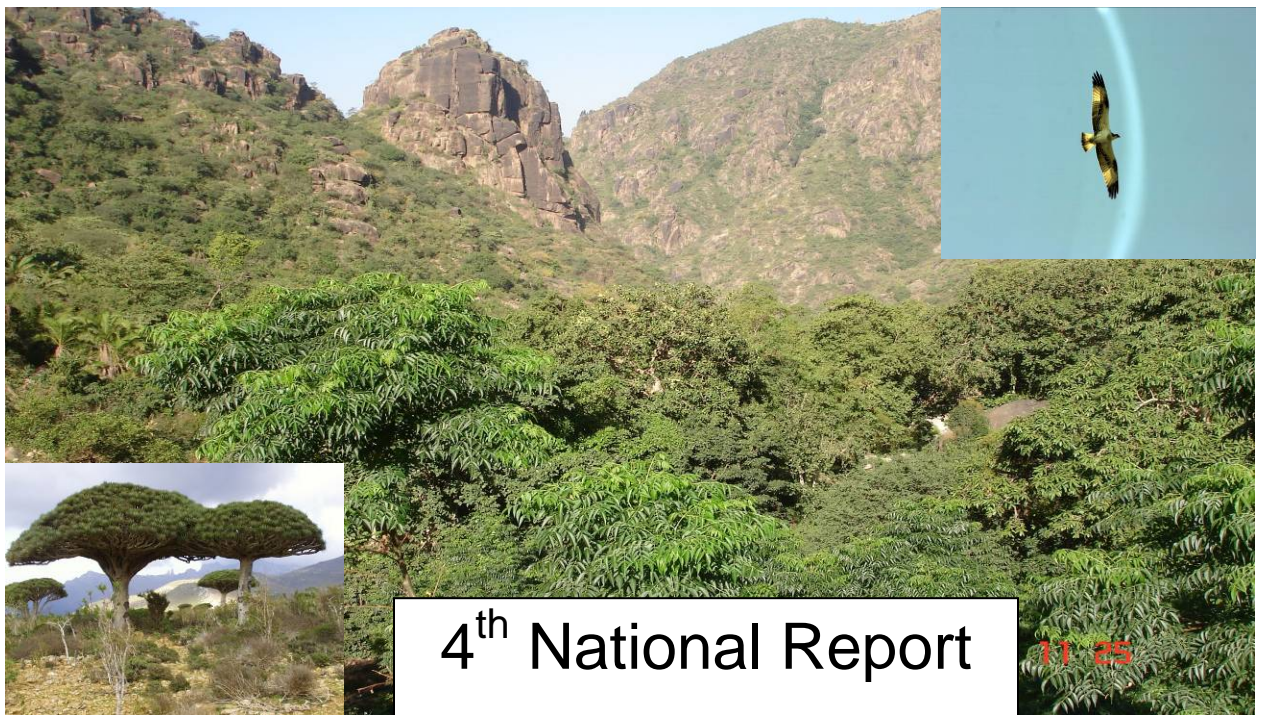




*Republic of Yemen*  
*Ministry of Water and Environment*  
*Environment Protection Authority*



**Assessing Progress towards the 2010  
Target -  
The 4<sup>th</sup> National CBD Report July, 2009**



## **Acknowledgment:**

In accordance with Article 26 of the Convention and COP decision VIII/14, Parties are required to submit their fourth national report to the Executive Secretary, using the format outlined in the 4<sup>th</sup> NR guidelines. Parties to the Convention on Biological Diversity, in adopting a Strategic Plan, have committed themselves to achieving, by 2010, a significant reduction in the rate of biodiversity loss at the global, national and regional levels, as a contribution to poverty alleviation and to the benefit of all life on earth.

The fourth national report provides an important opportunity to assess progress towards the 2010 target, drawing upon an analysis of the current status and trends in biodiversity and actions taken to implement the Convention at the national level, as well as to consider what further efforts are needed.

This report which was prepared over a 6 months period during the preparation time of the 4<sup>th</sup> NR. Two workshops and several consultancies meeting were held, in addition to close collaboration with national specialists and research centers.

All relevant national agencies and stakeholders were involved in the preparation of the national report, including NGOs, civil society, and local communities, private sectors, and the media.

We gratefully thank all of the individuals, relevant agencies, stakeholders and local communities who have provided input to this report including the national consultant's team under the supervision of Mr. Mahmoud Shidiwah the Chairman of EPA, Mr. Abdul Hakim Aulaiah Team Leader, Dr. Mansor Al-Aqil, Dr. Abdul Wali Al-Khwilidi and Mr. Gamal Al-Harani.

We particularly thank the international organizations who supported the Republic of Yemen to prepare the 4<sup>th</sup> NR UNEP as the implementing agency for the GEF and UNDP for the technical and financial support, special thanks are due to Mr. Selva Ramchandran, UNDP Country Director for his conceptual guidance on the overall concepts of the report, Mr. Fuad Al-Khadasi, Team Leader Pro-Poor Economic Growth for his many hours of brainstorming, facilitation and follow-up the progress during development of the report and Ms. Zuzana Tollrianova for her administrative support.

Additionally, we would like to thank CBD Executive Secretary Dr. Ahmed Djoghlaif and his staff Mr. David Cooper and Mr. Lijie for their technical support.

EPA would like to thank the participants of the two workshops and other contributors for their creativity, practicality and enthusiasm, and for sharing their ideas and experiences; in particular Dr. Tafeq Abdul Latif and Ali Abdul Bari have made the editing of the 4<sup>th</sup> NR.

The assistance and contribution of all is appreciated, without their efforts it would have been difficult to make this achievement. I trust that this report will be of instrumental value, in achieving the vision in accordance with Article 26 of the Convention and COP decision VIII/14.

**Eng. Abdul Rahman Fadl Al-Eriani**  
**Minister of Water & Environment**

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## **Executive Summary**

The ecosystems of Yemen provide habitats for plants, animals and micro-organisms which can be used or which perform useful functions. Specifically, they regulate thermal and water regimes, influence the climate, and play an important role in maintaining atmospheric air quality and in ensuring a healthy ecological environment for humans. Elements of biodiversity also act to protect the soil from erosion. Yemeni people have hunted, fished and gathered the plants and animals of Yemen for centuries and their uses of natural resources continuing today.

In agriculture, biodiversity has ensured sources of food, fodder and grazing for livestock, genetic variation for selection, etc. Browsed and grazed plants include a large number of trees, shrubs, grasses and weeds that are important to cattle, sheep and goats.

In medicine, some plants are extremely important sources of natural and commercial remedies. Medicinal and aromatic: Even though the medicinal flora of Yemen is not well documented it is important to note that 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. A list of 224 medicinal and aromatic plants was compiled by national experts<sup>1</sup> in 1995.

Forest resources are widely used in industry and construction. Species most commonly utilized for fuel wood include most of the woody plant.

Fisheries are considered a promising sector for sustainable development. The Republic of Yemen owns one of the best fisheries areas in the region. The contribution of this activity to the GDP is limited 2% in the year 2008. Fish has already become Yemen's third most important export food commodity; one third of total fish production, with value 49,496 million Yemeni Rial was exported in 2007. Fish is also nutritionally significant, contributing to local food security by providing an important source of animal protein.

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. Similarly, forest and mountains areas threatened by cutting trees and over grassing .

Coastal and marine resources are threatened by over fishing, spear-fishing, aquarium fishing and dynamite fishing. These factors also represent major disturbances to the coral reefs of Yemen. Oil exploration and transport have resulted in several oil spills. Sewage discharge, agro-chemicals flushed by floods, and sedimentation from urban development pose further threats to the Red Sea's coral reefs. Industrial and urban development, as well as extensive coastal development, land filling, and coastal engineering are dramatically altering certain coastal areas. Recreation and tourism also contribute to eutrophication and reef degradation. Coastal and marine biodiversity, including the Socotra Island, and Kamaran Island is threatened by the cutting of mangroves for wood and the use of mangroves for feeding animals, fuel-wood supply.

Other threats to the coastal and marine environment of Yemen include the uncontrolled use of

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<sup>1</sup>Al-Dubaie and Al-Khulaidi, 1995: the list contains plant's scientific names, families, common names, distribution, active substances, and medicinal use.

coastal zones, destruction of marine and coastal habitats and ecosystems, spatial conflicts among various users, unplanned coastal reclamation, the destruction of benthic habitats by bottom trawling and the destruction of endangered species due to non-selective gear.

Over the past few years, Government efforts to protect and sustainable use the various components of Yemen's biodiversity have focused primarily on establishing Protected Areas. The results of these efforts have led to the identification more than 35 areas throughout the country, which are of outstanding biodiversity/natural value and urgently need to be protected. For their important role in supporting wildlife and maintaining the diversity and viability of the various components of Yemen's biodiversity, dense forest cover in Jabel Bura'a, Jabal Eraf forest, KetFah, Hawf, and Jabel Lawz (Khawlan) are identified as most important areas for declaring and establishment of protected areas. In Coastal region and Islands, Socotra Island, the coastline of Balhaf Burum ,and the coastline of Sharma-Jethmun , Al-Lhaia and Al-Gwrirah have been cited important for the protection of marine and coastal biodiversity .

The loss of biodiversity is the main specific issue of the habitat degradation problem in Yemen, and emphasized the need for inventorization of flora and fauna, including those species that are endemic, rare and endangered.

Conservation of biodiversity is vital in a country such as Yemen, where eco-systems are fragile and the renewable natural resources are scarce. Those ecosystems are deteriorating rapidly due to multiple interacting factors mostly due to socio-economic changes which result in excessive grazing, soil erosion, over-fishing, over-hunting, land degradation and declining biological diversity. Yemen has recognized the necessity to protect natural resources and biodiversity as reflected by the ratification of the Convention on Biological Diversity (CBD).

The indigenous natural resource management systems of the Yemeni people will be supported, protected, utilized and seen as a rich natural heritage. The basic principles also incorporate responsible public management based on accountability, transparency, participation in decision making and a full analysis of impacts.

The government of Yemen has approved Environmental Impact Assessment Policy and regulation in 1998. Yet, its implementation in large-scale projects is weak and there is urgent need to studying and analyzing the environmental feasibility of proposed projects, whose construction or activities might affect the safety of the environment.

EPA in cooperation of national specialist from the stakeholders ,relevant ministers, universities, national research centers and NGOs were developed the National Biosafety Framework. The National Biosafety framework was officially declared by the Prime Minister's decree .

This exercise came to a conclusion that the goals of sustainable development can never be reached through a short-term vision. A new approach was needed to concentrate on long-term vision and solutions since most of Yemen's development challenges require continuous action over a long period of time. Such long-term vision should however be flexible and liable to revision and correction through short to medium-term plans.

In short, the country's vegetation cover is being drastically reduced by rapid degradation of the environment, a direct result of desertification and droughts.

Effort has been made to mainstream biodiversity conservation into the plans and programs in the country. This is being done through the development of the new national strategy for economic development and poverty reduction which is being prepared, where environment has been put as a sector and is being defined as a cross-cutting issue. From these efforts, the components of biodiversity have been established as priorities areas of the country especially in environment sector, forestry, agriculture, private sector development, tourism, etc.:

One of the major challenges in the implementation of the convention is the lack of coordination of activities in the field of biodiversity. Also, there is no policy specific to biodiversity and the capacity of NGOs in the field of biodiversity conservation.

To date, many activities for the implementation of the convention are done through projects financed by the GEF ,UNDP,UNEP,World Bank and by other donors . However, the resources are still inadequate to effectively implement the NBSAP and for coordination and monitoring of activities in the field of biodiversity.

Inspire in what has been achieved in the country in the field of biodiversity; which though declaration of 6 protected areas and 9 ICZMP. These reflected the government concern to collaborate with the global commitments in sustainable development and natural resources conservation. Still the national efforts experienced shortage of technical and financial resources capacity.

In the forthcoming years the most national priority is to declare the remaining sensitive sites in the country to become areas under management (protected areas). However, these requires thorough studies and management plans preparing to enable the government to properly manage them.

# **Chapter I - Overview of Biodiversity Status, Trends and Threats**

## **INTRODUCTION**

### **1.1 Geographical Location and Borders**

The Republic of Yemen lies in the southwestern part of the Arabian Peninsula between latitude 12 40 and 19 00 North, and 42 30 to 53 05 East longitude. It is bordered by Saudi Arabia in the north, the Arabian Sea and the Gulf of Aden in the south, Oman in the east, and the Red Sea in the west.

### **1.2 Physical Geography**

The Republic of Yemen is located on the southern coast of the Arabian Peninsula. Its land boundaries are with Saudi Arabia in the north and Oman in the east. The coastline more than 2500 km .

Yemen covers a total land area of 527.970 square kilometers. About 3 percent of the land can be used for agriculture or about 1.609.484 hectares in the year 2007, but only million hectares were actually cultivated each year from 1990 to 1994. The main crops are grain, fruits, vegetables, and qat. Range lands together with forest and woodlands comprise almost 40 percent of the land area. The land is grazed by about 8.5 million sheep, 8.4 million goats, and 1.4 million cattle (2007). Other land, mostly desert with limited use potential, constitutes almost 60 percent of the total land area.

Yemen is a generally mountainous country .The altitudinal range extends from sea level up to 3760 meters at Jebel Al-Nabi Shauib, the highest point in the Arabian Peninsula. Such altitudinal variation results in a great diversity in climates and landscapes

Located at the cross- roads of the African, Asian, and Palearctic ecological zones, and with a wide range of terrestrial, coastal, and marine landforms, Yemen is characterized by a rich variety of natural habitats, species and genetic diversity, including many endemic species. These Resources are of major economic importance because of their potential for tourism and the wildlife and fisheries they support.

Also, numerous plants are used in traditional medicine, in local industries, and for grazing and fuel wood. However, in recent decades human activity has transformed the landscape and over-exploited available biological resources, which resulted the deterioration of many habitats, in major reduction in plant and animal species, and in extinction of endemic rare, and endangered species

The country is characterized by five major land systems: (1) a hot and humid coastal Tihama plain, 30-60 km wide, along the Red Sea and the Gulf of Aden, (2) the Yemen Highlands, a volcanic region with elevations between 1,000 and 3,600 m. parallel to the Red Sea coast, and with temperate climate and monsoon rains, (3) the dissected region of the Yemen High Plateaus and the Hadramawt - Mahra Uplands, with altitudes up to 1,000 m, (4) the Al-Rub Al-Khali desert interior, with a hot and dry climate, and (5) the islands, including Socotra in the Arabian Sea and more than 112 islands in the Red Sea. Yemen's coastal and marine ecosystems which include extensive

mangroves, coral reefs, and sea grass areas are of major economic importance for fisheries and tourism.

### **1.3 Climate**

Climate of Yemen is characterized by five major land systems: (1) hot and humid coastal plain, (2) the temperate Yemen Highlands, (3) the Yemen High Plateaus and Hadramawt – Mahra Uplands, (4) the desert interior, and (5) the islands. Reflecting this geographic variation, rainfall varies widely, from less than 50 mm along the coast, rising with the topography to between 500 and 800 mm in the Western Highlands, and dropping again to below 50 mm in the desert interior.

Rainfall and temperature are the most important factors for life. Because moisture from rainfall is the minimum factor it determines much of the ecology. Rainfall varies from less than 50 mm in the coastal plains and desert plateau regions to more than 1200 mm in the western mountainous highland region occurring in two periods, first March-May and second July-September.

Rain falls primarily in spring and summer, and is determined by two main mechanisms: the Red Sea Convergence and the Inter Tropical Convergence Zone. Temperature depends primarily on elevation, and in the coastal areas, is determined by distance from the sea. Mean annual temperatures range from less than 12C in the Highlands (with occasional freezing) to 30 C in the coastal plains. Yemen lies within the northern stretches of the tropical climatic zone and its border with the sub-tropical climatic zone. The extreme differences in elevation are largely responsible for the great variations in temperature and climate over the country. Mean annual temperatures range from less than 15C in the highlands to 30C in the coastal plains.

### **1.4 The Convention on biological diversity**

Yemen has signed in 1992 and ratified in 1995 the International Convention on Biological Diversity which was launched at the Earth Summit conference in 1992. In so doing, Yemen has acknowledged the value of biological resources as an integral part of its natural heritage with the potential for yielding long term benefits for the Yemen people and as essential foundation for sustainable development. The Government of Yemen takes its responsibilities for the conservation and sustainable use of its natural resource seriously. It recognizes also that the well being of its present and future communities depends on the conservation of the diversity and abundance of its biological resources.

### **1.5 portrait of biodiversity for Yemen**

The Republic of Yemen ranks as the most populous country in Arabian Peninsula with a population growth rate more than 3.0 Under current accelerating growth of economy, environmental quality is fast deteriorating, as dramatized by the increased occurrence of environmental problems. Specifically, the gains of economic growth are being diminished, or even negated, by numerous factors including: deforestation; pervasive and coral reef destruction; massive pesticide poisonings; degradation and erosion of agricultural lands; pollutant intrusion into aquifers; irresponsible tourism activities; marsh and mangrove destruction; loss of forest and green cover associated with massive urbanization; industrial pollution; continued reliance on non-renewable energy sources; destructive fishing methods; and indiscriminate oil exploration and exploitation.



Meanwhile, conservation of biological diversity has become a focal point for environmental conservation efforts with the declaration of a number of protected areas. There is also a growing awareness among the environmental community of the importance of biological diversity and the role of indigenous ways of life in maintaining the integrity of ecosystems. While operationalization has been slow; sustainable agriculture, agro-forestry, and environmentally sound fishery initiatives have spread to the majority of provinces in the Republic of Yemen.

## **1.6 Biodiversity status**

### **1.6.1 Habitats and Floristic**

Yemen hosts a variety of habitats which range from coastal mangroves, shrub lands and dunes along the coastal plains to the eastern deserts and an array of mountain habitats that reach elevations of up to 3760 m at Jabel Al-NabiShauib, the highest point on the Arabian Peninsula. These habitats harbour a great number of unique species of plants. Rapid degradation of the environment, a direct result of desertification and droughts, among the oldest global environmental phenomena, are drastically reducing the country's vegetation cover and posing severe threats to wildlife, including many endemic species.

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 with a current growth rate of some 3.5% per annum, one of the highest rate in the region. Plant populations are thought to have declined considerably, and agricultural production has undergone dramatic changes due to the expansion of Qat plantations at the expense of other crops.. These alarming trends demand urgent conservation attention, if even representative portions of Yemen's natural biotic wealth are to remain for future generations.

The unique geographical position between the Arabian Peninsula and Africa, and at the junction point of the Red sea and Arabian Sea has given Yemen different climatic and topographical features, which are favorable for the existence of divers ecosystems along with a high level of biodiversity.

### **1.6.2 Status of Yemen's Flora**

The flora of Yemen is very rich and heterogeneous. Species diversity is a result of considerable climatic changes in former periods, which enabled different species to survive in the different ecological habitats. About 2810 plant species were recorded in Yemen, 15% of them are endemic <sup>2</sup>. Socotra Archipelago is unique in its flora and like many oceanic islands has a high level of endemism. The latest study reported that Socotra Archipelago contains approximately 825 plant species, 307 (about 37%) of which are endemic and 15 endemic genera <sup>3</sup>.

The majority of endemic taxa in Yemen are associated with mountainous areas which provide a rich variety of ecological niches and offer a degree of environmental stability during periods of climatic changes. Endemism is generally very high among the succulent plants. The largest numbers of endemic species are found within the ASTERACEAE, APOCYNACEAE taking into account the Stapeliad genera (Caralluma, Duvalia, Huernia, and Rhytidocaulon). EUPHORBIACEAE, ACANTHACEAE, BORAGINACEAE (see table ). Preliminary data on the

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<sup>2</sup> (Al Khulaidi, A.A. (2000).

<sup>3</sup> (Miller, A.G. and Miranda, M (2004).

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 (see annex ).

Table ( 1 ) Endemic and near-endemic plant species with their status  
The most important families regarding to the number of endemic are:

Family	No of endemic
1. ASTERACEAE (COMPOSITAE)	46
3. APOCYNACEAE (ASCLEPIADACEAE)	42
2. EUPHORBIACEAE	31
4. ACANTHACEAE	27
5. BORAGINACEAE	26
6. FABACEAE ( PAPILIONACEAE)	21
7. LAMIACEAE (LABIATAE)	21
8. CARYOPHYLLACEAE	15
9. RUBIACEAE	13
10. Aloeaceae	13
11. SCROPHULARIACEAE	12
12. POACEAE (GRAMINEA)	10
13. BURSERACEAE	10

### 1.6.3 Status of Terrestrial Fauna

Yemen has a rich and diverse terrestrial fauna because of the wide range of habitats in the country and due to its position at the juncture of three major biogeographic regions, the Pale-arctic, Afro-tropical and oriental regions

Yemen has 71 recorded land mammal species representing eight orders including bats (table 2). About one third of the mammals are relatively large species which are rare in other parts of Arabia such as the Idmi or Arabian Mountain Gazelle (*Gazella gazella*), Ibex (*Capra ibex nubiana*), Baboon (*Papio hamadryas*), Arabian Red Fox (*Vulpes vulpes arabicus*), Sand Fox (*Vulpes ruppelli*), Blanford's Fox (*Vulpes cana*), Striped Hyena (*Hyaena hyaena*), Arabian Wolf (*Canis lupus arabs*), Jackal (*Canis aureus*), Arabian Leopard (*Panthera pardus nimr*), and possibly the Cheetah (*Acinonyx jubatus*).

It is notable that seven mammal species are now considered endangered including three of the four species of gazelle, and another three species 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 have been cut down. With some dedication and luck, ecotourists may still spot rare land animals such as the Arabian leopard, hyena, Hamadryas baboon, honey badger, hedgehog, ibex, and fox.

Table( 2 ). Preliminary record of orders, families, genera, and species of mammals in Yemen			
Order	Family	Genus	Species
Insectivora	2	3	6
Primates	1	1	1
Carnivora	6	11	16
Hyracoidea	1	1	1
Lagomorpha	1	1	1
Artiodactyla	1	4	8
Rodentia	4	9	15
Chiroptera	8	18	23
Total	24	28	71

For long time, large mammals have been under considerable pressure and some of which vanished from the country and most of the others became rare and threatened. Over the last century, four species have been killed and became extinct and these are listed in table.

The Nubian ibex -*Capra nubiana*-, the Arabian leopard -*Panthera pardus nimr*-, Arabian oryx *Oryx leucoryx* are and the three Arabian gazelles listed above are decreasing sharply and have become rare as a results of continues hunting and absence of protection, breeding and re-introduction programmes.

Yemen has ratified the Convention on International Trade in Endangered Species of Fauna and Flora (CITES), and has recently enacted by-laws to implement the treaty.

#### Birds

The Arabian Peninsula is an important “land bridge” between Africa, Asia and Europe for approximately three billion birds which annually migrate along north-south or east-west routes. Yemen has a very rich bird life with more than 363 species thus far recorded representing 18 orders, 61 families and 177 genera. It is a home to a large number of species that are endemic to southwest Arabia. For a country to be so richly endowed with endemic birds adds greatly to its international significance. With the exception of the Arabian Golden Sparrow, all endemic species occur in the Mainland. The loss of the terracing systems could adversely affect several of the endemics as a result of soil erosion and loss of trees. Terrestrial arthropods are represented by 5 classes, 38 orders, 313 families, 1 833 genera, and 3 372 species.

From an eco-tourism point of view, endemic birds have the highest relevance. The 13 endemic and near endemic species of the mainland found in the southern portion of Arabian Peninsula are: Philby’s and Arabian Partridges, Arabian Woodpecker, Yemen Thrush, Arabian Wheatear, Yemen Warbler, Arabian Golden Sparrow, Arabian Waxbill Yemen Accentor, Arabian Olive-rumped and Yemen Serins, Yemen Linnet, and Golden-winged Grosbeak. The six endemic species to Socotra Island include the Socotra Warbler, Socotra Cisticola, Socotra Sunbird, Socotra Starling, Socotra

Sparrow, and Socotra Bunting The distribution of endemic and semi endemic birds in mainland Yemen and Socotra is shown in Table 10.

Table 10. Endemic and near-endemic bird species in Yemen

Species	Endemic to Yemen	Semi Endemic
<i>Alectoris melanocephala</i> (Red-legge Partridge)	●	
<i>Alectoris philbyi</i> (Philby's Rock Partridge)	●	
<i>Carduelis yemenensis</i> (Yemen Linnet)	●	
<i>Cisticola haesitata</i> (Socotra cisticola)	●	
<i>Dendrocopos dora</i> (Arabian woodpecker)	●	
<i>Emberiza socotrane</i> (Soqotra Bunting)	●	
<i>Estrilda rufibarba</i> (Arabian Waxbill)	●	
<i>Incana incana</i> (Socotra Warbler)	●	
<i>Nectarinia balfouri</i> (Balfour Sunbird)	●	
<i>Oenanthe lugens lugentoides</i> (Mourning Wheatear)	●	
<i>Onychognathus frater</i> (Socotra Starling)	●	
<i>Otus senegalensis socotranus</i> (Socotra Owl)		●
<i>Parisoma buryi</i> (Yemen Warbler)	●	
<i>Passer euchlorus</i> (Golden Sparrow)	●	
<i>Passer insularis</i> (Socotra Sparrow)	●	
<i>Prunella fagani</i> (Arabian Accentor)	●	
<i>Rhynchostruthus s. socotranus</i> (Golden-winged Grosbeak)	●	
<i>Serinus menachensis</i> (Yemen Serin)	●	
<i>Serinus rothschildi</i> (Arabian Serin)	●	
<i>Turdus menachensis</i> (Yemen Thrush)	●	

The authoritative report by M. Evans et al (1994) on Important Bird Areas of the Middle East contains a detailed inventory of 57 sites, which are of vital importance for the conservation of birds in Yemen. These 57 sites, covering a total area of 7 300 sq km or about 1.4 % of the area of the country contain all the endemic or near-endemic bird species, as well as other rare, significant or limited-range species. These sites, distributed around the country (including Socotra Island), also represent prime eco-tourism destinations in Yemen since, apart from containing important and interesting avifauna, many of them consist of relatively undisturbed natural areas and are of great botanical interest. Some of them also contain other interesting types of animals. However, none of these sites are legally protected for nature conservation purposes (although some may be covered by traditional resource-use reserves, or Mahjur) and many of them are in serious risk of degradation or destruction.

Freshwater habitats specially near biologically rich mudflats along coastal areas and wadies are of particularly important for the following species: Carb Plover (*Dromas ardeola*), Greater Sand Plover (*Charadrius leschenaultii*), Lesser Sand Plover (*Charadrius mongolus*), Sanderling (*Calidris alba*), Little Stint (*Calidris minuta*), Curlew Sandpiper (*Calidris ferruginea*), Bar-tailed Godwit (*Limosa lapponica*), Grey Plover (*Pluvialis squatarola*), and Redshank (*Tringa totanus*). Storks, herons and egrets also occur on passage in small to moderate numbers but no important concentrations have been discovered. White Storks (*Ciconia ciconia*) winter in small numbers at freshwater sites and breeding species include Abdim's Stork (*Ciconia abdimii*) (on Tihama

rooftops), Reef Heron (*Egretta gularis*) (coast), Cattle Egret (*Bubulcus ibis*) (trees on Tihama and foothills), Green-backed Heron (*Butorides striatus*) (mangroves), and Pink-backed Pelican (*Pelicanus rufescens*) (mangroves); though none have been censused.

Raptors frequently suffer more than other species in terms of both indirect (e.g. pesticide pollution) and direct persecution. However neither is common in Yemen. As a consequence there appears to be a healthy raptor population with some 17 resident species and a further 15 occurring regularly on passage or in winter. The limited information suggests that the country is in the path of an important flyway, at least in autumn, for migrant Steppe Eagles (*Aquila rapax*), Buzzards (*Botu* spp.) and Black Kites (*Milvus migrans*) passing from their Palearctic breeding grounds to their main wintering area in East Africa. Clearly there is an international responsibility to ensure that these birds are unmolested. Within the Arabian Peninsula, Yemen is probably now the only country with a self-sustaining population of Arabian Bustards. This may in fact be partly supplemented by migrants crossing the Red Sea. The species may be threatened from hunting on the Tihama, the only place where this bird occurs in the country.

A number of these birds can be observed along the coast of Yemen. About 82 species of sea and shore birds were recorded from the coastal area of Yemen along the Red Sea; in which 14 species were endemic to the region. Fifteen species were also recorded from the southern coastal region of Yemen. In Socotra Archipelago a total of 70 species were known to be found, however the following species were endemic to the region:

- 1- *Phalacrocorax nigrogularis*
- 2- *Onychognathus frater*
- 3- *Passer insularis*
- 4- *Fringillaria socotrana*
- 5- *Cyaromitra balfouri*
- 6- *Incana incana*
- 7- *Cisticola haesitata*

#### 1.6.4 Reptiles and Amphibians

A total of 103 species of Reptiles and 8 species of Amphibians have been recorded in Yemen (table 4 ). The reptiles of Yemen include 71 species of lizards, 28 snakes and 3 amphibians, all belonging to the Order Squamata which comprises the largest reptilian group. Turtles (Order Testudinata) are represented in Yemen by 7 species, one terrestrial species (*Geochelon sulcata*), one freshwater species (*Pelomadora subrufa*) and four species of marine turtles<sup>4</sup>. The amphibians include 8 species belonging to 3 families.

Table 4 Preliminary records of orders, families, genera and species of the classes of reptiles and amphibians in Yemen.

Group	Number		
	Family	Genus	Species
Amphibians	3	4	8
Lizards	6	22	71

<sup>4</sup> See Section XXX under Marine Biodiversity for a list of species.

<b>Amphibians</b>	1	3	3
<b>Snakes</b>	7	22	28
<b>Turtles</b>	4	7	7
<b>Total</b>			

The 71 species of lizards recorded in Yemen belong to 22 genera and six families, and the 28 snake species are shown in (Table 4).

Table 5. Number of lizard species and their families, recorded in Yemen.

<b>Family</b>	<b>Number</b>	
	<b>Genera</b>	<b>Species</b>
<b>Agamidae</b>	3	11
<b>Chamaeleonidae</b>	1	5
<b>Geckonidae</b>	7	34
<b>Lacertidae</b>	5	9
<b>Scincidae</b>	5	10
<b>Varanidae</b>	1	2
<b>TOTAL</b>	22	71

Table 6. Number of snake species, and their families in Yemen.

<b>Family</b>	<b>Number</b>	
	<b>Genera</b>	<b>Species</b>
<b>Boidae</b>	1	2
<b>Colubridae</b>	12	15
<b>Elapidae</b>	2	2
<b>Hydrophiidae</b>	1	1
<b>Leptotyphlopidae</b>	2	3
<b>Typhlopidae</b>	1	1
<b>Viperidae</b>	3	4
<b>TOTAL</b>	22	28

### 1.6.5 INVERTEBRATE ANIMALS

The terrestrial Arthropods in Yemen are belonging to 5 classes, 38 orders, 313 families, 1833 genera and 3372 species (table 7 ). Unfortunately all these species are listed in the foreign literature and Yemen has no recorded specimens in its collections.

Table 7. Preliminary records of classes, orders, families, genera and species of terrestrial arthropods in Yemen

<b>Class</b>	<b>Number</b>			
	<b>Order</b>	<b>Family</b>	<b>Genus</b>	<b>Species</b>
<b>1-Arachnida</b>	8	52	134	252
<b>2-Malacostraca</b>	1	5	7	11

<b>3-Diplopoda</b>	2	2	2	5
<b>4-Chilopoda</b>	2	4	6	12
<b>5-Hexapoda</b>	25	250	1684	3092
<b>TOTAL</b>	38	313	1833	3372

The Class Arachnida (scorpions and spiders) are second after the insects in the number of species that have been recorded in Yemen. It is represented in Yemen by eight orders, 52 families, 134 genera and 252 species (Table8 )

Table 8. Preliminary record of orders, families, genera and species of the Class Arachnida

<b>Order</b>	<b>Number</b>		
	<b>Family</b>	<b>Genus</b>	<b>Species</b>
<b>Scorpiones</b>	3	8	19
<b>Amblypygi</b>	1	1	1
<b>Uropygi</b>	1	1	2
<b>Araneae</b>	31	85	160
<b>Opiliones</b>	2	2	3
<b>Acari</b>	8	25	49
<b>Pseudoscorpiones</b>	3	6	7
<b>Solifugae</b>	3	6	11
<b>TOTAL</b>	52	134	252

The remaining invertebrates recorded from Yemen are shown in (Table 9 )

Table 9. Invertebrates other than Archnida recorded from Yemen

<b>Class</b>	<b>Order</b>	<b>Number</b>		
		<b>Families</b>	<b>Genera</b>	<b>Species</b>
Malacostraca	Isopoda	5	7	11
Diplopoda	Polydesmida	1	1	3
“	Spirostreptida	1	1	2
Chilopoda	Scolopendromorpha	2	4	4
“	Geophilomorpha	2	2	3
Hexapoda	25 orders	250	1684	3092
<b>TOTAL</b>	30	261	1699	3115

### **Agricultural Biodiversity**

Arable land counts for 1.6 million hectares (3% of the country). It is estimated that during the last 5 years about 1.4 million hectares have been actually under cultivation in the year 2007. Main field

crops are: cereals including sorghum, wheat, maize, millet and barley; vegetables including potato, tomato, beans, cucurbits, onions, carrots, crucifers, okra, eggplant and pepper; fruits including grapes, dates, citrus, guava, mango, peach, apples, banana, papaya, apricot, almond and pomegranate; cash crops including qat, coffee, cotton, sesame and tobacco; forage and feed crops including alfalfa, sorghum and grasses.

Rangelands, forests and other woodland areas comprise about 40% of the land area. More than 8 million sheep, goats and cows graze the land. The remaining land (57% of the country) is mostly desert.

Farmers have utilized genetic diversity in different ways: by using suitable cropping patterns and crop rotation systems (maximum benefits from rainfall), using crop varieties highly adapted to specific conditions at different agro-ecological zones, using varieties (grapes, dates) with different maturity periods to supply the market during the year. These and other useful practices need to be preserved.

Modern agricultural practices result in loss of much agricultural biodiversity through uniform practices, reduction in the importance of local and traditional methods of tillage and husbandry and widespread use of pesticides. Once Yemen loses all the local varieties and wild relatives of crops, breeds of sheep, goats and camels, or even breeds of salukis, it will be totally dependent on foreign imports for seed, plants and animals.

All plants, whether they are endemic, near endemic, threatened, vulnerable or believed to be extinct, are important in maintaining the integrity of their respective ecosystems. Unless measures are taken to safeguard all species, then some of the relict populations could face extinction in the near future.

The government identified EPC as a steering and controlling institution and strengthened its capacity in coordinating and facilitating information sharing between relevant partners through establishing an effective data collection system, effective and efficient procedures for the scrutiny and approval of investment, development projects and projects.

Establish a national land resource data base suitable for physical planning of agricultural development at regional and sub-regional level

Train the national staff in soil surveying at different levels of intensity, land use surveying, land evaluation, agro-economic and agro-sociologic analysis particularly where related to land use, land use planning techniques, data base establishment, computer operations and soil laboratory and cartographic facilities operations

Towards this end and to enhance monitoring of habitat degradation, the Government has establishment Land Resource Management Center in AREA (Damar Governorate). The center since its formation in 1998 has been surveying, searching and collecting information on various aspects of biodiversity and land degradation and has succeeded in producing the following results:

- ❖ National inventory and data base development of fauna and flora.



- ❖ Land resource utilization studies and plans for watersheds in Abyan and Shbwa.
- ❖ Developing and guidelines and manuals for land resource utilization planning and land degradation monitoring.
- ❖ Soil survey, classification & mapping for Shabwah and Abyan Governorates.

### 1.6.6 Coastal and Marine Species

The coastline of Yemen is over 2500 km long and includes three different coastal regions, namely the Red Sea, Gulf of Aden and Arabian Sea. The Red Sea region represents about one third of this coastline, with the remainder bordering the Gulf of Aden region. The Red Sea and Gulf of Aden region of Yemen represent a complex and unique tropical marine ecosystem with extraordinary biological diversity and a remarkably high degree of endemism. The Eastern Gulf of Aden and Arabian Sea region is a highly productive fishery region due to the Tropical Upwelling phenomenon, supporting a food web that ultimately sustains fish communities. Both the Red Sea and the Gulf of Aden are designated “special areas” under the international MARPOL convention. To protect marine ecosystems of the Yemen Red Sea coast, including coral reefs and other critical habitats by surveying on the marine ecosystems of the Red Sea, establishment institution as a branch of the Marine Science and Research Center for monitoring of marine environment, and Provide training of national counterparts through overseas training for higher studies and in-country, on-the-job training.

The Protection of Marine Ecosystem of the Red Sea Coast , based in Hodeidah, started in December 1995. The main objective is building the capacity for the Government in sustainable .

Over 186 islands lie in the seawater of Yemen with distinct climatic and natural characteristics. More than 151 of these islands lie in the Red Sea region. Among those located in this region: Kamaran Island is the largest, and Mayoan Island, located in the Bab Mandab Strait, has strategic importance. Most corals and coral habitats exist around the Yemeni islands, but with different diversity of communities and number.

Table ( 10 ) marine resources

no.	Items	Species
1	<b>Fish</b>	969 spp
2	<b>Mollusks</b>	625 species
3	<b>Crustaceans</b>	53 species (Lobster 5spp and Shrimps 4spp)
4	<b>Echinoderm</b>	168 species (Sea Cucumber 20 spp)
5	<b>Algae</b>	485 species
6	<b>Macro algae</b>	283 species
7	<b>Sea grasses</b>	9 species
8	<b>Phytoplankton</b>	283 species
9	<b>Zooplankton</b>	139 species
10	<b>Sea and shore Birds</b>	102 species
11	<b>Marine turtles,</b>	4 species
12	<b>Corals reefs</b>	300 species
13	<b>Coastal Fresh water vegetation</b>	3 species
14	<b>Halophytes</b>	21 species

All species of marine turtles are regarded as endangered animals world wide by the IUCN. Four species of turtles were recorded from the Yemeni waters. These species are:

- 1- *Chelonia mydas* (Green turtle)
- 2- *Eretmochelys imbricata* (Hawksbill turtle)
- 3- *Caretta caretta* (Loggerhead turtle)
- 4- *Dermochelys coriacea* (Leatherbacks turtle)

*Caretta caretta* was recorded from Socotra Archipelago only. In particular, Ras Sharma beach is considered as the most important nesting area for the Green Turtle in the entire Arabian Region, including the Red Sea and Gulf of Aden. Approximately nesting 1,000 turtles were recorded in this area.

### **1.6.7 Marine Mammals**

The dugong dugon (Sirenia) and several species of dolphins and whales (Cetacea) are found in good numbers in several places along the Red Sea coast of Yemen. The common dolphin *Delphinus delphis* and the sperm whale *Physeter macrocephalus* are the only species recorded from Socotra Archipelago.

It is important to limit these, initiate and implement sound integrated coastal zone management for the sustainable use of Yemen's marine and coastal environment including the identification and management of protected areas.

The coast of the mainland is suffering from pollution and saltwater intrusion as most surface water is fully exploited upstream. The sea along the mainland coast and the numerous Islands in the Red sea are within the heavily sea traffic route for every kind of ships, and prone to oil spills from ships and oil terminals. Marine critical habitats such as mangrove, seagrass, and important coastal sites for bird feeding and breeding, are increasingly threatened by coastal development. If not planned correctly, development in Socotra Island will have considerable environmental impact on marine resources, including coral, fish and turtle species. Tourism attractions of the country include possibilities for diving and snorkeling in the coral reefs of the Red sea, the Gulf of Aden and Socotra Archipelago.

Moreover, coral reefs and seagrass important to fish and other marine life are destroyed by trawling and other unsuitable harvesting methods causing loss of productivity and threat to endemic and rare species. The formerly rich fish resources on the country's continental shelf are now reduced through outtake. Due to overexploitation of resources, a number of animal and plant species, some of which are globally threatened, rare and endemic to Yemen, are endangered or already extinct.

## **1.7 BIODIVERSITY PROBLEMS**

Under current accelerating growth of economy, environmental quality is fast deteriorating, as dramatized by the increased occurrence of environmental problems. Specifically, the gains of economic growth are being diminished and /or even negated by numerous problems including:

- ❖ Habitat destruction caused by activities associated with development.
- ❖ Degradation and conversion of natural habitat.
- ❖ Desertification, including wind erosion and sand dune encroachment
- ❖ Agricultural expansion and poor agricultural practices.
- ❖ Wood cutting for firewood, timber and charcoal production.
- ❖ Overgrazing of rangelands including loss of sustainable practices of sound rangeland management by local people.
- ❖ Over-hunting and indiscriminate killing of wildlife species, especially ungulates and carnivores.

- ❖ Overuse and depletion of limited fresh water.
- ❖ Degradation of wetland ecosystems.
- ❖ Contamination of ecosystems with sewage, industrial waste and other pollutants.
- ❖ Smuggling and uncontrolled exporting of indigenous livestock and native genetic species.
- ❖ Marine and coastal habitat degradation caused by unplanned coastal reclamation.
- ❖ Over-exploitation, pollution and mismanagement of fishing in the Red Sea, Arabian sea, Gulf of Aden and Yemeni Islands.
- ❖ Degradation of coastal and marine habitats caused by ship dumping, industrial, agricultural and sewage waste.
- ❖ Sharp decline in important marine resources especially lobsters, cuttlefish, shrimps and sharks caused by over-fishing, poaching of foreign vessels, uncontrolled gear and fishing effort, and lack of quality controls.
- ❖ Destruction of coral reefs and underwater habitats caused by bottom trawling, ornamental fishing
- ❖ Deterioration of native genetic resources as a result of introduction of alien species.
- ❖ Desertification, terraces and rangeland degradation associated with rapid urbanization.
- ❖ Increased water depletion for qat production and agriculture irrigation associated with lack of water conservation systems.
- ❖ Declining agricultural production caused by drought and degradation of agro-systems.
- ❖ Over-cutting of trees and shrubs for fuel consumption and timber.
- ❖ Loss of natural habitats as a result of deforestation, desertification and land conversion.
- ❖ Destruction of sensitive natural habitats caused by unplanned land reclamation.
- ❖ Rapidly growing population with intensive use and pressure on natural resources particularly in the densely populated centers of the country.
- ❖ Reduced economic values of marine and coastal biodiversity as a result of increasing pollution and habitat destruction.

### **1.7.1 Priority Problems**

The immediate and most critical problems contributing to the evolvement and continuation of this un favorable situations are water depletion and pollution, land degradation, habitat loss and waste disposal. The nature, extent and underlying cause of these problems are presented in the following parts of the report.

### **1.7.2 Key Causes of Biodiversity Problems**

Several factors and root causes contribute to the existence of environmental problems and to the continuation of degradation and resource depletion. These are of Societal, managerial, institutional, financial, regulatory, cultural and technical nature and are presented in the following:

### **1.7.3 Regulatory Policy and Legislative factors:**

To achieve sustainable and lasting improvement in natural resources management and environmental protection, there is a need for coherent policy and regulation frameworks and sector-specific actions to address the following policy and legislative constraints:

- Incomplete legal framework for protected areas, and flora and fauna.
- Lack of enforcement of wildlife protection measures;
- Absence of preventive and remediation measures;
- Lack of adequate legislative tools to control introductions of alien invasive species;
- Improper application and use of persistent pesticides and chemical fertilizers;

- Inappropriate agricultural practices.
- Abandonment of sustainable practices of sound rangeland management by local people;
- Inadequate legislative tools and conservation measures for the protection of indigenous plant and animal species/varieties.
- Non- functional fishing law.
- Abandonment of productive traditional agricultural practices.
- Improper use of agro-chemicals (pesticides, fertilizers, fruit ripening agents, etc.);
- Weak implementation of EIA procedures for development projects.
- Lack of policy addressing air pollution, wastewater, and solid waste production from industrial sources.
- Weak enforcement of standards regulating industrial activities;
- Lack of protection measures and legislations to regulate the use and release of living modified organisms;
- Absence of policy addressing biotechnology and biosafety issues.
- Inadequate legislative framework and weak enforcement of eco-tourism legislation.
- Weak enforcement of solid waste management guidelines.
- Inappropriate practices/ lack of norms regarding waste management;
- Weak enforcement of existing standards for air-pollution control.
- Absence or inadequacy of existing legislation and standards regulating biodiversity use and management, including agricultural practices.
- Inadequate law enforcement.
- Overlapping and unclear mandates of environmental agencies.
- Inexistence of establishment decrees for a number of agencies.
- Inexistence of a staff evaluation system within the public administration.
- Inadequate policies to comply with Yemen's obligations committed under international conventions.
- Antiquated environmental plans.
- Uncontrolled hunting of wildlife along with unregulated utilization of fuel wood, rangelands and agricultural lands.

#### **1.7.4 Institutional, Managerial and monitoring issues:**

Achieving sustainable improvement in environmental management and monitoring depend in large part on the establishment of and Institutional and Management frameworks /and Monitoring systems: Specific focus should be given to resolve the following constraints:

- Lack of effective administration and conservation management regimes for protected areas;
- Lack of Institutional Capacities for protected area;
- Inadequate systematic population monitoring of species, specially endangered ones;
- Weak monitoring capabilities for endangered and rare species.;
- Lack of institutional capacities in evaluating and preserving alien species;
- Lack of monitoring system for alien invasive species;
- Lack of institutional framework for the management and monitoring of biotechnology and biosafety issues;
- Inadequate systems for water management, inadequate restrictions on well drilling and inefficient use of irrigation facilities.
- Fragmented and non-participatory management and planning of watersheds.

- Unclear mandates of agencies involved in watershed management;
- Lack of national mitigation and adaptation plans for climate change.
- Weak recognition of the climate change issue relative to other development priorities.
- Absence of an institutional structure aimed at integrating climate change issues into national plans.
- Insufficient financial auditing system.
- Unregulated inter-agencies coordination for biodiversity and protected areas.
- Incomplete hierarchical structure of environmental agencies.
- Lack of coordinated mechanism for monitoring biodiversity deterioration.
- Lack of monitoring tools
- Inadequate records on the state and extent of abandonment of traditional environmental norms and practices.
- Lack of land property registration.
- Outdated land survey and registry records.
- Outdated data on species and their habitat as a result of research and monitoring.
- Absence of national indicators related to biodiversity.

**1.7.5 Societal:** Community participation, and Indigenous Knowledge and Traditions: To effective management and use of biological resources, involvement of all concerned parties, including local community, in the management and planning of natural resources should be facilitated by addressing the following most critical issue:

- Poor investment from the private sector in community-based biodiversity projects;
- Weak local communities and private sector participation in tourism management and investment in this sector;
- Limited participation of local communities and NGOs in biodiversity related initiatives;
- Lack of participation of local communities;
- Insufficient community role in planning, monitoring and managing natural resources.
- Lack of allocation system to share, access and use rangelands and hunting grounds equitably.
- Inadequate delegation of responsibilities from the center to the governorates district level;
- Lack of allocation system for equitable sharing of fishery resources.
- Conflicts among fishery users over the control and use of marine resources.
- Retardation of environmentally friendly traditional and indigenous techniques, practices and management systems.

**1.7.6 Cultural:** Information, Research and Public Awareness: To facilitate effective resource management, sport should be targeted for expanding information and public awareness rising on environmental issues, focusing on the following areas of deficiency:

- Lack of precise information on the number of fauna and flora species present in Yemen, or on rare, threatened endemic species and their habitats;
- Criteria for defining critical habitats or biotypes are missing;

- Lack of information on the status and habitat requirements of species at risk
- Lack of adequate information of the type, numbers, status and structure of alien species;
- Low public awareness and appreciation for biodiversity conservation;
- Insufficient and unreliable information and networking on agricultural biodiversity;
- Limited capacity and funding for biodiversity and agricultural research;
- Poor knowledge and understating of the nature and potential impacts of living modified organisms (LMO) on biodiversity;
- Lack of knowledge on eco-tourism attractions.
- Poor environmental awareness and ecological education amongst populations;
- Weak awareness and knowledge of solid waste impact;
- Lack of information on the vulnerability of watersheds to climate change;
- Limited public awareness on climate change and biodiversity issues;
- Poor understanding of the science of climate change domestically;
- Weak public awareness on biodiversity issues;
- Lack of national policy on Environmental education (EE)
- Biodiversity conservation and environmental protection themes are not integrated into school and university curricula.
- Notable absence of youth green clubs, green press, and eco-industry;
- Low level of public awareness in traditional and indigenous natural resource management systems, biodiversity conservation and sustainable development;

**Financial:** Tight Budget and limited financial resources are among the principle factors for the current deficiency in Infrastructure and facilities needed for addressing the following deficiencies:

- Lack of genetic resources centers that can collect genetic materials and conserve them to be available for research and genetic improvement.
- Lack of botanical garden for collecting and preserving rare and endangered flora.
- Absence of a Natural History Museum for biological diversity in Yemen
- A generalized deficiency in eco-tourism facilities.
- Limited geographic coverage of Protected areas (PA) associated with lack of PA management plans.

#### **1.7.7 Technological:**

- Use of environmentally unfriendly technologies.
- Weak of national capacity in the field of modern biotechnology specially in Biosafety.

#### **1.7.8 Development and access to alternative energy source:**

Capacity building: Reversing resources degradation require not only major investment in infrastructure, but the development of technical, financial, managerial and regulatory capacity to carry out effective environmental management and monitoring of available resources. Specific focus should be given to resolve the following capacity constraints:

- Insufficient staff and resources
- Insufficient level of professionalism and training in the tourism sector, including eco-tourism;
- Weak technical capacities in watershed management;

- Lack of human resources to address climate change issues;
- Notable shortage of trained manpower, specially of environmental educator and facilitators;
- Lack of professional and systematic training in the field of biodiversity conservation.
- Shortage of biodiversity specialists and general lack of adequately trained human resources in research, planning, policy development, monitoring and documentation.
- Poor training opportunities for local communities.
- Lack of training and financial support for electronic networking and access and use of the Internet;
- Insufficient manpower of regional and local environmental bodies in planning and monitoring managing natural resources.

## Chapter 2 :Current Status of National Biodiversity Strategies and Action Plans

### Goal 1. Conservation of Natural Resources

#### 1- protected Areas:

Key Issues	Priority Objectives	Performance Indicators	Status of implementation
<p>-Lack of effective administration and conservation management regimes for protected areas;</p> <p>-Limited geographic coverage of Protected areas (PA) associated with lack of PA management plans</p> <p>-Insufficient staff and resources.</p> <p>-Incomplete legal framework for protected areas.</p> <p>-Lack of precise information on the number of fauna and flora species present in Yemen, or on rare, threatened endemic species and their habitats;</p> <p>-Lack of adequate legislation to protect flora and fauna;</p> <p>-Lack of Institutional Capacities for protected area Criteria for defining critical habitats or biotypes are missing.</p>	<p><b>Short-Term(1-3years:)</b></p> <p>-Develop and strengthen co-ordinating management mechanisms to improve integrated management of the protected areas system.</p> <p>-Maintain and develop an integrated and adequate network of protected areas, representing key eco-systems of Yemen.</p> <p>-Prepare management plans for selected priority protected areas.</p> <p>-Establish an integrated database for biodiversity resources and protected areas</p> <p>-Establish a single department to manage protected areas.</p> <p><b>Medium-Term(4-8 years)</b></p> <p>-Expand the Protected area network to include Ramsar sites, World Heritage sites, and World Biosphere Reserves.</p> <p>-Expand management planning and implementation in selected protected areas.</p> <p>-Promote research targeted on protected areas improved conservation management practices.</p> <p>-Provide equipment, transport, communications and other material to strengthen conservation of protected areas.</p> <p><b>Long-Term (&gt;8 years)</b></p> <p>- Expand the program in protected areas management to include one trans-border reserve with Saudi Arabia or Oman.</p> <p>- Review management needs for key priority conservation areas and facilitate implementation.</p>	<p>-Single department for protected area management in place.</p> <p>-By 2010, at least 7 new protected areas created.</p> <p>-Results of research on protected areas published and made publicly accessible.</p>	<p>Increased awareness among relevant authorities and individual on the environmental issues and the importance of biodiversity and the role of local communities in environmental systems conservation..</p> <p>Thorough surveys and studies were made with community participation results on formulation management plans several locations and declare them as natural protected areas such as:</p> <p>The Socotra Archipelago protected area.</p> <p>The main land protected area in “Bura’a” mountain, “Hawf” mountain forest.</p> <p>Utma District in Dhamar Governorate has been declared protected area in 2<sup>nd</sup> of June 1999 as per the Council of Ministers Resolution No. (137)</p> <p>The declaration of wet land as protected areas in Aden Governorate in August 2006.</p> <p>Coastal protected areas. There are efforts to declare these areas as natural protected areas in Bal-Haf, Brum, and Sharma - Gathmoon.</p> <p>Declear 9 ICZMP</p> <p>There are other sensitive area been rapidly assessed and needs thorough study to enable the GoY to declare them as protected areas. These area are: Rayma Governorate, Gabal Allawz, Gabal Al-Ahgor in Al-Mahweet Governorate, Gabal Al-Areas in Abyan Governorate, Gabal Gowl in Hadramout, Ras Fartak in Al-Mahara Governorate, mangroves areas in Al-Luhayya-Medi, and Kamaran Island in the Red Sea.</p> <p>A number ranging from fifteen to sixteen sites have been identified as sensitive areas in the coastline of Yemen.</p> <p>The launching the management process in “Bura’a” and “Hawf” and Aden wetland Pas at Aden Governorate along with progress achieved in Socotra Island which is considered the most important protected area in Yemen.</p> <p>- A comprehensive checklist of flora of Yemen including endemic, near endemic and rare species was obtained,</p>

#### 2. Endemic and Endangered Species

Key Issues	Priority Objectives	Performance Indicators	Status of implementation
<p>-Weak monitoring capabilities for endangered and rare</p>	<p><b>Short-Term(1-3years:)</b></p> <ul style="list-style-type: none"> <li>-Inventory existing information on</li> </ul>	<p>By 2006, inventory of endemic species published.</p> <p>By 2007, relevant by-laws</p>	<p>-Inventory of endemic species</p>



<p>species. -Lack of enforcement of wildlife protection measures. -Inadequate systematic population monitoring of species, specially endangered ones. -Lack of information on the status and habitat requirements of species at risk. -Habitat destruction caused by activities associated with development.</p>	<p>endemic plant and animal species.</p> <ul style="list-style-type: none"> <li>-Prepare and effect by-laws and regulations on protection of endangered and threatened wildlife species.</li> <li>-Prepare and establish an IUCN red list of rare and endangered species of Yemen.</li> </ul> <p><b>Medium-Term(4-8 years)</b></p> <ul style="list-style-type: none"> <li>Design and implement a local community-based program related to in situ conservation of selected endemic, endangered fauna and flora.</li> </ul> <p><b>Long-Term (&gt;8 years)</b></p> <ul style="list-style-type: none"> <li>Prepare and implement recovery and rehabilitation plan for threatened species</li> </ul>	<p>and regulations on wildlife protection prepared and enacted. Pilot community-based in-situ conservation programs for endemic, endangered fauna and flora implemented. Recovery and rehabilitation plans prepared and implemented.</p>	<p>Published in 2008 .</p> <ul style="list-style-type: none"> <li>- IUCN red list of rare and endangered species -prepared in 2008.</li> <li>- initial information on status of endemic and near endemic plant species was obtained</li> </ul>
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### 3. Ex situ Conservation

Key Issues	Priority Objectives	Performance Indicators	Status of implementation
<p>Lack of genetic resources centers that can collect genetic materials and conserve them to be available for research and genetic improvement. Lack of botanical garden for collecting and preserving rare and endangered flora. Absence of a Natural History Museum for biological diversity in Yemen</p>	<p><b>Short-Term(1-3years:)</b> . Develop and establish a basic reporting system for monitoring biodiversity deterioration. Prepare and adopt a national policy on ex-situ conservation.</p> <p><b>Medium-Term(4-8 years)</b> Stimulate ex situ conservation through the establishment of gene banks, seed banks, green belts and public gardens. Develop guidelines for collection, maintenance and reintroduction of plants and animal species in ex-situ programmes.</p> <p><b>Long-Term (&gt;8 years)</b> Expand the establishment of botanical gardens, National Herbarium and Seed Banks to collect, house and preserve rare and endangered native taxonomic groups of plants species of Yemen.</p>	<p>By 2005, a reporting system for monitoring biodiversity in place. By 2008, a national policy on ex-situ conservation prepared and enacted. Number of gene banks, seed banks, green belts and public gardens established. Guidelines on collection, maintenance and reintroduction of plants and animal species developed and used.</p>	<p>-Among the significant efforts exerted by the EPA, the following can be recorded: -Preparation of by laws by the EPA to support the principle of biodiversity protection in protected areas with emphasis on rare species in this diversity located ex situ. Moreover, several memorandum of understanding were signed between Yemen and neighboring Arab Countries with the aim of organization of conservation efforts of rare species of plants and animals and birds threatened by distinction (the Panthera Pardus (Leopard), Ardeotis Arabs (Arabian Bustard) birds... etc.) -Despite the rich biodiversity and the wide range of diversity in Yemen, the progress achieved so far in the construction of Gene Banks for plants and animals is still modest. There is a nucleus of Gene Banks in Yemen represented by the Faculty of Agriculture in Sana'a University and the Agricultural Research and Extension Authority in Dhamar. -There is a program conducted in the Livestock Research Center in Lahej and the Central Highlands Regional Research Station in Dhamar under AREA where animal species are introduced and kept in the two research sites for further research and reproduction. The EPA has generated financial support through a regional project supported by UNDP under the title "Sub Program-2, (SP2)" under the title "Information and consultancies on the use of land resources" which was implemented through AREA during the period 1998-1999. The sub program was considered a response to the national plan of action for environmental protection which stipulates the creation of a center for renewable resource management. The Renewable Resource Center was established through a donor support from the Netherlands and further strengthened by SP2. The center has three units. These are: Utilization of land resources unit.</p>

			<p>Land degradation monitoring unit. Genetic resources unit.</p> <p>-The Genetic Resources Unit (GRU) was further developed into a National Center for Genetic Resources. This center was financially supported by the “Evaluation of environmental Resources for rural land use planning” during period 1994-1999. The support covered the following areas: The establishment of a National Herbarium. Connect the collected data into the Geographic Information System. Disseminate information on collected genetic resources. Securing a MScs. Scholarship for one of research staff in the center. Purchase of equipment and supplies for the GRU .</p> <p>-The GRU in AREA has a number of local research staff with various backgrounds and training. There is Ph.D holder and two MSc holders and six BSc holders plus five technicians.</p> <p>-The Genetic Resource Center in Sana’a University is mandated to collect and conserve genetic resources. One PhD holder and two MSc holders and seven BSc holders comprise the staff of this center. The center accommodates a tissue culture lab and has good storage facilities.</p> <p>-There are several efforts to conserve and protect species outside their natural habitats. These can be summarized as follows: <i>The reproduction of the Panthera Pardus (Leopard) in “Taiz” Governorate through national efforts.</i> <i>The reproduction of the Panthera Pardus (Leopard) through regional cooperation between Yemen and “Al-Sharjah” Emirate in the UAE.</i> <i>The reproduction of Ardeotis Arabs (Arabian Bustard) birds through regional cooperation between Yemen and the UAE.</i></p> <p>-There were several attempts to cultivate coastal shrimps especially in Al-Luhayya in Hodeidah Governorate by the private sector. The Marine Research Center in Aden conducted several experiments to raise coastal shrimps. However, these attempts did not materialize into concrete actions to reintroduce the reared species into their natural habitats to compensate for the high percent loss of this valuable species.</p> <p>-The Marine Research Center was able to breed and cultivate small shrimps in the laboratory. However, this was not accompanied by commercial rearing of these lobsters and reintroducing them into their natural habitats to compensate for the losses of this species.</p> <p>- First Botanic Garden was established in Taiz city</p>
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#### 4. Alien Invasive Species

Key Issues	Priority Objectives	Performance Indicators	Status of implementation
<p>Lack of adequate information of the type, numbers, status and structure of alien species.</p> <p>Lack of institutional capacities in evaluating and preserving alien species.</p> <p>Lack of monitoring system for alien invasive species.</p> <p>Lack of adequate legislative tools to control introductions of alien invasive species.</p> <p>Absence of preventive and remediation measures.</p>	<p><b>Short-Term (1-3 years)</b>            Prepare a list of alien invasive species and identify the most dangerous ones.            Monitor and control the expansion of key alien invasive species.            Strengthen quarantine measures to control intentional and unintentional introduction of alien invasive species</p> <p><b>Medium-term (4-8 years)</b>            Develop and implement control programs for key alien invasive species.</p> <p><b>Long-Term (&gt;8 years)</b>            Develop relevant legislation to control the importation and trade of alien invasive species.            Develop and strengthen database of alien species            Establish a specialized unit to be concerned with alien invasive species.</p>	<p>By 2007, a list of some alien invasive species published and disseminated.            Number of control programs for key alien invasive species completed.            By 2010, adequate legislation regulating import and trade of alien invasive species in place.            By 2012, a list of most dangerous alien invasive species eradicated and controlled.</p>	<p>- Prepare scientific reports (list ) on alien invasive species .</p> <p>- Number of control programs for key alien invasive species completed (mitigating and investigating)</p>

**Goal 2. Sustainable Use of Natural Resources**  
**5. Terrestrial Wildlife Resources**

Key Issues	Priority Objectives	Performance Indicators	Status of implementation
<p>Degradation and conversion of natural habitat.</p> <p>Desertification, including wind erosion and sand dune encroachment</p> <p>Agricultural expansion and poor agricultural practices.</p> <p>Wood cutting for firewood, timber and charcoal production.</p> <p>Overgrazing of rangelands including loss of sustainable practices of sound rangeland management by local people.</p> <p>Over-hunting and indiscriminate killing of wildlife species, especially ungulates and carnivores.</p> <p>Overuse and depletion of limited fresh water.</p> <p>Degradation of wetland ecosystems.</p> <p>Improper application and use of persistent pesticides and chemical fertilizers.</p> <p>Contamination of ecosystems with sewage, industrial waste and other pollutants.</p> <p>Smuggling and uncontrolled exporting of indigenous livestock and native genetic species.</p> <p>Low public awareness and appreciation for biodiversity conservation.</p> <p>Inadequate legislative tools and conservation measures for the protection of indigenous plant and animal species/varieties.</p>	<p><b>Short-Term (1-3 years)</b></p> <p>Evaluate maps and data availability, information accuracy and gaps for endangered ecosystems, habitats, vegetation and threatened or rare endemic species.</p> <p>Develop and update data-base and GIS information systems on biodiversity, including species, habitats, vegetation and other thematic information.</p> <p>Conduct surveys and research on rangeland utilization and management patterns to assess effectiveness of rangeland management and utilization.</p> <p>Halt hunting and capturing wildlife until utilization of wildlife is surveyed, assessed and regulated.</p> <p><b>Medium-term (4-8 years)</b></p> <p>Formulate rangeland policies and programs for improving rangeland management.</p> <p>Expand action program for forest restoration and desertification reduction.</p> <p><b>Long-Term (&gt;8 years)</b></p> <p>Support traditional and environmentally sound land use practices.</p> <p>Expand rangeland management program, to include more areas in the country.</p>	<p>Gaps in maps and information pertaining to endangered ecosystems, habitats, vegetation and rare species identified.</p> <p>Data-base and GIS information systems on biodiversity established and functioning.</p> <p>Assessments report on rangeland management and utilization published and accessible.</p> <p>Survey and assessment report of wildlife utilization published.</p> <p>By-laws on wildlife utilization prepared and enforced.</p> <p>A rangeland policy in place and a number of rangeland management programs completed.</p> <p>Number of forest restoration and desertification control programs implemented</p> <p>Traditional and environmentally sound land use practices in place</p>	<p>the Government has establishment Land Resource Management Center in AREA (Damar Governorate). The center since it formation in 1998 has been surveying, searching and collecting information on various aspect of biodiversity and land degradation and has succeeded in producing the following results:</p> <p>National inventory and data base development of fauna and flora.</p> <p>-Land resource utilization studies and plans for watersheds in Abyan and Shbwa.</p> <p>-Developing and guidelines and manuals for land resource utilization planning and land degradation monitoring.</p> <p>-Soil survey, classification &amp; mapping for Shabwah and Abyan Governorates.</p> <p>Several legislations were issued prohibiting hunting or attacking wild animals.</p>

## 6. Coastal/Marine Life and Fisheries

Key Issues	Priority Objectives	Performance Indicators	Status of implementation
<p>Marine and coastal habitat degradation caused by unplanned coastal reclamation.</p> <p>Over-exploitation, pollution and mismanagement of fishing in the Red Sea, Arabian Sea, Gulf of Aden and Yemeni Islands. Degradation of coastal and marine habitats caused by ship dumping, industrial, agricultural and sewage waste. Sharp decline in important marine resources especially lobsters, cuttlefish, shrimps and sharks caused by over-fishing, poaching of foreign vessels, uncontrolled gear and fishing effort, and lack of quality controls. Destruction of coral reefs and underwater habitats caused by bottom trawling, ornamental fishing. Non-functional fishing law</p>	<p><b>Short-Term (1-3 years)</b> Design and conduct inventory, surveys, habitat mapping, and sensitivity analysis of the entire coastline, including distribution of rare and endangered species.</p> <p>Assess impact and extent of mangrove cutting and grazing and find alternative sources of wood and camel fodder. Establish improved data base management systems of fishery resources based on stock assessment for cuttlefish, rock lobsters, shrimps, sharks, sea cucumber and other species. Prepare and implement pilot Integrated Coastal Zone Management Plans (ICZMP) for Balhaf-Bir Ali area, Al-Hodidah and Jethmun-Sharma and red ses ecosystem Declare protection areas on Sikha Island, Jethmun-Sharma, AlloHayah and Kamaran</p> <p><b>Medium-term (4-8 years)</b> Complete coastal zone mapping for the mainland and islands. Establish a national body, with appropriate representation of communities, local administrations and NGOs, for ICZMP. Enhance ICZM planning through establishing regional branches of central authorities. Develop fisheries management plans based on fish stock assessments. Continue stock assessment for other commercial pelagic and demersal fishes. Conduct studies on coastal and marine environment to develop and implement local communities' strategies on sustainable management and use of their fishery resources and recovery of depleted areas. Assist fishing communities in protecting traditionally used areas from outsiders, implementing alternative programs during fisheries recovery periods, and marketing their marine products.</p> <p><b>Long-Term (&gt;8 years)</b> Conserve key threatened coastal and marine species, habitats and ecosystems. Re-plant/re-forest mangroves wherever feasible.</p>	<p>By 2007, inventory reports and maps on coastline habitats and endangered species published.</p> <p>By 2007, assessments report on mangrove clearance and alternative options for camel fodder published. By 2007, data base management systems for fishery resources in place and Functional. Four pilot Integrated Coastal Zone Management Plans implemented. By 2009, two marine areas legally declared as protected areas. By 2009, a national agency for costal zone management legally declared and functioning. Fish stock assessment report prepared. Adequate fishery management plans officially approved. By 2008, local communities' strategies on sustainable management of fishery developed. Pilot area of forest mangroves re-planted.</p>	<p>Identification and classification of fish and other marine species in the coastal water of Yemen using international guides for classification.</p> <p>Management plans including zonation were formulated as results of intensive surveys in Balhaf-Broum &amp; Sharma-Jathmoun, 2007. ICZM plans were declared for the coastal governorates in Yemen, 2008. Zoning plan were formulated for Socotra Archipelago in 2000, and declared as world heritage site 2008 Surveys and inventories were undertaken for Shark, Sea cucumber and shrimps. Study for lobsters in Yemeni water was also carried out, 2002 and 2003, 2004. Stock assessment were undertaken for the marine resources such cuttlefish, lobsters, shrimps and the main (commercial species) of fish. Fishery management plan for Socotra were prepared and approved, 2003. Fishing regulating laws and bylaws were issued and enacted 2006. Collection reference for marine fauna established with support of PERSGA in 2004. Detail vegetation maps of different ecological zones were implemented</p>

## 7- Agro-biodiversity

	Priority Objectives	Performance Indicators	Status of implementation
<p>Deterioration of native genetic resources as a result of introduction of alien species.</p> <p>Improper application and use of pesticides.</p> <p>Insufficient and unreliable information and networking on agricultural biodiversity.</p> <p>Desertification, terraces and rangeland degradation associated with rapid urbanization.</p> <p>Increased water depletion for qat production and agriculture irrigation associated with lack of water conservation systems.</p> <p>Declining agricultural production caused by drought and degradation of agro-systems.</p> <p>Abandonment of productive traditional agricultural practices.</p> <p>Improper use of agro-chemicals (pesticides, fertilizers, fruit ripening agents, etc.).</p> <p>Over-grazing and over-cutting of trees and shrubs for fuel consumption.</p> <p>Limited capacity and funding for biodiversity and agricultural research.</p>	<p><b>Short-Term (1-3 years)</b></p> <p>Conduct research on improvement of drought resistant varieties, terrace management, traditional land use and water management systems, and introduction of efficient irrigation systems.</p> <p>Encourage research on the use of alternative feed resources and agro-processing by-products as a ruminant feed to reduce pressure on rangelands.</p> <p><b>Medium-term (4-8 years)</b></p> <p>Promote in situ conservation of indigenous crops by farmers.</p> <p>Promote integrated pest management techniques.</p> <p>Develop incentives for natural fertilizer use in replacement of imported agrochemicals.</p> <p>Provide incentives and implement pilot projects in propagation of local and crop varieties and replacing qat plantations with cash crops, coffee and grapes.</p> <p><b>Long-Term (&gt;8 years)</b></p> <p>Implement pilot projects on land use management, terrace management, desertification, and in situ conservation of rangeland.</p> <p>Adopt programs to reduce ground water consumption through wastewater recycling, efficient irrigation, etc.</p> <p>Enhance seed banks.</p>	<p>By 2007, results of research in five agro-biodiversity areas published.</p> <p>Number of farms applying integrated pest management techniques.</p> <p>Quantity of natural fertilizer use increased and level of agrochemical fertilizer import reduced.</p> <p>Areas of cash crops, coffee and grapes increased and qat plantation reduced.</p> <p>Number of pilot projects on terrace rehabilitations, desertification, and in-situ conservation of rangeland implemented.</p> <p>Number of wastewater recycling and efficient irrigation programs completed.</p>	<p>The sustainable agricultural systems are expanding in the country. This is evident in the tree planting campaigns,</p> <p>Research efforts during the sixties and the seventies before the unification of Yemen led to identification of significant information in the plant kingdom. These studies were carried out in joint collaboration with the UN and the International Centers such as ICARDA and others.</p> <p>These Efforts were geared at collection and preservation of local genetic resources and preserving them in the Gene Banks of the International Centers for future use. Equal amounts of these resources were retained locally for renewal and conducting local research in plant breeding and evaluation of varieties and local land races. The efforts were expanded to cover fruit tree species, cash crops such as coffee</p> <p>- By 2007 results of research on main Agro-forestry of Yemen published</p>

## Goal 3. Integration of Biodiversity in Sectoral Development Plans

### 8. Infrastructures and Industry

Key Issues	Priority Objectives	Performance Indicators	Status of implementation
<p>-Weak implementation of EIA procedures for development projects.</p> <p>-Poor investment from the private sector in community-based biodiversity projects.</p> <p>-Lack of policy addressing air pollution, wastewater,</p>	<p><b>Short-Term (1-3 years)</b></p> <p>Enforce EIA procedures implementation for infrastructure and industrial projects.</p> <p>Regulate the use of dangerous chemicals.</p> <p>Develop policies and regulations concerning use of appropriate and safe technologies.</p> <p><b>Medium-term (4-8 years)</b></p>	<p>EIA procedures in place.</p> <p>Laws, by-laws, and regulations on preventing industrial pollution reviewed, updated and enforced.</p> <p>Laws on dangerous chemicals prepared and enacted.</p> <p>Industrial</p>	<p>Updating the Environmental Law.</p> <p>Issuing of Environment Protection Law No. (26) for the year 1995, which imply the environmental impacts assessment, and the mechanism of conducting EIA.</p> <p>The establishment of Disasters control unit is considered one of the major achievements in the coordination of efforts to confront disaster such as "Tsunami Disaster". During the period 17-18 April 2006. There are plans to prepare a national plan and the</p>

<p>and solid waste production from industrial sources.</p> <p>-Weak enforcement of standards regulating industrial activities.</p> <p>-Use of environmentally unfriendly technologies.</p>	<p>Promote certification processes leading to the adoption by industry of more responsible and efficient production.</p> <p>Review, amend and adjust laws, by-laws, and regulations to prevent industrial pollution.</p> <p><b>Long-Term (&gt;8 years)</b></p> <p>Promote eco-tech in replacement of unfriendly industrial technologies polluting coastal and marine habitats and ecosystems.</p>	<p>certification for eco-industry and eco-production in place.</p> <p>Policies and regulations on safe technologies prepared and enforced.</p>	<p>adoption of policies and measures among which, the approval and ratification of "Cairo Declaration".</p> <p>Support coordinating efforts with regional organizations such as the Regional Organization for Protection the Environment of Red Sea and Gulf of Aden (PERSGA). This regional organization supports several initiatives and adopts a participatory approach in conservation and sustainable of biodiversity.</p> <p>Some actions were taken to implement EIA measures in the context of development projects.</p>
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## 9. Biotechnology and Biosafety

Key Issues	Priority Objectives	Performance Indicators	Status of implementation
<p>Poor knowledge and understating of the nature and potential impacts of living modified organisms (LMO) on biodiversity.</p> <p>Lack of protection measures and legislations to regulate the use and release of living modified organisms.</p> <p>Lack of institutional framework for the management and monitoring of biotechnology and biosafety issues.</p> <p>Weak of national capacity in the field of modern biotechnology.</p> <p>Absence of policy addressing biotechnology and biosafety issues.</p>	<p><b>Short-Term (1-3 years)</b></p> <p>Carry out stock-taking and assessment of existing biotechnologies and their safe application and use.</p> <p>Identify and analyze options for biotechnology applications and implementation of biosafety frameworks.</p> <p>Prepare and enact national biotechnology policy and biosafety frameworks.</p> <p><b>Medium-term (4-8 years)</b></p> <p>Create an entity responsible for the management and control of biotechnology and biosafety issues.</p> <p>Implement priority activities and information exchange requirements.</p> <p>Develop National Biosafety Database.</p> <p>Assess feasibility and impacts of applying genetically engineered seeds to introduce drought-resistant, herbicide-tolerant, insect-resistant and saline-resistant species of crops, fruits and vegetables.</p> <p>Regulate, manage or control the risks associated with the use and release of living modified organisms (LMOs) resulting from biotechnology which are likely to have adverse environmental impacts affecting the conservation and sustainable use of biological</p>	<p>Stock-taking of safe use of biotechnologies published.</p> <p>A national biotechnology policy and biosafety frameworks prepared and enforced.</p> <p>Laws on LMOs and Biotechnology prepared and enacted.</p> <p>An entity for the management of biotechnology and biosafety created and functional.</p> <p>A National Biosafety Database established and made publicly accessible.</p> <p>Assess report on applying genetically engineered seeds published.</p> <p>Number of genetically engineered species safely introduced and controlled.</p> <p>Number of staff trained in Biosafety.</p>	<p>National Biosafety Framework (NBF) was approved.</p> <p>The legal basis of the NBF is the current policies, laws and the administrative regulations and decisions. These documents were put together in an integrated manner to ensure transparency in order to take decisions in the field of Biosafety in the Republic of Yemen.</p> <p>The formulation of NBF was organized in such a way to be in harmony with prevailing laws, regulations and practices within the neighboring regional countries. This was vital for NBF to serve as an effective tool for the implementation of Cartagena Protocol on Biosafety. Moreover, the NBF was tailored locally to accommodate local laws and regulations.</p> <p>To cope with Global efforts, and in accordance with Cartagena Protocol, the Government of Yemen prepared a by law for the NBF. This by law aims to contribute to the provision of certain level of protection in transport, handling and utilization of GMOs as an output from the modern biotechnologies. These technologies might have negative impacts on the sustainable use of biodiversity and human health.</p> <p>The NBF implies the formulation of National Committee on Biosafety. Members and mandates of this committee were identified in the NBF document.</p> <p>The NBF also implies the formulation of a technical committee under the</p>

	<p>diversity.</p> <p><b>Long-Term (&gt;8 years)</b></p> <p>Strengthen institutional capabilities in the field of Biosafety.</p> <p>Enhance management skills in biosafety issues through training.</p>		<p>National Biosafety Committee. The membership and tasks of this technical committee were highlighted in the NB document. Moreover, as secretariat of the NB Committee was also highlighted. The membership of the secretariat was illustrated in the same document.</p> <p>The NBF stressed the importance of formation of sector committees in sectors that are engaged or likely to be engaged in dealing with GMOs in research, transport, handling or marketing across borders. A mechanism for submission of requests was dealt with in details in the NBF document. The deadlines for finalizing procedures at each level were also highlighted.</p> <p>The NBF gave the assessment of risks and risk management in handling GMOs due attention to be in harmony with the importance of this issue in the Cartagena Protocol.</p> <p>The NBF stressed the importance of participation and increasing public awareness on Biosafety issues. The role of local communities in monitoring and follow up of activities related to GMOs was highly stressed. The capacity building and the role of communication channels were given priority in their impacts on the public to increase their awareness on the dangers of mishandling of GMOs and the likely negative impacts on the environment and human health in this respect.</p> <p>A web site was created for Biosafety by EPA.</p> <p>Several newsletters on Biosafety issues were prepared and disseminated.</p> <p>Biosafety Clearing House was completed and start working providing information.</p> <p>A roster of national experts was finalized and published.</p> <p>A comprehensive stocktaking exercise was carried out in all concerned institutions directly or indirectly linked to Biosafety matters.</p>
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## 10. Tourism and Eco-tourism

Key Issues	Priority Objectives	Performance Indicators	Status of implementation
<p>Lack of knowledge on eco-tourism attractions.</p> <p>Insufficient level of professionalism and training in the tourism sector, including eco-tourism.</p> <p>Poor environmental awareness and ecological education amongst populations.</p> <p>A generalized deficiency in eco-tourism facilities.</p> <p>Inadequate legislative framework and weak enforcement of eco-tourism legislation.</p> <p>Weak local communities and private sector participation in tourism management and investment in this sector.</p>	<p><b>Short-Term (1-3 years)</b></p> <p>Conduct surveys of areas suitable for eco-tourism, taking into account habitat vulnerability.</p> <p>Consider criteria for eco-tourism development in protected areas and buffer zones.</p> <p>Minimize the impact of tourism activities on biodiversity and natural habitats.</p> <p>Assess impacts of recreational activities in coastal areas.</p> <p>Prepare proposals of pilot tourism projects based on significant natural and/or cultural attractions.</p> <p>Develop manpower development plan for the sector.</p> <p><b>Medium-term (4-8 years)</b></p> <p>Promote cooperation and participation of the private sector, NGOs and local communities in tourism investment and management.</p> <p>Review, update and publish a directory for eco-tourism sites.</p> <p><b>Long-Term (&gt;8 years)</b></p> <p>Promote eco-tourism in established and managed national parks.</p>	<p>Survey reports on eco-tourism published.</p> <p>Criteria for eco-tourism development published and enforced.</p> <p>Four assessment reports on eco-tourism impacts on coastal sites published.</p> <p>Number of pilot tourism projects in areas of significant natural and/or cultural attractions implemented.</p> <p>Human resource development plan for tourism sector implemented.</p> <p>Number of investment project in tourism completed by private sector, NGOs and local communities.</p> <p>A directory for eco-tourism sites published.</p>	<p>- established an eco-tourism department in the General Tourism Authority (GTA) as an entity responsible for managing and monitoring eco-tourism impact on environmentally valuable sites, landscapes, monuments, ecosystems and species across the country.</p> <p>- In order to handle monitoring responsibility, the GTA collected, analyzed and disseminated information on potential of ecotourism in Yemen to relevant national and international organizations.</p> <p>- In support to ecotourism management, local authority has developed a Coastal Zone management plan for Aden and the coastal areas .</p> <p>- prepared the tourism strategy</p>

## 11. Climate Change and Energy

Key Issues	Priority Objectives	Performance Indicators	Status of implementation
<p>Intensive use of fuelwood leading to rangeland degradation.</p> <p>Weak enforcement of existing standards for air-pollution control.</p> <p>Development and access to alternative energy sources.</p> <p>Lack of national mitigation and adaptation plans for climate change.</p> <p>Limited public awareness on climate change and biodiversity issues.</p> <p>Lack of human resources to address the issues.</p> <p>Weak recognition of the</p>	<p><b>Short-Term (1-3 years)</b></p> <p>Assess current energy use to identify key areas for mitigating GHG emission and potential use of renewable and alternative energy.</p> <p>Reduce the use and GHG emissions from fuelwood through switching to cleaner energy sources and technologies (e.g. LPG lamps, solar water heating and LPG stoves in replacement of fuel-wood stoves).</p> <p>Establish energy balance and scenario.</p> <p>Implement “no regrets” mitigation policy and technologies in energy sector.</p> <p>Identify causes of desertification associated with climate change and</p>	<p>A report on options to mitigate GHG emissions from energy sector published.</p> <p>Reduction rate of fuelwood consumption.</p> <p>Utilization rate of cleaner energy sources/technologies.</p> <p>Energy balance scenario prepared.</p> <p>“No regrets” mitigation policy and technologies implemented in energy sector.</p> <p>Number of indigenous land use management systems to combat desertification</p>	<p>- published the first National communication .</p> <p>-published report on options to mitigate GHG emissions .</p> <p>-approved National Adaptation Program of Action (NAPA)</p> <p>- preparing the Second National Communication.</p>

<p>climate change issue relative to other development priorities. Poor understanding of the science of climate change domestically. Absence of an institutional structure aimed at integrating climate change issues into national plans.</p>	<p>revive indigenous knowledge of land use management systems to help combat desertification. Integrate biodiversity principles into climate change through developing and implementing a National Adaptation Program of Action (NAPA). Conduct feasibility studies on alternative sources of energy (solar, biotechnology, wind) while taking into account their potential impacts on biodiversity.</p> <p><b>Medium-term (4-8 years)</b></p> <p>Develop and implement a National Mitigation Plan (NMP) for reducing greenhouse gases emissions from energy sector. Develop an investment strategy for Clean Development Mechanism (CDM) and implement pilot projects of best practice. Promote agriculture drought management. Improve irrigation efficiency.</p> <p><b>Long-Term (&gt;8 years)</b></p> <p>Develop energy use and air-quality strategy. Develop and enact air quality control measures. Establish national coordination body for emergency and disaster management. Prepare emergency and disaster management plan.</p>	<p>applied. A National Adaptation Program of Action (NAPA) approved. A National Mitigation Plan (NMP) for reducing greenhouse gases emissions from energy sector developed and implemented. Feasibility studies on promising alternative sources of energy (hydro-power, biotechnology, wind) published. Agriculture drought management adopted. Irrigation efficiency increased. Energy use and air-quality strategy developed. Air quality control measures developed and enacted. A national coordination body for emergency and disaster management in place. An emergency and disaster management plan developed.</p>	
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## Goal 4. Implementation of Enabling Mechanisms

### 12. Public Awareness and Participation

Key Issues	Priority Objectives	Performance Indicators	Status of implementation
<p>Weak public awareness on biodiversity issues</p> <p>Limited participation of local communities and NGOs in biodiversity related initiatives.</p> <p>Lack of national policy on Environmental education (EE)</p> <p>Biodiversity conservation and environmental protection themes are not integrated into school and university curricula.</p> <p>Notable shortage of trained manpower, specially of environmental educator</p>	<p><b>Short-Term (1-3 years)</b></p> <p>Assess capacity needs for incorporating environmental themes into schools and universities.</p> <p>Promote public awareness of various aspects biodiversity issues through TV and radio mass campaigns, press campaigns, community workshops, fact sheets and brochures production, electronic information and other communication materials.</p> <p>Promote the development and expansion of youth organizations, green clubs, green media and NGOs to act as advocacy groups for the protection of nature and the</p>	<p>By 2005, needs for incorporating environmental themes identified</p> <p>A nation-wide environmental awareness campaign minimally addressing 18 environmental themes implemented.</p> <p>Adequate TV and radio mass campaigns, press campaigns, community workshops completed.</p> <p>Adequate awareness materials publicly distributed.</p> <p>Number of youth organizations, green clubs,</p>	<p>EPA organizes meetings to celebrate international day of biological diversity. This event publicizes the knowledge and information on biodiversity through the dissemination of biodiversity's books and brochures to organizations and interested persons.</p> <p>Awareness raising among relevant authorities and individual on the environmental issues and the importance of biodiversity and the role of local behaviors in the conservation of the environmental eco-systems.</p>

<p>and facilitators Notable absence of youth green clubs, green press, and eco-industry.</p>	<p>environment Develop a nation-wide environmental awareness campaign, addressing priorities of biodiversity and environmental issues</p> <p><b>Medium-term (4-8 years)</b> Integrate green themes into the education curricula of schools and universities. Expand public education and awareness program to cover various aspects of biodiversity issues such as protected areas, habitats and wildlife conservation, biosafety, alien invasive, energy saving, etc. Improve professional skills of teachers and university lecturers in producing and teaching environmental topics. Encourage community-based participatory research and management at local levels to revive traditional indigenous knowledge and practices for biodiversity conservation and sustainable use of natural resources. Strengthen the capacity of non-governmental conservation and development organizations as advocacy groups to promote biodiversity conservation.</p> <p><b>Long-Term (&gt;8 years)</b> Promote and facilitate community awareness and involvement in biodiversity conservation programs, particularly women and the underprivileged. Expand public awareness and education programs to target government officials and promote the conservation and sustainable use of biodiversity. Integrate more biodiversity environmental themes into university and school curriculum.</p>	<p>green media and NGOs agencies in place. By 2007, at least six themes introduced into formal curricula of schools and universities. Number of teachers and university lectures trained. Number of women participating in biodiversity conservation programs Percentage of population aware of the importance of conservation and sustainable use of biodiversity. By 2012, all environmental themes incorporated into curriculum of universities and schools.</p>	<ul style="list-style-type: none"> <li>➤ Preparation of various materials on conservation of biodiversity and natural habitats.</li> <li>➤ Preparation of systematic programs through communication channels (Radio and Television).</li> <li>➤ Issuing of a periodical journal and some newsletters and pamphlets by the EPA.</li> <li>➤ Promotion of activities in schools among environment friends and clubs as well environmental NGOs.</li> <li>➤ The integration of environmental into school curricula, and organizing fixed columns in local newspapers as a first step in raising awareness among communities on the importance of local environment and the dangers facing its conservation.</li> </ul>
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### 13. Indigenous Knowledge and Traditions

Key Issues	Priority Objectives	Performance Indicators	Status of implementation
<p>Retardation of environmentally friendly and indigenous techniques, practices and management systems. Low level of public awareness in traditional and indigenous natural resource management systems, biodiversity conservation and sustainable development. Inadequate records on the state and extent of abandonment of traditional environmental norms and practices. Lack of participation of local communities</p>	<p><b>Short-Term (1-3 years)</b></p> <p>Compile and verify information on traditional knowledge and skills pertaining to biodiversity.            Document and disseminate traditional knowledges addressing sustainable use of natural resources.            Identify sites where traditional systems are successfully functioning to be studied for potential replication.            Prepare case studies in consultation with knowledgeable rural people at selected sites to revive and improve abandoned systems, techniques, practices, skills and methods.            Promote replication of environmentally friendly systems, practices, skills and methods to other areas through appropriate awareness campaigns and by facilitating cross visits to demonstration sites.            Based on research results, revive indigenous practices, including terraces management, water harvesting, etc.</p> <p><b>Medium-Term (4-8 years)</b></p> <p>Provide incentives for integrating traditional resource management systems into modern management practices, and their adaptation among agricultural, pastoral and fishing communities country-wide.            Expand extension services to assist rural and coastal communities in adapting eco-technologies, both new innovations and traditional systems, in resource management.</p> <p><b>Long-Term (&gt;8 years)</b></p> <p>Expand integration of appropriate traditional and indigenous management systems in rural and coastal areas of Yemen.            Provide incentive, materials, guidance and monitoring to farmers to enable them to repair terraces.            Develop a funding program to stimulate traditional experience and sustainable use of biodiversity at a local level.</p>	<p>Information on traditional knowledge and skills pertaining to biodiversity gathered and published.            By 2006, number of thematic reports on traditional biodiversity practices, skills, techniques and management are published.            Number of models on traditional biodiversity management developed and replicated.            Traditional systems of biodiversity conservation are parts of provided extension services.            Funding program to stimulate traditional experience in place.</p>	<p>There is a lack in reporting the traditional knowledge and skills related to biodiversity conservation, there are however, site specific collection and adaptation of indigenous knowledge during surveys prior the establishment of the terrestrial and marine PAs and ICZM. These practices were accommodated in the legal frame work of the protected areas. Moreover, it appears through involving the local communities in practicing their knowledge in the management of the protected areas which the work in their management were launched these as:            Involving local communities in the management of protected areas to ensure sustainability in the utilization of natural resources in Socotra protected areas, and wet lands protected areas in Aden Governorate as well as in Hawf protected area.</p>

## 14. Capacity Building

Key Issues	Priority Objectives	Performance Indicators	Status of implementation
<p>Lack of professional and systematic training in the field of biodiversity conservation. Shortage of biodiversity specialists and general lack of adequately trained human resources in research, planning, policy development, monitoring and documentation. Poor training opportunities for local communities. Lack of training and financial support for electronic networking and access and use of the Internet.</p>	<p><b>Short-Term (1-3 years)</b></p> <p>Conduct training needs assessment for environmental agencies and NGOs regarding their capacity in effective biodiversity management. Based on the assessment findings, develop and implement national, regional and local training plans addressing relevant biodiversity issues. Develop specialized training programs in desertification control planning, sand dune management, monitoring and impact assessments, Geographic Information Systems (GIS) and remote sensing techniques. Strengthen the capacities of relevant institutions, including NGOs and local communities in the implementation and management of biodiversity and protected areas projects. Provide training for various stakeholders on coordinated policy planning, project development, implementation, and monitoring of environmental resources.</p> <p><b>Medium-term (4-8 years)</b></p> <p>Review and assess training plans and amend appropriately. Establish regularly information system on biodiversity. Build national staff capacity in preparing and enforcing EIA regulations for development projects. Develop and strengthen national capacity in monitoring biological resources utilization. Develop the capacity in combating oil pollution. Continue capacity building of various stakeholders, including local communities, fishery management, coastal and marine protection. Develop staff capacities in preparing, reviewing and updating action plans.</p> <p><b>Long-Term (&gt;8 years)</b></p> <p>Strengthen biodiversity management capabilities line environmental agencies.</p>	<p>Biodiversity training needs for environmental agencies and NGOs identified. National, regional and local training plans developed and implemented. Number of national staff trained in desertification control planning, sand dune management, monitoring and impact assessments, GIS and remote sensing. Number of staff trained in EIA, policy planning, project development, implementation and monitoring. Information system on biodiversity functional. Number of staff trained in management plan development, combating oil pollution, and monitoring of biological resources utilization. Number of stakeholders, including local communities, trained in fishery management, coastal and marine protection. Number of stakeholders trained in solid waste management.</p>	<ul style="list-style-type: none"> <li>• On job training for the local communities, NGOs and EPA staff on biodiversity conservation and protected areas management in two pilot areas mountains forest and wetlands.</li> <li>• Local experience exchange on protected areas management and monitoring.</li> <li>• Overseas study tours for the local communities and makers on protected areas management.</li> <li>• Handicrafts training for the women communities.</li> </ul>

## 15. Equitable Sharing of Biodiversity Benefits

Key Issues	Priority Objectives	Performance Indicators	Status of implementation
<p>Lack of land property registration. Outdated land survey and registry records. Lack of allocation system to share, access and use rangelands and hunting grounds equitably.</p>	<p><b>Short-Term (1-3 years)</b></p> <p>Strengthen local capacity to access and benefit from crop and genetic diversity through provisions of seeds, seedlings, fingerlings, etc., and through extension services, participatory dialogues, and promoting the establishment of cooperatives within communities.</p>	<p>Number of rural peoples accessing/benefiting extension services. Marketing schemes for protected area products functioning and percentage of local people benefiting from</p>	<p>Efforts to improve access to Genetic Resources are still in the initial stages of implementation. This is mainly because concepts of</p>

<p>Inadequate delegation of responsibilities from the center to the governorate district level.</p> <p>Uncontrolled hunting of wildlife along with unregulated utilization of fuelwood, rangelands and agricultural lands.</p> <p>Reduced economic values of marine and coastal biodiversity as a result of increasing pollution and habitat destruction.</p> <p>Lack of allocation system for equitable sharing of fishery resources.</p> <p>Conflicts among fishery users over the control and use of marine resources.</p>	<p>Promote and facilitate the development of community forests integrating useful trees (nuts, fruits, animal fodder, etc.) into existing habitat, and tree plantations for construction, fuel and domestic use.</p> <p>Encourage marketing of cash crops products in protected areas to create job opportunities for peoples living there.</p> <p>Provide incentives and support for fishing cooperatives and communities in adopting equitable quotas of fishery resources.</p> <p>Medium-Term (4-8 years)</p> <p>Establish “polluter pays“ legislation to recover rehabilitation costs of damaged resources by polluting industries.</p> <p>Conduct studies on indigenous medicinal plant and assess the feasibility of replicating traditional methods nationally and globally.</p> <p>Integrate in resource-based development policies and programs the notion of equitable participation of local communities to resource management and benefits from the use of these resources.</p> <p>Long-Term (&gt;8 years)</p> <p>Establish guidelines for trading Yemen’s native genetic resources and for pharmaceutical and biotechnological uses.</p>	<p>the scheme.</p> <p>Equitable quotas of fishery harvest adopted by number of fishing cooperatives.</p> <p>Rehabilitation cost of damaged resources born by polluting industries.</p> <p>Number of studies on indigenous medicinal plant published and disseminated.</p> <p>The principle of Equitable Sharing of Biodiversity Benefits incorporated in national development policies.</p> <p>Guidelines on trade of pharmaceutical genetic resources published</p>	<p>property rights are still not understood properly. There is no clear direction in this regard. The absence of scientific and academic institutions did not allow for exchange and mutual use of these genetic resources in scientific, commercial or industrial fields.</p>
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## 16. Policy, Legislation and Institutional Structure

Key Issues	Priority Objectives	Performance Indicators	Status of implementation
<p>Absence or inadequacy of existing legislation and standards regulating biodiversity use and management, including agricultural practices.</p> <p>Inadequate law enforcement.</p> <p>Overlapping and unclear mandates of environmental agencies.</p> <p>Inexistence of establishment decrees for a number of agencies.</p> <p>Insufficient financial auditing system.</p> <p>Inexistence of a staff evaluation system within the public administration.</p> <p>Unregulated inter-agencies coordination for biodiversity and protected areas.</p> <p>Incomplete hierarchical structure of environmental agencies.</p> <p>Inadequate policies to comply with Yemen’s obligations</p>	<p>Short-Term (1-3 years)</p> <p>Review the adequacy of government agencies’ mandates and management responsibilities for biodiversity and harmonize them according to EPL and other relevant regulations.</p> <p>Develop biodiversity management and co-ordination mechanisms recognizing the legitimacy of NGO, private sector and local community involvement in the planning and management of natural resources.</p> <p>Develop strategies for sustainability, and implement them directly and through regional and local planning.</p> <p>Adopt an integrated approach to environmental policy for the conservation and sustainable use of natural resources.</p> <p>Prepare waste reduction, reuse and recycling strategies, policies, and legislation.</p> <p>Strengthen and enforce legislations, regulations and guidelines on agro-chemicals import, plant quarantine, water use and harvesting, and protected areas.</p> <p>Promote approval of by-laws for relevant agencies: EPA and NWRA.</p> <p>Review, amend where necessary and enforce existing laws and by-laws for tourism sector.</p> <p>Medium-Term (4-8 years)</p> <p>Enforce laws, by-laws, and regulations prohibiting sea pollution from passing ships and land-based sources.</p> <p>Enforce laws, by-laws, and regulations national marine resources.</p>	<p>By 2006, overlap and duplication in regulation and mandates of environmental agencies identified</p> <p>By 2006, co-ordination mechanisms for Biodiversity management created and functional.</p> <p>Strategies and policies for renewable energy, hazardous waste and waste reduction officially endorsed.</p> <p>Enforce Legislations on agro-chemicals import, plant quarantine, water use and harvesting approved.</p> <p>EPA and NWRA laws and by-laws</p>	<p>See attachment</p>

<p>committed under international conventions. Insufficient manpower of regional and local environmental bodies in planning and monitoring managing natural resources. Insufficient community role in planning, monitoring and managing natural resources Antiquated environmental plans</p>	<p>Enforce fishery legislation to halt catching sharks and cuttlefish by nets, destruction of coral reefs by any method, turtle slaughtering or egg collecting, and prohibit collection of aquarium and reef fishes. Develop a renewable energy policy. Prepare and enforce by-laws on Protected Area and Forest Create a partnership mechanism with community groups and the private sector to enhance law enforcement. Promote biodiversity research and funding.</p> <p>Long-Term (&gt;8 years) Review, update and enforce regulations for land use. Develop and implement hazardous waste policy, including incentives and law enforcement. Review national policy, legal and institutional framework and amend where necessary to support decentralization. Strengthen decentralizing through devolution of sufficient power to regional, local governments and local communities in monitoring the effectiveness of modified systems of natural resource management.</p>	<p>enacted. Laws and by-laws for tourism sector reviewed and amended. Laws for Protected Area, Forest and Land use enforced.</p>	
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### 17. Regional and International Cooperation

Key Issues	Priority Objectives	Performance Indicators	Status of implementation
<p>Continued commitment in global and regional efforts for environmental protection and biodiversity conservation. Continued implementation of national obligations under international environmental agreements.</p>	<p>Short-Term (1-3 years) Enable national expertise, through the provision of adequate training, to actively participate in the development of a regional biodiversity strategy and studies related to the Red Sea. Promote exchange of information on mutual biodiversity issues at both regional and international levels.</p> <p>Medium-term (4-8 years) Develop regional co-ordinating mechanism for biodiversity issues of common interest. Continue regional projects in the Red Sea.</p> <p>Long-Term (&gt;8 years) Develop international partnerships and cooperation in biodiversity. Enhance country capacity in negotiating and follow up biodiversity issues at the regional and international levels.</p>	<p>Number of national experts, involved in the development of a regional biodiversity strategy and studies related to the Red Sea. A regional co-ordinating mechanism for biodiversity issues in place. Number of new regional projects in the Red Sea approved and implemented. Number of international and regional agreements approved. Up-to-date information on international and regional biodiversity issues accessible.</p>	<p>-Scientific and technical cooperation and coordination with international organizations and donor agencies has been launched in the field of the conservation and the sustainable use of biodiversity. Examples are: UNDP, UNEP, GEF, PERSGA ,Italian ,France and others. - The neighboring countries. - Efforts to develop and increase capacities of individuals and institutions of agencies working in the environmental sector are progressing. - Research activities and cooperation with neighboring countries are gaining momentum.</p>

## 18. Monitoring and Reporting

Key Issues	Priority Objectives	Performance Indicators	Status of implementation
<p>Outdated data on species and their habitat as a result of research and monitoring inadequacy.</p> <p>Absence of national indicators related to biodiversity.</p> <p>Lack of coordinated mechanism for monitoring biodiversity deterioration.</p> <p>Lack of monitoring tools</p>	<p>Short-Term (1-3 years)</p> <p>Prepare annual reports and submit to government coordination committee.</p> <p>Review and adapt plan of activities and relative priorities in response to changing situations.</p> <p>Review the adequacy of administrative controls, and of implementation and monitoring mechanisms, recognizing the legitimacy of local approaches.</p> <p>Develop environmental indicators for monitoring resources deterioration.</p> <p>Develop a nationwide coordination committee for implementing the NBSAP and for monitoring natural resources depletion.</p> <p>Subject development projects to environmental impact assessment.</p> <p>Prepare and submit national reports on the convention implementation to the conference of the parties (COP) of the convention as per agreed upon reporting requirements</p> <p>Conduct annual review of implementation, and revise NBSAP document regularly.</p> <p>Medium-term (4-8 years)</p> <p>Conduct feasibility studies for initiating a national biodiversity monitoring program.</p> <p>Develop regional and local plans for the conservation and sustainable use of biological resources.</p> <p>Long-Term (&gt;8 years)</p> <p>Assess the various sectors' (protected areas, rangeland management, fisheries, agriculture, and tourism) achievements with a view towards generating improvements.</p>	<p>Annual reports on NBSAP submitted to government coordination committee.</p> <p>Environmental indicators for monitoring resources deterioration published.</p> <p>A national coordination committee for NBSAP implementation in place.</p> <p>EIA applied to all development projects.</p> <p>Regular national reports submitted to the COP of the biodiversity convention.</p> <p>Implementation of NBSAP regularly reviewed and amended.</p> <p>Number of regional and local plans on biodiversity developed.</p>	<p>-The government of Yemen has approved environmental Impact Assessment Policy and regulation in 1998</p> <p>- Efforts made to amend EIA law to integrate wider aspects of biological diversity. This would allow the impact on biodiversity to be estimated at an early stage and permit appropriate precautionary measures to be addressed and planned. An effort must be made to better incorporate issues raised in the convention on biological diversity.</p> <p><i>Yemen submitted the first national report in October 2004. Moreover, a report on sustainable development was also submitted. Currently the second and third national reports are being prepared. The periodical report on the status of the environment in the Republic of Yemen was prepared.</i></p> <p>Reports prepared and submitted to the World Summit.</p> <p>Issued the fishery law no.2 for the year 2006.</p>

The NBSAP been formulated with stakeholders, local communities and NGOs included coordination and consultation at the time been, however, the strategy experienced gaps in addressing enough threats due to the shortage of suitable knowledge in biodiversity conservation and lacks of information on Yemen biodiversity.

According to the rapid review 2008 of the NBSAP found that there had been significant progress towards the goals of the national strategy. However, there are needs for a greater focus on key priorities and for specific thematic objectives and targets to be developed.

The weak capacities in the NBSAP implementation were attributed to the limited staff available and limited training provided as well as limited financial resources.

To implement the NBSAP priorities in Yemen, major financial and technical support was provided by donors and international organizations, such as GEF, UNEP, UNDP, World Bank and others which composed about 80% of total funds.



## **Chapter III - Sectoral and cross-sectoral integration or mainstreaming of biodiversity considerations**

### ***3.1 Environmental Policy and Strategy :***

The government has recognized the importance of integrating environmental issues in the developmental plans. In the recent years significant steps have taken place to enable a more systematic consideration of environmental issues. Provisions have been made in the Environment Protection Law to enable incorporation of environmental aspects and concerns at all stages of the developmental plans. The NEAP acknowledges the inter-relationship of socio-economic developments and sound environmental developments. This NEAP formed the basis for the environmental chapters in the Five Year Development Plan for the period 1996-2000 and for the National Population Strategy and Action Plan for the same period. These plans recognized this approach. These provisions and documents form the basis to integrate environmental concerns in development policies and plans and reflect the commitments and efforts of the country in integration of environmental concerns into developmental plans as being a major item in the country's development agenda. Furthermore this commitment is evident in the government initiative for the development of the Socotra Island with strong commitment for environmental protection and biodiversity conservation of the island.

### ***3.2 National Environmental Action Plan***

The NEAP was issued in mid 1996. The developmental objectives of the plan are based on the national awareness that the well being of the Yemeni people in the present and future generation depends on the nation natural resources base. The plan promotes sustainable use of natural resources through a set of policy options in addressing priority issues.

Environmental issues of national concern were identified and environmental analyses including biodiversity were carried out on the major resource assets and economic sectors; particularly on biodiversity and natural habitats, water, land, marine and coastal resources, urban environment, cultural heritage, , oil and energy sector, mining sector and the industrial sectors

The NEAP promotes sustainable use of natural resources and biodiversity through a set of policy options addressing priority issues. These policy options deal with legislative, institutional, economic and financial measures in addition to information and community involvement.

### ***3.3 The Second and the third Five-Year Developmental Plan to 2010***

Environmental protection strategy in the Second and the Third Five-Year Developmental Plan was based on preserving sustainability of the nation's natural resources and maintenance of ecological system through maintaining a balance between socio-economical growth and available resources.

The plan proposes a number of measures and actions including institutional restructuring, strengthening of natural resources planning and management capacities, establishment and operation of environmental monitoring systems, upgrading of legal frames and information bases, resource mobilization and support participation of relevant agencies, target groups and local communities.

### ***3.4 The Poverty Reduction Strategy Paper 2003 – 2005***

The government acknowledges its commitment towards poverty eradication. This commitment is evident through adaptation of a set of policy actions undertaken since early nineties, such as the economic and financial reform policy and the PRSP. The PRSP acknowledges relationship and linkages between poverty issues and environment protection. The poor are one of the most population groups reliant on environment for their livelihood. As the same time they are the most affected group by environmental problems and the way natural resources are exploited. Also poverty increases pressure on natural resources, though poverty does not necessarily lead to environmental deterioration.

PRSP indicated four major developmental challenges of which two issues, water resources and population problems, have direct linkages with natural resources management practices and relate to carrying capacities of natural resources. The other two challenges have indirect linkages as they deal with having the right to use natural resources for the benefit of current population without undermining the ability of the future population and of improving institutional structure and efficiencies for sound environmental management.

PRSP aims to reinforce sustainable management of natural resources, mobilize beneficiaries, involve the poor and support the role of women and youth in environmental conservation.

### ***3.5 Vision 2025***

Vision 2025 supports environmental and poverty reduction actions. The vision noted that environmental degradation affects the poor and development. It reviews major environmental problems such as water resources depletion and pollution, degradation of land resources, natural habitat and biodiversity, waste management, over exploitation of natural resources such as fisheries, and urban expansion over agricultural land. In terms of environmental interventions following measures have been proposed:

- Development and implementation of sustainable management and monitoring programmes for water and land resources, agriculture, coastal zone, biodiversity and waste management.
- Development of desertification control programme.
- Provision of energy substitutions.
- Application of environment friendly technologies and enhancement of renewable energy resources.
- Application of environmental impact assessment for developmental projects.
- Enhancement of environmental awareness.

### ***3.6 Environment and Sustainable Development Investment Programme 2003 – 2008***

The plan presents an outline strategy and priority interventions aimed at controlling and gradually reversing environmental impacts. It also aims at supporting sustainable human development for the people of Yemen. 6 main areas of interventions were identified in the plan as follows:

- Habitat and biodiversity conservation

- Sustainable land management
- Sustainable water resources management
- Sustainable waste management
- Sustainable climate change and energy management
- Institutional development / capacity building

Within each programme area, the plan proposes priority actions and budget for each action. The total proposed investment budget is estimated to be US \$ 30.2 million.

### ***3.7 The National Strategy for Environmental Sustainability (NSES) 2006***

The National Strategy for Environmental Sustainability (NSES) was completed in 2006 through UNDP's Sustainable Natural Resource Management Programme (SNRMP). The NSES examined the environmental problems in terms of impacting causes, Pressures and Driving Forces and hence suggests strategic framework and action plan for environmental Sustainability. The NSES calls undertaking a numbers of short and medium term interventions to address the following critical environmental issues:

- Water.
- Land resources.
- Biological diversity.
- Coastal and marine environment.
- Waste management.

The NSES attempts to link the effect of environmental degradation on poverty, and seek to investigate means to achieve the Millennium Development Goals (MDGs).

### ***3.8 Environmental and Sustainable Development Investment Program 2003–2008***

The plan presents an outline strategy and priority interventions aimed at controlling and gradually reversing environmental impacts. Six main areas of interventions were identified in the plan. The total proposed investment budget is estimated to be US \$ 30.2 million. The six main areas of interventions are:

- Habitat and biodiversity conservation.
- Sustainable land management.
- Sustainable water resources management.
- Sustainable waste management.
- Sustainable climate change and energy management.
- Institutional development/capacity building.

The list depicted in the plan does not reflect priority areas for interventions, but emphasizes areas where some funding was available under ongoing projects

### ***3.9 Millennium Development Goals (MDGs):***

Targeted to integrate the principles of sustainable development into country policies and programs, reverse the loss of environment resources by 2015.

### ***3.10 National Capacity Self Assessment***

NCSA action plan prepared to enable Yemen to fill full its obligation to wards the implementation of the environmental conventions. NCSA primary focus on capacity needs assessments in the three main areas: biodiversity conservation, climate change and desertification, land degradation, particularly in the context of MEAs. The NCSA comes with Action Plan for Environmental Capacity Development which presents an outline strategy and priority interventions to achieve the MEAs goals. Six strategic objective addressing synergistic and conventions specific capacity development intervention areas were revealed during long participatory process undertaken with the related to the environment and natural resources conservation stakeholders, the six areas of interventions are:

- Policy Development and planning.
  - Resource mobilization.
- Institutional and legislative strengthening.
- Research and technology development.
  - Data and information collection, dissemination and monitoring.
- Rising environmental awareness and education of Yemeni society.
- Sustainable use of natural resources
- Sustainable climate change and energy management

### ***3.11 National Adaptation Programme of Action***

The primary goal of the NAPA process to broadly communicate to the international community priority activities that address Yemen's urgent needs for adapting to the adverse impacts of climate change through:

- Ensuing adequate shareholder representation in the development of NAPA process.
- Identify a comprehensive range of climate change adaptation strategies.
- Establishment of country-driven criteria to evaluate and prioritize adaptation measures.

Make consensus-based recommendations for adaptation activities. And Recommend capacity building and policy, programme and policy institutional integration as part of adaptation priority activities

### ***3.12 National Agricultural & Natural Resources Management Policies (PRSP) Agriculture:***

#### ***Specific Goal:***

Contribute to increasing economic growth; diversification of the base of the economy; and the provision of basic services in order to reduce poverty, which is more widespread in the rural areas, as well as improving efficiency within the sector.

#### **Policies**

- Promoting bio-protection and resistance to plant diseases and aphids and supporting

- Giving incentives to the private sector to investing in agriculture production and marketing and to adopt projects outside the densely populated areas, with a view towards creating extensive and diversified job opportunities, in addition to those projects that promote integration between agriculture and industry.

### ***3.12.1 Main relevant Sectoral Agricultural Policies***

#### ***3.12.1.1 Plant Production Policies***

- Raise the levels of production through achievement of higher yields per unit area.
- Find the compatible environment that will help in the improvement of the conditions and efficiency of rain-fed crop production as well as increasing its returns.
- Promote the cultivation of market-oriented cash crops, in terms of enhancing the efficiency of production techniques used and to market those products that have a comparative advantage.
- The Introduction of modern techniques in rain-fed agriculture that is compatible with the traditional practices.

#### ***3.12.1.2 Seeds and Fertilizer Production Policies***

Increase agriculture output through the exploitation of the natural resources by the methods that will lead to conservation of natural resources, and that will ensure their continuity, by means of upgrading the productive capacity of one unit area, quantitatively and qualitatively, with the participation of the beneficiaries to ensure the efficient use of the natural resources available.

- Meet local requirements of improved seeds and appropriate fertilizers.
- Preparation of the regulations for handling agricultural seeds and fertilizers.
- Set up an effective mechanism for coordination among the relevant entities in the production of seeds and fertilizers.
- Vitalize the role of the quality control unit and coordination of its activities in accordance with international and domestic standards in effect.
- Continuation of the research in the production of original breed seeds and drought resistant seeds.
- Provision of technical research information for the beneficiaries.
- Improve technical awareness and training of human resources of the beneficiaries in producing and handling seeds and agricultural fertilizers.
- Support the establishment of specialized associations for the producing and supplying seeds and agricultural fertilizers in the different agricultural regions.
- Upgrade the efficiency of control of fertilizers and seeds at the entry points.

#### ***Protection Policies***

- Support to the research on protection from agricultural diseases and aphids.
- Activate the agriculture quarantine measures.

#### ***3.12.2 Forestry and Anti-Desertification Policies***

- Provision of forestry and pasturage seeds and the expansion of rangeland areas and provision of incentives for this.

- Promotion of recreational parks, based on the concept of available social efficiency.
- Expand the establishment and dissemination of natural protected zones and, with a view towards conserving inherited plant assets and protecting the ecological bio-sphere.
- Provision of investment conditions for the private sector that encourage the establishment of health resorts in the range land areas and as a first pilot project to include the planting of mixed forestry trees.
- Development of the legal frameworks by taking advantage of traditional social practices in forestry and range land management.
- Improvement of the management, conservation and development of the existing forests and natural vegetative pasturage areas, and to involve local communities in this respect.
- Support farmers and social institutions to set up windbreaker tree belts and the construction of terraces and water barriers.
- Coordination with non-governmental organizations and the relevant environmental protection agencies through having them support the government efforts to combat desertification of the hinterland, which is threatened by encroaching sands.
- Support activities, at the school, university and social levels for the establishment of vegetative grounds and recreational parks.
- Promote the use of terraces to protect soil from erosion and provide economic benefits, using efficient techniques, in which the government and the communities participate jointly.

### ***3.12.3 Agriculture Research Policies***

Agricultural research is important for the achievement of the objectives of agricultural and sustainable development and for directly contributing to increasing agricultural production, and, accordingly, to the alleviation of poverty. Research shall remain a general service of public benefit that the public sector will continue to provide. Accordingly, research programs will be associated with and linked to whatever will serve the implementation of agricultural development and whatever will lead to increasing the efficiency of production, the determination of the priorities of research and concentration on the activities of direct and immediate impact on increasing and improving production through research plans and programs. Agricultural research shall seek to improve production and productivity on sustainable grounds, to develop different varieties of crops, improve livestock production, improve the uses of land and water resources as well as forests and prairies, whereby **agricultural research shall work towards:**

1. Increase productivity of crops through development of improved varieties of farm and garden crops, that would have been adapted to different production systems, as they have been applied, scientifically and practically, to different agricultural environments; .
2. The development of production techniques that are applicable and economically sustainable, and which will lead to reducing the reliance on scarce groundwater and which will help to enhance the efficient use of rainwater.
3. Exploring alternative production methods with emphasis on the conservation and efficient use of water, the development of watersheds and the improvement of water harvesting techniques.
4. Ensure food security at the level of the rural family, especially for cereals and legumes for the small farmers who are dependent on agriculture, and who work in rain-fed system settings and eroded settings; improve the efficiency of farmers and rural women through

- the development of production systems and techniques that help to provide for stable yields and to process the necessary goods that are required for the rural families.
5. Develop efficient sustainable systems, and an integrated pest control system that is environmentally safe and reduces the reliance on chemical pesticides.
  6. Development of improved systems for sustainable and high yielding agriculture, including integrating crop production systems with environmental livestock production systems; and integrating fruit production systems with forestry, and integrating feed production systems with farm systems; with a view towards working towards halting environmental deterioration through the participation of farmers and beneficiary customers.
  7. The development of an integrated soil fertilization management process, through the use of a number of options that lead to the increase of production in a sustainable manner and to increase the optimal benefit of the farm resources and agricultural inputs purchased.
  8. To improve the free access of small holding families with limited resources to fulfill nutritional requirements, through the development of appropriate techniques that work to improve their purchasing power<sup>5</sup> and the production of the appropriate foods in the farm, as well as support the activities of rural women through training.
  9. Explore the possibilities of increasing the use of the appropriate drawing animals, manual implements and the effective cost mechanisms that will enhance the efficient use of labor and reduce arduous labor.
  10. Increase the abundance and production of natural rangeland pasturage and the vegetative cover, through the participation and rehabilitation of beneficiary users.
  11. Improve the productivity of livestock with emphasis on selectivity and proper health care and the improvement of feed resources.
  12. Reinforce the dissemination of research efforts without any sexual discrimination, through the development of techniques that are helpful to rural women in improving their incomes and reducing arduous labor.
  13. The development and improvement of natural resources for the purpose of achieving better and more efficient use of such resources.
  14. The development of techniques for qat and farming that depends on qat , which will help to reduce the use of pesticides and increase the efficient use of water and achieve the optimal productivity per unit of cultivated area used.
  15. Reduction of post-harvest losses of farm products through improving the handling and storage techniques, and adding value to such products, as well as the secondary products through the development of storage and processing techniques there for.
  16. Development of the techniques for the rapid proliferation of seeds and the vegetative accretion materials, provided that the contribution of The General Authority for Agricultural Research and Extension is output for the relevant institutes, the priority refined seed breeds of farm and garden crops, for the follow-up proliferation of the original seed breeds and the approved seeds of the National Center for Seed Accretion at the farmer's fields; AREA will also participate in inspections of farms during the agricultural season.
  17. Improvement of the relationships with the private sector in the areas of reciprocal benefit, such as in training, post harvest techniques, marketing and processing, provision of consultancy that help to solve the problems faced by the private sector.
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18. Start on the preparation of a policy on Research in the agriculture sector that will provide guiding signs for the continuing the design of policies for comprehensive economies of production.
19. Reusing the deteriorated land or soil resources and combating desertification for agricultural purposes, with a view towards developing appropriate agricultural systems for the reclaimed land after its use.

#### ***3.12.4 Livestock Policies***

- Motivation of small farmers to create small enterprises for producing dairy products, and to form associations for assembling milk; and encouragement of the manufacture of dairy products.
- Issue the required legislation for the preservation of animals and livestock by banning the sale of young female livestock, and to set the bottom age limit for slaughtering livestock.
- Activate the animal quarantine in all the entry points to prevent the entry of animal diseases and aphids from these entry points.
- Increase veterinarian services and encourage the private sector to enter this field.
- Increase the production of poultry products through adoption of the essential measures to improve the quality of production, reduce costs, especially feed costs. This could be done by supporting the establishment of companies that produce poultry feed, by the use of the maximum amount of local raw materials available.
- Increase the production of red meat by disseminating and spreading the cultivation of high nutrition feed crops that animals require; and expand on the use of concentrated nutritional supplements.
- Improve livestock extension directed towards rural women, concerning the feeding and care methods in the barns and stables; and spread awareness on the importance of minimum weight requirements before slaughtering, in view of the fact that most animal husbandry is undertaken by rural women and small farmers.
- Direct attention to the Domestic Livestock Breed Improvement Centers by taking advantage of imported breeds to arrive to highly productive breeds.
- Motivation of the private sector to adopt and provide veterinary health services.
- Expand in the dissemination of national campaigns against livestock diseases and aphids.
- Enhance the performance level of and activate internal and external veterinary quarantine.
- Improve the quality of veterinarian technical training and enhance veterinary awareness among breeders and producers.
- Direct attention to grazing areas and to shepherds; and to commence using the concepts of feed units and the spread of such concepts using the public media channels.
- Motivate the cooperative sector in spreading and expanding agriculture and livestock integration and the expansion of livestock producing farms.

#### ***3.12.5 Fisheries Sector Strategy:***

The general directions of the national strategy for the development of the fisheries sector were prepared from a perception and deep understanding of the importance of the fisheries sector and its role in supporting and developing the national economy. It aims at providing detailed analysis of the current situation and assessment of the magnitude of previous policies and supporting programs provided, the assessment also included topics and major directions for the sector



development and preparation of suitable conclusions and recommendations for the future directions and for all potential donor agencies to ensure support to the sector. The assessment will provide to the government and donors clear vision to develop the fisheries sector in the medium and long term prospects. The strategy contains three domains:

**The First Domain:**

Provides comprehensive explanation on the conducted studies and prospects in research in fisheries and the status of fisheries resources, institutional structure of the fisheries sector.

**The Second Domain:**

Covers the utilization of fish wealth and maintaining marine monitoring and inspection and quality control and development of fish exports and conserving the marine environment and the proper management of fishing operations.

**The Third Domain:**

Analysis of the status of infrastructure and major structures of the service and production sectors.

***3.13 Education and Public Awareness***

Though the responsibility of environmental education and awareness lies on all institutions dealing with biodiversity, the education and awareness unit of EPA has been the most active. The unit issues Environment Magazine on quarterly basis and actively participates in publishing the environmental page in Al-Thawra daily newspaper through providing environmental news, information and newspaper articles. It also provides the national TV and radio with environmental information and audio-visual materials to produce TV spots, and documentaries programmes when necessary. EPA cooperates with many national partners in producing bulletins and posters and brochures to enhance public awareness in general workshops, environment clubs, school campaigns, and summer camps.

The EPA organize and actively participate in exhibition, campaign and educational activities conducted annually for the celebration of environmental events like world international environmental day, water environmental day, desertification day and Arabs environmental day etc. Annually, EPA organizes meetings to celebrate international day of biological diversity. This event publicizes the knowledge and information on biodiversity through the dissemination of biodiversity's books and brochures to organizations and interested persons.

***3.14 Genetic Resources in Yemen***

Yemen is characterized by large diversity of native species, varieties and soil types adapted to different agro-ecological zones. 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.

Yemen is characterized with rich genetic resources as a result of its rich biodiversity and natural resources base; associated with different climatic conditions and agro-ecosystems. Historically, the ancient people developed traditional practices to preserve the genetic resources. However, in the recent period and due to increased demand for foodstuff, mechanical systems and new alien species were introduced to agricultural practices. There was no efficient and proper attention given

to the use of the indigenous genetic resources. There are no breeding programs to improve local strains, collect data, characterize, research and evaluate them.

Sustainable use of agro-biodiversity depends largely on the inherited knowledge and experience and understanding of natural resources. Endogenous genotypes are the result of long selection process by ancient local farmers that were inherited to successive generations. They used indigenous breeding methods for selections for new genotypes to improve species productivity and adaptability to different agro-ecosystems. Examples of such selections were in sorghum, which had been practiced to improve seed's color and size with super early maturation and free of pests. New varieties of sorghum were developed as a result of such processes, which are still widely used in Tihama, Taiz, Ibb and Lahj.

Although Yemen hosts rich biodiversity and genetic resources, and progress made in this respect is minimal compared to other countries that do not have large genetic resources. This had impacted on the productivity of various varieties. For example, the introduction of chicken breeds caused large reduction in local strains. In addition, there have not been any breeding programs to research, evaluate, characterize and improve local strains.

Some research centers use breeding process for species improvement. However most of their activities have been limited to certain varieties such as sorghum, wheat, and onion. Their research work has focused on production of synthetic varieties. An excellent achievement in this respect is improved onion variety called Bafatim, which was developed from mass selection in Syeiun Research Center. This variety was later on released to many regions in the country.

Some genotypes of the endogenous species have excellent unique genetic characterizes. Research need to be done to assess the potentiality of utilizing these resources along with modern knowledge to improve the sustainable use of agro-biodiversity.

Improvement of genetic resources depends of research work and selection of breeding method based on sufficient evaluation process. The academia and research centers have and important role in such research work. Particular roles involve the collection and conservation of genetic materials. The establishment of genetic resources centers in the Faculty of Agriculture of Sana'a is an important step toward genetic resource conservation and assessment in Yemen. These centers have initiated processes to collect and preserve genetic resources for vegetables, and other crops in order to study genetic behavior of the collected species and their potential for species improvement.

### ***3.15 Biotechnology and Biosafety***

Given that biotechnology and biosafety are relatively new issues in Yemen, there is poor understanding and knowledge on the nature and extent of risks on biodiversity associated with transfer of biotechnology and use of genetically modified organisms (GMOs). Furthermore, there is no specific entity responsible for handling the safe use and transfer of biotechnology and GMOs. There is still a urgent need to develop guidelines for their safe application and to control the impact of the modification operation on human health and agro-biodiversity. These deficiencies, combined with unavailability of policy and legislation framework for regulating biotechnology and biosafety issues, are likely to cause high level of risk on the country fragile ecosystems and its endemic species. Therefore in order to foster this situation and halt any further biodiversity destruction, this national biosafety framework has been developed to regulate their application.

There is however, no legal instrument to regulate use and application of GMOs. There is no research work on GMOs at the national level and no such crops are produced locally. The awareness level is low and presently no authority has been assigned to regulate and research and monitor safe application of biotechnology.

Biotechnology can play an important role in addressing agricultural research and contribute to agricultural development. Presently, there are basic facilities and capacities for biotechnology both at the academia and research centers. Technical capacities and institutional capabilities need to be further improved and public awareness needs to be enhanced. Policies and systems need to be developed and put in place to regulate biotechnology and biosafety. There is a need to develop adequate policies and legal frameworks, as well as on technical, institutional, international cooperation, research and social aspects main issues are as follows:

- On the policy aspects, policies need to be developed to address research work giving due attentions to challenges and priorities, capacity building needs and awareness raising. Due attention should also be given to intellectual property rights and linkages with regional and international efforts.
- On the legal aspects, legal framework, guidelines and instruments for biotechnology and biosafety need to be developed to regulate use and monitor safe applications.
- On the research aspects, there is a need to improve and enhance scientific capacities and technological infrastructure, to research and integrate biotechnology risk management into existing environmental, health, and agricultural regimes. Sufficient funds, incentives and facilities need to be provided
- On the institutional aspects, there is a need to assign an authority to oversee, coordinate, monitor and enforce biotechnology and biosafety issues. Adequate power, facilities and funds need to be provided to effective operation of the agency.
- On the technical level, there is a need to develop technical capacities through capacity development of research and scientific cadre, provision of adequate equipment and facilities and laboratories.
- On the social aspects, targeted awareness programs need to be developed and implemented. Due attention should be given to stakeholders and community participation.
- On international cooperation, mechanisms need to be developed for exchange of experience and linkages with regional and international efforts to ensure biotechnology development, transfer of knowledge and safe and sustainable applications.
- On the role of private sector, due attention should be given to the involvement of the private sector who should be encouraged through provision of incentives for creation and financing of local private biotechnology enterprises and promote local public research and development.

## **Chapter 4: Conclusions: Progress Towards the 2010 Target and Implementation of the Strategic Plan**

The Republic of Yemen reaffirms its acknowledgement and recognition of the importance of sound natural resources management in achievement of sustainable socio-economic development. The government also increasingly promotes greater community participation and livelihood approaches for the sound natural resources management. Valuing that, it began with a group of steps towards the conservation of biodiversity component. This has been recognized by the perpetration and implementation of the biodiversity strategy and action plan (NBSAP), national environment action plan (NEAP), and with the sectoral development strategies which combine the environment sector as an important issue for sustainable development.

### ***Goal 1. Promote the conservation of the biological diversity of ecosystems, habitats and biomes.***

The promoting of the conservation of the biological diversity of ecosystem, habitats and biomes within the global target is to achieve at least 10% of Yemen ecological system effectively conserved. In fact Yemen has been achieved more than this value so far if we consider the lately declared coastal management plans which covered mostly the whole coastal line of Yemen (the main task is the sustainable use of coastal resources). According to the biodiversity strategy and action plan, 6 protected areas and 9 integrated coastal zone management plans for nine coastal governorates have been declared, which hardly reach the 8% of Yemen total area. These protected areas system have been selected to cover habitat and species of special importance to Yemen, within the principals of sustainable wise management to conserve a groups of sustainable ecosystem. The ICZMP also aims to plan and the use of the coastal areas in sustainable manner involving all the sectors to wisely manage the natural resources. Furthermore, there is a list of areas of outstanding natural value in needs of protection. These areas need thorough study to enable the country to declare them as protected areas in the coming future.

Yemen could reach the global target (protection of 10% of Yemen total area) in the coming year, only if Sharmah-Jathmoon and Bir Ali-Broum coastal protected areas have officially declared.

There are also specific programmes have been identified within the strategies approaching different sectors, these programs were supportive to biodiversity conservation. The main are the agricultural research strategy, fisheries strategy, the desertification combating action plan and others.

The declared protected areas are maintaining the diversity and viability of various components of Yemen's biodiversity, dense vegetation forest cover on mountains (in main lands and Islands endemic and medicine plants), coastal/marine areas (zoning plans, areas of special management for its habitat and species importance) and wetlands (mudflats, marshes and mangrove).

### ***Goal 2. Promote the conservation of species diversity***

Republic of Yemen has diverse both marine and terrestrial fauna and flora. However, more concern has been devoted in conservation the threatened and endangered species, with special attention to large mammals, birds, marine turtles and some of the plants (medicine plants) the endemic species. Preliminary list of threaten and endangered species has been prepared according to IUCN category. Sea turtles tagging programmes were carried out with local community

participation, management plans also implemented in different areas under protection to conserve endemic plants and animals precisely at Gabl Bura'a and Hawf. Attempts to conserve the wildlife in its natural habitats especially to protect the Ibex in Hadramout valley are about to become true in coming future. These recognized by the desire and effort of the local communities to protect the Ibex in its natural areas. Awareness rising programme on the conservation and natural resources sustainable use widely implemented and its results been recognized by the public decision making behavior improvement to importance of biodiversity component and its sustainable use in socio-economic development. Efforts also continue in ex-situ conservation of the endangered species such as the Arabian Leopard. Many of crop plants were conserved in the gene banks and gardens established for these propose. The country also encourages the marine resources aquaculture especially for shrimps and different species of fish to reduce the fishing pressures on the marine resources in the Red Sea.

It is important to mention that the Ex Situ conservation of plant genetic resources in Yemen increased rapidly at the end of the 20th century and the beginnings of the current century. The first Botanic Garden in Yemen has been established also in southern uplands of Yemen (NE of Taiz) in which different wild plant species were planted as Ex Situ farm.

Gene banks were established in agricultural research and extension authority and Sana'a University. They conserve more than 6000 accessions. There are also some Yemeni plant genetic resources conserved in the Agricultural Research and Extension Authority, Taiz farm and in international centers.

These allowed due to shortage of technical of financial resources efforts is contribute in successful biodiversity conservation to achieve the 2010 targets.

### ***Goal 3. Promote the conservation of genetic diversity***

Yemen keen special concern to conserve its genetic resources, these concern been acknowledged through the establishment of the plant gene resources unit in the Agricultural Research and Extension Authority (AREA) with UNDP support by Sustainable Environment Management Programme. The aim of the unit is to collect and conserve wild and crop plant species, both native and exotic. Research were carried out in classical plant breeding of field crops like wheat, sorghum, maize millet, barely and pulses (lentil). The vegetable breeding program of potato, tomato, and onion has many successes. The cash and oil crops like cotton, sesame, and peanut breeding programs started so early. Germ plasm of potato where imported from Netherlands and France and cotton germplasm were introduced so early from Sudan. Other Germplasm are of local varieties and from international research center ICARDA.

In relation to the gene bank of field crops, fodder and vegetable, AREA has good collection at the head quarter in Dhamar, but it has modest facility. The major problem is the unreliable power supply and well-trained staff to maintain, evaluate and characterize the germplasm in adequate way. Another gene bank also established at Sana'a University and also has good collection of plants.

In general no modern biotechnology facility or research are there at AREA, although its is the oldest research institute in Yemen, most of the staff were trained for classical type of research, laboratories, reagents, faculties, research funds, and rehabilitation in addition to biotechnology

policy are needed at AREA personal for risk assessment of plant genetically modified material are less in number.

The Marine research and Biological Authority, undertakes research on shrimp and some commercial fish species aquaculture using laboratory and covered spaces for nursery and eight open big ponds for cultivation and releasing adults to the open water in order to enhance the species stocks. In spite of good success but it is still moderate, and faces financial difficulties which killed it in its initiation.

Yemen also extreme conservation efforts of rare species with cooperation with neighbouring Arab Countries especially with the UAE Al-Sharqah to conserve and reproduce the *Panthera Pardus* (Leopard) and *Ardeotis Arabs* (Arabian Bustard). Success to conserve and protect the *Pardus* (Leopard) in "Taiz" Governorate reveals to reproduction of these species.

Yemen with the support of UNDP has established National Livestock Research Center in Lahej and the Central Highlands Regional Research Station in Dhamar under AREA in which animal species are introduced and kept for further research and reproduction

The government through the Environment Protection Authority encourages the local communities to conserve the genetic biodiversity in their natural sites or areas. Through providing the possible help to enable them to use the indigenous methods in the natural resources conservation. However, conservation the genetic biodiversity still in its first step because this issue needs lacks of the technical and financial support to continue and to expand widely to cover the fauna and flora marine and terrestrial.

#### ***Goal 4. Promote sustainable use and consumption***

In these regard Yemen was a good example of economical and sustainable use of the available natural resources, where conservation of soil, crops, rangelands and fisheries were part of the traditional systems, and agricultural terraces were mainly built for conserving water and preventing soil erosion. However, the low growth rate in agricultural GDP, averaged only 6.7 % during the period 1997-2001, combined with population growth rate of the highest in the region (3.5% according to 2001 Census), causes natural resources deterioration due to critical food shortage. These will continue to be pressing issues hindering sustainable development until this situation is reversed. Recognizing this problem Yemen began to establish protected areas and collect the traditional methods in sustainable resources management to enforce their implementation in the resources management.

Yemen also has formulated groups of sector strategies and action plans for the agricultural, fisheries, environmental and other development sectors enhancing the resources wise management. Regulate the marine resources fishing by issuing, Laws and bylaws which strictly inhibit fishing in the spawning seasons. Provide livelihood alternatives for the local communities to reduce the pressure and excessive demands on the natural resources. Besides, there are efforts to encourage the investment in the marine aquaculture industry to provide food and to enhance the country economics. Cooperation with local communities and NGOs through providing awareness programmes in using the traditional ways in natural resources management.

Good achievement been made in sustainable use of some biodiversity components, however, the sustainable consumption needs more efforts especially in scientific research programmes and in

formulation policies for sustainable consumptions of biodiversity components outside the protected areas.

***Goal 5. Pressures from habitat loss, land use change and degradation, and unsustainable water use, reduced***

The Government of Yemen priorities in the development strategies are integrated sustainable development projects. Some of these projects are directly related to land degradation, natural resources losses. These were reflected in the second five-year plans 2001-2005 and 2006-2010. The National Environmental Action Plan (NEAP) has priorities the environmental problems in Yemen and gives a plan to overcome these problems of land and natural resource degradation and the depletion and contamination of water resources. Yemen has prepared also national plan to combat desertification, which give special attention to land and resources degradation. Yemen has already implemented several directly related projects to combating desertification in different parts of the country. Moreover, several similar projects are currently being implemented in different agro ecological zones of Yemen in land and traces rehabilitation, and forest and natural resources preservation

Yemen involves the local communities in rural areas in land resources management. Revive traditional knowledge and improving their application in conservation and rehabilitation of terraces, watersheds and rangeland management and using them in a sustainable manner.

In order to reduce green cover and trees removing and cutting, Yemen improves the understanding of local communities in the using alternative energy resources (Sunshine oven, Biogas, Modern oven working on natural gas) through concentrated awareness and education programs on using these techniques and adapts them for different uses. In addition, the government has facilitated easy access to these alternatives. Furthermore, Yemen enhanced and enforced the environmental law and applies and activates the EIA mechanisms in all the development projects to avoid habitat and species degradation. Yemen has improved its research agenda in the field of rangelands, rain-fed agriculture, irrigated agriculture, resource management and land use planning techniques scientific.

Environmental conservation is directed towards integrated water resource management. The conservation, use and sustainable management of water resources to meet the demands of growing populations have become a major concern for the country. The important role of environment in integrated water resources management falls still behind the attention given to technical solutions and water supply aspects in Yemen's programmes and priorities.

Environmental conservation and environmentally friendly natural resource management need to be further promoted. Until today interventions such as forest restoration and terrace rehabilitation, which does not have a direct and short-term impact on family income is seldom considered a priority for local communities. Environmental awareness and natural resource management skills need to be improved. Yemen, undertakes research programmes to improve the efficiency of irrigation by adapting new irrigation systems and techniques and widely apply them among the farmers in the country, and plant alternative crops requires less water for irrigations. These helps to some extant to reduce unsustainable water uses.

### ***Goal 6. Control threats from invasive alien species***

Alien invasive species are still away from control and rating their economical, social and environmental effects. Efforts eager by international and local experts were determining the problem size of *Prosopis juliflora* and wild cactus (*Opuntia* spp.) but the output of these studies are still far beyond the crystallization to practical actions and integrated national programs. In spite the recognition of the problem but still there is no data base information about the invasive species and their spreading magnitude in Yemen. Agricultural quarantines in the main gates are ineffective in addition the absence of internal quarantine has led to spreading of these species between the different governorates.

Ad-hoc actions were taken to remove the wild cactus in some areas, where it is appears in dense quantity, especially in Bura'a protected areas. Even though the actions repeated but, did not completely remove this species. There are attempts to document the alien invasive species and prepare monitoring programme to facilitate their control in Yemen. In addition the EPA is about to prepare a national policy addresses the problems, integrated risk-based approach to control and manage intentional and unintentional introductions of alien invasive species. Awareness programmes also provided to the local communities addressing the problems of the invasive alien species, however, these still needs to address the technique to control these species even locally. In spite of the effort devoted by the government but Yemen still lacks the capacities to control the invasive alien species entrance to and spreading in its territory.

### ***Goal 7. Address challenges to biodiversity from climate change, and pollution***

Yemen with the help of international donors conducted several studies on climate change resilience and natural resources vulnerability to climate change impact. The first national communication report, the national adaptation plan of action was prepared and the second national communication report is under preparation. These reports and NAPA preparation were based on specific sectoral reports covered the water, agricultural and marine sectors in addition to the GHG emissions inventory report. Different Climate Change Prediction and Downscaling were prepared. There are however, undergoing studies on climate change impact to the water and agricultural sectors. Initiative towards developing climate scenarios for the Republic has already started with support of WB, and is expected to result into a set of climate projections at the individual meteorological station level. The first initiative will also establish a reasonable database of historical climate data at those meteorological stations. Clean developments mechanisms have launched in Yemen and inter ministerial committee where established with propose to coordinate CDM implementation in Yemen, and endorsing projects.

Yemen had have prepared a plan to remove the Ozone depleting gases and machinery from the market and impose the Ozone friend gases through a group of capacity development and awareness programmes.

Yemen also began studies to impose the renewable energy sources through implementing different pilot projects on solar energy and wind driven energy. Wind atlas was prepared in different coastal areas in the Red Sea to enable the country to consider the wind as source of energy production.

In spite of the effort mentioned but there is still lacking of capacities to face any dramatic change in the climate or any disasters. Still needs a lot of capacity development, awareness programme and scientific researches in all the sectors as in the agriculture and water as in the marine and coastal sectors, with great concern to the adaptation. Unlikely these cannot be true without providing the proper technical and financial resources.



Yemen also devoting great efforts oil pollution or contamination to occur in the coastal and marine habitat. In addition to the institution responsible for species healing and habitat rehabilitations, there are special institutions were established to prevent and control oil pollution in the Yemeni waters. Yemen also has prepared the National Plan of Action to prevent land based activities marine pollution (NPA).

***Goal 8. Maintain capacity of ecosystems to deliver goods and services and support livelihoods***

People especially the rural communities rely on the natural resources, agriculture, livestock and fishing in their livelihood. However, the high population growth rate ascends the demand to the natural resources render it to be vulnerable and degradable to extinct. So, to maintain the capacity of ecosystem to continue deliver goods and services and support livelihood, Yemen has had prepare several policies and regulations in order to preserve the natural resources. These policies and regulations provide roles and arrangement to control the fisheries, agriculture and environment. Group of training and awareness programmes addressing the sustainable use and wise natural resources exploitation were provided to the local communities and stakeholders. Environment friend methods and techniques imposed and adapted as alternative to the bad practiced habitat destroyed methods such as fishing gears used in marine fishing and irrigations techniques to conserve ground water. Many studies been conducted on water quality, fish and marine resources stock assessments, fishing grounds and the taxonomy of marine species. Protected areas have been declared, with the main propose maintaining the ecosystem and provide alternative livelihoods.

There are formalized training courses been devoted to biodiversity conservation available within the country. All development assistance projects and programs such as the UNDP support Sustainable Natural Resources Management Project (SRNMP) recognize the needs and place capacity building and institutional development among the priorities for assistance. The nation's self-reliance and abilities to carry out the demanding tasks ahead in biodiversity conservation depend upon it.

Information on the Yemen ecosystem, terrestrial and marine as a source of livelihood, these been obtained through group surveys and inventories undertaken in different fields of biodiversity such rangelands, forest, crops, livestock, surface and ground water, wetlands, mangrove, coral reefs and fish. Yemen still needs help to study the ability of the ecosystem in providing goods and livelihoods sustainably and undertake the proper measures to maintain them to continue grant daily subsistence for the current and future generation in Yemen.

***Goal 9 Maintain socio-cultural diversity of indigenous and local communities***

The legal protection and enhancement of traditional and indigenous knowledge and skills and the improvement of people's attitude and participation for the conservation and the sustainable use of biodiversity and related natural resources are very important steps towards rehabilitation of the natural resource base and man-made agricultural, pastoral, and fisheries systems. In recent decades, economic growth and development in Yemen has proceeded without giving sufficient support, cognizance or respect for the environment and the natural capital. In addition, the high population growth rate, and rapid expansion in urbanization with immigration to cities from rural areas has increased pressure on the country's limited natural resources. It has enhanced

environmental degradation and is threatening some of the country's most famous agricultural landscapes, the terraces of the western mountain slopes, as well as the traditional rangelands and movements of nomads and their domestic flocks. Rekindling the knowledge and skills of the ancestors will be a process of re-learning, testing and adapting sometimes forgotten systems to the present day situation. The public will need to be convinced of the advantages, economy and rationality of looking to the past to help guide the country's future development.

***Goal 10. Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources***

The commercialization of genetic resources is becoming more popular as a means of promoting the conservation and sustainable use of the biodiversity of different countries around the world through two powerful mechanisms. First, the recognition of genetic resources as an economic asset that can generate income results in the local communities, leading government policy makers to view the protection of biodiversity in a different light. Realizing that the development of genetic assets creates jobs and generate income for local peoples, government officials have a greater interest in the protection and sustainable use of biological resources. At the national level, the recognition of biodiversity contributing positively and directly to Yemen's economic well-being, is giving conservation a new priority among policy makers. And second, the development of the country's genetic reserves offers the opportunity to generate the revenues necessary to finance further conservation and protection efforts, particularly protected areas management. A careful assessment of Yemen's resources with respect to their potential for generating income on a more equitable basis is an option that should be pursued.

There is no existing legislation regulating the sharing of benefits derived from the use of genetic resources. Fortunately, neither are there provisions in either existing legislation or Islamic Shari'a, which would prevent or restrict the sharing of such benefits. Any legislation regulating access to genetic resources and sharing of benefits from the use of those resources will likely rely on some form of contract for the transactions involved. Therefore, it is also important to look at the legislation governing contracts in Yemen. Contracts of any kind between state bodies (ministries, authorities, etc.) or corporations and others are subject to the general provisions of the Civil Code, the Law on Public Purchasing (which needs to be reviewed) and other legislation. Contracts entered into by any government entity for the purpose of access to genetic resources or benefit sharing would also be subject to the provisions governing biological resources such as State ownership of those resources, among others.

Also Environmental Protection Authority (EPA) of the ministry of water and environment has issued a national regulations and law in contest with CBD as follows:-

Environment Protection Law No.26 of 1995 related to protect natural recourses and conservation of endemic plant species.

Prime Minster decree ( resolution ) No.104 of 2002 related to protection of some wild animal and plant species and management of it's trade

***Goal 11: Parties have improved financial, human, scientific, technical and technological capacity to implement the Convention***

Yemen experiences a shortage of specialists in several biodiversity related disciplines such as, taxonomy, marine biology, entomology, land-use planning and resource management. The country

is also in need of experienced public relations and community development specialists. This situation is aggravated by lack or shortage of funds and resources to conduct proper training on a regular and systematic basis.

There are no formalized training courses devoted to biodiversity conservation available within the country, and thus far there have been too few opportunities for international studies, because of limited options and language deficiencies. It is therefore imperative that all development assistance projects and programs recognize this situation and place capacity building and institutional development among the priorities for assistance. The nation's self-reliance and abilities to carry out the demanding tasks ahead in biodiversity conservation depend upon it.

Therefore, there is an urgent need to increase funding support to establish a systematic programme for scientific and technical training of human resources within the formal and informal education systems. Only with this investment will the country be able to meet the required qualifications and training needs in biodiversity conservation and natural resource management.

There is still a lack of understanding of the value of biodiversity, even when it is admitted that the situation was better in the past, in terms of biomass production and in terms of number of species present. There is a lack of understanding on how over-exploitation of one species can affect the well being and the productivity of the ecosystem as a whole.

There is fragmentation and lack of coordination among environmental agencies related information exchange and management. This results in the proliferation of several incompatible Geographical information systems, which produce unreliable, inaccurate and inconsistent information for the management and monitoring natural resources. This situation is aggravated by limited funding, lack of technical capacity and trained manpower to maintain and operate established systems sustainably. There is in fact need for to establish coordination mechanism among environmental agencies to enable them collect, process and produce accurate and harmonized products for planning natural resources.

#### ***4.2 Success Stories:***

Socotra, Aden Wetlands and Bura'a protected areas are successfully managed by the local communities and NGOs, those protected areas were good example of participatory approach management supported by the government with cooperation donors. These success been recognized through livelihood improvement of the neighboring communities to the protected areas.

The achievements of this stories contributed to poverty reduced , income increased, good management , sustainable use and conservation of natural resources in the protected areas.

Taiz Zoo succeeded in reproduction the Arabian leopard in traditional manner. It has a great success and the numbers of Arabian leopard exceeded until they became bigger than the capacity of the Zoo.

Although of this unique experience success, the government faces difficulties to re-release it to their natural habitats due to lacks of physical and technical capacities. In addition to the local technical and financial problems in species conservation, there is another new obstacle which is 1:1 co-finance condition for the new projects.

### ***4.3 Needs and Opportunities to Address Biodiversity Issues***

The conservation and sustainable use of Yemen's natural resources requires translation of Yemen's environmental problems/ issues into a well-defined capacity needs for enabling various concerned agencies address environmental issues at system institutional and individual levels in line with biodiversity convention provisions and pursuant to national priority goals.

#### ***4.3.1 HABITAT & BIODIVERSITY CONSERVATION***

Protecting the nation's habitats and reversing degradation requires a good understanding and adequate information on Yemen's habitats and eco-systems, particularly the following:

- Database for biodiversity resources and protected areas
- Research on protected areas and conservation management practices.
- Inventory and record the flora of Yemen.
- Inventory existing information on endemic, near endemic and endangered plant and animal species. An IUCN red list of rare and endangered species of Yemen.
- Database for alien species
- System for monitoring biodiversity deterioration.

Other important needs are establishing sound institutional and policy frameworks and the building of management capabilities with special focus on the following most important needs:

- Co-ordinating management mechanisms protected areas.
- Specialized unit for alien invasive species.
- Strengthen quarantine centers to control introduction of alien invasive species.
- Establishment of gene banks, seed banks, green belts and public gardens.
- Adequate network of protected areas, representing key eco-systems of Yemen.

Special concern in the conservation of critical habitats in Yemen is the development of new protected areas in new sites of importance to the conservation and preservation of the remaining country's biotic assets. This has been a concern for some time and the following sites have been identified as most important:

- Six sites representing mountain ecosystems. Potential areas Jabal Bura'a, Jabal Hawf, Utoma, Jabal Eraf, Jabal Al-Lawz, Ases forest, Jabal Al-Kwod and other .

Additional three coastal zone Protected Areas in Jathmon, Sharman and other areas are needed for complete representation of key marine eco-systems of Yemen.

Support should be given for small-scale village conservation projects in combination of awareness raising, gender, NGO and community participation and ecotourism.

Some of the potential areas were declared during the past few years but still need more efforts and resources support especially in the field of implementation of the management plans.

Existing initiatives in establishing ex-situ collections of plants and animals need to be strengthened and expanded. There is a particularly urgent need to develop botanic gardens that have conservation goals explicitly built into their management plans. In addition, municipalities need to be encouraged and assisted in making municipal parks and zoos more useful as repositories of biological material as well as centers of environmental education.

The illegal logging of mangrove forests will be reduced through cooperation with local communities, authorities, through awareness raising as well as law enforcement measures. However, investment in conservation programme should be supported with adequate and enforced policy, legislation and action plans for effective utilization of biological resources particularly in the following areas:

- A national policy on ex-situ conservation.
- By-laws and regulations enforcement on endangered and threatened wildlife species.
- Legislation controlling the importation and trade of alien invasive species.
- Recovery and rehabilitation plan for threatened species.

Community involvement is crucial for the success of any conservation management program. Therefore, it is of special important to encourage and support local community-based programs on conservation of endemic, endangered fauna and flora.

### ***4.3.2 Sustainable use of components of biological diversity***

#### ***4.3.2.1 Terrestrial Wildlife Resources***

To facilitate effective of management Terrestrial Wildlife Resources, technical support will be needed to expand information on biodiversity, land resources (e.g., endangered ecosystems, habitats, vegetation and threatened or rare endemic species, rates of depletion of land) and manage that information through an appropriate database and introduction of a low-cost GIS. To ensure effective biodiversity monitoring and land management, efforts should focus on filling the following critical data needs:

- ❖ Maps on endangered ecosystems, habitats, vegetation and threatened or rare endemic species.
- ❖ Surveys of rangeland utilization and management patterns
- ❖ Adequate mapping of soil degradation and desertification
- ❖ Surveys, habitat mapping, and sensitivity analysis of coastline, including distribution of endemic, near endemic, rare and endangered species.
- ❖ Surveys of areas suitable for eco-tourism, considering habitat vulnerability.
- ❖ Criteria for eco-tourism development in protected areas.
- ❖ An Update of a directory for Eco sites.

#### ***4.3.2.2 Coastal and marine resources***

Coastal and marine areas are currently under intensive pressures associated with the growing use of their natural resources. If this situation continues unabated, it will lead to the depletion of coastal and marines divers ecosystems and reduction in their productivity. Reversing this situation requires to move towards integrated marine and coastal area management planning, addressing various threats contributing to marine and coastal biodiversity loss. The most important present and potential threats to marine and coastal biological diversity are:

- Alteration and loss of habitat, including destruction of watersheds;
- Global climate change;
- Pollution including from land-based activities;
- Invasion of alien species; and over utilization of living marines and coastal resources.

**Priority actions to address these treats are:**

- Implementing the NBSAP
- Integrated Coastal Zone Management Plans (ICZMP) for coastlands and marine ecosystem
- Fisheries management plans and fish stock assessments.
- Halting uncontrolled urbanization and enhance land-zoning and land use management plans.
- Plans for improving sewage systems.
- Watershed management plans for limited pilot areas.
- Implementing a National Adaptation Program of Action (NAPA).
- A National mitigation plans (NMP) for reducing greenhouse gases emissions from energy sector.
- An emergency and disaster management plan.
- Pilot tourism projects based on significant natural and/or cultural attractions.

***4.3.2.3 Forest, terraces, and rangeland Conservation***

Efforts to combat desertification needs to expand conservation of plant cover, and reduction of soil erosion through watershed management, establishment of green belts against moving sand dunes and sand expansion in selected areas. The sustainable use of agricultural biodiversity also needs conservation and protection of forest, terrace, and rangeland which mobilizing resources for the following immediate needs:

- ❖ Resources for forest restoration and desertification control.
- ❖ Rangeland policies and programs
- ❖ Pilot projects on land use management, terrace management, desertification, and
- ❖ in situ conservation of rangeland.
- ❖ Re-plant/re-forest mangroves wherever feasible.
- ❖ In situ conservation programs of indigenous crops by farmers.
- ❖ Integrated pest management Programs.
- ❖ Programs on conservation of plant cover, reduction of soil erosion and watershed management.

At institutional level, it has become necessary, and steps were taken, at present, to establish a central coordinating body national body for ICZMP. Similarly, to mitigate adverse effects of natural disasters frequently occurring in the country, there is urgent need to create national coordination body for emergency and disaster management

- ❖ Enforcement of rangeland management and controlling illegal logging.
- ❖ Enforcement of land regulation, pricing and registration.
- ❖ EIA Enforcement waste projects (e.g. landfills, waste projects, and treatment plants).
- ❖ Nation-wide application of water quality standards (standards for drinking water, irrigation water, wastewater disposal and bottled water).

The Yemeni Government needs to set up an Incentives System which may offer incentives to the authorities, establishments, individuals, and others who undertake works or projects that protect the environment. Incentives for propagation of local and crop varieties and replacing Qat plantations with cash crops, coffee and grapes would reduce overuse of depleting under ground water for qat plantation. Generally, evaluation of subsidy programmes in different sectors would

help to modify those measures that negatively affect the conservation and sustainable use of biodiversity. Financial subsidies from the government to promote biodiversity in agriculture, can be designed by cultivation of rare species and varieties.

### ***4.3.3 Access to and transfer of technology***

A greater effort should be made to transfer green technologies, in particular related biotechnologies, within the framework of aid and development programmes. The private sector, however, can play an important role in this respect, particularly in the following areas:

- Application of eco-tech in industry.
- Assess needs for mitigating GHG emission and potential use of renewable energy.
- Switching to cleaner energy sources and technologies to reduce fuelwood consumption.

#### **Environmental impact assessment**

To enhance national capacity in monitoring Biological resources utilization it is needed to create an operational monitoring and assessment system, including EIA policy & Procedures, clearer criteria and responsibilities for EIA application and enforcement. Specific need in this area include establishment of laboratory for air, water, and soil quality along with improved Information and Knowledge Management System and Enhanced staff capacity in preparing and implementing EIA. Efforts should be made to amend EIA regulation to integrate wider aspects of biological diversity. This would allow the impact on biodiversity to be estimated at an early stage and permit appropriate precautionary measures to be addressed and planned. An effort must be made to better incorporate issues raised in the convention on biological diversity. Enforcement of EIA procedures implementation for planned project, focusing on:

#### ***4.3.31 Biotechnology and Biosafety***

Given that biotechnology and biosafety are relatively new issues in Yemen, there is poor understanding and knowledge on the nature and extent of the risks on biodiversity associated with the transfer of biotechnology and the use of living modified organisms (LMOs). Furthermore, there is no specific entity responsible for handling the safe use and transfer of biotechnology and LMOs. These deficiencies, combined with unavailability of policy and legislation framework for regulating biotechnology and biosafety issues, are likely to cause high level of risk on the country fragile ecosystems and its endemic species. Therefore in order to foster this situation and halt any further biodiversity destruction, there is a need to implementing the national biosafety framework.

- ❖ Assessment of existing biotechnologies and their safe application and use.
- ❖ A national biotechnology policy and biosafety frameworks.
- ❖ An entity for the management of biotechnology and biosafety issues.
- ❖ Updating the National Biosafety Database.
- ❖ Strengthen institutional capabilities in the field of Biosafety.
- ❖ Enhance management skills in biosafety issues through training.

### **4.4 Public Awareness and Participation**

It is generally agreed that the current level of ecological awareness, especially among decision-makers and relevant agencies, is still very poor. So long as it remains so, conservation measures will be less than adequate and policies for sustainability are unlikely to be adequately supported by policy makers. Similarly, the impacts of human actions on ecosystems and the level of biological monitoring remain poorly limited.

Efforts by government agencies and NGOs are under resourced and the following actions are needed to overcome this situation:

- ❖ Developing a national strategy that addresses issues of environmental awareness and education at the national and local levels,
- ❖ Ensuring the effective transfer and integration of new environmental knowledge into the educational and training system,
- ❖ Strengthening and raising environmental awareness through a nationwide public campaign,
- ❖ Improving the free flow of information to the public; and
- ❖ Establishing mechanisms for monitoring the state of the environment and progress towards sustainability

#### ***4.4.1 Future Specific Need to in this area are:***

- Capacity needs assessment for including environmental themes into schools and universities.
- A nation-wide and comprehensive campaign on biodiversity issues
- Expansion of youth organizations, green clubs, green media and NGOs to act as advocacy groups for the protection of nature and the environment
- Green themes adequately included in curricula of schools and universities.
- Strengthening the capacity of non-governmental conservation and development organizations as advocacy groups to promote biodiversity conservation.

#### ***4.5 Indigenous Knowledge and Traditions***

Traditional knowledge have play most important role in the conservation and sustainable uses of natural resources for long time. Many of these skills, practices and techniques presently retarding leading to significant loss of agricultural landscapes, terraces, rangelands and habitats. Therefore, reviving traditional knowledge, skills techniques and practices has become most important for the future survival and continuing production of the remaining ecosystems of Yemen. The priority needs in this context are:

- Documenting traditional knowledge, skills and practices on biodiversity conservation.
- Reviving and improving abandoned systems, techniques, practices, skills and methods on biodiversity conservation.
- Incentives for adapting eco- technologies, both new innovations and traditional systems, in resource management.

#### ***4.6 Capacity Building***

Yemen lacks national capacity in the field of biodiversity conservation and sustainable use, which is hampering the nation's ability to conserve and manage its unique and critical biological resources. The Government has yet to enable the environmental agencies in fulfilling its responsibilities under Law EPL and international conventions. Furthermore, Line Ministries and Govern orates lack capacity in natural resource management and continue to monitor biodiversity loss and to implement projects, which needlessly and detrimentally impact Yemen's natural assets. Specific needs in this area are:

- Training needs assessment for environmental agencies and NGOs.
- National, regional and local training plans for biodiversity issues.
- Training programs in desertification control planning, sand dune management, monitoring and impact assessments, GIS and remote sensing techniques.



#### ***4.7 Equitable Sharing of Biodiversity Benefits***

Currently, there is no adequate policy and legislation regulating the sharing of benefits derived from the use of genetic resources. Therefore in order to enable local communities and central government better uses these resources, there is urgent needs for undertaking the following actions:

- ❖ Income generated from nature-based tourism.
- ❖ Increase the income generated from wild plants through finding and propagating new commercially valuable plants
- ❖ Incentives for marketing cash crops products in protected areas
- ❖ Incentives for fishing communities in adopting equitable quotas of fishery resources.
- ❖ Policies and programs to facilitate equitable participation of local communities to resource management and benefits from the use of these resources.
- ❖ Guidelines for trading Yemen's native genetic resources for pharmaceutical and biotechnological uses.

#### ***4.8 Access to genetic resources***

In Yemen, access to genetic resources is relevant for varieties used in agriculture. Access to wild species with the exception of endangered and threatened protected species is not restricted. Yemen strategy is to :

- ❖ Establish gene banks, whose task is to provide free access to genetic material.
- ❖ Strengthening the capacity of the local intuitions, research centers, universities and relevant agencies.

#### ***4.9 Policy, Legislation and Institutional Structure***

Fragmented and uncoordinated development of policies and legislations in addition to deficiencies in regulatory and economic policies are key factors contributing to biodiversity loose and land degradation. Managing Yemen's habitats requires the establishment and implementation of effective institutional framework. The existing mandates of the relevant institutions needs to be harmonized based on in-depth review of current legislative and policy framework. To remedy this situation, the Government is now launching a nationwide reform program aiming to rationalize government institutions and policies, to be more responsive to the public and international needs, and to become more efficient and effective in developing and executing environmental policies and programs. The objective of the initiative is to restructure the environmental agencies to effectively meet their ultimate objectives nationally and internationally. This will be reached through:

- ❖ Restructuring and rationalizing environmental agencies with redefined mandates and responsibilities.
- ❖ Strengthening collaborative working relationships among environmental agencies supported with solid legislative and regulation framework for environmental protection.
- ❖ Updating and implementing the Environment policy and its action plans;
- ❖ Creating a reliable resource mobilization mechanism to finance environmental protection and facilitate greater involvement of private sectors, NGOs and local councils in environmental protection activities.
- ❖ Expanding decentralization policy through providing adequate power to regional, local governments and local communities in addressing biodiversity issues.

**Appendix I - Information concerning reporting Party and preparation of national report**

**A. Reporting Party**

Contracting Party	
<b>NATIONAL FOCAL POINT</b>	
Full name of the institution	Environment Protection Authority
Name and title of contact officer	Mahmoud M.Shidiwah
Mailing address	p.o Pox 19719
Telephone	00967 1 207816 / 7
Fax	00967 1 207327
E-mail	epa-yemen@yemen.net.ye
<b>CONTACT OFFICER FOR NATIONAL REPORT (IF DIFFERENT FROM ABOVE)</b>	
Full name of the institution	
Name and title of contact officer	
Mailing address	
Telephone	
Fax	
E-mail	
<b>SUBMISSION</b>	
Signature of officer responsible for submitting national report	
Date of submission	17/9/2009

**Annex II - Provisional framework of goals, targets and indicators to assess progress towards the 2010 Biodiversity Target**

<b>Goals and targets</b>	<b>Relevant indicators</b>
<b>Protect the components of biodiversity</b>	
<i>Goal 1. Promote the conservation of the biological diversity of ecosystems, habitats and biomes</i>	
Target 1.1: At least 10% of each of the world's ecological regions effectively conserved.	<ul style="list-style-type: none"> <li>• Hardly reach the target</li> <li>• 6 protected areas of them two marine areas and 9 ICZM at 9 coastal governorates.</li> <li>• The total protected areas less 500 km<sup>2</sup> out of 500,000 km<sup>2</sup></li> </ul>
Target 1.2: Areas of particular importance to biodiversity protected	<ul style="list-style-type: none"> <li>• Conservation of wild forests of endemic and medicine plants, supporting plenty of fauna, (insects, mammals, reptiles, baboons, birds....). the conservations also cover also wetlands ecosystem, mangroves and coral reef areas</li> </ul>
<i>Goal 2. Promote the conservation of species diversity</i>	
Target 2.1: Restore, maintain, or reduce the decline of populations of species of selected taxonomic groups.	<ul style="list-style-type: none"> <li>• Stabilize the saturations of the flora and fauna in the protected areas and restoring some species.</li> <li>• No indicators for the wild species out of the protected areas except for some species like Arabian Leopard which restoring and increasing due ex situ conservations.</li> </ul>
Target 2.2: Status of threatened species improved.	<ul style="list-style-type: none"> <li>• There are improvement on the limited medicine plant species.</li> <li>• Arabian Leopard breeding in Taiz zoo.</li> <li>• About 10% of Yemen total area covered with areas under sustainable management but not full protected only 6 protected Areas declared, total protected Areas less 5000 km<sup>2</sup>.</li> </ul>

<b>Goals and targets</b>	<b>Relevant indicators</b>
<i>Goal 3. Promote the conservation of genetic diversity</i>	
<p>Target 3.1: Genetic diversity of crops, livestock, and of harvested species of trees, fish and wildlife and other valuable species conserved, and associated indigenous and local knowledge maintained.</p>	<ul style="list-style-type: none"> <li>• Research were carried out in classical plant breeding of field crops like wheat, sorghum, maize millet, barely and pulses in limited areas (lentil).</li> <li>• The vegetable breeding program of potato, tomato, and onion has many successes . The cash and oil crops like cotton, sesame, and peanut breeding programs started so early</li> <li>• Research on shrimp and some commercial fish species aquaculture and reproduction to release to the sea.</li> <li>• Gene banks established in AREA and University of Sana'a. Good collections of plants were preserved.</li> <li>• National livestock research and reproduction center were established at Lahij governorate, it is collection covers the whole country lately reach Socotra Archipelago</li> </ul>
<b>Promote sustainable use</b>	
<i>Goal 4. Promote sustainable use and consumption.</i>	
<p>Target 4.1: Biodiversity-based products derived from sources that are sustainably managed, and production areas managed consistent with the conservation of biodiversity.</p>	<ul style="list-style-type: none"> <li>• Legislations and polices regulating the activities and practices related to the biodiversity in the field of agriculture, irrigations, marine fishing, wood cutting and land cultivation. These with propose of sustainable use and conservation of the biodiversity.</li> <li>• Controlling the water pollution through entities responsible for water regulation establishment with clear mandates and supportive laws.</li> <li>• Maintain good sea water quality, through surveillance and observation. By regular sampling and analyses</li> <li>• Stock assessment for marine resources to determinate the allowed catch quantities regularly carried out, unfortunately not for all species.</li> </ul>

<b>Goals and targets</b>	<b>Relevant indicators</b>
Target 4.2. Unsustainable consumption, of biological resources, or that impact upon biodiversity, reduced.	<ul style="list-style-type: none"> <li>Techniques to identify the Ecological footprint are still not available in Yemen.</li> </ul>
Target 4.3: No species of wild flora or fauna endangered by international trade.	<ul style="list-style-type: none"> <li>Yemen is party of CITES, so CITES are well enforced in Yemen. Training for the customs, police and other related to trade handling and observation in Yemen working in the ports (Air, Sea and land at the boundaries). Therefore, there are no species endangered by international trade.</li> </ul>
<b>Address threats to biodiversity</b>	
<i>Goal 5. Pressures from habitat loss, land use change and degradation, and unsustainable water use, reduced.</i>	
Target 5.1. Rate of loss and degradation of natural habitats decreased.	<ul style="list-style-type: none"> <li>Yemen territory is very wide, and needs more technical and financial resources to enable the government to undertake surveys and inventories for the whole area. However, Yemen implements many projects to prevent the loss of natural habitats.</li> <li>Formulate and implement group of policies in land and natural resources conservation.</li> <li>Yemen has enforced the Environment law, and enacted the EIAs mechanisms in agricultural infrastructure projects, Road construction and the development in the coastal areas</li> </ul>
<i>Goal 6. Control threats from invasive alien species</i>	
Target 6.1. Pathways for major potential alien invasive species controlled.	<ul style="list-style-type: none"> <li>In spite of the effort addressed in invasive alien species, but there is no planned control for their distribution in Yemen</li> </ul>
Target 6. 2. Management plans in place for major alien species that threaten ecosystems, habitats or species.	<ul style="list-style-type: none"> <li>Still there is no inventory identifying and documenting the alien species in Yemen, therefore also there is no management plans to control them. However, there are attempts to prepare management plan in the future. But before that there are needs to prepare list of the alien invasive species.</li> <li>There is no attempts to wards the marine alien species</li> </ul>

<b>Goals and targets</b>	<b>Relevant indicators</b>
<i>Goal 7. Address challenges to biodiversity from climate change, and pollution</i>	
Target 7.1. Maintain and enhance resilience of the components of biodiversity to adapt to climate change.	<ul style="list-style-type: none"> <li>• Studies and reports on water, agricultural and marine sectors and their adaptation to climate change impact been carried and formulated. Still there are undergoing works on climate change impact modeling on the water and agricultural sectors, for the next fifteen years in Yemen.</li> </ul>
Target 7.2. Reduce pollution and its impacts on biodiversity.	<ul style="list-style-type: none"> <li>• Because of the lack of industries in Yemen, there are no major pollution sources in country. It is likely that the oil pollution caused the oil tankers is the problem to marine biodiversity, however, there big efforts to prevent these pollution to occur and there are facilities to control it. It is important to mention that the oil spill events very rare and Yemen territorial sea water quality is very good.</li> </ul>
<b><i>Maintain goods and services from biodiversity to support human well-being</i></b>	
<i>Goal 8. Maintain capacity of ecosystems to deliver goods and services and support livelihoods</i>	
Target 8.1. Capacity of ecosystems to deliver goods and services maintained.	<ul style="list-style-type: none"> <li>• Big concern to maintain areas of ecosystems delivers good and services provided by the government and local communities, to sustainably use the resources for daily livelihood.</li> </ul>
Target 8.2. Biological resources that support sustainable livelihoods, local food security and health care, especially of poor people maintained.	<ul style="list-style-type: none"> <li>• Number of protected areas established in order to maintain the biodiversity and natural resources supportive to local food security and health care to the poor people.</li> <li>• Group of policies and legislations were issues to conserve the biodiversity to enable them to continue providing goods to people</li> <li>• These mentioned above effort still moderate and totally effective.</li> </ul>

<b>Goals and targets</b>	<b>Relevant indicators</b>
<b>Protect traditional knowledge, innovations and practices</b>	
<i>Goal 9 Maintain socio-cultural diversity of indigenous and local communities</i>	
Target 9.1. Protect traditional knowledge, innovations and practices.	<ul style="list-style-type: none"> <li>In this regards Yemen still not documented the traditional knowledge used to been practiced in the natural resources conservation and sustainable use. However, it was hardly accompanied in the legal frame work of the established protected areas.</li> </ul>
Target 9.2. Protect the rights of indigenous and local communities over their traditional knowledge, innovations and practices, including their rights to benefit sharing.	<ul style="list-style-type: none"> <li>In spite their variety and the of their practices in the past, but still not documented yet.</li> </ul>
<b>Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources</b>	
<i>Goal 10. Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources</i>	
Target 10.1. All access to genetic resources is in line with the Convention on Biological Diversity and its relevant provisions.	<ul style="list-style-type: none"> <li>Locally there are no roles against or not allowing the access to the genetic resources. However, Yemen is a party of the convention of biodiversity and committed to implement it, but according to manageterial process keeping the intellectual wrights for Yemen.</li> </ul>
Target 10.2. Benefits arising from the commercial and other utilization of genetic resources shared in a fair and equitable way with the countries providing such resources in line with the Convention on Biological Diversity and its relevant provisions	<i>Indicator to be developed</i>
<b>Ensure provision of adequate resources</b>	
<i>Goal 11: Parties have improved financial, human, scientific, technical and technological capacity to implement the Convention</i>	
Target 11.1. New and additional financial resources are transferred to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with Article 20.	<ul style="list-style-type: none"> <li>There a financial support provision, but still needs more to develop the country capacity to fully fulfill their commitment and obligation to implement the convention.</li> </ul>

<b>Goals and targets</b>	<b>Relevant indicators</b>
<p>Target 11.2. Technology is transferred to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with its Article 20, paragraph 4.</p>	<p><i>Indicator to be developed</i></p>



### III Targets and Means of Implementation on Global Strategies for Plant Conservation in Yemen

Global Targets	National Targets	Means of Implementation
<b>A. Understanding and documenting plant diversity</b>		
1. A widely accessible working list of known plant species, as a step towards a complete world flora	80 .per cent progress on the compilation of “Flora of Yemen”	<ul style="list-style-type: none"> <li>publishing the first list of flora of Yemen</li> <li>Developed a comprehensive list of compilation flora of Yemen</li> <li>Promote ongoing researches related to Flora of Yemen Project , giving priority to endemic, near endemic and endangered plant species</li> </ul>
2. A preliminary assessment of the conservation status of all known plant species, at national, regional and international levels	<ul style="list-style-type: none"> <li>Carry out a preliminary assessment of endemic, near endemic plant species</li> </ul>	<ul style="list-style-type: none"> <li>A preliminary assessment of endemic, near endemic plant species</li> </ul>
3. Development of models with protocols for plant conservation and sustainable use, based on research and practical experience	Compiling and promoting researches to further develop models	<ul style="list-style-type: none"> <li>Support very few of researches focusing on creation balancing sustainable use with conservation in the sensitive areas.</li> <li>Promote monitoring conservation and sustainable use activities in the national protected areas.</li> </ul>
<b>B. Conserving plant diversity</b>		
4. At least 10 per cent of each of the world's ecological regions effectively conserved	5per cent of the Yemen’s important ecological regions effectively conserved	<ul style="list-style-type: none"> <li>Promote activities to identify six ecological regions for protected areas</li> <li>Establishment of 6 protected areas representing different types of ecological regions</li> <li>Formulate legislation on the management and protection of plant resources in each protected areas.</li> </ul>
5. Protection of 50 per cent of the most important areas for	Protection of 30 per cent of the most important areas for plant diversity	<ul style="list-style-type: none"> <li>Identification of most important areas for plant diversity at local and national level more than 35</li> </ul>

Global Targets	National Targets	Means of Implementation
plant diversity assured		<p>sensitive areas.</p> <ul style="list-style-type: none"> <li>• Cabinet protected areas declarations for the 6 protected to ensure plant protection, through the formulation of effective conservation measures, and using traditional land management and</li> <li>• Collaboration with local communities in the 6<sup>th</sup> protected areas to ensure sustainability and maximum benefits from the protected areas .</li> </ul>
6. At least 30 per cent of production lands managed consistent with the conservation of plant diversity	Les than 10 per cent of production lands managed consistent with the conservation of plant diversity	
7. 60 per cent of the world's threatened species conserved <i>in situ</i>	20 per cent of threatened species in Yemen conserved <i>in situ</i>	<ul style="list-style-type: none"> <li>• Identification of main threatened plant species</li> <li>• Establishment 6 protected areas</li> <li>• Identified of threatened plant species in the sensitive areas as a endangered and threatened plant species.</li> </ul>
8. 60 per cent of threatened plant species in accessible <i>ex situ</i> collections, preferably in the country of origin, and 10 per cent of them included in recovery and restoration programmes	20 per cent of Yemen's threatened plant species in accessible <i>ex situ</i> collections, and 5 per cent of them included in recovery and restoration programmes	<ul style="list-style-type: none"> <li>• Established one Botanical Gardens representing the vegetation of southern uplands of Yemen</li> <li>• Established seed banks in Thamar ARIA.</li> </ul>
9. 70 per cent of the genetic diversity of crops and other major socio-economically valuable plant species conserved, and associated indigenous and local knowledge maintained	25 per cent of the genetic diversity of crops and other major socio-economically valuable plant species conserved, and associated indigenous and local knowledge maintained	<ul style="list-style-type: none"> <li>• Collected of crops and other major socio-economically important species, such as medicinal plants through on farm management. Documented some methods in some national regions and procedures for plant conservation maintaining the associated indigenous and local knowledge</li> </ul>

<b>Global Targets</b>	<b>National Targets</b>	<b>Means of Implementation</b>
10. Management plans in place for at least 100 major alien species that threaten plants, plant communities and associated habitats and ecosystems	Development of Management plans for very few major alien species in Yemen	<ul style="list-style-type: none"> <li>• Identified and collected data on major alien species in Yemen that threaten indigenous plants, plant communities and associated habitats and ecosystems</li> <li>• Developed management plans for some major alien species that threaten plants, plant communities and associated habitats and ecosystems</li> </ul>
<b>C. Using plant diversity sustainably</b>		
11. No species of wild flora endangered by international trade	No species of wild flora in Yemen endangered by international trade	<p>Yemen is a member of SITES Convention.</p> <ul style="list-style-type: none"> <li>• Control the boundary to stop illegally importing plant species</li> <li>• Increase punishments for tourists and people who are smuggling and illegally importing economic, rare, endangered and endemic plant species especially in the protected areas (Socotra and Bura'a).</li> <li>• Approved the National Biosafety Frame work and its by law to regulate the use and release of living modified organisms.</li> </ul>
12. 30 per cent of plant-based products derived from sources that are sustainably managed	Les than 30 per cent of plant-based products derived from sources that are sustainably managed	Implementing some sustainable projects in the protected areas and awareness programs.
13. The decline of plant resources, and associated indigenous and local knowledge, innovations and practices that support sustainable livelihoods, local food security and health care, halted	Development of methods to protect the land resources and local knowledge	
<b>D. Promoting education and awareness about plant diversity</b>		
14. The importance of plant diversity and the need for its conservation incorporated into communication, educational and public-awareness programmes	The combination of plant diversity and its conservation into communication, educational and public-awareness programmes	<ul style="list-style-type: none"> <li>• Awareness programs , TV and Radio environmental programs.</li> <li>• Environmental clubs (schools) NGOs activities and raising awareness and education about the importance of plant conservation.</li> </ul>

Global Targets	National Targets	Means of Implementation
<b>E. Building capacity for the conservation of plant diversity</b>		
15. The number of trained people working with appropriate facilities in plant conservation increased, according to national needs, to achieve the targets of this Strategy	Support training for building capacity for the plant conservation of plant diversity	<ul style="list-style-type: none"> <li>• Increasing the number of NGOs working in the conservation .</li> <li>• Increasing the environmental clubs.</li> </ul> Number of Training programmes and workshops for decision makers and community working in plant conservation done by relevant agencies.
16. Networks for plant conservation activities established or strengthened at national, regional and international levels	6 protected areas declared. National networks for plant conservation activities not established.	<ul style="list-style-type: none"> <li>• Biodiversity Dep. established in EPA</li> <li>• Data base for plant at EPA established.</li> </ul>

## Annex V – Goals and Targets of the Programme of Work on Protected Areas

Goals	Target
1.1. To establish and strengthen national and regional systems of protected areas integrated into a global network as a contribution to globally agreed goals.	Established 3 terrestrial protected areas. Scotra terrestrial and marine protected Kamaran island protected Area. And Aden wetland protected Area. Each protected area managed by the local community under supervisor of the EPA. Two new marine protected areas will declare in the year 2009. National network system not established. By 2010, terrestrially <sup>6/</sup> and 2012 in the marine area, a global network of comprehensive, representative and effectively managed national and regional protected area system is established as a contribution to (i) the goal of the Strategic Plan of the Convention and the World Summit on Sustainable Development of achieving a significant reduction in the rate of biodiversity loss by 2010; (ii) the Millennium Development Goals – particularly goal 7 on ensuring environmental sustainability; and (iii) the Global Strategy for Plant Conservation
1.2. To integrate protected areas into broader land- and seascapes and sectors so as to maintain ecological structure and function.	By 2015, all protected areas and protected area systems are integrated into the wider land- and seascape, and relevant sectors, by applying the ecosystem approach and taking into account ecological connectivity <sup>5/</sup> and the concept, where appropriate, of ecological networks.
1.3. To establish and strengthen regional networks, transboundary protected areas (TBPAs) and collaboration between neighbouring protected areas across national boundaries.	<ul style="list-style-type: none"> <li>○ Memorandum of Understanding between Yemen and Oman.</li> <li>○ Memorandum of understanding between Yemen and Saudi Arabia.</li> <li>○ Establish and strengthen by 2010/2012 <sup>6/</sup> transboundary protected areas, other forms of collaboration between neighboring protected areas across national boundaries and regional networks, to enhance the conservation and sustainable use of biological diversity, implementing the ecosystem approach, and improving international cooperation</li> </ul>
1.4. To substantially improve site-based protected area planning and management.	All protected areas to have effective management in existence by 2012, using participatory and science-based site planning processes that incorporate clear biodiversity objectives, targets, management strategies and monitoring programmes, drawing upon existing methodologies and a long-term management plan with active stakeholder involvement
1.5. To prevent and mitigate the negative impacts of key threats to protected areas.	By 2009, effective mechanisms for identifying and preventing, and/or mitigating the negative impacts of key threats to protected areas are in place.
2.1. To promote equity and benefit-sharing.	Establish by 2010 mechanisms for the equitable sharing of both costs and benefits arising from the establishment and management of protected areas
2.2. To enhance and secure involvement of indigenous and local communities and relevant stakeholders.	Full and effective participation by 2011, of indigenous and local communities, in full respect of their rights and recognition of their responsibilities, consistent with national law and applicable international obligations, and the participation of relevant stakeholders,

<sup>6/</sup> Terrestrial includes inland water ecosystems.

<sup>5/</sup> The concept of connectivity may not be applicable to all Parties.

<sup>6/</sup> References to marine protected area networks to be consistent with the target in the WSSD plan of implementation.

Goals	Target
	in the management of existing, and the establishment and management of new, protected areas
3.1. To provide an enabling policy, institutional and socio-economic environment for protected areas.	By 2010 review and revise policies as appropriate, including use of social and economic valuation and incentives, to provide a supportive enabling environment for more effective establishment and management of protected areas and protected areas systems.
3.2. To build capacity for the planning, establishment and management of protected areas .	By 2010, comprehensive capacity-building programmes and initiatives are implemented to develop knowledge and skills at individual, community and institutional levels, and raise professional standards.
3.3. To develop, apply and transfer appropriate technologies for protected areas.	By 2013 the development, validation, and transfer of appropriate technologies and innovative approaches for the effective management of protected areas is substantially improved, taking into account decisions of the Conference of the Parties on technology transfer and cooperation.
3.4. To ensure financial sustainability of protected areas and national and regional systems of protected areas.	By 2011, sufficient financial, technical and other resources to meet the costs to effectively implement and manage national and regional systems of protected areas are secured, including both from national and international sources, particularly to support the needs of developing countries and countries with economies in transition and small island developing States.
3.5. To strengthen communication, education and public awareness.	By 2011 public awareness, understanding and appreciation of the importance and benefits of protected areas is significantly increased
4.1. To develop and adopt minimum standards and best practices for national and regional protected area systems.	By 2010, standards, criteria, and best practices for planning, selecting, establishing, managing and governance of national and regional systems of protected areas are developed and adopted.
4.2. To evaluate and improve the effectiveness of protected areas management.	By 2012, frameworks for monitoring, evaluating and reporting protected areas management effectiveness at sites, national and regional systems, and transboundary protected area levels adopted and implemented by Parties
4.3. To assess and monitor protected area status and trends.	By 2012, national and regional systems are established to enable effective monitoring of protected-area coverage, status and trends at national, regional and global scales, and to assist in evaluating progress in meeting global biodiversity targets
4.4 To ensure that scientific knowledge contributes to the establishment and effectiveness of protected areas and protected area systems.	Scientific knowledge relevant to protected areas is further developed as a contribution to their establishment, effectiveness, and management

## (ANNEX )PROTECTED AREAS IN YEMEN

### **Convention on Biological Diversity:**

Recognizing the importance of biological diversity for human beings, and also realizing the urgent need to protect and conserve it for the benefit of the entire humanity, world leaders adopted, in 1992, the Convention of Biological Diversity (CBD). Since then, this convention has been ratified by 187 countries, including Yemen. CBD specifically calls for establishment of protected areas (PAs) as a tool for in situ conservation that should be used in conjunction with other relevant provisions of the convention.

Paragraphs a, b, c and e of Article 8 contains specific references to PAs and provide that parties should:

- a. Establish a system of PAs or areas where special measures are taken to conserve biodiversity.
- b. Develop guidelines for the selection, establishment and management of PAs.
- c. Regulate or manage biological resources important for biodiversity conservation, within or outside PAs.
- d. Promote environmentally sound and sustainable development in areas adjacent to PAs with a view to furthering protection of these areas.

Moreover, human activities have affected all kinds of habitats in one way or another. Some of these activities, and their effects are:

- 1- Aerial photographs show that, during 1973 – 1988, up to 60% of Bura'a Forest has deteriorated. Over 53% of its woodland and 13% of the biodiversity, have disappeared.
- 2- Sharks are facing aggressive fishing for their flesh and fins, especially at the southern coasts.
- 3- Coral reefs are being destroyed in the expense of developing harbors. A good example is the damage caused to the coastal protected area at Balhaf, in Shabwa Governorate, where a harbor is being constructed for the export of liquefied natural gas.
- 4- Ibex hunting and leopard killing in Wadi Hadhramout and Wade'a, respectively.
- 5- Overgrazing by sheep, goats, cattle and camels.
- 6- Wood harvesting for construction, firewood, manufacture of furniture and beehives.
- 7- Expansion of agriculture and/or urbanization on the expense of natural habitats

According to the "Environment Protection Law" No. 26 for the year 1995, and article 11 of the bylaw No. 148 for the year 2000, "A protected Area may be established, in natural habitats, by a Prime Ministerial decree upon the recommendation of EPA or any specialized body". The objectives for establishing protected areas are:

- 1- To ensure conservation of biological diversity and functioning of ecological processes in compliance with relevant international obligations, by preserving:
  - selected examples of Yemen's different biotic communities; and
  - viable populations of rare, endemic and threatened species of wild plants and animals, and other species judged to be of special concern.
- 2- To protect and preserve selected sites or areas of scenic beauty or of special interest.
- 3- To provide sustainable base for long term consumptive use of selected natural resources by local people.

- 4- To protect environments against erosion, flooding, watershed degradation, deforestation and desertification.
- 5- To provide a basis for conservation education and research, including maintaining undisturbed environments as a baseline for measuring environmental change.
- 6- To provide a sustainable base for developing and diversifying recreation and tourism.
- 7- To contribute to the economic and environmental well being of the country.

### Yemen Protected Areas

NO	Declaration no.	Date of declarations	location	Protected area	covers area	Remarks and implement status
1	Cabinet declaration no.137	June, ,5 1990	Dhamar - Autma	Autma	460 km <sup>2</sup>	- No Management plan has prepared.
2	Presidential declaration no. 275	Sep.27 2000	Hadramout	Socotra	3,600 km <sup>2</sup>	Management plan has prepared.
3	Cabinet declaration no. 260	August.16 2005	Al-Mahara -Hawf	Hawf	30,000 ha 300 km <sup>2</sup>	Management plan has prepared.
4	Cabinet declaration no24.	January 17,2006	Al-Hodidah	Bura'a	4278 ha 42.78 <sup>2</sup> km	Management plan has prepared.
5	Cabinet declaration no304.	August,1 2006	Aden	Wetland Aden	ha2200 22 km <sup>2</sup>	Management plan has prepared.
6	Cabinet declaration no 310 .	August.16 2009	Al-Hodidah	Kamaran Island	ha 2000 20km <sup>2</sup>	No Management plan has prepared.

#### **1- Utoma Protected Area:**

This is the first to be declared as protected area. It is located in Dhamar province. It lies at elevations ranging from 920 to 2800 meters above sea level and covers an area of 460 km<sup>2</sup>. It is characterized by a volcanic series of mountains with granite cliffs. This series is intersected by deep valleys and springs that hold water throughout the year.

Utoma has a rich biodiversity. Over 130 plant species have so far been recorded. Several wild mammals species, including wolves, hyenas, foxes, hares and hedgehogs, and birds such as vultures, eagles, falcons and partridges are known to occur here.

Although no management plan has been prepared for Utoma PA, it was officially declared in 1999 by the “Prime Minster’s decree” number 137.

Several Environmental societies are established in Utoma until now no management plan or details studies in the socio-economic or the habitats.

The NGOs active with some project funded by donors .



## **2- Socotra Protected Areas:**

These comprise four islands which are located in the Indian Ocean. The largest, Socotra, has an area of 3,600 km<sup>2</sup> and a mountainous interior rising to more than 1,500 m. The other three islands lie at about fifty km to the south-west. These are Samha, 41 km<sup>2</sup> in area, Darsa 17 km<sup>2</sup>. and Abd al Kuri with an area of 133 km<sup>2</sup>. Socotra island lies on the margins of the sub-equatorial and northern tropical climate belts. Average temperatures range between 17 to 37°C, in winter and summer, respectively. From May to September the island receives summer monsoon where strong south-westerly winds blow, restricting maritime access.

Socotra has long been isolated from the mainland, a feature that gives the island a unique biogeographical and evolutionary significance. It has a rich flora with a high rate of endemism. Among the some 850 plant species known from the island, about 293 are endemic. The fauna also is unique, especially in the reptiles and certain invertebrates. About 80% of the latter group are endemic. As for the vertebrates, 27 (90%) out of 30 reptiles are endemic. The bird fauna is represented by 32 species, 6 (19%) of which are endemic. Several studies on the biodiversity of the island have been conducted. The management plan has been prepared in it is in effect.

Socotra declared by the International Organization of World Heritage” as a “World Heritage”, and by UNESCO as a protected area for “Man and Biosphere”. It was officially declared as “protected Area” by the Prime Minister’s decree No. 257 in the year 2000.

Socotra Conservation started earliest than the PA s in the country. The projects supported by international donors. Several organizations has focusing in Soctra conservation as the main PA in Yemen.

## **3- Bura’a Natural Protected Area (BNPA):**

The Name Bura’a Natural protected area is taken from that of the granite massif, Jabal Bura’a, on which it is located. Administratively, BNPA is located in Al Hudaidah Governorate, about 50 km north of Al Hudaidah city. It has an area of 4278 ha. Jabal Bura’a ranges in altitude between 300 to 2200 meters and is intersected by a number of valleys, the most important of which are “Wadi Rijaf” “Wadi Al Aswad” and “Wadi Al Bussal”.

Bura’a forest represents a relict of the tropical forests that once predominated the Arabian Peninsula. About 300 plant species belonging to 83 families have been recorded from BNPA. A total of 63 species are considered rare; 35 vulnerable and 8 species endemic. Among animals, 9 terrestrial vertebrate, including the hamadryas baboon, White tailed mongoose, the porcupine and the hyena have been recorded in the descend. About 93 bird species have been recorded in BNPA. Of these, 32 are resident species, 17 migrant, 5 summer visitors, 2 endemic and 2 threatened species. Reptiles are represented by 13 species including fresh water turtles and the Yemeni monitor lizard. There are also frogs and toads in addition to many species of invertebrates.

The Sustainable Natural Recourse Management Project executed the updated management plan e.g :

- Established the management of the protected area
- Created local communities.
- Provided the capacity building .
- Training programs for local communities and the staff was provided.
- Implemented several awareness raising activities

- Furniture's and equipments was provided.
- Strengthened the PA management.
- Strengthened the women societies in the PA.
- Built toilets.
- Built number of traditional tents.

#### **4- Hawf Protected Area:**

This protected are is located in Al Mahra Governorate near the borders with the Sultanate of Oman. It covers an area of 30,000 ha ascending gradually from the sea level to an altitude of 1400 meters. There are several valleys intersecting the mountains. Hawf normally receives very little rain, but mist/fog covers the entire region from June to September.

Hawf forest is the largest in the Arabian Peninsula. A few large mammals such as the Arabian leopard, the ibex, gazelles, wolves, hyenas, foxes wild cats and porcupines are expected to live in it. Other animals recorded here include 65 bird species six of which are rare species. About 220 plant species have been recorded to occur in the forest.

- Sustainable Natural Recourse Management Project implemented some activities strength the local communities especially the gander.
- A local community-based management plan of Hawf updated and is ready for execution;
- Implemented several awareness raising activities which have led to positive changes in local people's attitude towards conservation of the three nature reserves in Hawf.
- Capacity building effort has been paid for the staff members of protected areas & NGOs at JBNP, AWPA, and Hawf through NGOs. Scope of training was mainly devoted for: protected area management & creating non-farming jobs. At institutional level, they were trained , English language, delivery of ecotourism services, computer use, monitoring of birds and book-keeping.
- At Hawf proteced area, biodiversity conservation activities has been tailored to undertaking of number of studies and surveys, establishment of plant nursery & providing of training to operate the nursery.
- The nursery was then provided with the necessary tools for its full functioning. These include adequate items of: wheelbarrows, spades, shovels, water spray, water pipes, water network, plastic bags, agriculture soil, nursery- plants of local plant species, and a metal water tanks.
- To enable local women operate the nursery, five women from Hawf protected area were provided with initial training on operating the nurseries and following their training they have been in charge of management of the established nursery. Recently, the Hawf women's groups of confirmed that they need more training on managing the nursery. To improve information base for effective planning conservation and monitoring of Hawf nature reserve.
- The SNRMP has undertaken two surveys of mangrove areas and turtle for Hawf coastal zone. These studies been used as baseline for developing the management plan & for conservation & monitoring of the Hawf nature reserve.

**5- Wetlands in Aden:** these are suitable sites for visiting and migratory birds, in addition to their importance in maintaining several plant and aquatic animal species.

**Sustainable Natural Recourse Management Project supported the Aden wetland protected Area with many activities as follows:  
Output's Achievements & Rating**

*SNRMP in producing interventions of Capacity building with the achievements of following:*

- A Board of Directors for coordinating environmental resources management established and partly functional
- EPA organizational structure for all management levels produced and & enacted at both central and regional management levels
- EPA job description for all management levels produced and & enacted at both central and regional management levels
- The By-laws regulating internal business operations produced and & enacted at both central and regional management levels
- A total of 248 persons from EPA & regional offices & protected areas have been trained in different disciplines of natural resources management.
- Survey of available EPA human resources completed
- Training needs assessments completed for EPA
- A guideline on EPA environmental services drafted and yet it needs to be published.
- Incentive scheme for EPA personnel drafted but yet not enforced.
- Attendance- Sheet of EPA personnel has been replaced by a Bio-print machine that automatically records attendance
- Computer equipment & software composed of one PC, printer provided to EPA board of directors and seven newly established EPA branches.
- Office furniture provided to the board of director and Al-Hodidah regional Branch

*In the technical respect the project achieved progress in several aspect e.g. as follow:*

- Established management system for Aden wetlands & Buraa
- Prepared the management plan for Aden wetland.
- Updating the management plan of Buraa PA. :
- Created the gray water reused system and irrigation method in Aden and Taiz cities.
- Re-habituated the sea channels supply in Aden lagoons
- Established number of Environmental school clubs around 33 clubs in Aden..
- Created environmental NGOs including women env. NGOs.

## **6- Kamaran Island Protected Area.**

Marine protected area located in the Red sea 5Kilometers far from Al-Hodidah , Mangrove cover the mean parts of the island . Until now no more studies the habitat of Kamaran Island it declared by the cabinet resolution during the year 2009.

### **1- Bir Ali- Burum Protected Area:(in pipeline)**

This is a coast extending through a distance of 125 km from Bir Ali in Shabwa Governorate to Burum in Hadhramout Governorate. It also includes the islands of Hallaniyah, Baraqa, Sikha, Ghadreen Al Kubra and Ghadreen Al Sughra.

This coastal zone is rich in marine biodiversity. Several species of mollusks, arthropods such as crabs and shrimps; echinoderms such as starfishes and sea urchins.

One of the most interesting features in this PA is the presence of a lake which is believed to have formed by a volcanic crater. The lake host mangrove trees that grow around it. It also serve as a suitable resting site for migratory birds.

In addition to these biological features, the area is historically interesting for the nearby Kana port and the fort of “Husn Al Ghurab”.

### **2- Sharma – Jethmun Protected Area: :(in pipeline)**

This protected area is located in Hadhramout Governorate. It extends for 55 km, along the coast between Sharma and Jethmun. Ras Sharma is an important nesting site for the green turtle and the hawk’s bill turtle. During this event, many scientists and other interested people visit the area to watch the turtles, which makes it a good spot for eco-tourism.

Several other areas have high potentials to be protected. Preliminary studies have already stated at some of these areas, which include.

1- Jabal Al areas, Abyan Governorate; Jabal Milhan, Al Mahweet Governorate; Jabal Eraf, Lahej Governorate; Halamlam and Midi, Hajjah Governorate; Thi-Alsharm, Ibb Governorate; Al Luhayyah, Hudaidah Governorate and some Red Sea Ilands.

## **SITUATION ANALYSIS IN THE PAs**

The situation analysis in the protected Areas prepared by the Integrated Costal Zone Management Project, before the year 2005. Some interventions progress achieved through many the conservation activities related to Biodiversity.

Despite existence of several points of strength, the current situation of Yemen PAs is not very encouraging.

### **Strengths:**

The unique biodiversity and high plant and animal species endemism are among the features that attract many scientists and eco-tourists to Yemen PAs. A good example is the ongoing conservation are Socotra , Bura'a and Aden wetland . The scenic views in many areas are good assets for most PAs in Yemen.

Despite the conflicts between the locals, they are generally cooperative and helpful. This is reflected in the acceptance, by the majority of the local communities, for the idea of establishing the PAs.

### **Weaknesses:**

Several points of weakness are present in all PAs in Yemen. Most of the people living inside or in the vicinity of the PAs are ignorant and have no basic knowledge of conserving nature and using

natural resources in a sustainable way. Many still believe that no one should deprive them from the right of grazing their animals in and around the PAs. However, it is essential that alternative opportunities should be available for them. No authorities or management boards are active in the PAs. Even in areas (as in Socotra) where signs of management are available, more effective well trained personnel are needed.

**Opportunities:**

The international concern in Yemen biodiversity is reflected in the funding of projects related to conservation of natural resources by various countries, UNDP, IUCN, Global Environmental Facility and the World Bank. Establishment of PAs in different parts of the country will guarantee sustainable use and management of natural resources and gives opportunity to biodiversity to survive. It will also help provide alternate opportunities for socio-economic development of the community in various aspects.

**Threats:**

Restrictions on resource use in PAs without providing alternatives may result in further poverty to certain sectors of the community. The majority of community members are not aware of the importance of PAs and the need for protection and conservation of biodiversity. Due to lack of previous experience in PA management in Yemen, and lack of trained staff, there might be difficulties in managing PAs in Yemen. Lack of infrastructure to provide services for tourists will affect income generation to PAs, which will affect the socioeconomic development in these areas.

## **REQUIRED ACTIONS**

The first action to be taken towards the establishment of a PA, is to prepare a management plan. Once this has been done, it should be implemented by qualified personnel.

Management plans for Socotra, Bura'a, Aden wetland and Hawf have already been prepared by professional companies. These management plans are the result of extensive surveys and studies conducted by specialized scientists. They have covered various aspects, including the following:

- a- Biodiversity issues: these were carried out in different seasons; and lists of all plants and animals encountered or believed to exist in the PAs are included in the document of the management plan.
- b- Capacity building, where counterparts and members of the local community were presented with training programs, workshops and visits to other countries in order to benefit from their experience in managing PAs. Moreover, awareness campaigns and establishment of CBOs/NGOs were carried out in varying ways.
- c- Preparation of complete sets of maps, the most important is the zoning map.
- d- Social organization, land tenure & legal status, and economic opportunities.
- e- Community based natural resource management.

Although Utoma PA was the first to be declared as protected area, it does not have a well prepared management plan. Similar Kamaran Island PA. Therefore, one is urgently needed.

The management plans should be immediately implemented as soon as possible.

Proper implementation of the management plans is an important process.

**Challenges can be summarized as follows:**

**1- Institutional and legal,**

- Enforcement the Environmental Protection Law, the Environment laws exist, but not enforced at any level.

## **2- Administrative and technical:**

- Although management plans have been prepared by specialists for three PAs, these plans have not been implemented due to administrative and technical difficulties. For proper implementation, selection of managers and other staff should be done with sincerity, without bias to any particular person or group of people.
- Updating the management plan of the PAS.
- Compromise the management plan and prioritize according the budget availability and urgent needs.

## **3- Capacity building and training:**

- Unfortunately, training programs are not well conducted, and in most cases, the trainees do not take the matter seriously. Therefore, all trainees should be committed and play their role correctly; otherwise, all efforts will go astray and all foreseen goals will not be achieved.

## **4- Availability of budget:**

Performing effective PA management requires that an adequate budget should be allocated to cover all expenses. Sustainable sources for this budget may include:

- a- Government funding.
- b- Income generated by local communities, PA entrance fees etc.
- c- Plans for future social and economic development.
- d- Eco-Tourism services.

## **4- Biodiversity projects**

1. Sustainable environmental management, YEM/97/100- sp5: promotion of eco-tourism
2. Fisheries development project, phase 4 and 5 World Bank, EU
3. Conservation and Sustainable Use of the Biodiversity of Socotra Archipelago, YEM/96/G32, GEF-UNDP
4. Biodiversity strategy & action plan, GEF-UNDP, YEM/96/G1
5. Protection of the Marine Ecosystem for the Red Sea Coast, YEM/97/G32
6. Strategy Action Plan for the Red Sea and Gulf of Aden, RAB/97/G33
7. Protected Areas Management Project PF023491/2
8. Sustainable Natural Resource Management Project, UNDP

## **Key-Results of above projects.**

- Conservation and sustainable use of biodiversity
- Zoning plan of Socotra
- Essential infrastructure
- Community awareness
- Pilote protected areas
- Coordination unit
- Socotra Master plan
- Declared number of protected Areas.
- Improved watershed database, maps watershed infrastructure.

- Aden wetland management
- Bura'a Protected Area management.
- Established environmental School clubs.
- Created some Environmental NGOs in the protected Areas.

**Lessons learned so far:**

- 1- Local community & NGOs involvement in planning and managing Nature reserves. to be enabling local communities to conserve and sustainable use biological resources by facilitating their participation in the planning and management of natural resources and providing them with secure access to biological resources and sufficient financial and technical funding for enacting community-based management model..
- 2- Local communities able to led the PA management. The NGOs can get initiative to represent them in addressing livelihoods, poverty & participation issues.
- 3- PA can create good income, reduce the poverty, conserve and help for sustainability of the natural resources.
- 4- Help people to refecton there needs in protected Areas achieved the balancing conservation targets.
- 5- Women societies in the PA can introduce more economical production, marketing ecotourism and handcraft basic on the traditional services. .
- 6- Dealing with local communities needs value of police capability.
- 7- Centralized management of protected areas has been found to be ineffective, costly and unsustainable with little effect on conservation & protection of Yemen nature reserve. This exclusive policy has hindered local communities accessing forest resources, deprived them of available income and job opportunities, & hence created hostile attitudes towards Government initiatives in protected area management. To minimize widespread effects associated with centralization policy, the Government of Yemen has decided to shift to decentralized management of natural resources & decreed the Local Authority Law No. 4 on February 2000. Although the law provides the local authority & communities the right to participate in planning and managing local resources, shifting to a decentralized management model has been constrained by number of factors such as: weak local capacity to plan & execute management plans, limited local community awareness in environmental management, lack of skills & finance to plan & manage nature reserves, and little consideration of the livelihoods of local people by decision makers while policy formulation & implementation.

### List of the sensitive areas in Yemen:

no	Sensitive area name	location	description
1	Belhaf –Ber ALI	SHABWAH	Marine protected Area
2	Eraf	Taiz	Terrestrial
3	Sharma-Gathmoun	Hadramout	Marine Area
4	Jabal Al-Araees	Abian	Terrestrial
5	Jabal Gol –Ras Frtk	HADRAMOUT	Terrestrial - Marine
6	Al-Lhia	Al-Hodidah	Marine
7	Jabal Al-Lwz	Sana'a	Terrestrial
8	Jabal -Malhan	Al-Mehweet	Terrestrial
9	Wada'a	Amran	Terrestrial
10	Al-Zwbair Island	Al-Hodidah	Marine
11	Zwkair Island	Al-Hodidah	Marine
12	Hwnish Islands	Al-Hodidah	Marine
13	Halmlm	Hajja	Terrestrial
14	Jabal Al-Kwr	Abian	Terrestrial
15	Dwnava + Am al-Hagar	Aden	Terrestrial+Marine
16	Kwshan Costal Area	Al-Mharra	Marine
17	Thy-Sharm	Ibb	Terrestrial
18	Al-Erg	Al-Hodidah	Marine
19	Hamel Bait Bus	Sana'a	Terrestrial
20	Bab Al-Mandab	Taiz	Marine
21	Hajat ass(Forest )	Taiz	Terrestrial
22	Al-Riady	Al MEHWEET	Terrestrial
23	Jabal Al-Awd	Ibb	Terrestrial
24	Al-Mallah Al-Habilin	Al-DHALAA	Terrestrial
25	Khwr- Omira	HADRAMOUT	Marine
26	Bani-Omar	Taiz	Terrestrial
27	Al-KHWBA	Sadaa	Terrestrial
28	Rimah	Rimah	Terrestrial
29	Wsab	Themar	Terrestrial
30	Maidy	Al-Hodidah	Marine
31	Al-Tkari	Al-Hodidah	Terrestrial
32	Al-ADDIN Wadi Al-Dor	Ibb	Terrestrial
33	Ras –Amraan	Lhj	Marine
34	Al-Tair Island	Al-Hodidah	Terrestrial
35	WADI Hadrmout	Hadramout	Terrestrial



**Table 1. YEMEN ENDEMIC PLANTS:**

Family	Species	National IUCN status	World IUCN Status
Leguminosae	<i>Acacia campoptila</i> Schweinf.		NT
Leguminosae	<i>Acacia pennivenia</i> Schweinf.	NT	VU
Crassulaceae	<i>Aeonium</i> sp.		NT
Amaranthaceae	<i>Aerva artemisioides</i> Vierh. & Schwartz subsp. <i>artemisioides</i>		NE
Leguminosae	<i>Aeschynomene arabica</i> Deflers		NE
Aloeaceae	<i>Aloe abyssicola</i> Lavr. & Bilaidi		NT
Aloaceae	<i>Aloe austroarabica</i> Lavr		NT
Aloeaceae	<i>Aloe castellorum</i> J.R.I. Wood		NT
Aloeaceae	<i>Aloe doei</i> Lavr.		NT
Aloeaceae	<i>Aloe eremophila</i> Lavr.		NT
Aloeaceae	<i>Aloe fulleri</i> Lavr.		R
Aloeaceae	<i>Aloe inermis</i> Forssk.		VU
Aloeaceae	<i>Aloe irafensis</i> Lavranos, Al-Gifri & McCoy		NT
Aloaceae	<i>Aloe jawiyon</i> Christie, Hannon &	NT	
Aloeaceae	<i>Aloe lavranosii</i> Reynolds		NT
Aloeaceae	<i>Aloe luntii</i> Baker		NT
Aloeaceae	<i>Aloe menachensis</i> (Schweinf.) Blatter		VU
Aloeaceae	<i>Aloe niebuhriana</i> Lavr.		NT
Aloeaceae	<i>Aloe pendens</i> Forssk.		NT
Aloaceae	<i>Aloe perryi</i> Baker	NT	
Aloeaceae	<i>Aloe rivierei</i> Lavr. & Newton		NT
Aloeaceae	<i>Aloe rubroviolacea</i> Schweinf.		NT
Aloeaceae	<i>Aloe serriyensis</i> Lavr.		NT
Aloeaceae	<i>Aloe splendens</i> Lavr.		NT
Aloaceae	<i>Aloe squarrosa</i> Balf.f.	VU B2 a bii	
Aloeaceae	<i>Aloe tomentosa</i> Deflers.		NT
Aloeaceae	<i>Aloe vacillans</i> Forssk.		NT
Gramineae	<i>Andrachne schweinfurthii</i> (Balf.f.) Radcl.-Sm.	VU D2	
Gramineae	<i>Andropogon bentii</i> Stapf	DD	
Gramineae	<i>Andropogon crossotes</i> Cope		NE
Commelinaceae	<i>Aneilema woodii</i> R.B.Faden		en
Acanthaceae	<i>Angkalanthus oligophylla</i> Balf.f.	EN D	
Combretaceae	<i>Anogeissus bentii</i> Baker.	EN B1+2e	
Gramineae	<i>Aristida anaclasta</i> Cope	DD	
Gramineae	<i>Aristida pennei</i> Chiov.		NE
Asparagaceae	<i>Asparagus</i> sp. A.	DD	
Aspleniaceae	<i>Asplenium schweinfurthii</i> Baker	VU B2 a b	
Acanthaceae	<i>Ballochia amoena</i> Balf.f.	DD	
Acanthaceae	<i>Ballochia atro-virgata</i> Balf.f.	DD	
Acanthaceae	<i>Ballochia rotundifolia</i> Balf.f	DD	

Acanthaceae	Barleria argentea Balf.f.	Extinct	
Acanthaceae	Barleria popovii Verdc.	EN B2 a b iii	
Acanthaceae	Barleria tetracantha Balf.f.	VU D2	
Labiatae	Becium serpyllifolium (Forssk.) Wood		NE
Begoniaceae	Begonia semhaensis M.Hughes & A.G.Mill.	EN B2 a, b iii	
Acanthaceae	Blepharis kuriensis		VU D2
Acanthaceae	Blepharis linariifolia Pers.		NE
Acanthaceae	Blepharis spiculifolia Balf.f.	VU D2	
Compositae	Blepharispermum yemense Deflers		VU D2
Burseraceae	Boswellia aff. ameero	VU D2	
Burseraceae	Boswellia ameero Balf.f.	VU B2 ab (ii,iii)	
Burseraceae	Boswellia bullata Thulin ined.	VU D2	
Burseraceae	Boswellia dioscorides Thulin ined.	VU D2	
Burseraceae	Boswellia elongata Balf.f.	VU B2 a b iii	
Burseraceae	Boswellia nana Hepper	VU D2	
Burseraceae	Boswellia popoviana Hepper	VU D2	
Burseraceae	Boswellia socotrana Balf.f.	VU D2	
Capparidaceae	Cadaba insularis A.G.Mill.	CR A 2acd; B2ab(iii)	
Polygonaceae	Calligonum crinitum Boiss subsp. Arabicum (Soskov) Soskov		NE
Scrophulariaceae	Campylanthus milleri Thulin		NE
Scrophulariaceae	Campylanthus pungens Schwartz..		NE
Scrophulariaceae	Campylanthus yemenensis A.G.Mill.		NE
Apocynaceae	Caralluma B [fide Wood]		NT
Apocynaceae	Caralluma C [fide Wood]		NT
Apocynaceae	Caralluma D [fide Wood]		NT
Apocynaceae	Caralluma lavranii Rauh & Wertel		NT
Apocynaceae	Caralluma sp. A [fide Wood]		NT
Compositae	Centaurea yemensis Wagenitz		NE
Compositae	Centaurothamnus maximus (Forssk.) Wagen. & Dittr.		NE
Euphorbiaceae	Cephalocroton socotranus Balf.f.	VU D2	
Apocynaceae	Ceropegia foliosa Bruyns		NT
Apocynaceae	Ceropegia sepium Deflers		NT
Apocynaceae	Ceropegia yemensis Meve & Mangelsdorff		NT
Leguminosae	Chapmannia gracilis (Balf.f.) Thulin	NT	
Leguminosae	Chapmannia reghidensis Thulin & McKean	EN B2 ab(iii)	
Leguminosae	Chapmannia sericea Thulin & McKean	NT	
Leguminosae	Chapmannia tinireana Thulin	EN B2 ab(iii)	
Verbenaceae	Chascanum yemenense Sebsebe		NE
Anthericaceae	Chlorophytum sp. Nov.	EN B2 ab(iii)	
Acanthaceae	Chorisochoa minor (Balf.f.) Vollesen	VU D2	
Acanthaceae	Chorisochoa striata (Balf.f.) Vollesen	VU D2	
Orobanchaceae	Cistanche rosea E.G.Bak		NE

Capparidaceae	Cleome macradenia Schweinf.		NE
Verbenaceae	Clerodendrum galeatum Balf.f.	VU D2	
Verbenaceae	Clerodendrum leucophloeum Balf.f.	VU D2	
Verbenaceae	Coelocarpum haggierensis A.G.Mill.	VU D2	
Nyctaginaceae	Commicarpus adenensis Miller.		NE
Nyctaginaceae	Commicarpus arabicus Meikle		NE
Nyctaginaceae	Commicarpus stenocarpus (Chiov .) Cuf.		NE
Burseraceae	Commiphora foliacea Sprague.		NT
Burseraceae	Commiphora kataf (Forssk.) Engl.		NT
Burseraceae	Commiphora ornifolia (Balf.f.) Gillett	NT	
Burseraceae	Commiphora parvifolia (Balf.f.) Engl.	NT	
Burseraceae	Commiphora planifrons (Balf.f.) Engl.	NT	
Burseraceae	Commiphora socotrana (Balf.f.) Engl.	NT	
Convolvulaceae	Convolvulus sericophyllus T. Anders.		NE
Convolvulaceae	Convolvulus thymoides O. Schwartz		NE
Compositae	Conyza sp A [fide Wood]		NE
Cucurbitaceae	Corallocarpus sp A [fide Wood]		NE
Tiliaceae	Corchorus cinerascens Deflers		NE
Compositae	Crepis Sp A		NE
Compositae	Crepis Sp B		NE
Leguminosae	Crotalaria socotrana (Balf.f.) Thulin	VU D2	
Leguminosae	Crotalaria squamigera Deflers		NE
Euphorbiaceae	Croton sarcocarpus Balf.f.	VU D2	
Euphorbiaceae	Croton sulcifructus Balf.f.	VU D2	
Euphorbiaceae	Croton wissmannii Schwartz		NE
Apocynaceae	Cryptolepis macrophylla (Radcl.-Sm.) Ventner	VU D2	
Apocynaceae	Cryptolepis socotranus (Balf.f.)	VU D2	
Commelinaceae	Cyanotis nyctitropa Deflers		NE
Boraginaceae	Cynoglossum sabirense (R.Mill & A.G.Mill.) Wood		NE
Boraginaceae	Cynoglossum yemenense (R.Mill & A.G.Mill.) Wood		NE
Boraginaceae	Cystostemon kissenioides (Delf.) A.G.Mill. & H.Riedl		NE
Gramineae	Dactyloctenium hackelii	DD	
Gramineae	Danthoniopsis sp A		NE
Umbelliferae	Daucus yemenensis Deflers		NE
Cucurbitaceae	Dendrosicyos socotrana Balf.f.	VU A2cd	
Caryophyllaceae	Dianthus uniflorus Forssk.		VU
Leguminosae	Dichrostachys dehiscentis Balf.f.	VU D2	
Hyacinthaceae	Dipcadi balfourii Baker	VU D2	
Hyacinthaceae	Dipcadi kuriensis A.G.Mill.	VU D2	
Cruciferae	Diploaxis kohlaanensis A.G.Mill. & J.Nyberg		NE
Dirachmaceae	Dirachma socotrana Schweinf.	VU B2ab(iii)	
Salvadoraceae	Dobera glabra (Forssk.) Poir.		NT

Moraceae	<i>Dorstenia gigas</i> Schweinf. ex Balf.f.	NT	
Moraceae	<i>Dorstenia socotrana</i> A.G.Mill.	VU D2	
Dracaenaceae	<i>Dracaena cinnabari</i> Balf.f.	VU B2ab(iii)	
Hyacinthaceae	<i>Drimia porphyrostachys</i> Baker	DDd	
Apocynaceae	<i>Duvaliandra dioscoridis</i> (Lavr.) M.G.Gilbert	CR D	
Plumbaginaceae	<i>Dyerophytum pendulum</i> (Balf.f.) Kuntze	VU D2	
Plumbaginaceae	<i>Dyerophytum socotrana</i> J.R.Edm.	VU D2	
Acanthaceae	<i>Dyschoriste longicalyx</i> (Deflers) Lin.		dd
Apocynaceae	<i>Echidnopsis squamulata</i> (Decne.) P.R.O.Bally		NT
Apocynaceae	<i>Echidnopsis bentii</i>	VU D2	
Apocynaceae	<i>Echidnopsis globosa</i> Thulin & Hjertson		NT
Apocynaceae	<i>Echidnopsis inconspicua</i> Bruyns	VU D2	
Apocynaceae	<i>Echidnopsis insularis</i> Lavr.	VU D2	
Apocynaceae	<i>Echidnopsis milleri</i> Lavr.	VU D2	
Apocynaceae	<i>Echidnopsis seibanica</i> Lavr.		NT
Apocynaceae	<i>Echidnopsis socotrana</i> Lavr.	VU D2	
Apocynaceae	<i>Echidnopsis squamulata</i> (Decne) Bally		NT
Compositae	<i>Echinops spinosissimus</i> Turra.		NE
Boraginaceae	<i>Echiochilon pulvinata</i> A.G.Mill.	VU D2	
Erythroxylaceae	<i>Erythroxylum socotranum</i> Thulin	EN B2ab(iii)	
Euphorbiaceae	<i>Euphorbia abdelkuri</i> Balf.f.	EN B2ab(ii,iii)	
Euphorbiaceae	<i>Euphorbia aff schimperi</i> Presl.		NE
Euphorbiaceae	<i>Euphorbia applanata</i> Thulin & Gifri		NE
Euphorbiaceae	<i>Euphorbia arbuscula</i> Balf.f.	NT	
Euphorbiaceae	<i>Euphorbia fodhliana</i> Deflers		NT
Euphorbiaceae	<i>Euphorbia fractiflexa</i> S.Carter & Wood		NT
Euphorbiaceae	<i>Euphorbia hajhirensis</i> Radcl.-Sm.	VU D2	
Euphorbiaceae	<i>Euphorbia hamaderoensis</i> Radcl.-Sm.	EN B2a(biii)	
Euphorbiaceae	<i>Euphorbia inarticulata</i> Schweinf.		NT
Euphorbiaceae	<i>Euphorbia kuriensis</i> Vierh.	VU D2	
Euphorbiaceae	<i>Euphorbia leptoclada</i> Balf.f.	DD	
Euphorbiaceae	<i>Euphorbia meuleniana</i> O. Schwartz		NT
Euphorbiaceae	<i>Euphorbia obcordata</i> Balf.f.	VU D2	
Euphorbiaceae	<i>Euphorbia parciramulosa</i> Schweinf.		NT
Euphorbiaceae	<i>Euphorbia qarad</i> Deflers		NT
Euphorbiaceae	<i>Euphorbia quaitensis</i> S. Carter		NT
Euphorbiaceae	<i>Euphorbia rubriseminalis</i> S. Carter		NT
Euphorbiaceae	<i>Euphorbia schweinfurthii</i> Balf.f.	DD	
Euphorbiaceae	<i>Euphorbia seibanica</i> Lavr. & Gifri		NT
Euphorbiaceae	<i>Euphorbia socotrana</i> Balf.f.	VU D2	
Euphorbiaceae	<i>Euphorbia sp. aff. schimperi</i>		NT
Euphorbiaceae	<i>Euphorbia uncinulata</i> Radcl.-Smith ined.		NT
Euphorbiaceae	<i>Euphorbia uzruk</i> S.Carter & J.R.I.Wood		NT
Cucurbitaceae	<i>Eureiandra balfourii</i> Cogn.	VU D2	

Gentianaceae	Exacum affine Balf.f.	LC	
Gentianaceae	Exacum caeruleum Balf.f.	VU D2	
Gentianaceae	Exacum socotranum Balf.f.	EN B2a(biii)	
Zygophyllaceae	Fagonia socotrana		NE
Cruciferae	Farsetia inconspicua A.G.Mill.	VU D2	
Cruciferae	Farsetia socotrana B.L.Burt	VU B2ab(i,ii,iii,iv)	
Gramineae	Festuca cryptantha T.Cope		NE
Urticaceae	Forskohlea grierrsonii A.G.Mill.		NE
Cyperaceae	Fuirena felicis Hooper		NE
Rubiaceae	Gaillonia jolana Thulin		NE
Rubiaceae	Gaillonia putorioides (A.R. Smith) Petruss. & Thulin	VU D2	
Rubiaceae	Gaillonia sp A of Wood		NE
Rubiaceae	Gaillonia thymoides Balf.f.	En B2ab(iii)	
Malvaceae	Gossypium areysianum Deflers		NT
Malvaceae	Gossypium incanum (Schwartz) Hillcoat		NT
Scrophulariaceae	Graderia fruticosa Balf.f.	VU D2	
Tiliaceae	Grewia bilocularis Balf.f.	VU D2	
Tiliaceae	Grewia milleri Abedin	VU D2	
Tiliaceae	Grewia turbinata Balf.f.	VU D2	
Caryophyllaceae	Gymnocarpos argenteus Petruss. & Thulin		NE
Caryophyllaceae	Gymnocarpos bracteatus (Balf.f.) Thulin	VU D2	
Caryophyllaceae	Gymnocarpos kuriensis (Radcl.-Sm.) Thulin	VU D2	
Caryophyllaceae	Gymnocarpos maharanus Petruss. & Thulin		NE
Cistaceae	Helianthemum argyraeum Baker		NE
Compositae	Helichrysum arwae J.R.I. Wood.		VU D2
Compositae	Helichrysum dioscorides R. Atkinson	EN B2 a biii	
Compositae	Helichrysum forskahlii (J.F.Gmel.) Hillia. & Burt+B295		NE
Compositae	Helichrysum nimmoanum Oliv. & Hiern	VU D2	
Compositae	Helichrysum samhaensis R. Atkinson	VU D2	
Compositae	Helichrysum socotranum r. Atkinson	VU D2	
Compositae	Helichrysum sp. A	VU D2	
Compositae	Helichrysum sp. B	EN B2 a b iii	
Compositae	Helichrysum suffruticosum Balf.f.	VU D2	
Boraginaceae	Heliotropium aff. socotranum Vierh.	VU D2	
Boraginaceae	Heliotropium azzanum O.Schwartz		NE
Boraginaceae	Heliotropium bottae Deflers.		NE
Boraginaceae	Heliotropium cimaliense Vierh.		NE
Boraginaceae	Heliotropium congestum Baker		NE
Boraginaceae	Heliotropium deflersii Schwartz		NE
Boraginaceae	Heliotropium dentatum Balf.f.	VU D2	
Boraginaceae	Heliotropium derafontense Vierh.	DD	
Boraginaceae	Heliotropium kuriense Vierh.	VU D2	

Boraginaceae	<i>Heliotropium makallense</i> Schwartz		NE
Boraginaceae	<i>Heliotropium nigricans</i> Balf.f.	VU D2	
Boraginaceae	<i>Heliotropium paradoxum</i> Vatke.		NE
Boraginaceae	<i>Heliotropium paulayanum</i> Vierh.	VU D2	
Boraginaceae	<i>Heliotropium riebeckii</i> Schweinf. & Vierh.	DD	
Boraginaceae	<i>Heliotropium shoabense</i> Vierh.	DD	
Boraginaceae	<i>Heliotropium wagneri</i> Vierh.	VU D2	
Boraginaceae	<i>Heliotropium wissmannii</i> Schwartz.		NE
Cruciferae	<i>Hemicrambe townsendii</i> Gómez Pompa	VU D2	
Caryophyllaceae	<i>Herniaria maskatensis</i> Bornm.		NE
Malvaceae	<i>Hibiscus dioscorides</i> A.G. Mill.	DD	
Malvaceae	<i>Hibiscus malacophyllus</i> Balf.f.	VU D2	
Malvaceae	<i>Hibiscus noli-tangere</i> A.G.Mill.	EN B2ab(iii)	
Malvaceae	<i>Hibiscus scottii</i> Balf.f.	VU D2	
Malvaceae	<i>Hibiscus socotranus</i> G.Lucas	EN B2ab(iii)	
Orchidaceae	<i>Holothrix socotrana</i> Rolfe	VU D2	
Apocynaceae	<i>Huernia hadhramautica</i> Lavr.		NT
Apocynaceae	<i>Huernia marnieriana</i> Lavr.		NT
Apocynaceae	<i>Huernia rosea</i> L.E.Newton & Lavr.		NT
Hypericaceae	<i>Hypericum balfourii</i> N.Robson	VU D2	
Hypericaceae	<i>Hypericum fieriense</i> N.Robson	VU D2	
Hypericaceae	<i>Hypericum socotranum</i> subsp. <i>smithii</i> N.Robson	EN B2 a biii	
Compositae	<i>Iphionia anthemidifolia</i> (Baker) A.Anderb.		NE
Compositae	<i>Iphionia teretefolia</i> A.Anderb.		NE
Gramineae	<i>Ischmaeum</i> sp. nov.	DD	
Labiatae	<i>Isoleucas arabica</i> Schwartz		En
Euphorbiaceae	<i>Jatropha variegata</i> (Forssk.) Vahl		NE
Acanthaceae	<i>Justicia alexandri</i> R.Atkinson	VU D2	
Acanthaceae	<i>Justicia takhinensis</i> R.Atkinson	EN B2 a biii	
Crassulaceae	<i>Kalanchoe alternans</i> (Vahl.) Pers.		NT
Crassulaceae	<i>Kalanchoe bentii</i> C.H.Wright subsp. <i>bentii</i>		NT
Crassulaceae	<i>Kalanchoe robusta</i> Balf.f.	VU D2	
Crassulaceae	<i>Kalanchoe yemensis</i> (Deflers) Schweinf.		NT
Scrophulariaceae	<i>Kickxia petiolata</i> D.Sutton		NE
Scrophulariaceae	<i>Kickxia qaraticus</i> D.A.Sutton		NE
Scrophulariaceae	<i>Kickxia sabaia</i> D.Sutton		NE
Scrophulariaceae	<i>Kickxia sabarum</i> V.W.Sm. & D.A.Sutton		NE
Scrophulariaceae	<i>Kickxia saccata</i> D. A. Sutton		NE
Scrophulariaceae	<i>Kickxia scalorum</i> Schweinf. ex D.Sutton		NE
Scrophulariaceae	<i>Kickxia spiniflora</i> (Schwartz) D.A.Sutton		NE
Scrophulariaceae	<i>Kickxia woodii</i> D.A.Sutton		NE
Compositae	<i>Kleinia deflersii</i> Deflers		cr
Compositae	<i>Kleinia scottii</i> (Balf.f.) P.Halliday	VU D2	
Liliaceae	<i>Kniphofia sumarae</i> Deflers		NT

Rubiaceae	Kohautia socotrana Bremek.	DD	
Rubiaceae	Kraussia socotrana Bridson	VU D2	
Cruciferae	Lachnocapsa spathulata Balf.f.	VU D2	
Anacardiaceae	Lanea transulta (Balf.f.) Radcl.-Sm.	NT	
Compositae	Launaea almahrahensis N.Kilian		NE
Compositae	Launaea crepoides Balf.f.	VU D2	
Compositae	Launaea sp. A	DD	
Labiatae	Lavandula citriodora A.G.Mill.		NE
Hyacinthaceae	Ledebouria insularis A.G.Mill.	EN B2ab(iii)	
Gramineae	Lepturus calcareus Cope	DD	
Gramineae	Lepturus pulchellus Cope	DD	
Gramineae	Lepturus tenuis	DD	
Labiatae	Leucas alba (Forssk.) Sebald		NE
Labiatae	Leucas flagellifolia (Balf.f.) Guerke	VU D2	
Labiatae	Leucas haggierensis Cortez-Burns & Gifri	VU D2	
Labiatae	Leucas penduliflora Cortez-Burns & Gifri	VU D2	
Labiatae	Leucas samhaensis Cortez-Burns & Gifri	VU D2	
Aizoaceae	Limeum arabicum Friedr.		NE
Plumbaginaceae	Limoniastrum arabicum J.R.Edm. Ined.		cr
Liliaceae	Littonia obscura E.G.Baker.		NT
Leguminosae	Lotus mollis Balf.f.	VU D2	
Capparidaceae	Maerua angolensis DC. subsp. socotrana (Schweinf. ex Balf.f.) Kers var. socotrana	NT	
Apocynaceae	Marsdenia robusta Balf.f.	VU D2	
Celastraceae	Maytenus sp. nov. A.	VU D2	
Euphorbiaceae	Meineckia filipes (Balf.f.) G.L.Webster	DD	
Sterculiaceae	Melhania milleri Abedin	DD	
Sterculiaceae	Melhania muricata Balf.f.		NE
Convolvulaceae	Metaporana obtusa (Balf.f.) Staples	VU D2	
Scrophulariaceae	Nanorrhinum kuriensis (Radcl.-Sm.) A.G.Mill.	VU D2	
Labiatae	Nepeta woodiana Hedge.		NE
Cruciferae	Nesocrambe socotrana A.G.Mill.	EN B2ab(iii)	
Acanthaceae	Neuracanthus aculeatus Balf.f.	EN B2ab(iii)+2ab(iii)	
Umbelliferae	Nirarathamnos asarifolius Balf.f.	VU D2	
Resedaceae	Ochradenus spartioides (Schwartz) Abdulla		NE
Labiatae	Ocimum suave Willd.		NE
Rubiaceae	Oldenlandia aretioides Vierh.	DD	
Rubiaceae	Oldenlandia ocellata Bremek.	VU D2	
Loranthaceae	Oncocalyx doberae (Schweinf.) A.G.Mill. & Nyberg		cr
Apocynaceae	Orbea araysiana (Lavr. & Bilaidi) Bruyns Stultitia araysiana Lavr. & Bilaidi		NT
Apocynaceae	Orbea chrysostephana (Deflers) Bruyns (= Caralluma chrysostephana (Deflers) Burg.		NT

Apocynaceae	<i>Orbea wissmanii</i> (= <i>Caralluma wissmanii</i> ) O.Schwart.		NT
Umbelliferae	<i>Oreofraga morissiana</i> M.Watson & E.Barclay	VU D2	
Leguminosae	<i>Ormocarpum dhofarensis</i> Hille. & Gillett	VU B1+2c	
Leguminosae	<i>Ormocarpum yemenense</i> Gillett.		NE
Labiatae	<i>Orthosiphon brachystemon</i> Deflers		NE
Labiatae	<i>Orthosiphon ferrugineus</i> Balf.f.	VU D2	
Gramineae	<i>Panicum socotranum</i>	VU D2	
Rubiaceae	<i>Pavetta</i> sp A		NE
Rubiaceae	<i>Pavetta</i> sp b		NE
Malvaceae	<i>Pavonia subaphylla</i> Schwartz.		NE
Geraniaceae	<i>Pelargonium insularis</i> Gibby & A.G.Mill.	CR B2 ab(iii); D	
Umbelliferae	<i>Peucedanum areysianum</i> Deflers		NE
Compositae	<i>Phagnalon harazianum</i> Deflers		NE
Compositae	<i>Phagnalon resecta</i> Qaiser & Lack		NE
Compositae	<i>Phagnalon scalarum</i> Schweinf. E Schwartz		NE
Compositae	<i>Phagnalon woodii</i> Qaiser & Lack		NE
Compositae	<i>Phagnalon yerrimense</i> Qaiser & Lack		NE
Loranthaceae	<i>Phragmanthera austroarabica</i> A.G.Mill. & Nyberg		NE
Euphorbiaceae	<i>Phyllanthus hodjelensis</i> Schweinf.		NE
Compositae	<i>Picris scabra</i> Forssk.		NE
Compositae	<i>Picris</i> sp A [fide Wood]		NE
Compositae	<i>Piloselloides hirsuta</i> (Forssk.) C.Jeffrey		NE
Umbelliferae	<i>Pimpinella menechensis</i> Schweinf. ex Wolff.		NE
Umbelliferae	<i>Pimpinella woodii</i> C.Townsend		NE
Plantaginaceae	<i>Plantago cylindrica</i> Forssk.		NE
Labiatae	<i>Plectranthus asirensis</i> J.R.I. Wood		NT
Labiatae	<i>Plectranthus hyemalis</i> J.R.I.Wood		NT
Labiatae	<i>Plectranthus ovatus</i> Benth.		NT
Compositae	<i>Pluchea glutinosa</i> Balf.f.	Extinct	
Compositae	<i>Pluchea obovata</i> Balf.f.	VU D2	
Caryophyllaceae	<i>Polycarpaea hassalensis</i> D.F.Chamb.	VU D2	
Caryophyllaceae	<i>Polycarpaea haufensis</i> A.G.Mill.		NE
Caryophyllaceae	<i>Polycarpaea kuriensis</i> Wagner	VU D2	
Caryophyllaceae	<i>Polycarpaea paulayana</i> Wagner	VU D2	
Polygalaceae	<i>Polygala kuriensis</i> A.G.Mill.	VU D2	
Portulacaceae	<i>Portulaca samhaensis</i> A.G.Mill.	EN B2ab(iii)	
Portulacaceae	<i>Portulaca sedifolia</i> A.G.Mill.	EN B2ab(iii)	
Compositae	<i>Prenanthes amabilis</i> Balf.f.	EN B2ab(iii)	
Compositae	<i>Psiadia schweinfurthii</i> Balf.f.	Extinct	
Amaranthaceae	<i>Psilotrichum aphyllum</i> C.C. Townsend	EN B2ab(iii)	
Compositae	<i>Pulicaria aromatica</i> (Balf.f.) King-Jones & N. Kilian	EN B2ab(iii)	
Compositae	<i>Pulicaria disocoridis</i> R.Atkinson	EN B2ab(iii)	



Compositae	<i>Pulicaria grandidentata</i> Jaub. & Spach.		NE
Compositae	<i>Pulicaria lancifolia</i> Schwartz		NE
Compositae	<i>Pulicaria nivea</i> Schwartz		NE
Compositae	<i>Pulicaria rauhii</i> Gamal-Eldin		NE
Compositae	<i>Pulicaria vieraeoides</i> Balf.f.	VU D2	
Compositae	<i>Punica protopunica</i> Balf.f.	VU B1ab(iii)	
Rubiaceae	<i>Pyrostria socotrana</i> (Radcliffe-Smith) D.M.Bridson	VU D2	
Anacardiaceae	<i>Rhus flexicaulis</i> Baker		VU D2
Anacardiaceae	<i>Rhus</i> sp. nov. A	VU D2	
Leguminosae	<i>Rhynchosia flava</i> (Forssk.) Thulin		NE
Leguminosae	<i>Rhynchosia</i> sp A [fide Wood]		NE
Apocynaceae	<i>Rhytidocaulon maccoyii</i> Lavr. & Mies		NT
Apocynaceae	<i>Rhytidocaulon ciliatum</i> Hanacek & Ricanek		NT
Apocynaceae	<i>Rhytidocaulon splendidum</i> McCoy		NT
Apocynaceae	<i>Rhytidocaulon tortum</i> (N.E.Br.) M.G. Gilbert		NT
Rosaceae	<i>Rubus arabicus</i> (Deflers) Schweinf.		NE
Acanthaceae	<i>Ruellia kuriensis</i> Vierh.	VU D2	
Acanthaceae	<i>Ruellia longicalyx</i> Deflers		dd
Acanthaceae	<i>Ruellia paulayana</i> Vierh.	VU D2	
Umbelliferae	<i>Rughidia milleri</i> M.Watson & E.Barclay	VU D2	
Rutaceae	<i>Ruta amoena</i> Schwartz.		NE
Rutaceae	<i>Ruta mollis</i> Schwartz.		NE
Amaranthaceae	<i>Saltia papposa</i> (Forssk.) Moq.		NE
Labiatae	<i>Salvia areysiana</i> Deflers		NE
Apocynaceae	<i>Sarcostemma socotranum</i> Lavr.	DD	
Labiatae	<i>Satureja remota</i> (Balf.f.) Vierh.		NE
Goodeniaceae	<i>Scaevola socotraensis</i> St John	EN B2ab(iii)	
Scrophulariaceae	<i>Schweinfurthia latifolia</i> (.Baker.ex) Oliver		NE
Compositae	<i>Scorzonera musilii</i> Velen.		NE
Scrophulariaceae	<i>Scrophularia arguta</i> Ait.		NE
Apocynaceae	<i>Secamone cuneifolia</i> Bruyns	VU D2	
Convolvulaceae	<i>Seddera fastigiata</i> (Balf.f.) Verdc.	VU D2	
Convolvulaceae	<i>Seddera hadramautica</i> R.R. Mill ined.		NE
Convolvulaceae	<i>Seddera pedunculata</i> (Balf.f) Verdc.	DD	
Convolvulaceae	<i>Seddera secundiflora</i> Jaub. & Spach		NT
Convolvulaceae	<i>Seddera semhahensis</i> R.R.Mill ined.	VU D2	
Convolvulaceae	<i>Seddera spinosa</i> (Vierh.) Verdc.	VU D2	
Compositae	<i>Senecio asirensis</i> Boulos & Wood		NE
Compositae	<i>Senecio haraziansis</i> Deflers		NE
Compositae	<i>Senecio sumarae</i> Deflers		NE
Leguminosae	<i>Sideroxylon fimbriatum</i> Balf.f.	VU D2	
Apocynaceae	<i>Socotrella dolichonema</i> Bruyns	VU D2	
Solanaceae	<i>Solanum platacanthum</i> Dun.		NE
Compositae	<i>Sonchus saudensis</i> Boulos		NE

Sapotaceae	Spinuluma discolor	VU D2	
Labiatae	Stachys yemenensis Hedge		NE
Sterculiaceae	Sterculia africana var. socotrana (K.Schum.) Fiori	NT	
Gentianaceae	Swertia polynectaria (Forssk.) Asches. ex C.Chr.		NE
Gentianaceae	Swertia woodii Shah.		NE
Compositae	Taraxacum sp A [fide Wood]		NE
Leguminosae	Taverniera albida Thulin		NE
Leguminosae	Taverniera glauca Edgeworth		NE
Leguminosae	Taverniera multinoda Thulin		NE
Leguminosae	Taverniera schimperi Jaub. & Spach.		NE
Leguminosae	Taverniera sericophylla Balf.f.	VU D2	
Leguminosae	Tephrosia socotrana Thulin	VU D2	
Labiatae	Teucrium eximium Schwartz		NE
Labiatae	Teucrium paulayanum Schwartz.		NE
Labiatae	Teucrium rhodocalyx O. Schwartz		NE
Rutaceae	Thamnosma socotrana Balf.f.	VU D2	
Labiatae	Thymus laevigatus Vahl		NE
Acanthaceae	Trichocalyx obovatus Balf.f.	DD	
Acanthaceae	Trichocalyx orbiculatus Balf.f.	DD	
Boraginaceae	Trichodesma scottii Balf.f.	VU B2a bii	
Boraginaceae	Trichodesma sp A [fide Wood]		NE
Gramineae	Tricholaena vestita	DD	
Leguminosae	Trigonella falcata Balf.f.	DD	
Meliaceae	Turraea socotrana White & Styles	VU D2	
Valerianaceae	Valerianella affinis Balf.f.	Extinct	
Scrophulariaceae	Verbascum bottae (Deflers) Huber-Mor.		NE
Scrophulariaceae	Verbascum luntii Baker		NE
Scrophulariaceae	Verbascum melhanense (Murb.) Huber-Mor.		NE
Scrophulariaceae	Verbascum yemense Deflers		NE
Compositae	Vernonia areysiana Deflers		NE
Compositae	Vernonia bottae Jaub. & Spach		NE
Compositae	Vernonia unicata C.Jeffrey	VU D2	
Compositae	Volutarella dhofarica Wagenitz		NE
Compositae	Volutaria albicaulis (Deflers) Wood		NE
Boraginaceae	Wellstedtia socotrana Balf.f.	VU D2	
Zygophyllaceae	Zygophyllum simithii Hadidi		NE

**Table 2. Yemen near Endemics [Also in Oman or Saudi Arabia; not outside the Arabian Peninsula]**

Family	Species	World IUCN status:
Leguminosae	<i>Abrus botte</i> Deflers	NE
Leguminosae	<i>Acacia origena</i> Hunde	NE
Aloeaceae	<i>Aloe fleurentinorum</i> Lavr. & Newton	NT
Aloeaceae	<i>Aloe sabaea</i> Schweinf.	NT
Aloeaceae	<i>Aloe yemenica</i> J.R.I.Wood	NT
Combretaceae	<i>Anogeissus dhofarica</i> A.J.Scott	VU A1cd
Gramineae	<i>Arthraxon pusillus</i>	NE
Compositae	<i>Atractylis kentrophyloides</i> (Baker) F.G.Davis	NE
Acanthaceae	<i>Blepharis dhofarensis</i> A.G.Mill.	VU B1+2c
Compositae	<i>Blepharispermum hirtum</i>	VU A1cd
Capparidaceae	<i>Boscia arabica</i> Pestalozz.	VU A1cd
Scrophulariaceae	<i>Campylanthus chascaniflorus</i> A.G.Mill.	NE
Scrophulariaceae	<i>Capmpylanthus pungens</i> O. Schwartz	NE
Apocynaceae	<i>Caralluma adenensis</i> (Deflers) A.Berger (= <i>C. rauhii</i> Lavr. <i>C. kalmbacheria</i> NE Lavr. )	NT
Apocynaceae	<i>Caralluma arabica</i> N.E.Br.	NT
Apocynaceae	<i>Caralluma adscendens</i> (Roxb.) R. Brown (= <i>C. subulata</i> (Forssk.) Decne.)	NT
Apocynaceae	<i>Caralluma awdelia</i> NE (Deflers) A.Berger	NT
Apocynaceae	<i>Caralluma cicatricosa</i> (Deflers) N.E.Br.	NT
Apocynaceae	<i>Caralluma flava</i> N.E.Br.	NT
Apocynaceae	<i>Caralluma hexago</i> NE Lav. (= <i>Caralluma foulcheri-delboscii</i> Lavr.)	NT
Apocynaceae	<i>Caralluma petraea</i> Lav.	NT
Apocynaceae	<i>Caralluma quadrangula</i> (Forssk.) N.E.Br.	NT
Apocynaceae	<i>Caralluma solenophora</i> Lavr.	NT
Apocynaceae	<i>Caralluma tuberculata</i>	NT
Compositae	<i>Centaurea dhofarica</i> Baker	NE
Compositae	<i>Centaurea pseudosi</i> NEcia ssp <i>nieburhii</i>	NE
Leguminosae	<i>Ceratonia oreothauma</i> subsp. <i>oreothauma</i>	VU A1cd
Apocynaceae	<i>Ceropegia arabica</i> Huber	NT
Apocynaceae	<i>Ceropegia aristolochioides</i> Decne subsp. <i>deflersia</i> NE Bruyns	NT
Apocynaceae	<i>Ceropegia rupicola</i> Deflers	NT
Apocynaceae	<i>Ceropegia tihama</i> NE Chaudh. & Lavr.	NT
Gramineae	<i>Chrysopogon macleishii</i> Cope	NE
Apocynaceae	<i>Cibirhiza dhofarensis</i> Bruyns	NT
Compositae	<i>Cichorium bottae</i> Deflers	NE
Capparidaceae	<i>Cleome albescens</i> Fran. subsp. <i>omanensis</i> Chamb. & Lamond	NE
Capparidaceae	<i>Cleome austroarabica</i> Chamb. & Lamond. subsp. <i>austroarabica</i>	NE
Menispermaceae	<i>Cocculus balfourii</i> Schweinf. ex Balf.f.	NE
Convolvulaceae	<i>Convolvulus hystrix</i> ssp. <i>dhofarica</i> R.R.Mill ined.	NE
Amariidaceae	<i>Crinum album</i> (Forssk.) Herb.	NE
Cucurbitaceae	<i>Cucumis canoxyi</i> Thulin & Gifri	NE
Capparidaceae	<i>Dhofaria macleishii</i> A.G. Mill.	VU D2
Caryophyllaceae	<i>Dianthus deserti</i> Kotschy	NE
Liliaceae	<i>Dipcadi biflorum</i> Ghaz.	NE

Dracaeneceae	<i>Dracaena serrulata</i> Baker	NT
Acanthaceae	<i>Dyschoriste dalyii</i> A.G.Mill. & J.Biagi	NE
Apocynaceae	<i>Echidnopsis scutellata</i> (Deflers) A.Berger	NT
Boraginaceae	<i>Echiochilon arabicum</i> (Schwar.) I.M.Johns.	NE
Boraginaceae	<i>Echiochilon callianthum</i> Lonn	NE
Euphorbiaceae	<i>Euphorbia ammak</i> Forssk.	VU A1c
Euphorbiaceae	<i>Euphorbia dhofarensis</i> S.Carter	NT
Euphorbiaceae	<i>Euphorbia fruticosa</i> Forssk.	NT
Euphorbiaceae	<i>Euphorbia reibeckii</i> Pax	NT
Euphorbiaceae	<i>Euphorbia smithii</i> Carter	NT
Zygophyllaceae	<i>Fagonia mahra</i> NE	NE
Cruciferae	<i>Farsetia dhofarica</i> Jonsell & A.G.Mill.	NE
Cruciferae	<i>Farsetia linearis</i> Decne. Ex Boiss.	NE
Cruciferae	<i>Farsetia latifolia</i> Jonsell & A.G. Mill.	NE
Rubiaceae	<i>Gaillonia yemenensis</i> Thulin	NE
Caryophyllaceae	<i>Gymnocarpos dhofarensis</i> Petruss & Thulin	NE
Caryophyllaceae	<i>Gymnocarpos rotundifolius</i> Petruss. & Thulin	NE
Caryophyllaceae	<i>Gypsophila umbricola</i> (J.R.I.Wood) Clement	NE
Chenopodiaceae	<i>Halothamnus bottae</i> Jaub. & Spach	NE
Cistaceae	<i>Helianthemum citriunum</i> Ghaz.	NE
Boraginaceae	<i>Heliotropium fartakense</i> Schwartz	NE
Boraginaceae	<i>Heliotropium</i> sp. nov. [Thulin]	NE
Convolvulaceae	<i>Hildebrandtia africana</i> Vatke. subsp arabica Sebsebe	NE
Apocynaceae	<i>Huernia laevis</i> J.R.I.Wood	NT
Apocynaceae	<i>Huernia lodarensis</i> Lavr.	NT
Apocynaceae	<i>Huernia velutina</i> Lavr.	NT
Violaceae	<i>Hybanthus durus</i> (Baker) Schwartz.	NE
Solaneceae	<i>Hyoscyamus flaccidus</i> Wright	NE
Leguminosae	<i>Indigofera rubromarginata</i> Thulin	NE
Compositae	<i>Iphiona senecionoides</i> (Baker) A. Anderb.	NE
Euphorbiaceae	<i>Jatropha dhofarica</i> R.Sm.	NE
Acanthaceae	<i>Justicia areysiana</i> Defl.	dd
Compositae	<i>Launaea castanosperma</i> F.G.Davies	NE
Compositae	<i>Launaea fragilis</i> (Asso) Pau. subsp. asirensis N.Kilian	NE
Labiatae	<i>Lavandula dhofarensis</i> A.G.Mill.	NE
Labiatae	<i>Leucas dhofarensis</i> Hedge & Sebald	NE
Celastraceae	<i>Maytenus dhofarensis</i> Sebsebe	LR/NT
Celastraceae	<i>Maytenus forsskaolia</i> NE Sebsebe	NT
Labiatae	<i>Nepeta deflersia</i> NE (Schweinf. ex ) Hedge	NE
Boraginaceae	<i>Nogalia drepanophylla</i> (E.G.Baker)Verdc	NE
Resedaceae	<i>Ochradenus arabicus</i> Chaudhary, Hillc. & A.G. Mill.	NE
Resedaceae	<i>Ochradenus gifrii</i> Thulin.	NE
Labiatae	<i>Ocimum dhofarense</i> (Sebald) Paton (= <i>Becium dhofarense</i> (E.G.Baker) Sebald)	NE
Apocynaceae	<i>Orbea deflersia</i> NE (Lavr.) Bruyns (= <i>Caralluma deflersia</i> NE Lavr.)	NT
Apocynaceae	<i>Orbea luntii</i> (B.E.Br) Bruyns (= <i>Caralluma luntii</i> N.E.Br. )	NT
Apocynaceae	<i>Orbea sprengeri</i> subsp commutata	NT
Apocynaceae	<i>Orbea wismannii</i> (O.Schwartz) Bruyns	NT

Umbelliferae	Oreoschimperella arabiae-felicis C. Townsend	NE
Santalaceae	Osyris sp nov.	cr
Amarylidaceae	Pancreatium maximum Forssk.	NE
Urticaceae	Parietaria umbricola A.G.Mill.	NE
Rubiaceae	Pavetta longiflora Vahl	NE
Umbelliferae	Peucedanum inaccessum C. Townsend	NE
Labiatae	Plectranthus arabicus Bruce.	NT
Polygalaceae	Polygala tinctoria Vahl	NE
Compositae	Pulicaria argyrophylla subps oligophylla Gamal-Eldin	NE
Compositae	Pulicaria cylindrica (Baker) O. Schwartz	NE
Compositae	Pulicaria nobilis Gamal-Eldin	NE
Compositae	Pulicaria omanensis Gamal-Eldin	NE
Resedaceae	Reseda sphenocleoides Deflers	NE
Apocynaceae	Rhytidocaulon macrolobum Lavr.	NT
Acanthaceae	Ruellia longiflora Vahl	dd
Labiatae	Salvia sp. A	NE
Apocynaceae	Sarcostemma arabicum Bruyns & P.Forster	VU D2
Scrophulariaceae	Schweinfurthia spinosa A.G.Mill. Sutton & Short	NE
Labiatae	Scutellaria arabica Jaub. & Spach	NE
Convolvulaceae	Seddera intermedia Hoschst. & Steud.	NE
Chenopodiaceae	Suaeda moschata A.J.Scott.	NE
Labiatae	Teucrium nummularifolium Baker	NE
Labiatae	Teucrium yemense Deflers	NE
Boraginaceae	Trichodesma laccophilum R.R.Mill	NE
Solanaceae	Withania qaraitica A.G.Mill. & J.Biagi	NE
Velloziaceae	Xerophyta arabica (Baker) N. Menezes	NE
Caryophyllaceae	Xerotia arabica Oliver.	NE
Rhamnaceae	Zizyphus leucoderms O. Schwartz	NE
Leguminosae	Zygocarpum dhofarensis (Hillc. & J. B. Gillett) Thulin & Lavin	NE

Critically Endangered (CR), Data Deficient (DD), Endangered (EN), Extinct (Ex), Least Concern (LC), Near Threatened (NT), Not Evaluated (NE), Rare R, Vulnerable (VU)