 8.4 million people who are considered to be "severely food insecure and at risk of starvation", about 24 percent more than in 2017.

To sum up, under the reported progressive decline in total cultivated area and the subsequent drop of lcoal genetic landraces such as barley, wheat, sorghum, cereals, vegetables, fodder, cash crops and fruits all together provide solid evidence that the

[68] International Union for Conservation of Nature (IUCN), can be accessed at http://www.iucn.org/ and BirdLife International (2018), can be accessed at http://www.birdlife.org/

[69] Source : Reference http://www.fao.org/nr/aquastat accessed Dec-2018

[70] Source : FAO/GIEWS (global information and early warning system on food and agriculture) country balance cereal sheet, http://www.fao.org/nr/aquastat

[71] Source : FAO/GIEWS (global information and early warning system on food and agriculture) country balance cereal sheet, http://www.fao.org/nr/aquastat

[72] Source : Reference http://www.fao.org/nr/aquastat accessed Dec-2018

[73] Source : FAO/GIEWS (global information and early warning system on food and agriculture) country balance cereal sheet, http://www.fao.org/nr/aquastat

conservation rate of Yemen's cultivated genetic resources remained inadequate to meet the 2020 national target identified by the NBASP2. Thus, Yemen's current performance remained inadequate to effectively contribute to the intended ABT 13a & to SDG Target 2.5 on maintaining the genetic diversity of cultivated plants. This performance is likely to continue, and the loss of genetic diversity is likely to intensify in the future, unless the persistent war is halted and rough measures are taken to implement overall interventions identified by the NBSAP2 for this target .

ABT 14.1: Ecosystem services (Poverty Reduction)

Because of insignificant progress made towards the achievement of national target13 on reduction of poverty level Yemen's current performance, is by far, lagging below the expectation to contribute significantly towards achieving the ABT14 , and achievement of the SDG 1.1 on eradicate extreme poverty. The manifestation of this conclusion is elaborated by the FAO analysis[74] on Strengthening resilient agricultural livelihoods, presented in section III. This analysis shows that in 2018 some 75 percent of the country's total population of 29.3 million are in need of humanitarian assistance, including 11.3 million people who are in acute need and urgently require immediate assistance to survive – an increase of 1 million since June 2017-.

Even though country performance at national level has reported insignificant progress in poverty & gender mainstreaming, progress at protected area level has been more effective. Specifically, the Government through implementation poverty & gender mainstreaming activities has facilitated equal access to productive resources among men and women at protected area level through building the capacity of a total 831 local men/women groups (of whom 50% were women), and enabling them to implement tremendous conservation and livelihood activities , including establishment & management of 295 home-garden, enhancing local community livelihoods based on handicrafts production (7 Projects) and conservation & sustainable use of biodiversity assets (4 projects). Among these activities, the establishment & management of 295 home-garden have been viewed by the beneficiary women as the most successful. It has enabled each owner of home-garden to earn an average monthly income amounting to 64,000 YR, which nearly equivalent to the average salary received by government employee across the country.

ABT14.2: Restoration and Safeguarding of Ecosystem Services, Delivering Fresh water

To assess the state of Yemen's contribution to ABT14 and to SDG 6 on water saving, a reference is made to assessment results concluded by section III as regard progress to achieve national target5 (NT5) on restoring and safeguarding Yemen's aquatic ecosystems. The finding of this assessment is demonstrated by two national indicators illustrated by figure 3.14 (Section III) on trends of water access and map3 on spatial water stress. The national indicator on water access as spelled out by figure 3.14 indicates that water access of Yemen's population has not demonstrated progressive increase towards meeting the 65% national target by 2020(NT5), but rather has declined from 62.2 % in 2005 to 59.3

[74] Source: FAO. 2018.Yemen, Plan of Action –Strengthening resilient agricultural livelihoods (2018–2020). Rome. 68 pp.

percent in 2017[75]. Therefore, Yemen's current performance is neither progressing towards achieving the ABT 14 nor contributing effectively to the SDG 6.1 on Percentage of population using safely managed drinking water services. Such an inadequate performance is further depicted by continuing water scarcity as described by FAO statistics , which confirms that the negative trend in water access has been attributable to none change in total renewable water resources, for which the production of renewable water has remained at be 2.1 Km^3/year for the period 2005 to end 2017[76]. This scarcity of water resources has not only hindered the attainment of NT5 on water restoration and accessibility, but also resulted into uneven water distribution regionally coupled with deceasing trend in per capita annual water share. The regional variation in water mining is clearly described by maps 3, which shows that 80% of ground water is mined[77] in highly populated governorates of western area, as compared with 10 to 40 percent of groundwater mining in eastern part, where population density is lower. This implies that Yemen -by now- is unfairly contributing to the ABT 14 . and to SDG 6.6 as regard the restoration & protection of water-related ecosystem.

ABT 15.1: Climate Resilience(Adaptation)

To assess the level of Yemen's contribution to ABT15 on enhancing ecosystem resilience, and to SDG 13 on combating climate change impacts, reference is made to assessment results concluded by section II as regard the implementation effectiveness of actions taken to restore and safeguard Yemen's key ecosystems concerned with delivery of key ecosystem services. This assessment shows ineffective delivery of interventions planned for restoration of degraded ecosystems, leading to insignificant progress towards the achievement of national target9 (NT9) concerned with restoration of at least 15 per cent of degraded ecosystems in Yemen. None attainment of NT9, has in turn, led to the reported poor country performance towards achieving the ABT 15b on enhancing ecosystem resilience via restoration of 15% of degraded ecosystems, and to the SDG 13.1 on strengthening resilience and adaptation to disasters. This conclusion of the assessment can be verified through two national indicators illustrated by figure 3.15 & figure 3. 4 (section) on trends of carbon stocks & trend of forest area presented under section III. The national indicator on trends of carbon stocks[78] as given by figure 3.15 shows that above-ground biomass in forest per hectare remained at 13.99 tons for the period of 2000 to 2015, implying that carbon stock of forest area in Yemen have not changed since the world adoption of the Strategic Plan for Biodiversity 2011-2020. This finding is also consistent with results shown in figure 3.4 under ABT 5 on forest. The figure shows that that the carbon stocks[79] of Yemen forest for the period of 2012 to 2017 remained at 5.16 million tons as direct result of none change in Yemen forest land, have remained at 547 K ha for the same period see also figure 3.4 . To this end, it can be concluded that Yemen's

[75] Source: UNDDATA, Dec, 2018
[76] Source: http://www.fao.org/nr/aquastat accessed in Dec-2018
[77] Source: UN Biodiversity Lab at: www.unbiodiversitylab.org

[78] SDG Indicators access at https://unstats.un.org/sdgs/indicators/database/ , data was exported from FAO, Global Forest Resources Assessment

[79] Data source: UNDATA, accessed on DEC 2018 combined with data derived from FAO, Global Forest Resources Assessment 2015

performance still lagging below the intended level of ABT 15 b, and not yet meeting the SDG13.1 on strengthening ecosystem resilience.

ABT 15.2: Climate Resilience (mitigation)

To quantify the level of Yemen's contribution to ABT15 on mitigation and to SDG7.2 on renewable energy, reference is made to assessment results concluded by section III as regard the achievement national target11 (NT11) on energy resilience attributable to implementation mitigation activities. The assessment results of section III shows that a resilient society is emerging in household sector of Yemen in association with successful implementation of two interventions, namely the diffusion of individual solar home systems (SHS) and introduction of Ma'rib-I & Ma'rib-II open-cycle gas turbine power plants. These two initiatives have led to total annual emission reduction amounting to 1647 Kton CO2 e, being 7% of 2012 energy-related GHG emissions., implying that Yemen is progressing towards meeting the 14% targeted by the NT11. Consequently, Yemen is considered on track to contribute to the ABT15 related to climate change mitigation, and to the SDG 7.2 concerned with the increase use of renewable energy. Additional evidence on this fact is given by the findings of the Rapid Survey Report of Installed Solar Systems In Districts of Capital Sana'a & its Sub-Rural Districts [80]". Specifically, the survey concluded an increased trends in number of households accessing SHS from 8,459, being 3% in 2014 to about 246,969 households, being 87% of both urban and rural households. However it worth-noting that the reported contribution to the ABT15 , and to the SDG 7.2 on promotion of renewable energy remains conditional on the continuing promotion of all green interventions as targeted by the identified by NSREEE, including the promotion of Wind energy, Concentrated Solar Power (CSP) systems, the geothermal energy, biomass power energy and the promotion of energy efficiency.

ABT 18: Promotion of Traditional Knowledge & Community-based management

To assess the state of Yemen's contribution to the ABT18 and to SDG 10.2, reference is made to assessment results concluded by section II as regard the implementation effectiveness of actions taken to produce NT17 on promoting traditional knowledge & Community-based management, and NT9 on promoting community based planning and land use management plans. The said assessment demonstrates that the implementation of interventions concerned with promotion of community-based management & planning has been viewed to be partly effective, implying that Yemen is on track to achieve the national target17, concerned with expansion of community-based management approach to cover 50% of Yemen's protected areas by 2020. In support of this result, it worth recalling that about six out of 11 terrestrial & marine protected areas, being over 50% of existing protected areas network are- by now- having effective community management bodies and management plans. This indicates that significant progress has been made towards the ABT18b, which calls for securing effective participation of local communities.

Even though of success made in community-based planning at PA level, no parallel success achieved in promoting community based planning in management of water,

80 The Rapid Survey Report of Installed Solar Systems In Districts of Capital Sana'a & its Sub-Rural Districts of May 2018, & was prepared by Dar Al-Khadarah for Studies Consultations and Services under the third National Communication

rangelands, and fishery resources. Additionally, current community-based planning at PA level does account for managing pressures of the neighboring non-protected landscape. This impact is manifested by the indicator named as the Protected Area Connectedness Index given by Figure 3.15 presented in section III. The Protected Area Connectedness Index for Yemen was 0.3579 in 2012, and has changed from 2010 to 2012 at an annual rate of 0%, implying that Yemen's PAs management are not giving due regard to pressures incurred by neighboring corridors of PAs, for which these PAs remains vulnerable to impacts of urban sprawl, pollution, climate change, unsustainable tourism, and invasive species incurred by neighboring corridors. Therefore current protected areas management approach is not meeting the planning requirements as identified by NT 9 on integrated land use planning.

Section V: YEMEN Biodiversity Profile

5.1 Summary on Measures to Implement the NBSAPII

The NBSAPII adopts a framework that places the Yemeni people and nature at the center of the government concern in the development process. Thus the NBSAP2 has 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

Pursuant to ABT 17, the NBSAP2 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. The NBSAP2 was prepared between 2014 and 2015 in a context of acute political, social and economic challenges, wide societal disparities, and a growing demand for real participation by citizens and stakeholders. The production of Yemen's NBSAP in such a highly inclusive and participatory approach has allowed all environmental partners, key productions sectors, research institutions, local communities, and traditionally under-represented groups such as the youth and women to take role in the entire development process and thus incorporated their needs into the NBSAP. Environmental partners played leading roles in the Production of NBSAP2 and this role was organized via the establishment of a 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 and International Coordination, the Ministry of Electricity, Ministry of Oil and Mineral Resources, the Water Resources Authority, the Union of Agricultural Cooperatives, 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. To this end, 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

Yemen's NBSAP2 will contribute to the national vision of achieving a resilient, productive and sustainable socio-ecosystem by 2050, through the implementation of the vision's five strategic goals/ national outcomes addressing the following priority areas: 1) biodiversity and ecosystems conservation; 2) sustainable use of biological resources; 3) reduction of natural and anthropogenic pressures; 4) biodiversity and poverty mainstreaming in sectoral development plans; and 5) good governance in biodiversity management

The Priority area on Biodiversity and Ecosystems Conservation focuses on halting overall biodiversity loss and maintaining healthy, productive and functional ecosystems, based on establishing coherent and resilient ecological networks, conservation of rare and endangered species, & conservation of genetic resources and Biosafety, supported by restructured policies and adequately mandated and empowered local communities and institutions. To promote sustainable use of biological resource main focus is given for promoting sustainable use of forests and rangelands, sustainable agriculture, sustainable management of marine living resource, and water restoration & conservation. To implement the priority outcome3 on reduction of natural & anthropogenic pressures, the action plan for the 2015-2025 period calls for strengthening socio-ecosystems resilience through ecosystems and adaptation to climate change; pollution control, control of invasive alien species, and enhanced preparedness against anthropogenic waste & hazards. The priority area4 on biodiversity & poverty mainstreaming deals with national policy distortions through five innovative policies focused for: (1) for mainstreaming ecosystems values into national accounting and decision makings , (2) poverty mainstreaming, (3)promotion of green technology, (4) promoting integrated planning in land resources management, and (5) sustainable tourism. Finally, the national priority areas 5 on promoting good governance in biodiversity management addresses institutional weakness in biodiversity conservation through institutional restructuring and improvement of Public awareness, research and knowledge sharing.

Yemen' priority areas- in the action plan for the 2015-2025- have been translated into 18 SMART national targets where each represents an output that is consistent with specific Aichi Biodiversity Targets. The action plan outputs have been defined for each strategic goal/outcome, and planned actions associated to baseline threats, responsible institutions and partners, budgetary (costing) figures and potential funding sources.

According to Yemen's Ecosystem Valuation Study, the value of the country's key ecosystems (forest, rangeland, wetland, marine, mangroves) is estimated to be worth approximately USD 287,829 million, which is about ten times the value of the GDP (USD 20,000 million per year). Unfortunately, most of the values of ecosystem products are ignored in economic decision-making and thus not accounted for when estimating GDP and developing national income accounts. In this light, National Target 16, 17 & 19 aim to increase awareness of the values of biodiversity and ecosystem services among decision-makers and integrate these values into key environmental sectors by 2025 (which contributes to Aichi Biodiversity Target 2). Gender aspects were taken into consideration from the outset through the representation of the National Women's Committee (NWC) on the Steering Committee established to lead the NBSAP2 development process. Beside enabling local community and women to be part of environmental management at the central level, local communities, including women have been empowered to participate in protected area management in at least 6 local conservatories in compliance with national target 17 . The National Target calls for promoting community-based management approach to cover 50% of Yemen's protected area by 2020, and 100% by 2025, thereby leading to improved effectiveness of Yemen's protected areas and promotion of traditional knowledge and practices on conservation and sustainable use of biological resources (which contributes to Aichi Biodiversity Target 18). As concluded by the national stakeholders, the National Target12 is structured 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 combined with introducing innovative waste management strategies to hospitals, industry, mining and manufacturing sectors. Key strategies to be introduced includes the promotion green-technology, recycling hazardous/useful materials from waste, and producing non-wasteful products. These strategies are proposed to be applied at both national & local levels. More details on implementation measures undertaken, assessment of their effectiveness, associated obstacles and scientific and technical needs to mitigate ecosystems pollution and achieve this national target are presented in section 2 of the 6NR.

5.2 Biodiversity Facts: Status and trends of biodiversity, including benefits from biodiversity and ecosystem services:

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 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.

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.

Socotra Island is unique in regard to its flora and, like many islands, has a high level of endemism. Plant populations in Yemen are thought to have declined considerably; agricultural production has undergone dramatic changes due to the expansion of Qat plantations at the expense of other crops. For even representative portions of Yemen's natural biotic wealth to remain for future generations, these alarming trends demand urgent conservation attention. The flora of Yemen is very rich and heterogeneous with endemism being generally very high among the succulent plants. Forest resources are widely used in industry and construction and medicinal and aromatic plants play an important role in the lives of most Yemenis who use them as traditional remedies to cure diseases. They are also used as cosmetics, condiments, coloring and flavoring agents. Crops such as wheat, lentil and millet are examples of local varieties whose yield and quality are deteriorating as a result of the introduction of homogenous high-yielding varieties. For a long time, large mammals have been under considerable pressure; some have vanished from the country and most others have become rare and threatened. Yemen also has very rich birdlife (there appears to be a healthy raptor population).

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[1]. 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

[1] EPA 2009. Yemen's role in the conservation of biodiversity, 4th Biodiversity National Report submitted to CBD 2009.

tolerant to saline environments. Studies indicate that the Gulf of Aden coast supports few communities of sea grasses compared to the Red Sea coastline.

Fisheries are considered a promising sector for sustainable development. Fish has already become Yemen's third most important food commodity export, and is also nutritionally significant, contributing to local food security by providing an important source of animal protein. The formerly rich fish resources on the country's continental shelf are now reduced through outtake. Dugongs and several species of dolphins and whales are found in good numbers in several places along the Red Sea.

5.3 Main pressures on and drivers of change to biodiversity (direct and indirect)

Biodiversity pressures & threats have been identified in two reports, namely the NBSAPII & Rapid Assessment and Prioritization of Protected Area Management of Socotra Island [2].

The NBSAP II identifies Biodiversity threats at national level & this include urban encroachment, damaging fisheries, climate change & desertification, spread of invasive alien species, ecosystem pollution, unfavorable tourism, & threatening agriculture. The Rapid Assessment and Prioritization of Protected Area Management of Socotra Island [3]& this include threats encountered at protected area level and these are shown by figure 5.1

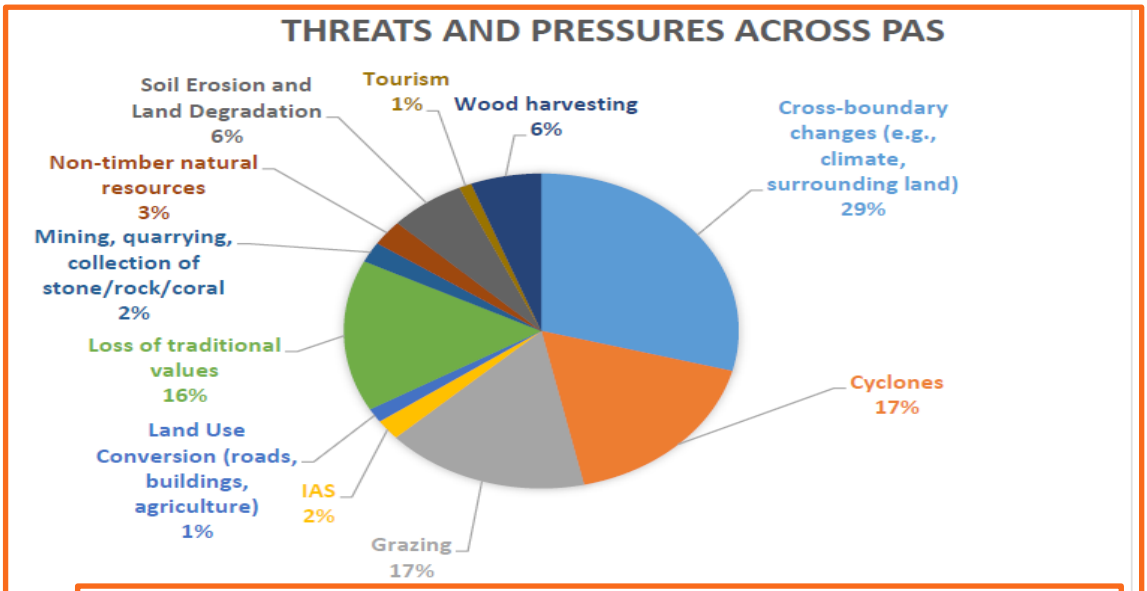


Figure 5.1: A total of all threats and pressures across all PAs, from the cumulative degrees across six protected areas within Socotra .

[2] Source : Rapid Assessment and Prioritization of Protected Area Management on Socotra Island Terrestrial Protected Areas , Dec 2017, Senckenberg – UNEP/GEF – EPA

[3] Source : Rapid Assessment and Prioritization of Protected Area Management on Socotra Island Terrestrial Protected Areas , Dec 2017, Senckenberg – UNEP/GEF – EPA

The figure shows the climate change impact is highest(29%), followed by grazing & cyclone (each of 17%), and followed by loss of traditional values(16%). More details on extent & impact of threats at national level are described below:

Land Use Change & Urban Encroachment

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 wastewater treatment capacity has increased from 132 MCM/yr in 2010 to 135 MCM/yr in 2015. Out of 2010 production only 35% treated while the remaining untreated wastewater discharged to underground aquifer, arable land, marine & in the water courses of Wadies, causing progressive increase contamination of these ecosystems, leading to the reduction in ecosystems productivity and hence the delivery of their services..

Over the last several decades, the area of natural habitat has decreased or been degraded, through over-exploitation of range resources, land conversion, poor agricultural practices and the pressures of an ever-expanding population (the current growth rate is around 3.5% per annum which is one of the highest in the region). Coral reefs and seagrass are destroyed by trawling and other unsuitable harvesting methods causing loss of productivity and threatening endemic and rare species. Oil exploration and transport resulting in several oil spills, along with sewage discharge, agro-chemicals flushed by floods and sedimentation from urban development pose further threats to coral reefs. Coastal and marine resources are threatened by overfishing, spear-fishing, aquarium fishing and dynamite fishing as well as by the cutting of mangroves for wood, animal feed and fuelwood supply. Industrial and urban development, as well as extensive coastal development, land filling, and coastal engineering are dramatically altering certain coastal areas. The quantity and quality of freshwater are threatened by numerous factors, including overuse of water sources,

degradation of wetland ecosystems, excessive use of pesticides, misuse of fertilizers, untreated wastewater and increased industrial waste.

Erosion of Agro-biodiversity

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 Apies mellifera jemenitica as a result of spreading of the Varroa mite pest. Such undesirable introduction has had major environment and economic impacts. Recent examples include citrus nurseries, which introduced diseases, and the armyworm.

Ecosystem Pollution

During the war time, no significant progress made to address the ecosystem contamination. The pollution level incurred by the continuing use of agro-chemicals and fertilizers, some of them remained harmful to key ecosystem services, particularly to agricultural lands and underground water. As per national data, out of total country wastewater production, only 35% is treated while the remaining 65% is discharged untreated into wadies, aquifers & coastal areas causing high damage to these ecosystems. Similarly, the country overall production of municipal solid waste is progressively increasing, against low collection & recycling capacities. Only 40% of generated municipal solid waste are collected, out of which only 6.7 % are recycled. This implies that 60% of the country municipal solid waste generated is disposed untreated to open environment with severe impact on water, land & marine ecosystems.

Given that the generated solid waste contains fertilizers, pesticides, agrochemicals & hospital wastes, such a hazardous materials seep into groundwater aquifers causing excessive pollution that exceed the capacity of ecosystems to maintain water quality. The continuing discharge of untreated municipal and industrial wastewater and agro-chemicals, agro-chemicals and other industrial chemicals into water aquifers & coastal areas leads to reduction in water quality, causing ,in turn, financial burdens on rural poor, particularly on women. Further, The continuing discharge of untreated MSW & wastewater 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. To this end, more work & renewed efforts are required to reduce waste diffusion & reduce impacts of pollutants and contaminants on soils, water, plant species, and marine ecosystems in accordance with intended target of the NBSAP2.

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.

Threatening agriculture

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.

The country's vegetation cover is being drastically reduced by rapid degradation of the environment which is a direct result of desertification and droughts. Agricultural production has undergone dramatic changes due to the expansion of Qat plantations at the expense of other crops. In recent decades, human activity has transformed the landscape and overexploited available biological resources, which has resulted in the deterioration of many habitats, a major reduction in plant and animal species and the extinction of endemic, rare and endangered species. Furthermore, the most sizeable mammals have long since been hunted into extinction in the country where firearms aboundant and a large proportion of the natural forests have been cut down.

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

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, large quantities of untreated solid and liquid waste are directly dumped in the environment with sever impacts on vulnerable people and fragile ecosystems. In order to mitigate the impact of ecosystems pollution, specialized working group on ecosystem pollution was formed during NBSAPII development. The working group was formed with a mandate to conduct a participatory stocktaking exercise targeted for drafting the national target 12, addressing national priorities and also aligned to the global Aichi Target 8. The expert members of the designated working group conducted extensive review and stocktaking of national strategies, and based on which they proposed and forwarded an initial draft of the target to the plenary meeting for their validation. The participants to the plenary meeting further applied participative stocktaking exercise, by which they reached a consensus on refined scope, content and timeline of the national target 12. Key stakeholders participated to the plenary meeting were representatives of media, civil society; universities and scientific research centers; Woman & youth groups; local communities; local authorities; private sectors and central authorities representing agriculture, fishery, water, land-use management tourism, energy sectors.

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 umber 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 *Apies mellifera jemenitica* as a result of spreading of the Varroa mite pest. 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. 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. Under business as usual scenario, the key obstacles contributing to the continuing spread of alien invasive species 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. The political instability has progressively weakened the capacities of central and decentralized bodies to take any measures addressing invasive alien species. Data on IAS is mostly unavailable

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. Under anticipated climate change, extreme weather and climate events **drought**s & floods 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[4].
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 with subsequent instability of food production levels.

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. 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[5]. 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. 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 others.

Unfavorable Tourism.

Tourism is a rapidly growing industry causing 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.

[4] V&A studies developed under National Adaptation Programme of Action (NAPA, 2009)
[5]UNDP, 2013.

5.4 NBSAP Implementation

As conclude by the assessment of NBSAP implementation of section II, only 26 per cent of 270 measures identified in the NBSAP have been completed, while the vast majority, being 74 per cent have not yet started. This implies that Yemen's performance in NBSAP implementation tends to be poor, and figure 5.2 further confirms this finding. As given by the Figure 5.2, the extent & trends of Yemen's performance towards meeting national targets spelled out by overall national strategies, including the NBSAP remained at score of 3 over the period 2006 to 2014, **noting that the** index which developed by Bertelsmann

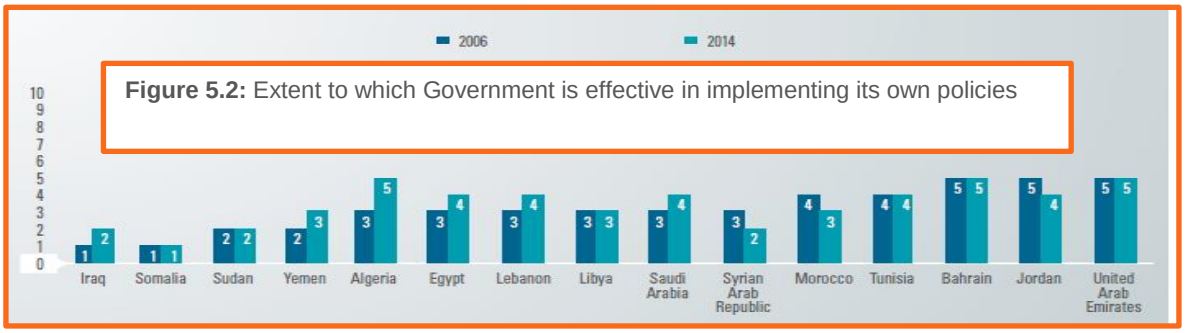


Figure 5.2: Extent to which Government is effective in implementing its own policies

Stiftung Index[6] (BTI) suggest 1 as a worst score & 10 as the best score . However, it worth noting that all Arab countries scores are below 5 out of 10, implying weak performance ln implementing national strategies.

The reported weak implementation performance of NBSAPII is attributed multiple challenges, including lack of coordination and cooperation mechanisms among biodiversity's stakeholders associated with lack of partnerships with private sector, NGOs and local community in management of biodiversity resources; insufficient government funding for NBSAP Implementation coupled with low level of Official Development Assistance (ODA) from international sources; lack of innovative mainstreaming tools for integrating and anchoring the implementation of NBSAP plan into national development frameworks; and weak institutional capacity in biodiversity management coupled with inadequate capacity building, legislation, and weak monitoring and reporting capacities.

[6] Source: Arab Sustainable Development Report, 2015, which derived it Bertelsmann Stiftung, BTI. Available from http://www.bti-project.org/ (accessed 2 November 2015)..

5.4.1 Support mechanisms for national implementation (legislation, funding, capacity-building, coordination, mainstreaming, etc.

5.4.1.1 Coordination & biodiversity Mainstreaming

Biodiversity coordination mechanism as concluded in 5.1 has been assessed to be ineffective. The manifestation on weak coordination among stakeholders is given by figure 5.3 , which shows that the Yemen coordination capacity is rated at 3, being of lowest score among the 15 Arab countries included in the BTI assessment study[7]. Therefore, there is urgent needs for a cross-ministerial coordination mechanism linked to budgetary processes in order to make decision-making effective and to foster timely implementation.

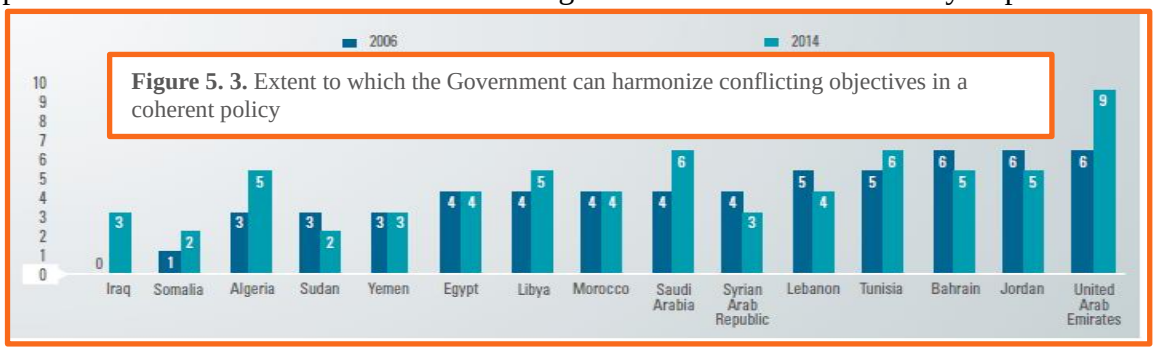


Figure 5. 3. Extent to which the Government can harmonize conflicting objectives in a coherent policy

Therefore, there is urgent needs for a cross-ministerial coordination mechanism linked to budgetary processes in order to make decision-making effective and to foster timely implementation. Such a mechanism could come by activating the EPA board of director to act as planning body & oversight committee while implementation. The activation of this

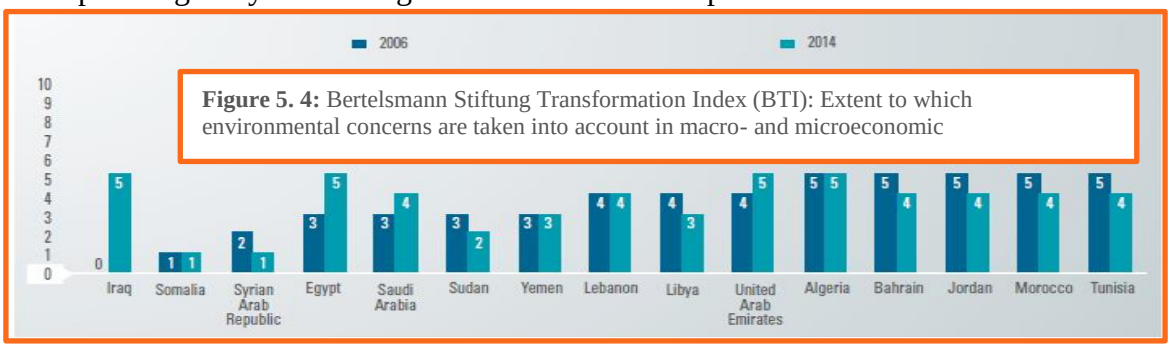


Figure 5. 4: Bertelsmann Stiftung Transformation Index (BTI): Extent to which environmental concerns are taken into account in macro- and microeconomic

mechanism could help better mainstream biodiversity into national and sectoral strategies, recalling that environmental concerns are taken into account in macro- and microeconomic strategies and plans, and this shortage is clearly highlighted by figure 5.4[8], which shows that Yemen performance towards mainstreaming environmental concerns into national policies has not reported any change between 2004 to 2014.

[7] Source: Arab Sustainable Development Report, 2015, which derived it Bertelsmann Stiftung, BTI. Available from http://www.bti-project.org/ (accessed 2 November 2015).

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5.4.1. 2 Funding for NBSAP Implementation:

Key drivers contributing insufficient government funding for NBSAP Implementation is attributed to low levels of Official Development Assistance (ODA) associated with low level awareness of decision makers on available international funding mechanisms and funding eligibilities. Yemen's 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 biodiversity Funds (NBF) as a designated national entity responsible for coordinating, mobilizing and administrating of NBSAP, including the supervision of project and programme implementation. Additionally, Yemen weak capacity to tap to international financing opportunities is constrained by weak planning capacities of the Environmental Protection Authority (EPA). The EPA weakness to coordinating donor finance for NBSAP is due to lack of the technical expertise needed for identification, planning and formulation of nation-wide investment programs and sectotal projects as per national priorities and pursuant to the international eligibility requirements. Given this fact and recalling that the availability of documented projects & programmes in line with international standards is a key prerequisite to access international climate finance, it is therefore strongly needed to build EPA planning capacity with specific focus on identification, assessment and prioritization of related national biodiversity needs, including identification of capital investment needs and hence formulating the needed funding documents.

Because of low level of Official Development Assistance (ODA) for funding environmental activities , the Yemeni Government , over the past 15 years, has received about USD 219.57 million, of which only 37% has been invested biodiversity conservation, as compared with 63%for climate change . The main partners contributed to this amount during this period are the World Bank, GEF, UNDP, GIZ , Netherlands and Italy, please see table5.1 listing implemented and active Projects by the aforementioned donors.

Table 5.1: Summary of Donors' Projects[9] for environmental sector for the period 2000-2015

Donors		Project Title	Approval date/ Duration	Status	Budget (Million) US$
WB	Mitigation	Mocha Wind Park Project	2014-2017	N/A	20
WB	Mitigation	Biogas Digesters: An Integrated Solution for Poverty Alleviation and Climate Change Mitigation in Yemen	2012- 2014	Closed	2.61
WB	Mitigation	RURAL ELECTRIFICATION & REN. EGY DEV	February 4, 2005	Closed	1
WB	Adaptation	Taiz Municipal Development and Flood Protection Project	2001-2005	Closed	50

9Source: data on WB Project from : http://projects.worldbank.org/search?lang=en&searchTerm=&countrycode_exact=RY on 4/5/2017: Data on other projects retrieved from relevant Projects documents

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WB	Adaptation	Taiz Municipal Development and Flood Protection Project	January 29, 2008	Closed	20	
Netherland	Capacity building	Support to Socotra	N/A	Closed	N/A	
GEF/UNDP	Adaptation	National Adaptation Programme of Action, YEM/03/G37	2003 – 04	Closed	0.2	
GEF/UNDP	Mitigation	National Recovery and Recycling Programme for Refrigerators in the Commercial and MAC Sectors in Yemen, YEM02/G61	2002 – 05	Closed	1.47	
WB	Adaptation	FLOOD PROTECTION AND EMERGENCY RECONSTRUCTION ADDITIONAL FINANCING II	March 24, 2009	N/A	35	
GEF/UNDP	Capacity Building	National Capacity Self-Assessment	2004 – 05	Closed	0.2	
GEF/UNDP	Adaptation	Yemen Geothermal Development Project	2008- 2012	N/A	1	
UNDP/ Gov. of Italy	Adaptation Capacity building	Sustainable Development and Biodiversity Conservation for the People of Socotra Island, YEM/03/004	2003 – 08	closed	5	
GEF/UNDP	Capacity building	*Third National Communication and First Biennial Update Report to the UNFCCC*	2014- 2017	Closed	0.942	
UNDP/GEF	Adaptation/ capacity Building	UNDP/ GEF Socotra Governance and Biodiversity(SGBP)	2008-2013	Closed	2	
UNEP	Conservation & development	Socotra Biodivesity Conservation& development		Active	5	
GIZ	Adaptation Capacity building	Conservation and sustainable use of biodiversity	2011- 2016	Active	6	
GIZ/malek	Resilience & Development	*Enhanced Rural Resilience in Yemen (ERRY) Programme*		Active	35	
GEF	Adaptation	Conservation and Sustainable Use of the Biodiversity of Socotra Archipelago	1996 - 2003	Closed	1.3	
GEF/WB	Adaptation	Protected Areas Management	1999- 2005	Closed	0.74	
GEF/WB	Adaptation	Adaptation to Climate Change using agro biodiversity resources in the Rain fed Highlands	2010- 2015	closed	4	
UNDP/GEF	Adaptation/ capacity Building	Strengthening Socotra policy and regulatory framework for mainstreaming biodiversity	2008-2013	Closed	1.807	
UNDP	Adaptation/ capacity Building	Sustainable Natural Resources Management, II	2009-2013	Closed	1.398	
UNDP	Adaptation/ capacity Building	Sustainable Natural Resources Management, I	2004 – 08	Closed	1.6	
GEF/UNDP	Adaptation	Protection of the Marine Ecosystems of the Red Sea Coast Yemen, YEM/97/G32	1997 – 04	Closed	2.8	

WB	Capacity building	Climate Information System and PPCR Coordination	2013- 2017	closed due to war	19
WB	Adaptation	Pilot Program for Climate Resilience Phase I (PPCR I)	August 22, 2010	Closed	1.5
				Total	219.57

As for support received for the preparation of the 6NR, the Government received about USD 100,000 from the Global Environment Facility (GEF) as compared with USD 942,000 received for prepare the Third National Communication (TNC). To improve the country readiness for biodiversity funding, there is urgent needs to create National Biodiversity Fund (NBF) under the country focal point to act as coordination body responsible for mobilizing funding resources Biodiversity conservation, including the funding of NBSAP.

As for government financing for implementation of National Biodiversity strategies, it has been generally reported as inadequate and not exceeding 20% of total funding needs, indicating that the bulk of funding (80%) for biodiversity conservation initiatives is usually covered from international donor sources. More drastically, government financing for the environmental protection and biodiversity conservation is likely to further reduced under ongoing war, & the subsequent economic deterioration coupled with severe budget cuts in all development sectors, including the environmental one. The political instability and insecurity, together with the weakening capacities of the government, has minimize the opportunities and chances for resource mobilization from external sources for both the government, the civil society and communities managing the natural resources and protected areas. Resource mobilization strategies and management plans of community managed protected areas' count with (through the reporting period) inexistent incomes from eco-tourism and related sustainable livelihoods. Situation, which has left them without financial resources, vulnerable, unmanaged and at high risk of over exploitation of their natural resources by the population under extreme survival stress.

5.4.1..3 **Institutional Framework for Biodiversity Management**

Biodiversity management responsibility has been entrusted to the EPA, including the responsibility of development of & implementation of environmental policy. However, for the multiple aspects of biodiversity and environmental issues, the EPA undertake this responsibilities key actors concerned with Biodiversity conservation & protection and these include : 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.

Even though of progress made in biodiversity management, institutional capacity remains weak, and his weakness is due to lack of good governance under tight centralization management triggered by inadequate community partnerships, inadequate law enforcement, inadequate government funding of conservation projects and incomplete legal frameworks for promoting decentralization & local community involvement. Other 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, 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. More drastically, institutional capacity weakness has been escalated due to the continuing political instability and insecurity, in which the territory under the governments' authority isn't constant, its headquarters have been displaced, the critical infrastructure, financial and human capital area disrupted, neither central nor decentralized authorities have been able provide adequate capacity to the natural resources and biodiversity considerations and enforce the existing legislation.

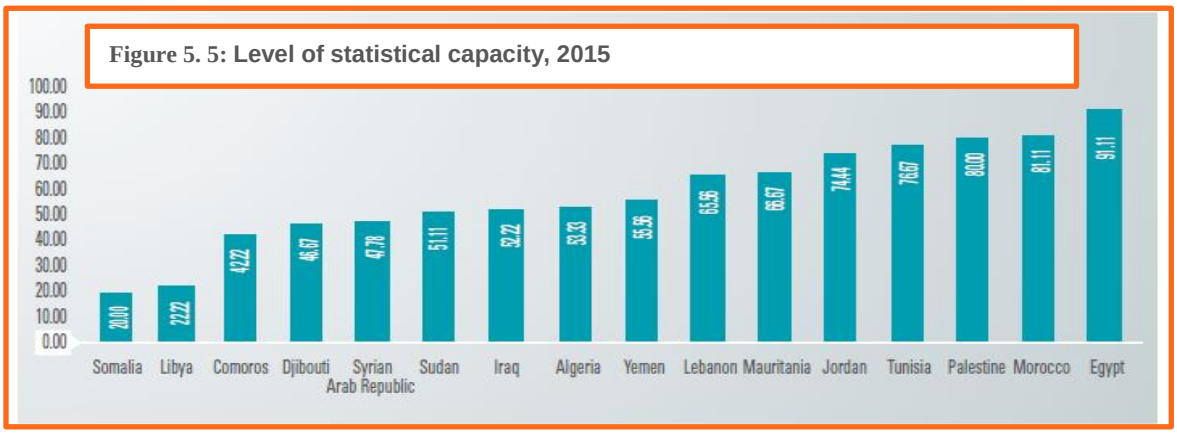
5.4.1.4 Legal Framework for Biodiversity Management

Even though of tremendous efforts being made in developing and strengthening legislative frameworks, 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, the fertilizers and fodder law, the plant pest and disease law and the handling of pesticides law, and the development of an application decree for EIA law as well as the development of a Protected Areas law.

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 CBD;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).

5.4.1.5 Mechanisms for Implementation, Monitoring and Review

As learned from National Stakeholders consultation workshops related to the development the 6NR, the country still lacking for effective statistical capacity, monitoring mechanism, biodiversity indicators and reporting systems to help guiding them towards producing evidence-based policy and evidence-based assessment report. Yet, statistical capacity of Yemen remains weak, and this is illustrated by Figure 5.5[10] developed by the Bertelsmann Stiftung's Transformation Index (BTI). The figure shows that the statistical



capacity index of Yemen in 2015 was 56, being among Arab countries with moderate statistical capacity, however this level remains much below the capacity of perfect ones such as Morocco & Egypt. Additionally,

[10] Source: **Source:** World Bank, World Development Indicators. **Note:** Scale from 0 (worst) to 100 (best)..

The weakness of statistical capacity of Yemen can also be further verified by the reported lack of evidence-based indicators to precisely quantify Yemen progress towards meeting the national biodiversity target and the ABT targets, including the SDGs. This can be verified by recalling that only 12 indictors, being 32% of overall indicators used in this report have been derived from official nation statistics, while the remaining being 68% have been compiled from international agencies. Specifically, indicators on GHG, Solid waste, wastewater, and agricultural area & products have been compiled from national sources, while indictors on most of national biodiversity targets such as, red list, coverage of biodiversity protection, PA representativeness, habitat loss, Genetic diversity, ocean health, Poverty, climate resilience, alien invasive, and endangered species, and Protected Area Connectedness Index have been gathered from international resources.

As for policy development, current biodiversity planning remain ineffective because of low level of knowledge & awareness among public & decision makers on ecosystems values, trends and importance. Therefore, in order to better develop evidence-based policies strategies & evidence-based assessment report, there is strong need to tackle current weakness on information sharing and statistical capacity based on establishing an improved computerized systems for data collection storage, analysis of biodiversity data, including processing & development spatial maps of biological resources. Otherwise, Yemen information & monitoring system is likely to remain ineffective as regard information exchange and management, resulting in the proliferation of several incompatible information systems, which produce unreliable, inaccurate and inconsistent information for managing and monitoring implementation of national biodiversity targets/ indicators. Specific needs in this context should be geared towards securing sufficient fund for enhancing statistical capacity with focus on improving technical capacity of manpower as regard to maintaining and operating the established statistical systems sustainably.

To further enhance monitoring and reporting capacities on biodiversity status, including the reporting to the CBD convention, the national stakeholders during the development process of 6NR have reached a consensus on the necessity to build the management capacity of clearinghouse mechanism (CHM) website within the EPA so as to act as a national server that is accessible to all biodiversity partners through appropriate networking. The CHM 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 biodiversity area.

To put this mechanism in place, it is proposed to include ; (a) information system containing biodiversity indicators for information exchange, monitoring, evaluation of the NBSAP2 implementation & biodiversity status; and (b) a reporting system on biodiversity status and progress of implementation of the NBSAP2 for international, national and local stakeholder communities. In its capacity as secretariat for the 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(the EPA Board of directors) as monitoring and evaluation tool on which the board will decide on remedy actions.

5.4.1.6 Capacity Building

Few capacity building activities have been taken with aim to enable local poor mainly women & men to access productive resources through participation in biodiversity conservation, enhancing their livelihoods & strengthening their resilience withstand against poverty. Specifically, the Government in cooperation with UNDP/ GEF Socotra Governance and Biodiversity(SGBP) has built the capacity of a total 887 local men/women groups , of whom 50% were women in several capacity needs such as management of CHM(1), need identification for accessing donor funding(55), establishment & management of home-garden(295), and enhancing local community livelihoods based on handicrafts production (250), improvement of use of medicinal plant(36), and conservation of the dragon blood (260). This training has led to partial enhancement of community participation in biodiversity conservation and access to biodiversity resources, thereby leading to higher sense of local community ownership, and subsequently to changing their attitude towards environment protection.

5.5 Actions taken to achieve the 2020 Aichi Biodiversity Targets

As indicated in table 3.2, out of 17 national targeted pursued one target has been achieved, additional three are on track, another three are showing progress but at in sufficient rate, nine targets reported insignificant progress, and one target is moving away from target (things are getting worse rather than better). A target by target assessment is presented in the following parts of this section. For simplicity of reporting, description of overall achievements are presented here under five national priority outcomes, which respectively addressing the following biodiversity concerns: 1) biodiversity and ecosystems conservation; 2) sustainable use of biological resources; 3) Strengthening socio-ecosystems resilience against natural and anthropogenic pressures; 4) biodiversity and poverty mainstreaming; and 5) good governance in biodiversity management.

Beside the declaration of Kamaran Island as protected areas, few conservation actions have been implemented, this include rehabilitating/constructing of irrigation canals in 20 sites in Hodeidah, building protective walls against floods to protect agricultural terraces in 8 small sites In Haja, and constructing 17 protective gabions walls for wadi bank stabilization in Abyan & Lahaj. Further, water conservation activities include : renovation of 10 traditional water conservation systems (storage tank/cistern) in 10 highland areas, and establishment of fog harvesting schemes in five highlands areas. The established cisterns along with the promotion of fog harvesting systems contributed to water supplies

for remotely highlands villages, leading to reduction of work load among women while fetching water from long distance .

In its effort to promote sustainable production & consumption (outcome 2) , the Government has undertaken interventions identified by NBSAP2, and this effort has led, by far, to : partial enforcement environmental impact assessment(EIA) to new development projects in mining, energy, and cement industry; diffusion of solar energy into households & commercial sector; the growing business community initiatives in recycling & reuse of plastic garbage; and the gradual increase of diesel prices for water bumping. Additionally, several strides have been taken to mainstream sustainability & biodiversity concerns into environmental strategies, and these efforts have already led to integrating sustainability into several strategies & sectoral plans, including the poverty reduction, and into sectoral development strategies of forestry, agriculture, water & energy sectors. However, implementation of these strategies has been hampered by lack of funding incurred by the continuing war.

To implement outcome 3 on Socio-ecosystems resilience, focus has been geared for addressing three priority concerns, namely sstrengthening socio-ecosystems resilience against climate change, control of invasive alien species, and control of ecosystem pollution

In its effort to alleviate GHG emissions, the Government of Yemen is being implementing the mitigation interventions identified by NBSAP2, and this effort has led, by far, to : 1) Implementation of Ma'rib natural gas generation plant phase I and II Ma'rib; 2) nationwide introduction of individual solar home systems (SHS) into rural & urban households; 3) the shift towards LPG in transportation and in replacement of Biomass energy; 4) and shift to solar pumps for irrigation in of diesel pumping. The diffusion of individual solar home systems (SHS) coupled with the introduction of Ma'rib-I & Ma'rib-II open-cycle gas turbine power plants are considered of significant in terms of global context, simply because the contributed to international mitigation effort through emission reduction, amounting to 1647 Kton CO2 eq annually .

As for controlling alien invasive key achievements include : the eradication of the Indian House Crew from whole invaded areas of Socotra archipelago, the eradication of alotropis procera and Argemone mexicane alien species form several sites within Socotra archipelago, and removal of eradication 3 ha of cactus Opuntia dellenii threatening Bura'a Park biodiversity.

Key measures taken to address ecosystem pollution include: 1) Promoting use organic fertilizers to control of soil erosion and other environmental degradation ;2) setting and enforcing standards for agriculture fertilizer use; 3) and development programs for improved reuse of treated wastewater and reuse of gray water including brackish water.

To implement outcome4 on mainstreaming, focus has been geared, poverty mainstreaming, gender mainstreaming biodiversity mainstreaming, and removal of harmful subsidies to environment.

As regard Poverty & gender mainstreaming key achievements include the creation of 9 women groups in Aden-wetlands & Socotra Protectorates, and building their capacities to serve as catalyzing bodies concerned with promoting livelihoods activities, including marketing of environmental friendly products such handicrafts, basketry, vinegar, honey, traditional clothes and milk products among other. In Socotra only, a total of many women & families have become members of these NGOs and are now fully capacitated to manage home garden to produce adequate vegetables, honey and fruits for their own use and for selling in local market. AS per UNDP Assessment report [11], a total of 295 women of Socotra have been enabled to access door fund and establish and manage their own home-garden, and each owner of home garden earns an average monthly income amounting to 64,000 YR in return of consumption & marketing of home-gardens products such as tomatoes, eggplants, sweet potato, radishes, okra, pistachios, and melons.

As for biodiversity mainstreaming, efforts have been made to mainstream biodiversity conservation into national strategies, plans and programs in Yemen. As a result, several NBSAP targets have already been mainstreamed into several strategies & sectoral plans, including the poverty reduction, and into sectoral development strategies of forestry, agriculture, water & energy sectors. key targets integrated to these policies focused on raising biodiversity awareness, sustainable consumption, conservation of degraded ecosystems, pollution reduction, climate resilience and enabling local communities in management of natural resources. Beside mainstreaming activities, few efforts has been made to reform policy distortion with specific focus on removal subsidies harmful to biodiversity snd replacing these subsidies with positive subsidies, advocating biodiversity conservation. This include partial application of EIA while approving projects implemented by some production sectors, development & application of solar energy in irrigation , the introduction of solar energy into household and commercial sectors, and partial reform of fuel subsidies advocating water pumping for Qat.

Promoting Good Governance in Biodiversity Management (Outcome 5)

Key results achieved under outcome5 on good governance include the successful creation of six community-based bodies coupled with development of six community –based management plans and enabling at least two local women groups to be active partners in management of protected areas natural and promotion of ecotourism. In addition, the development & enforcement of entry fees scheme for 2 nature reserves coupled with the development & enforcement of by-laws for managing the entry fees associated with building capacities of community based entities as regard PA management and provision

[11] Source: Assessment report on achievements of the GEF/UNDP project (SGBP) related to NGO support in Socotra Archipelago, Dec, 2019

of ecotourism services are considered of most important measures, which significantly contributed to the creation of two self-managed community based management bodies in Aden wetland & Bura'a national parks. However the reported impacts of this achievement have recently retarded owing to escalating war which has led to partial damage & closure of available ecotourism infrastructures of the two protected areas.

Key impacts are attributable to increased public awareness in association of implementation of awareness raising intervention are : the creation of the Alliance of Nature Protectors (ANP), local environmental lobbyists Group, 8 Women NGOs, & over 120 environmental schools clubs, which provide strong manifestation on enhanced biodiversity awareness among people.

National Biodiversity Process for Development of Yemen's Sixth National Report

The entire development process of Yemen's Sixth National Report(Y6NR) to the CBD has been accomplished applying a participatory planning exercise, by which a total of 60 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 **three** Multi-Stakeholder consultation workshops to review, discuss, and reach a consensus on the scope & content of Y6NR.

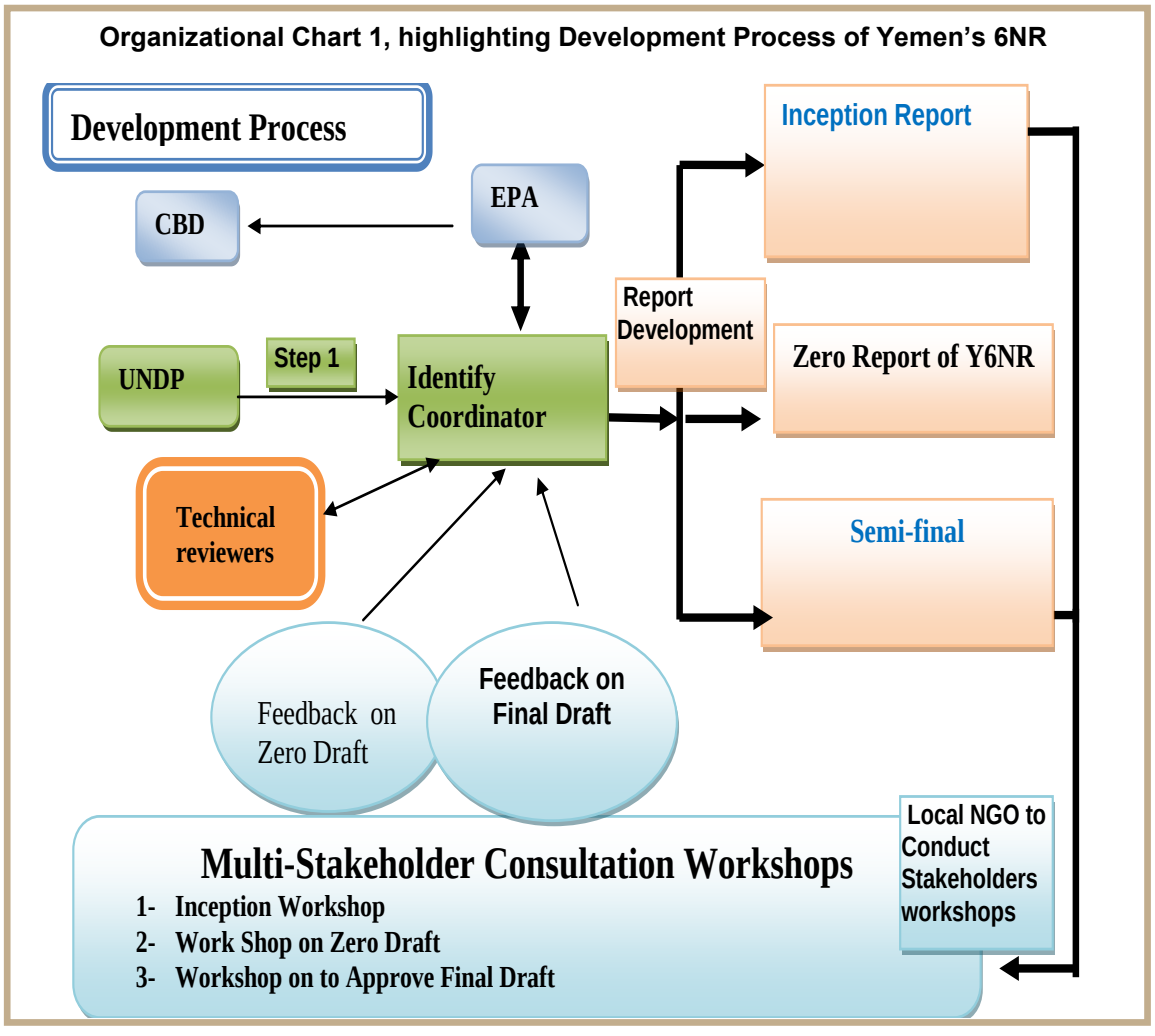
To proceed with this process, the EPA in it capacity as a National focal point to the CBD Environmental partners has initiated communicating with overall environmental partners to agree with them on representation to the stocktaking process targeted for the for the production of Y6NR. As a result, this consultation process has ended by identifying 60 participants to the stakeholders consultation workshops from following environmental actors:

1. Minister of Water and Environment (MWE),
2. A representative of Ministry of Agriculture and Irrigation(MAI),
3. Environed Protection Authority (EPA)
4. Ministry of Planning & International Cooperation (MoPIC),
5. Ministry of Fishery Wealth (MFW),
6. National Women Committee (NWC),
7. Local Women & Men Environmental groups(NGOs)
8. Representatives of Community-based management of at least three protected areas
9. Representative of the Alliance of Nature Protectors (ANP),
10. Representatives of five environmental associations in Aden, namely the Ras Omran Marine Turtles Protection Society, Environmental Friends Society, Al Hassawah Environmental Women Society and Yemen Society for Natural Resource Sustainability.
11. National Water Resources Authority (NWRA);
12. National Water and Sanitation Authority;

13. General Authority of Rural Water supply(GARWS);
14. General Department of Forestry and Combating Desertification (GDFCD);
15. Agricultural Research and Extension Authority (AREA);
16. Civil Aviation and Meteorology Authority (CAMA);
17. Ministry of Tourism, National Women Committee,
18. Aden University;
19. Aden Marine centre
20. Ministry Of education

Under current lack of spatial data & lack of effective monitoring system in place, the development of high-quality assessment report on cannot be achieved unless a wide range of stakeholder specially women & youth are mobilized towards generating adequate information to produce gender responsive report that account for the interests, needs and priorities of both women and men in a balanced manner. To this end, the Sustainability for Natural Conservation (SFNC) has been assigned to facilitate and contribute in data collection for the development of the 6NR, through conducting assessment report in gender mainstreaming for Socotra PA, as well as the facilitation to organize 3 stakeholders workshops delineated for the following:

A. Inception workshop to brief & train stakeholders on reporting structure and format of 6 NR, and to enable them assess progress to achieve national target using the templates, and a pre-defined questionnaire.
B. Second consultation workshop validate zero report
C. Third consultation workshop to validate the semi-final draft of Yemen's 6NR report



To enable stakeholders be effective partners in this process, Yemen adopted cyclical approach shown in organization chart1. The process facilitates progressive refinements of the various draft of the Y6NR, thereby leading to produce a highly refined report. As shown in Organization chart 1, the, cyclic, participatory and consensus-based process has been initiated by launching the inception workshop through which the national stakeholders have learnt about reporting structure of the 6 NR, and also assessed progress to achieve national target of CBD, utilizing questionnaire prepared for this purpose. In this workshop, they have agreed to adopt the adopt the CBD Guideline reporting structure of the 6 NR, and agreed that Y6NR should cover following sections:

1. Information on the targets being pursued at national level;
2. Implementation measures taken and assessment of their effectiveness, and scientific and technical needs;
3. Assessment of progress towards each target;
4. Assessment of the national contribution to the achievement of each Aichi Biodiversity Target; and
5. Updated biodiversity country profiles.

To validate the zero draft of Y6NR, The EPA organized the second national consultation workshop, whereby a total of 60 persons, being representatives of overall environmental governmental and none-governmental actors have come together and reach a consensus on the scope & content of the zero draft of Y6NR. Given the workshop suggested some modification to improve the zero draft, the national coordinator prepared a revised version, incorporating all views and comments raised by the national workshop. This version was then forwarded to a backstopping international consultant to refine it before submitting it to the GEF team for conducting intensive technical review in line with the CBD reporting guideline for 6NR. Having completed the technical review, the national coordinator in line with recommendation of the technical review prepared & presented a semi-final draft of Y6NR to the third stakeholders workshop to get it validated and approved. The national stakeholders in this workshop, held two plenary and 5 task group meetings, where the task groups meetings has been devoted to review, discuss and approve or amend one section of the semi-draft of the Y6NR on initial basis, while the plenaries were responsible for approving the content and scope of each section in final shape. By end of this workshop, a final draft has been developed and forwarded to the EPA focal point, who is currently in his way to submit it to the CBD secretariat.

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32. Data on red list accessed at International Union for Conservation of Nature (IUCN), can be accessed at http://www.iucn.org/ and BirdLife International (2018), can be accessed at http://www.birdlife.org/
33. Data on cereal production accessed at: http://www.fao.org/nr/aquastat accessed Dec-2018
34. Data on crop land and production accessed at FAO Aquastat database at: http://www.fao.org/nr/aquastat accessed Dec-2018
35. Data on chemicals fertilizer use taken from World Development Indicators (WDI)

36. Data on fossil-fuel energy consumption taken from :**http://unstats.un.org/unsd/energy/yearbook/default.htm, derived from World Energy Balances, IEA (2017)**
37. Data on trends of cultivated area taken from: FAO statistics accessed at http://www.fao.org/nr/aquastat in Dec-2018
38. Data on renewable water resources at: http://www.fao.org/nr/aquastat accessed Dec-2018
39. The assessments indicators have been gathered through accessing wide range of national & international sources including among others the following:
    i. CBD Secretariat Information portal and toolsat: https://www.cbd.int/nr6/default.shtml
    ii. The CBD Technical Reporting Guidance accessed at : http://nbsapforum.net/sites/default/files/6NR%20Technical%20Guidance%20--%20FR.pdf
    iii. The CBD Technical Review Frameworkaccessed at http://nbsapforum.net/sites/default/files/6NR%20Technical%20Review%20framework%20 FR_1.pdf
    iv. The 6NR Technical Webinar Series: https://www.youtube.com/playlist?list=PL8vwCyAB16RoQ------l2-1MGrm7CgGIg6KL
    v. The NBSAP Forum accessed At nbsapforum.net: http://nbsapforum.net/sites/default/files/6NR%20Technical%20Guidance%20-%20EN.pdf
    vi. The CBD Data Tracking Tool : https://www.cbd.int/nr6/
    vii. UN Biodiversity Lab: www.unbiodiversitylab.org
    viii. Biodiversity Indicators Partnership (BIP): www.bipindicators.net
    ix. FAOSTAT (http://faostat3.fao.org/home)
    x. OECD Producer and Consumer Support Estimates database (http://www.oecd.org/tad/agricultural-policies/producerandconsumersupportestimatesdatabase.htm)
    xi. CITES (https://cites.org/eng)
    xii. IUCN Red List of Threatened Species (http://www.iucnredlist.org)
    xiii. FAO's Global Forest Resources Assessment (http://www.fao.org/forest-resources-assessment/en)
    xiv. www.bipindicators.net or at : http://bipdashboard.natureserve.org/metadata/ocean-healthindex