



**Ministry of Environment and Climate Affairs
Sultanate of Oman**

**FOURTH NATIONAL REPORT TO THE
CONVENTION ON BIOLOGICAL DIVERSITY**

**Produced by the
Directorate-General of Nature Conservation**

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LIST OF ACRONYMS

AOS – Arabian Oryx Sanctuary
CITES – Convention on International Trading in Endangered Species of Fauna and Flora
DGNC – Directorate General of Nature Conservation
EMP – Environmental Management Plan
EIA – Environmental Impact Assessment
ERWDA – Environmental Research and Wildlife Development Agency
ESO – Environment Society of Oman
IUCN - International Union for the Conservation of Nature and Natural Resources
GCC – Gulf Cooperation Council
GDP – Gross Domestic Products
GEF – Global Environment Facility
JICA – Japan International Cooperation Agency
MD – Ministerial Decree
MRMEWR – Ministry of Regional Municipalities, Environment and Water Resources
MECA – Ministry of Environment and Climate Affairs
MAF – Ministry of Agriculture and Fisheries
NBSAP – National Biodiversity Strategy and Action Plan
NGO – Non-government Organization
OBG – Oman Botanic Garden
PDO – Petroleum Development Oman
RD – Royal Decree
ROPME – Regional Organization for the Protection of the Marine Environment
SQU – Sultan Qaboos University
UNCLOS – United Nations Convention on the Law of the Sea
UAE – united Arab Emirates
WIWO – Working Group International Waterbird and Wetland Research (Walk In, Walk Out)

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EXECUTIVE SUMMARY

Considered as the third largest in the Arabian Peninsula, the Sultanate of Oman's vast landscapes and seascapes host one of the richest biodiversity in the region. Its unique wildlife and vegetation at the north and central parts of the country are sharing species with that of Iran and Pakistan while those at the southern parts are of African affinities. As presented, over four thousand species composed the entire biological diversity of Oman with a number of species in the protected categories. Based on the IUCN, CITES and GCC 2002 Convention criteria, the following summarizes the categories of endangerment of fauna and flora in the Sultanate of Oman:

- eight species of birds are classified as endangered with the Northern Bald Ibis and Slender-billed Curlew are critically endangered;
- four species of marine turtles nesting in Oman are endangered with the Hawksbill and Leatherback turtles classified as critically endangered;
- two species of mammals are under the endangered status with the Arabian Leopard and Dhofar White-toothed Shrew as critically endangered;
- two species of sawfish are critically endangered;
- three species of plants are categorized in the endangered status.

Other species are either in the near threatened or vulnerable classifications. They include 5 species each of mammals, birds and fish, 12 species of birds and 9 species of plants.

Trends and threats on the major groups of organisms and the different types of ecosystems in the country were discussed by the review team. In general, loss of habitat through over grazing, poaching, pollution and accidents were identified as contributing to the decimation of many wild animal populations. On the other hand, erosion, alteration of *wadi* courses and changes, saline intrusion in coastal agricultural lands, pollutants from pesticides, invasive species were highlighted as some of the factors that have threatened many species of Oman plants.

An overview assessment of the implementation of the National Biodiversity Strategy and Action Plan (NBSAP) since 2001 to the present was also carried out. The strategy established the political directions, basic rules, principles and guidelines for a sustainable development process and the preservation of biodiversity. The review highlighted biodiversity projects, programs, and facilities. Outstanding projects with tangible accomplishments include:

- Mangrove transplantation of MECA
- Coral reef restoration of MECA
- Arabian Oryx Captive Population at Jaaluni (Arabian Oryx Sanctuary)
- Arabian Leopard and Sooty Falcon Surveys of the Office for Conservation of the Environment, Diwan of Royal Court
- Oman Botanic Garden of the Office for Conservation of the Environment, Diwan of Royal Court
- Museum of Natural History
- Certain biodiversity projects by the fisheries sector
- Scientific research projects on environment from SQU

- Media in raising environmental awareness on biodiversity conservation
- Biodiversity concepts in the Omani curriculum

The mangrove transplantation project was initiated by MECA in collaboration with JICA in 2000. Four nursery establishments in Qurum Nature Reserve (QNR), Sur and Salalah were sources of seedlings which were distributed in various areas of the country. The project was envisioned to produce seedling in the nurseries and transplant them in *khwars* to enhance existing mangrove vegetation or reforest bare lagoons. QNR nursery in Muscat was the first pump irrigated nursery in the country and is currently producing 24,000 seedlings annually with about 85% survival. Participation in transplanting of seedlings to the site by local resident volunteers especially women and school children had been very encouraging. To date, less than half a million *Avicennia marina* seedlings had been successfully transplanted in various coastal locations of the country. Signs of mangrove regeneration are evident in many areas.

Similarly, the ministry's coral reef restoration project in collaboration with PDO was started in 1998. Forty artificial coral balls were submerged in various sites of Mina Al-Fahal Island. Until the end of 2004, about 130 balls had been transplanted in the island. Also started in Dimaniyat Islands Nature Reserve in 2003, a total of 340 artificial balls had been distributed in different locations of the islands. Monitoring of the coral balls were closely adhered to which revealed successful growth of the corals on the artificial media. Campaigns for cleaning the coral reef environments by MECA in cooperation with ESO have regularly been conducted particularly in Dimaniyat and Masirah Islands to clear the reef of all types of wastes. Abandoned fishing nets had destroyed corals aside from unnecessarily killing fish, turtles and dolphins had been removed in the clean-up drive. Authorities have so far deployed several buoys in Bandar Al-Kheeran, Bandar Al-Jissa, Dimaniyat and Fahal Islands to protect coral reefs from the damage caused by boat anchors dropped at the seabed. Similarly, diving permits are issued at DGNC-MECA under Ministerial Decision No. 40/2009 to eliminate risks posed by diving activities.

About 250 heads of Arabian Oryx are maintained in the captive population in Jaaluni which is within the territory of the Arabian Oryx Sanctuary. To date, captive breeding of the Oryx is temporarily halted for space problem in the Jaaluni facilities and largely for economic reasons in maintenance of the animals. Arabian Leopard Survey was since started in 1997 which produced the first scientific data on the ecology of the species. The population is being monitored by camera trapping and satellite tracking in the Dhofar region. Sooty Falcon mark and recapture surveys in the Sea of Omn had been conducted since 2007 on Dimaniyat and Fahal Islands. Captured adults and nestlings were fitted with numbered rings and microchip rings. The study had so far established that those islands could hold up to 10% of the global population of Sooty Falcons.

The Oman Botanic Garden has propagated 350 of the 1,200 species of Oman flora and has grown more than 60,000 plants. It has produced a comprehensive Red List of plants in the Sultanate. It also regularly conducts field research in various locations of the country.

Limitations or obstacles in accomplishing the goals set by NBSAP were evaluated; foremost of which are insufficient coordination between agencies, lack of funding and manpower, absence of methodologies, tools and mechanisms for assessing and monitoring of biodiversity components in the Sultanate, limited scientific research endeavor, non-implementation/updating of management plans and limited participation of local communities on matters pertaining to biodiversity.

Achievements in the Eight Meeting of the Conference of the Parties were also listed. Implementation achievements were highlighted. Among the examples given were the establishments of ESO, Omani Women's Society, Al Batinah Farmer's Society, accession of the country to UNCLOS, database on fish and marine species in the Omani waters, implementation of a research project on 13 demersal fish species, shark management project, lobsters and shrimp project and other projects on commercial fishing. Management plans for the nation's coastal areas are being prepared for immediate implementation.

Biodiversity conservation has been integrated within different sectors, across sectors, and in programs and policies of the country. The government agencies are led by MECA, Diwan of Royal Court, SQU and MAF while ESO represent the non-government organizations. The Ministries of Information, Tourism, Defense, Oil and Gas, Education and Higher Education have also participated in considering biodiversity conservation in their systems. Environmental projects from the Diwan of Royal Court have been crucial in conserving some of the country's endangered species such as the Arabian Oryx, Arabian Tahr, and the Arabian Leopard. Its development of the Oman Botanic Garden has elevated the appreciation of and actual conservation of the country's rare and endangered plants.

The 1992 Earth Summit and the CBD prompted MECA to initiate integrated biodiversity protection in the many programs of the country. It made inroads into its various policy formulations which ultimately were formalized in regulatory legislations as Ministerial Decisions and Royal Decrees. A significant impact perhaps was the legal requirement of EIAs for development projects. R.D. 114/2001 prescribed detailed biodiversity assessments in the preparation of the EIA for all development projects proposed. The law requires an elaboration of how biodiversity should be conserved and protected in the environmental management plan.

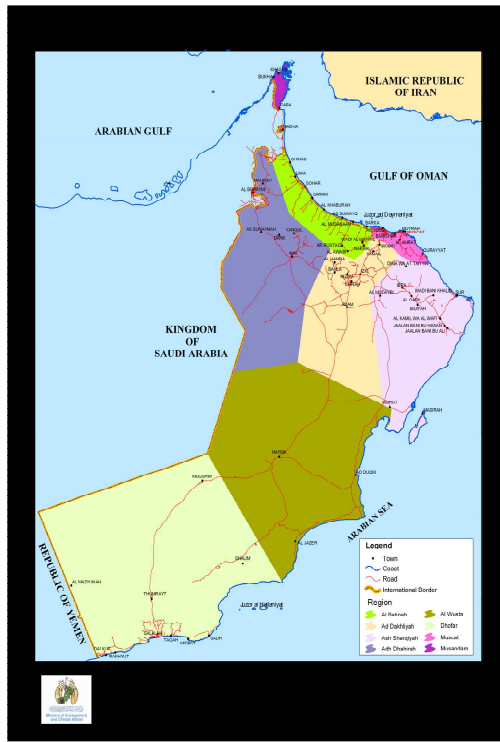
National accomplishments in implementing biodiversity conservation programs focusing on endangered species protection was assessed at 45-65 percent success. Initiatives to attain these are indeed difficult; various problems highlighted in delaying the attainment of established goals include: the need for progressive coordination with stake holders, more regional cooperation, funding and capacity building, the development of suitable monitoring and evaluation systems, updating of management plans and more participation and support elicited from local communities. There is a lack of proactive support from concerned agencies combined with their limited understanding of the value and impact of biodiversity.

Among the country's successful project engagements include: mangrove reforestation, captive breeding of selected endangered species, establishment of botanic garden, some biodiversity research efforts, consideration of biodiversity in EIA and education. They proved to be as evidences of the country's ability and willingness to cope with international expectations to conserve the nation's biodiversity. MECA is still seen as a front runner in conserving the country's biodiversity resources. Well-thought management plans, investing in manpower development and more links with interest groups are seen as some keys in attaining the country's goal to progressively conserve its biodiversity

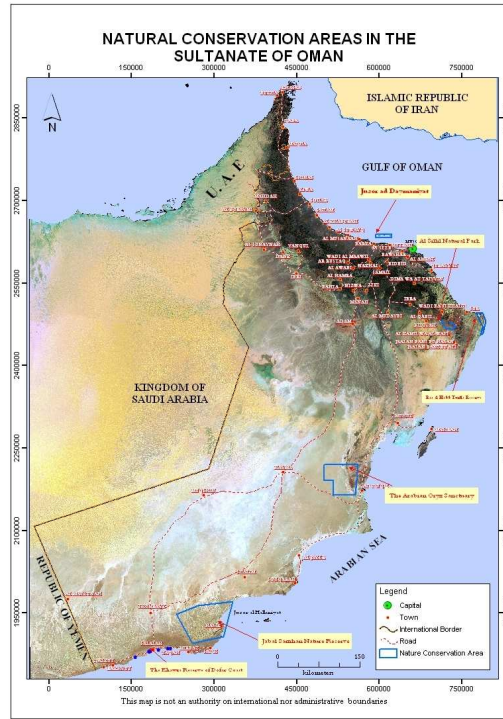
Chapter 1. Overview of Biodiversity Status, Trends and Threats

1.1 Physical Setting.

The Sultanate of Oman is found in the South-Eastern corner of the Arabian Peninsula and is located between latitudes 16°40' and 26°20' North and longitudes 51°50' and 59°40' East. Considered as the third largest country in the Arabian Peninsula, it has a total land area of 309,500 sq km. It covers vast gravel desert plains and mountain ranges and a long coastline of 3,165 km. Bordering on its north side is the Strait of Hormuz and the United Arab Emirates, on the northwest by Saudi Arabia while at the southwest by the Republic of Yemen. Three seas surround the country: the Arabian Gulf, the Sea of Oman and the Arabian Sea as shown in Fig. 1a. The current population is 2.3 million people. The greater part of the country has a dry climate except the south which is subtropical. Dhofar Region has most of the moisture through seasonal rainfall, the south-west monsoon brings in fog or rain in the area. Thus, the larger part of the country's biodiversity is being supported in this region.



a



b

Figs. 1a and b. Territories, surrounding oceans, political and topographic regions of the Sultanate of Oman. Fig. 1b highlights the Nature Conservation Areas of Oman.

Oman is part of the Gulf Regions' varied landscapes and seascapes (see Fig. 1b). The country has the typical salt flats or salt plains (*sabkha*), lagoons or saline creeks (*khwars*), oases and stretches of sand and gravel plains, which are dominated by mountain regions. The Hajar mountain ranges run from Musandam through most of northern Oman along the Sea of Oman. These mountains vary in width from 30 to 70 km and are mostly steep and barren formations of igneous and sedimentary rocks. They rise to almost 3,000 masl at Jabel Shams, the highest point in the country. The terrain is crossed by riverbeds or dry river valleys (*wadis*) which are formed by surging water during the rainy season but most remain dry until the next flooding. Off the coasts are several islands and islets, the largest of which is Masirah Island on the east.

A long stretch of desert is a typical feature of Oman. The almost endless Rub' Al Khali (Empty Quarter) covers the southwest of the country which traverses the neighboring Saudi Arabia and the UAE while a vast Wahiba Sands is nestled in the northeast. In great contrast is the greener southern Dhofar region, which is humid-tropical in appearance since it receives relatively high rainfall than the rest of the country.

1.2 Climate:

Oman is situated along the edges of moisture-rich air masses: one coming from the Mediterranean and the other from the Indian Ocean. Along the coasts is hot and humid while in the interior is hotter but drier. Hot summer months are from May to September and the cool winter months start in November until March. In Muscat, the daily average maximum temperature is 41 °C in late June and July but the minimum at around 16.5 °C in the colder months (Hawley, 2005).

Rainfall appears irregular with December and January are months of heaviest rainfall. Mean annual rainfall is less than 50 mm in the interior regions and around 100 mm in coastal areas. Mean monthly relative humidity is highest in coastal areas ranging from 50-90%. Much drier air is felt in the interior areas at 1-2%. Wind is under the influence of the equatorial convergence zone. In summer, this system reaches southern Oman and brings monsoon conditions to the Dhofar mountains. In winter, the system moves to south of the equator. Wind direction is generally moving from the north while in summer it is from the south. Cyclones occasionally occur in the country creating disastrous flash floods. The Super-Cyclone *Gonu*, which entered the Sea of Oman from 5-7 June 2007, was Oman's worst natural disaster and the largest Cyclone on record to strike the Arabian Peninsula. Highest winds were over 260 km/h in the Arabian Sea and the storm severely damaged coastal areas including 1,000s of sq m of reef damaged near Muscat.

1.3 Biodiversity.

Distinguished as a unique biogeographic region, northern Oman's biodiversity has strong affinity with its neighboring Iran and Pakistan species. At the far south is its increasing influence of African species. A number of relict species is prevalent in a number of habitats in the country. The vegetation of Oman is influenced by two major plant groups: the Saharo-Sindian (Arabian) groups in the west and central Oman and the Somalia-Masai (African) groups in the south (Ghazanfar and Fisher, 1998). Table 1 shows an updated tally of biodiversity found in Oman indicating conservation status of each group.

Table 1. Recent counts of Oman biodiversity.

Group	No. of Species and Subspecies	Noteworthy Status of Species
Plants	1,295	7 Gulf Cooperation Council (GCC) Appendix 1 3 IUCN endangered
Seagrasses	4	No data
Macroalgae	323	No data
Phytoplankton	182	No data
Arthropods	399	No data
Molluscs	58	No data
Corals	253	All species under CITES 2
Echinoderms	56	No data
Fish	991	IUCN: 2 critically endangered, 2 endangered, 1 threatened, 6 vulnerable, 2 proposed as globally vulnerable
Amphibians and Reptiles	93, 3 unconfirmed	No data
Birds	546	1 extirpated, 9 IUCN endangered, 1 IUCN threatened, 1 IUCN vulnerable, 1 GCC App. 1, 1 GCC App. 2, 1 Globally threatened, 33 rare passage
Mammals	99	IUCN: 1 critically endangered, 4 endangered, 2 near threatened, 9 vulnerable, 5 data deficient

Source: Checklist of Oman Biodiversity, DGNC-MECA, 2009

In summary and based on IUCN criteria, eight species of birds are in the endangered status with the Northern Bald Ibis in critically endangered level; four species of reptiles are endangered with the Leatherback Turtle being critically endangered; two species of mammals are under the endangered status with the Dhofar White-toothed Shrew as critically endangered; two species of sharks as critically endangered with two others as endangered; three species of plants are likewise in the endangered status. All the rest of the species listed are in the threatened or near threatened category or in CITES/GCC Appendices status. A summary of protected species is found in Table 2.

Table 2. List of protected species in Oman

Species	Common Name	Category
Mammals:		
<i>Oryx leucoryx</i>	Arabian Oryx, White Oryx	IUCN: endangered
<i>Panthera pardus nimr</i>	Arabian Leopard	IUCN: critically endangered; CITES 1
<i>Meriones arimalius</i>	Arabian Jird	IUCN endangered
<i>Crocidura somalica dhofarensis</i>	Dhofar White-toothed Shrew	IUCN: critically endangered
<i>Rhinolophus blasii blasii</i>	Blasius' Horseshoe Bat	IUCN: near threatened
<i>Felis margarita harrisoni</i>	Sand Cat	IUCN: near threatened
Reptiles:		
<i>Caretta caretta</i>	Loggerhead	IUCN: endangered; CITES 1
<i>Chelonia mydas</i>	Green Turtle	IUCN: endangered; CITES 1
<i>Eretmochelys imbricata</i>	Hawksbill	IUCN: critically endangered; CITES 1
<i>Lepidochelys olivacea</i>	Olive Ridley, Pacific Ridley	IUCN: vulnerable, CITES 1
<i>Dermochelys coriacea</i>	Leatherback	IUCN: critically endangered; CITES 1
Birds:		
<i>Geronticus eremita</i>	Northern Bald Ibis	IUCN critically endangered
<i>Aythya fuligula</i>	Ferruginous Duck	IUCN endangered
<i>Aquila heliaca</i>	Eastern Imperial Eagle	IUCN endangered
<i>Elanus caeruleus</i>	Black-winged Kite	GCC 2002 Conv. App. 1
<i>Gyps rueppelli</i>	Ruppel's Vulture	IUCN near threatened
<i>Milvus migrans</i>	Black Kite	GCC 2002 Conv. App. 2
<i>Falco naumani</i>	Lesser Kestrel	IUCN endangered
<i>Chettusia gregaria</i>	Sociable Lapwing	IUCN endangered
<i>Numenius tenuirostris</i>	Slender-billed Curlew	IUCN critically endangered
<i>Larus leucophthalmus</i>	White-eyed Gull	IUCN endangered
<i>Halcyon chloris kalbaensis</i>	White-collared Kingfisher	Globally threatened
<i>Rhynchostruthus socotranus</i>	Golden-winged Grosbeak	IUCN endangered
Fish:		
<i>Anoxypristis cuspidata</i>	Narrow Sawfish	IUCN: critically endangered
<i>Pristis zijsron</i>	Olive Sawfish	IUCN: critically endangered
<i>Sphyrna lewini</i>	Scalloped Hammerhead Shark	IUCN: endangered
<i>Sphyrna mokarran</i>	Great Hammerhead Shark	IUCN: endangered
<i>Stegostoma fasciatum</i>	Zebra Shark	IUCN: threatened
Plants:		
<i>Pancratium maximum</i>	Lily	GCC 2002 Conv. App.1
<i>Dracaena serrulata</i>	Dracaena	GCC 2002 Conv. App. 1; IUCN 2006 endangered
<i>Sansevieria ehrenbergii</i>	Blue Sansevieria	GCC 2002 Conv. App. 1
<i>Aloe whitcombei</i>	Aloe	IUCN 2002 endangered
<i>Monechma debile</i>		GCC 2002 Conv. App 1
<i>Caralluma sp.</i>		GCC 2002 Conv. App. 1
<i>Ceratonia oreothauma somalensis</i>		IUCN 2008 endangered
<i>Dorstenia foetida</i>		GCC 2002 Conv. App. 1
<i>Daphne mucronata</i>		GCC 2002 Conv. App. 1

Source: Internet references and GCC 2002 Convention Checklist

1.3.1 Ecosystem Diversity.

Oman has varied ecosystems ranging from coastal plains, rivers, lagoons, deserts and mountains. For purposes of discussion of the country's biodiversity, four distinct types are recognized with its associated biodiversity, as discussed below.

1.3.1.1 Desert Biodiversity

Sand and gravel deserts cover a great proportion of the land surface of Oman. These areas are generally hyperarid with less than 100 mm of rainfall per year. They have mosaic of little vegetation mostly confined to depressions, wadis, runnels and rocky pavements. These areas are treeless with very few species. The principal vegetation in the rocky and gravel desert include *Acacia-Prosopis-Ziziphus* woodland with shrubs like *Lycium shawii* and *Ochradenus arabicus*. Common annual vegetation include *Zygophyllum simplex*, *Plantago ovata*, *Aizoon canariense* and *Asphodelus fistulosus*. On sandy desert are two basic plant communities: 1) *Calligonium crinitum arabicum* and *Cyperus eremecius* and 2) *Heliotropium*, *Panicum*, *Euphorbia* and *Indigofera*.

Vegetation is scattered with *Bosellia sacra* tree and *Acacia etbaica* bushes predominate. Larger areas of the desert are free of vegetation. The succulent *Zygophyllum qatarense* and the leguminous tree *Prosopis cineraria* are the ones that also dominate the landscape. Near the edge of the desert, some common vegetation persist: *Calligonium crinitum*, *Tribulus arabicus*, *Dipterygium glaucum*, *Cyperus conglomerates*, *Heliotropium kotschyii* and *Zygophyllum qatarense*.

Restricted to the central desert plains and hinterland include *Pristurus minimus*, *Uromastix thomasi* and *Acanthodactylus masirae*.

1.3.1.2 Montane Biodiversity

Two types are recognized in the country: arid and monsoon-affected mountains. Hajar mountains in northern Oman including Musandam peninsula are dry with bare rock outcrop and varied shallow soils dominating on sloping terrain and with very gravelly soils occurring in the valleys and alluvial fans. Many scattered oases abound with mostly falaj irrigation systems, tap local springs or wadis underflow where date palms, limes, alfalfa and vegetables grow.

Remnants of forests, dense woodland and related plant formations are restricted to the mountainous regions of Oman. Two types of mountains predominate in the country: dry in the larger part and semitropical in the Dhofar region. Montane vegetation exhibits a distinct latitudinal zonation. The alluvial wadi fans and foothills of the mountains are dominated by open, drought-deciduous woodlands and shrublands, often intermixed with xeromorphic grasslands, *Panicum turgidum* community dominated by *Acacia ehrenbergiana*, *A. tortilis*, *Prosopis cinerea* and *Ziziphus spina-christi*

In the central range of the western Hajar mountains, from 2100 m to the summit at 3000 m, isolated populations of *Juniperus excelsa polycarpos* form open woodland, often dominant with *Olea europaea*. Juniper trees are generally in a poor state and

regeneration is minimal. At lower elevation, the trees are in very poor condition and regeneration is virtually absent. The juniper woodlands of Oman are unique to the Arabian Peninsula and they may be a result of plant migrations from SE Iran across the Arabian Gulf.

Northern Oman mountains passing through the eastern UAE are definitely a center of herp endemism. Three nationally endemic species namely *Asaccus montanus*, *Asaccus platyrhynchus* and *Pristurus gallagheri* and five regionally endemics such as *Asaccus caudivolvulus*, *Asaccus gallagheri*, *Pristurus celerrimus*, *Lacerta jayakari* and *Lacerta cyanura*. The Dhofar mountains until Yemen also contain a number of endemic species: *Hemidactylus lemurinus*, *Meslaine ayunensis* and *Coluber thomasi*.

Moisture rich mountains occur in Dhofar Region along north of Salalah and Rakhout coast. Woody vegetation predominates on steep slopes and gullies while grass and bushes under heavy grazing cover most of the plains. Soils are generally shallow in the grazed areas which means that soil erosion is rampant in the rangelands. Wooded slopes are protected from erosion by trees and bushes and they generally have deep soils. Rainfed cultivation of beans and sorghum is done by some Jibali in very tiny plots during the monsoon.

1.3.1.3 Agricultural Biodiversity

Soil survey of MAF in 2004 revealed that 2.223 million hectares are suitable for agricultural activities of about eight percent of the area of the country. Irrigated land area is about 72,820 ha and planted with various crops. Table 3 below shows estimates of cultivated areas in 2004.

Table. 3 Estimates of areas (1000 ha) and production (1,000 T) for various agricultural crops.

Agricultural Crops	Area	Production
Vegetables	6.65	162
Fruits	42.04	329.2
Field crops	6.25	24.8
Perennial fodder crops	17.88	728.8
Total	72.82	

Source: Min. of Agriculture and Fisheries, 1990, modified 2004

Agricultural lands are highly dependent on fertile lands which are likely located along wadi banks. Among Oman's top plantation crops raised by irrigation system would include the following: figs, guava, jujube, papaya, lemon, mango and dates (www.mafstat.gov.om/CensusResult/Oman.pdr). Locally produced crops such as pomegranate, banana, lettuce are locally consumed but many other crops are imported to supply the local markets. Other fruits, vegetables, grain crops and fodder are produced in Oman. Native plants are also produced into handicrafts, medicines and household items. Fisheries provide significant direct economic benefits representing 1% of GDP and ranks first among the non-oil exports (NBSAP, 2001).

Very large numbers of small farm holdings (about one hectare each) are cultivated to low yielding varieties, under fertilized and over-irrigated traditional crops. Soil fertility is expected to deteriorate after successive cultivation following single or double crop rotation system. Rate of mineral fertilizers applied is very low worsening the situation of soil fertility. Organic fertilizers are least practiced in Oman. Larger numbers of cattle, sheep, goats and camels went beyond the carrying capacities of the rangeland grazing. This caused the deterioration of vegetation composition and biomass productivity. Desertification had encroached on Dhofar mountains due to: heavy over stocking, little application of rangeland management practices and significant deterioration in rangeland and productivity.

Goats, sheep, cattle, donkeys and camels had dominated the farms and open spaces in almost all regions of the country. Overgrazing has taken its toll on plant diversity and vegetation cover particularly in the southern mountains of Jebel Samhan, Jebel Qamar and Jebel Qara. It caused soil erosion and compaction which increased runoff and decreased the level of groundwater aquifer. Camels constitute 18.6% of the total number of domesticated livestock in Dhofar region and considered as primary threat to the environment and vegetation covers than any others (Anonymous, 1998). Majority of the people let their camels graze freely on their own, thus their extensive browsing resulted in many trees and shrubs being killed

1.3.1.4 Wetlands, Islands and Marine Biodiversity

Wadis, *khwars*, *sabkhas* and mangrove forests encompass the country's wetlands. Seasonal water flows or *wadis* are one of the most common and important landscape elements in Oman draining rainwater from wide catchment areas and high mountains. Terraces along *wadi* banks are intensively farmed. Vegetation along *wadis* include *Tamarix*, *Saccharum sp.*, *Nerium mascatense*, *Ficus cordata* and *Acacia nilotica*. Alluvial plains support growth of *Acacia*, *Ziziphus*, *Moringa* and *Ficus salicifolia*.

Extensive sand dunes are associated to the coastal areas and are important protector of beaches. The dunes and their associated grasses and shrubs trap marine sands which help prevent both the erosion of beaches and the covering of inland areas by wind-blown sand.

Khwars are productive and valuable fish-breeding and nursery areas supporting dense masses of *Enteromorpha*, mullet fishes and the edible crab *Scylla serrata*. Fig. 2 shows a typical lagoon in the Dhofar region.



Fig. 2. Khwar Al Qurum Al Sagheer in Dhofar region where natural growth of mangroves thrives. Though a nature reserve, fishermen and other people still encroach actively inside the lagoon to fish and harvest other products.

Photo by: R. Rubio

Coastal plains and *sabkha* vegetation are dominated by mosaic-like communities of halophytes, drought-deciduous thorn woodlands and open xeromorphic shrublands and grasslands. There are four coastal vegetation communities recognized (Patzelt and Al Farsi, 2000): 1) *Limonium stocksii-Zygophyllum quatarense* community in northern Oman where the coasts are mainly sandy and interspersed with rocky limestone, 2) *Limonium cf. stocksii-Suaeda aegyptica* community characteristic of rocky shores with narrow beach areas and a wide spray zone, 3) *Atriplex-Sueda* community along offshore islands, flat sandy beaches and coastal sabkhas, 4) coastal lagoons with *Sporobolus virginicus*, *Sporobolus iocladius* and *Paspalum vaginatum* as bordering species and *Phragmites australis* and *Typha spp* forming bordering reeds.

Oman has a coastline stretch of 3,165 km which had been perceived as entirely covered by mangroves long time ago. Unfortunately, mangroves had been greatly reduced due to deforestation for fuelwood, grazing, and coastal developments. Mangrove vegetation is spread sporadically in the coastal areas of the country. In spite of massive mangrove destruction, there still exist good stands in Northern Batinah, Muscat, Eastern Sharqiyah, Mahawt Island and Salalah. It now covers a total of 1,100 ha.

There are few outstanding islands in Oman which include Dimaniyat, Masirah and Kuria-Murai (Hallniyat). Except for Dimaniyat, all other islands are still in the proposal state to become protected areas.

The Dimaniyat Islands Nature Reserve encloses some 203 sq km of sea and seabed and includes the nine islands, rocks and reefs and offshore shoals situated about 18 kms off the Seeb-Barka coast. The reserve is an outstanding conservation area of national and regional importance. They have the highest density of nesting seabirds and the only known osprey nesting sites in the capital area. They also shelter the largest nesting population of hawksbill turtles in the country. These are relative unspoiled islands of great scenic beauty offering a living natural museum, including the nesting green turtles and sooty falcons and a variety of reefs with high coral diversity.

Both the islands and the reefs are important to the mainland-based fishermen and people from Muscat, for fishing, recreation and worship. This is the most important site for wildlife conservation in the capital area and urgently in need of a management plan.

Surveys conducted in the preparation of the Oman Coral Reef Management Plan have revealed significant damage to the reefs and widespread degradation. The coral reefs are threatened by large scale, irreversible damage and continued devaluation or loss of coral reef resources.

Trends/Issues on Aquatic Biodiversity

Mangrove lagoons and *khawrs (khayraan)* of Oman are subject to damage from rapid development to include the following issues: 1) port and fishing boat harbour construction- require damaging landfill and dredging causing coastal erosion and sedimentation; 2) road construction; 3) tourism and recreation; 4) solid waste and water

pollution; 4) sustainable utilization and biodiversity conservation; 5) planting and new locations; 6) seed provenance; 7) mangrove nurseries; 8) monitoring; 9) education and awareness; 10) existing facilities; 11) information sharing and communication; 12) coordination; and 13) Omanization.

Coral reefs throughout Oman are threatened by large scale, irreversible damage and the continued devaluation or loss of coral reef resources, including those currently of value to fisheries, tourism and recreation, coastal protection, scientific study, marine biodiversity and marine ecology. Natural impacts on Oman's coral reefs indicate unusual and stressful conditions that corals in the Sultanate must tolerate. Principal impacts are:

1. Fishery-related damage causing coral reef breakage; caused by tangled gill nets and boat anchors
2. coastal destruction
3. litter
4. recreational activities
5. oil pollution
6. discharges from desalination plant
7. enriched water discharges from sea farms

In Oman, its aquatic ecosystems are unique in the sense that their locations are in an arid region and that its biodiversity composition has evolved into species that had been resilient of the almost harsh and dry environment. Therefore, any significant perturbation to their natural environment will result in the biodiversity's eventual extinction.

Aquatic communities include the spring-streams and *wedian* (plural of *wadi*). Streams originating from springs (*ayns*) could be natural or man-made *aflaj* (plural of *falaj*). Springs usually originate in the mountains or in the foothills of mountains. The Ministry of Water Resources has reported 69 important springs in the Sultanate of which 45 are cold and 33 are thermal. Of the total, 64 also yield potable water. Local rainfall patterns in the watershed affect the number of active streams at any given time. Floods affect the structuring and restructuring of habitats in the *wedian*. On the biodiversity point of view, only Muaydin drainage at Birkat al Mawz had been studied yielding 33 invertebrates and three vertebrate taxa were recorded in a 1.5-km stretch of the wadi (Victor and Al Mahrouqi, 1996 as cited by Victor, 2000).

There are no large natural freshwater lakes in Oman. However, in Wadi Darbat in the Dhofar region, the wadi pools merge to form lake-like conditions immediately after the khareef or monsoon. The pools shrink in size during the dry winter period. There are also reservoirs, ponds or pools and khwars in other parts of the country. Khwars in northern Oman are mostly brackish and sometimes hypersaline, while many in the Dhofar region remain freshwater for most part of their hydrological cycles. Important retention reservoirs are found in Jabal Akhdar area. Temporary ponds are those that dry up during most of the months of the year but refill briefly during rains while astatic pools are temporary with unpredictable pattern of recurrence. Thriving in such ponds are the ciliates, rotifers, copepods, *Cladocera* and *Ostracoda*. Some macro crustaceans like

shrimps (*Anostraca*), tadpole shrimps (*Nostraca*) and clam shrimps (*Conchostraca*) occur in these habitats (Victor, 2000).

Khawrs are best studied in the Sultanate. The biota included the fringing terrestrial and aquatic macrophytes (Ghazanfar, 1998), micro invertebrates, crustaceans macrofauna, mosquitoes, fish and birds by various scientists. Knowledge of aquatic macrophytes in Oman is very poor. In the retention reservoirs of the Western Hajar Mountains, *Potamogeton nodosus* dominated the macrophytes. Some species of micro/macro crustaceans, insects, freshwater mollusks, leeches, nematodes, other invertebrates, had been recorded but many species has to be identified or species to be verified. Oman has seven species of freshwater fish. Several exotic fish species have started establishing populations in the wild which is a threat to the environment. Tadpoles of *Bufo arabicus* and *Bufo dhufarensis* are common in the freshwaters of northern and southern Oman, respectively (Victor, 2000).

Overgrazing of vegetation in watersheds contributes to erosion and consequent severe siltation of *khawr* areas and the productive near shore marine environment. Feral animals like dogs, cats, goats, donkeys, introduced rats are potential threats to wildlife leading to potential extirpation of sensitive species. Other issues raised (Ministry of Commerce and Industry and IUCN, 1986-1991) reveal the following:

- Beaches and camping sites and scenic areas are fouled by litter.
- Drying of sardines and discard of fish offal, old nets, oil drums, rusted freezers and other litter on fish landing beaches diminishes their value for recreation.
- People lacking support of fisheries resource management due to ignorance or inadequate knowledge and information.
- Gross wastage of fishes together with the capture of undersize and berried crayfish is depleting fishery resources. , polluting beaches, and potentially threatening some species, notably crayfish, sharks and groupers with local extermination..
- Coastal archeological sites are being lost to coastal development, damaged by vehicle traffic and road works, looted by amateurs or degraded by litter before they are studied.
- Human predation of breeding seabirds and their eggs has resulted in local extermination of breeding colonies
- Mangroves , reeds and rushes are endangered by development pressure, overgrazing, infilling, pollution and dumping of garbage
- Intermittent illegal discharges of oil at sea off the coast contaminate the beaches with oil and tarballs, destroy their recreational value and threaten the breeding seabird colonies
- Escalating sand mining activities or the demand for sand by new development schemes could lead to disappearance of smaller beaches.
- Careless fishing practices are damaging corals thereby reducing aesthetic value of reefs for recreation, and their productive value for fisheries, through entanglement of nets, ropes and anchors

- Enriched waste water from inland containment lagoons enters the *khawrs* and solid wastes are dumped in the *khawrs*, mangroves and *wadis*, on the beach and into the sea
- Coral reefs in much of Mussandam are being devastated by the Crown-of-thorns Starfish (*Acanthaster planci*) and temperature-induced bleaching of the corals
- Breeding population of turtles are threatened by collision with the high speed boats of Iranian traders and heavy oil and flotsam pollution of their nesting beaches
- Gunnery target practice by Royal Navy of Oman causes disturbance to seabirds
- Tourism village, fisheries and other development projects may create the need for new or upgraded roads and improved access to the seashore could stimulate beach erosion, damage coastal environments and reduce their value for recreation, wildlife and fisheries, or lead to further loss of beaches.

Little is known about the population status of cetaceans in the waters of Oman. The Environment Society of Oman (ESO) had collected sufficient data by photo identification techniques only for the Humpback Whale. There is also historic whaling data for this species which enables a limited understanding of historic abundance and so a rudimentary trend assessment has been possible.

The results of this work indicate very conclusively that Humpback Whales occur in very low numbers in Oman (Baldwin, 2009), with a best estimate of just 82 individuals remaining in the population (95% CI 60-111, Chapman/Petersen Index). Oman's population of humpback whales is therefore genetically unique, and in severe danger of extinction. IUCN has declared the population Endangered (see attachment) based on its low numbers and limited regional range, and it is widely acknowledged that this is one of the rarest baleen whale populations in the world.

ESO's involvement in turtle research in Oman is currently focused on Loggerhead Turtles nesting on Masirah Island. This has included systematic data collection according to rigorous scientific protocols undertaken over the past two years that have allowed for preliminary estimates of abundance. When pooled with previous data, albeit collected in a non-systematic and less scientific manner, some analysis of trends has been possible.

These data suggest that the historic nesting population of Loggerheads on Masirah Island was in the region of 30-40,000 females in the late 1970's, but has declined since this time to a level of perhaps 20-25,000 by the early 1990's and to an estimated minimum of 12,000 by 2008 (Baldwin, 2009). This decline is similar to that experienced by the only other comparably large population of this species in the world, namely that of the Eastern United States (Florida), as well as most other populations globally. Oman would therefore appear to be no different to other nations of the world in experiencing severe decline in its nesting Loggerhead population. However, Oman has a greater responsibility than most countries to implement conservation measures to prevent further decline, or indeed enhance recovery, owing to the fact that its population remains one of the two largest in the world and probably still constitutes up to 40% of all nesting females.

ESO has also been involved with assessment of Hawksbill Turtles nesting on the Daymaniyat Islands. No population estimate has been attempted, but ecological evidence suggests that the nesting population is at, or very near to, carrying capacity.

Threats to Aquatic Biodiversity

Man had created impacts on aquatic biodiversity by: habitat alteration, pollution and biological invasions. Almost all spring-stream systems in the country have been harnessed as *aflaj* networks which are man-made channels. Traditional retention dams to harness surface run-off are also common in the mountain villages. Recent activities like construction of recharge dams and roads have severe impacts on the habitats. Mining, oil production and agriculture also physically impaired the habitats. Alteration of *wadi* courses and changes in the drainage characteristics of catchments impact both aquatic and terrestrial biodiversity. Over use of water for agriculture has resulted in salt water intrusion. This causes salinization of groundwater affecting both freshwater and terrestrial biodiversity. Agricultural land use, road and bridge construction activities and mining resulted in sediment loading of aquatic habitats directly or via surface runoff. Siltation has impacted on the depositional and erosional biotopes of perennial spring-streams. Silt and sand are deposited in khawrs and retention reservoirs affecting survival of biodiversity. Chemical pollutants such as nitrogen and phosphorus and toxic pesticides, hydrocarbons from oil and heavy metals from industrial wastes including organic wastes from sewage and septage disposal all contributed in the devastation of aquatic biodiversity.

Biological invasion of the water hyacinth (*Eicchornia crassipes*) has caused problems in choking water ways and degrading perennial water bodies into swamps in Oman (Victor, 2000). Tilapia (*Oreochromis*) has been introduced into Oman for aquaculture and mosquito control purposes. Its distribution now extends from Sohar in the north to Bahla in the interior. It is fast adapting to the conditions in *aflaj* where water flow is rapid and depth in only a few centimeters. Pet fish trade brings in an enormous number of exotics such as the guppies and platys. They had established viable populations in ornamental ponds.

Litter, tar balls and coastal roads are most conspicuous threats to shore land environments. Small beaches in the Khasab area and along the north coast of the peninsula are staging posts for Iranian small boat traders. These beaches are severely littered with tins, bottles, glass, plastic bags, cartons and sand bags used as ballast. Beaches and seabed at anchorages are frequented by people.

Green turtles are occasionally slaughtered and their eggs dug up for domestic use or for sale. Some turtles and hatchlings are caught incidentally in gill nets set parallel to and blocking nesting beaches or nets left directly on beaches. They are left to drown, or fell easy prey to crabs, foxes and gulls. Turtle watchers and photographers patrolling the beach at night scare back emerging turtles. Lanterns and fires disorient hatchlings who will occasionally wander into the flames or far inlands. Sand mining threatens nesting beaches. Egg clutches are lost when sections of beach are over washed or erosion occurs

in response to natural tidal cycles and strong onshore winds. Eggs and hatchling also fell as easy prey when exposed.

Over-harvesting of the mangrove trees for fuel wood and fodder for feeding of livestock had destroyed large areas near human habitations. People intruding inside the mangroves not only destroy the vegetation but leave a lot of litter polluting the forest.

Fishing nets entangled on reefs, lost and abandoned nets are killing many forms of marine life continuously and indiscriminately. Anchors, fish traps, ropes fishing line and other fishing gear are also damaging with reported worst areas such as Dimaniyat, Bandar Jissah, Bandar Khayran and Masirah Island. Coastal developments such as resorts, residence construction particularly in the Muscat area have greatly disturbed the areas.

1.3.2 Species Diversity

1.3.2.1 Macroalgae

The macroalgae or seaweeds are photosynthetic, non-flowering plants with over 8,500 species worldwide. They are subdivided into three main Divisions the Chlorophyta (*green algae*), Phaeophyta (*brown algae*) and the Rhodophyta (*red algae*). They are limited to growth in the upper 10 to 20 metre depth zones as well as in the intertidal zone.

Strong southwest winds of the summer southwest monsoon run from June to September along the Arabian Sea coasts of Oman which create one of the most intense coastal upwellings in the world. The high levels of nutrients, along with low seawater temperatures (< 20 °C) account for the annual development of dense beds of macroalgae. High air temperatures and desiccation reduce intertidal growth outside these periods along Arabian Sea coasts whilst they almost completely eliminate intertidal seaweed development along northern coasts of Oman not impacted by the southwest monsoon.

The macroalgal flora of Oman now includes some 323 species. This present list of taxa is made up of 69 taxa of Chlorophyta, 50 taxa of Phaeophyta and 205 taxa of Rhodophyta. This does not include crustose coralline algae.

There have been few studies on the macroalgae of Oman, e.g. the survey mainly for commercial potential of seaweeds by Mardela Int. (1975) listed around 30 taxa identified mostly to generic level. A list of seaweed taxa is given in Barratt *et al.*, (1984) with over 200 taxa of macroalgae collected in Dhofar mainly in the postmonsoon period. Several species of macroalgae were listed in the paper on seagrasses by Jupp *et al.*, (1996) and most of the 74 new records of benthic macroalgae (34 taxa of Rhodophyta, 16 taxa of Phaeophyta and 24 taxa of Chlorophyta) published in Wynne & Jupp (1998) came from Jupp's collections. New records were found during the Oman Seaweed Project (1998 – 2000). A total of 232 taxa were presented as a *Preliminary Check List* of marine macroalgae of Oman comprised of 2 taxa of Cyanophyta, 52 taxa of Chlorophyta, 49 taxa of Phaeophyta and 129 taxa of Rhodophyta.

The total number of species in any country or region often depends on the effort and time spent by taxonomists. The task in Oman is still in the early stages but recent studies have been carried out by M. Wynne and the Belgian group (T. Schils, K. Pauly). There are useful sources on the internet to check for macroalgal taxonomy namely <http://www.algaebase.org> and the Oman seaweed flora is the Indian Ocean catalogue which is accessible on at <http://ucjeps.berkeley.edu/rlmoe/tioc/ioctoc.html>.

Trends

Barratt *et al.*, (1984) reported the occurrence of the true kelp *Ecklonia radiata* (Laminariales) found at greater depths (between 6 to 11 m) off Sadh where the maximum upwelling occurs. The record of this kelp in a tropical region is of great biodiversity interest as it is otherwise reported only from South Africa, Australia and New Zealand. The presence of this exceptional record of a temperate species has not recently been confirmed since despite attempts (most recently in 2009) to find it. It is possible that the species is confined to a very localized site east of Sadh, Dhofar; further efforts should be made to confirm its presence.

Threats

The main threats to macroalgae include oil pollution and the construction impacts from rapid coastal developments.

Conservation status

The macroalgae are of primary importance as food supply for abalone, echinoderms, herbivorous fish and the green turtle. It is important to conserve stocks of algal beds for potential utilisation and also as feeding grounds for the above animals.

1.3.2.2 Seagrasses.

To date there are four known seagrass species in Oman, the smaller *Halodule uninervis* and *Halophila ovalis* and the larger-leaved *Syringodium isoetifolium* and *Thalassodendron ciliatum* (Jupp *et al.*, 1996). These are restricted to shallow sand and mud substrates both in intertidal and shallow subtidal habitats. Turtles, fishes and mollusks frequently feed on seagrass beds.

Studies up to 1996 on the distribution, abundance and biomass of seagrasses in Oman found the best development on the west coast of Masirah Island. Further studies have shown higher densities and biomass of *H. uninervis* at Ra's Sawadi in the Sea of Oman. In contrast to the seaweeds, the southwest monsoon upwelling system along Arabian Sea coasts is stressful for seagrasses and the lower biomass of *H. uninervis* at Masirah Island than at other sites is thought to be due to cold, turbid waters during summer upwelling and grazing at the Arabian Sea sites.

Trends

Cyclone Gonu, a Super Cyclonic Storm which caused extensive damage from 5 – 7 June 2007 along the Sea of Oman was the strongest tropical cyclone on record to hit the Arabian peninsula. The dense beds of *Halodule uninervis* and *Halophila ovalis* in the shallow intertidal at Ra's Sawadi apparently were destroyed by this storm.

Conservation status

The beds of *Halodule uninervis* and *Halophila ovalis* around Mahawt Island in Ghubbat Hashish are of particular importance as habitat for the important shrimp fishery providing shelter for juveniles of *Penaeus semisulcatus*. Areas of seagrasses here and in the Masirah channel provide important feeding grounds for the green turtle *Chelonia mydas*.

1.3.2.3 Flowering plants.

Recent count of the plant species composition in Oman yielded a total of 1,295 species (DGNC, 2009). Sixty species representing 4.7% of total are endemic to the country. Within the region's endemic species are 3.2% with that of Oman's total flora. Endemism is at its highest in the southern region where 46% of the species are threatened (Ghazanfar, 1998). Of a total of 100 endemic and regionally endemic species, 63 are present in Dhofar, 12 in central Oman and 25 in the northern mountains. Regionally endemic species existing in Oman are distributed in the western region of Dhofar and eastern Yemen. A new species of *Helianthemum* was recently discovered in Jabal Qamar, Dhofar region (Ghazanfar, 2002). Since 1980, there were 101 new range-restricted species described. A new species, *Barleria samhanensis* (see Fig. 3) had been uncovered in Jabal Samhan Nature Reserve, Dhofar region in November 2006 by local scientists (Koltow, 2005; Patzelt, *et al.* 2007). Three species had been classified as endangered according to the categories of IUCN for 2009, *Ceratonia oreothauma somalensis* and *Aloe whitcombei* and for 2002, *Dracaena serrulata*. On the other hand, seven regionally endangered species or accordingly adopted from GCC 2002 Appendix 1 category are listed as follows: *Pancratium maximum*, *Dracaena serrulata*, *Sansevieria ehrenbergii*, *Monechma debile*, *Caralluma sp.*, *Dorstenia foetida*, and *Daphne mucronata* (DGNC, 2009; GCC, 2002).



Photo by A. Patzelt

Fig. 3. A new species named *Barleria samhanensis* was discovered from Jabal Samhan in the Dhofar Region

In general, endemic taxa have been identified in three areas of the country (Patzelt and Al Farsi, 2000):

1) mountains of northern Oman including Mussandam mountains where 25 endemic species (4.2% endemism) are recorded from the northern mountains, most of these are uncommon and restricted in their distribution (i.e., endemic *Ceratonia* of eastern Hajar

mountains); northern mountains of Oman is considered as one of the richest areas in Arabia

2) limestone plateau of central Oman also called Jiddat al Harasis with 12 endemic species (6% endemism), highlighting on *Ochradenus harsuticus*;

3) escarpment woodlands of Dhofar where 63 endemic or regionally endemic taxa of 10.5% endemism) are found and represented by *Cibirhiza* and *Dhofaria*; mountain escarpments of Dhofar are under the influence of the southwest monsoon from middle June to middle of September.

1.3.2.4 Mangroves.

Only *Avicennia marina* thrives in the mangrove forest distributed in the northern and southern coasts on the edges of small sea inlets (see Fig. 3). *Rhizophora mucronata* has been introduced in small areas in the Dhofar coasts. Also in the brackish water lagoons (khawrs) in Dhofar is a distinctive *Ceratophyllum demersum*, *Potamogeton pectinatus*, *Najas marina* and *Chara spp.* In partnership with JICA, mangrove afforestation had been engaged with the Sultanate in April 2000. A Japanese mangrove expert was sent to then MRMEWR (now MECA) to spearhead an *Avicennia marina* afforestation programme. The programme has two-fold objectives: 1) formulate a masterplan on restoration, conservation and management of mangroves, comprising of site-specific plans in the priority areas as well as public awareness programmes and 2) transfer the relevant technology through on-the-job training in the course of the study. In the 1980's, four other species were introduced on experimental basis, namely: *Rhizophora stylosoa*, *Lumnitzera racemosa*, *Brugiera gymnorrhiza* and *Conocarpus erectus* were planted in Khwar Baleed in Dhofar Governorate. The Ministry of Agriculture and Fisheries collaborated on these plantings. Sediments from 6000 years ago revealed the presence of pollen from *Avicennia marina* and *Rhizophora mucronata* mangroves. At present, the nearest *Rhizophora* mangrove is found on the southwestern end of the Arabian Peninsula in Yemen and in the Sirik estuary of Iran. *Brugiera gymnorrhiza* is recorded as extinct in Yemen though still present in Somalia.

Plants associated with mangrove include those that grow in the lagoon or tidal channels, along the wet edges and in the surrounding saline soils. Subtidal plants are seagrasses and algae while water plants adapted to the brackish water along channels and lagoons. Reeds and sedges emerge from shallow water at the edges of less saline khwars. A zone of salt tolerant plants (holophytes) often occurs in wet saline mud adjacent to the mangroves. Drier saline areas support sabkha vegetation with a variety of succulent species.

Khwars and mangroves are productive and valuable fish breeding and nursery areas. Many khwars support dense masses of the alga *Enteromorpha*. These are particularly important nurseries for mullet fishes and edible crabs.



Fig. 4. *Avicennia marina* is the only mangrove species naturally growing in the coastal areas of Oman.

Photo by DGNC-MECA

Threats to Vegetation: The Arabian lands have low carrying capacity for vegetation. They depend mainly on perennial plants with availability of annual plant species, for fodder, only after rain. In Oman, threats to plant species diversity and vegetation cover can be inferred from land use, rangeland degradation (desertification) and pollution. In 1995, Oman signed the UN agreement on combating of desertification in countries facing severe arid conditions. Mesquite or Ghaf bahri (*Prosopis juliflora*) had been introduced in the country three decades ago as a fast growing ornamenting in landscape planting (Al Rawahy *et al.*, 2003) and is now been growing in most part of the country and even reaching oil exploration areas. The species is native of southwest US and northwest Mexico (Shiferaw, *et al.*, 2004). Fireweed recorded in 1998, *Nicandra physaloides* is native to Peru has been spreading around mountain settlements of Dhofar (Diwan of Royal Court). Lead Tree or Ghuwayf (*Leucaena leucocephala*) is now cultivated in home gardens and on sides of the roads. It is seen as a future colonizer. To date, threat of *Prosopis* and *Leucaena* to biodiversity is still undocumented in Oman.

Threats to vegetation are summarized in Oman Plant Red Data Book as follows:

- 1) Breakdown of traditional land management practices, including livestock management
- 2) Development of human settlements and other non-agricultural land uses with a substantial footprint
- 3) Human intrusion and disturbance
- 4) Climate change
- 5) Lack of protected areas for plant conservation
- 6) Lack of species management plans
- 7) Lack of monitoring of threatened species
- 8) Lack of restoration programmes

1.3.2.5 Amphibians and Reptiles:

Only two species of toads exist in the country: Arabian Toad (*Bufo arabicus*) and the Dhofar Toad (*Bufo dhufarensis*). Thirty-seven or 41.6% of Oman's herp species are

endemic at the regional level of which 6 or 6.7% are endemic at national level. More than 75 species of reptiles are found in the country. In particular, the Green Turtle has a nesting population of more than 13,000 with the largest concentration in Ras al Hadd area. Found in Masirah Island is the largest nesting population of the Loggerheads in the world (MRMEWR, 2001). All the nationally endemic species are lizards of which four are geckos and two are lacertids. Six nationally endemic reptiles include:

1. *Asaccus montanus*
2. *Asaccus platyrhynchus*
3. *Pristurus gallagheri*
4. *Pristurus minimus*
5. *Uromastix thomasi*
6. *Acanthodactylus masirae*

Asaccus and *Pristurus gallagheri* are confined in the northern Oman mountains while *Pristurus minimus*, *Uromastix* (see Fig. 5.) and *Acanthodactylus* are restricted to the central desert plains and hinterlands (Gardner, 2000). The later species is found Masirah Island and in the coastal mainland. Same trend with other taxa, Northern Oman herps have strong affinity with that of Iran and Baluchistan species while Dhofar species have likeness with southwestern Arabia and the Horn of Africa.



Fig.5. A rare and endemic Thomas' Spiny-tailed Lizard (*Uromastix thomasi*) encountered beside the road off Sharqiya Sands, east coast of central Oman.

Photo by R. Rubio

Of the seven recognised species of marine turtle in the world, five occur in the waters of Oman (Salm and Salm, 1991). Four of these nest on beaches in Oman namely the Loggerhead Turtle (*Caretta caretta*), Green Turtle (*Chelonia mydas*), Hawksbill Turtle (*Eretmochelys imbricata*) and Olive Ridley Turtle (*Lepidochelys olivacea*). The fifth species is an irregular visitor to Oman where it may feed in offshore waters whilst on migration to distant nesting beaches elsewhere in the world. Table 4 shows the IUCN categories of the species.

Table 4. Turtles of Oman and their conservation status.

Common Name	Scientific Name	IUCN Red List Category
Green turtle	<i>Chelonia mydas</i>	EN
Hawksbill turtle	<i>Eretmochelys imbricata</i>	CR
Loggerhead turtle	<i>Caretta caretta</i>	EN
Olive ridley turtle	<i>Lepidochelys olivacea</i>	EN
Leatherback turtle	<i>Dermochelys coriacea</i>	CR

Codes are: CR – Critically Endangered; EN – Endangered

Source: www.iucnredlist.org

Green and Hawksbill Turtles nest on the small beach on Dimaniyat Islands. Green Turtles nest during the summer with peaks on their populations between July and October. See Fig. 6 below. Hawksbills nest in winter with peaks between January and April.



Photo by DGNC-MECA

Fig. 6. Green Turtles abound in Ras Al Hadd beaches to nest.

Threats to Turtles Similar to the case of cetaceans, threats to turtles in Oman have been well-documented and are the same as those faced by the marine mammals. Their threats include:

- Interaction with fisheries gear, including by catch and ghost-netting
- Habitat loss, degradation, modification and obstruction associated with coastal development
- Lighting from coastal industry, housing, resorts, utilities, roads, airports, and other infrastructure
- Coastal erosion on nesting beaches due to coastal development, sand mining, beach driving, removal of vegetation and over-grazing
- Strikes from shipping traffic associated with some of the busiest shipping lanes in the world

- Pollution from litter, hydrocarbons and other contaminants, especially those associated with increased coastal industrial development
- Ineffective species or habitat protection programs on both nesting and feeding grounds

It is considered highly likely that the decline in the nesting Loggerhead Turtle population detected on Masirah Island is largely attributable to fisheries by catch, as is the case for the population of this species off the coast of the Eastern United States. However, lighting and coastal development are also an increasing threat to this species at key nesting sites, as well as to other species.

1.3.2.6 Birds:

The Oman Bird List has 496 species currently accepted with an additional 26 species considered escapes and a further 22 species claimed by various observers, but not accepted by the Oman Bird Records Committee (Eriksen, 2009). From this total, about 85 are considered resident species while the rest are visitors for certain period of the year. No endemic species lives in Oman but a near-endemic White-collared Kingfisher (*Halcyon chloris kalbaensis*) is found only in the mangroves of the northern Batinah coast and across the UAE border. The Golden-winged Grosbeak (*Rhynchostruthus socotranus*) is found in the Dhofar mountains only with other races on Socotra Island and in Somalia.

Though lacking in endemic species, the country is still an important migratory station for millions of birds. At the central east coast, the wide mudflats of Barr Al Hikman provided a vital wintering area for thousands of wading birds in all of southwest Asia. About 125 species are classified as resident breeders with the Houbara Bustard (*Chlamydotis undulata*) considered rare in the Arabian peninsula still thrives in the central part of Oman (see Fig. 7).



Photo by DGNC-MECA

Fig. 7. Rare Houbara Bustard (*Chlamydotis undulata*) is a resident breeder.

In the coastal zone are huge numbers of wintering and migrating waterbirds and seabirds. Khwars and mangrove areas are important feeding and resting sites for migrant birds as well as breeding sites for many resident birds. As described by Green, *et al.* (1992), a great concentration of waders (26 species of waders, 5 species of gulls, 7 species of terns) during the winter at Barr al Hikman. Barr Al Hikman is easily the most important area for

wintering waders in all of Arabia and West Asia. A highly successful survey was conducted at Barr Al Hikman in the winter of 1989/90 (during which three records of Slender-billed Curlews were obtained) and a new survey took place in the winter of 2008/early 2009 (WIWO) which counted a total of 360,000 birds.

The khwars of Dhofar support a great number of birds. In Dimaniyat Islands, sooty gulls, a wide variety of terns, red-billed tropic birds, reef herons, and sooty falcons nest on the offshore islands and some nearshore islands and coastal cliffs. In winter, ospreys also nest on the islands. Surveys of the Sooty Falcon were conducted in Dimaniyat and Fahal Islands (McGrady, 2009) accounting for 76 pairs of birds. The study has found that the population in those islands could hold up to 10% of the global population.

Trends

For the great majority of species no change in status has been noticed in recent years. However, the breeding populations of European Bee-eater (*Merops apiaster*) and the Blue-cheeked Bee-eater (*Merops superciliosus*) are continuing the downward trend probably due to loss of habitat and human disturbance at breeding colonies (Eriksen, 2009).

Threats to Birds. Considered major threats to birds in Oman are the following:

1) Loss of Habitat. A number of important bird areas are under threat from human developments. Presently, the trend is that development projects on coastal areas are shooing away shore birds (Eriksen, 2009). Though new habitats will be developed with more greenery and golf courses, the birds that will benefit from such development are completely different to the ones (herons, waders, gulls and terns) that now use the beaches and mudflats at the tidal creek. For these birds the added disturbance from far more people using the area on a daily basis is worrying. Likely, breeding population of Sooty Falcon (*Falco concolor*) on the offshore islands at Ras As Sawadi and the Daymaniyat Islands will probably be subject to increased disturbance.

Farmlands near Sohar and in Salalah are presently under severe threat. Water used to irrigate the cultivated areas and grasslands have greatly diminished in the last few years. A noticeable decrease in the number of species and the number of birds using these areas as wintering destination is apparent. In particular, two Red Data List species, the Sociable Plover (*Chettusia gregaria*) and the Greater Spotted Eagle (*Aquila clanga*) have already been reported a marked decrease on the number of sightings per year (Eriksen, 2009).

2) Spread of invasive, alien species. A number of alien bird species has spread alarmingly in recent years. Three species are currently considered invasive: Ring-necked Parakeet (*Psittacula krameri*), House Crow (*Corvus splendens*) and Common Mynah (*Acridotheres tristis*). All three species are exceedingly common on Al Batinah coast and these have now colonized the Salalah region, the latter species only recently so. Particularly alarming is the spread of the Common Mynah. This species is very aggressive towards native birds, say up to the size of at least Laughing Doves (*Streptopelia senegalensis*). It competes with native species for food and nesting sites. Whereas nothing much can be done on Al Batinah, there may still be time to control the

spread of at least the House Crow and the Common Mynah in Salalah, but action must be taken now before the number of birds explode.

1.3.2.7 Mammals.

A total of 101 species and subspecies of mammals were tallied for Oman. Thirty-six species are marine while 65 are terrestrial, eight of which are domestic species. The IUCN endangered Cheetah (*Acionyx jubatus*) is considered extinct in Oman but still exists in the neighboring Saudi Arabia. Some reports of Cheetah's signs have reached authorities. The IUCN vulnerable Wild Goat (*Capra aegagrus*) had been recorded once in the Oman/UAE border, thought to be an escapee is being recommended for deletion in Oman's mammal list. Also in the vulnerable category is the Arabian Gazelle (*Gazella gazella cora*) for which its population has dramatically declined since 1990s. Poaching for its meat had been rampant and live capture had become common for private collections and trade. Habitat loss through urban development and off-road driving as well as competition with other herbivores had been listed as threatening to their existence.

Categorized as endangered in the IUCN Red List, the Arabian Oryx (*Oryx leucoryx*) had been exterminated in the country in 1972. According to the Diwan of Royal Court (2009), the Oryx population was restored to viable population of over 500 in captivity after 10 years (Fig. 8). Habitat destruction and degradation through urban development projects, off-road driving and livestock grazing had been perceived as the principal threats of the Oryx in Oman.



Fig. 8. Successfully bred in captivity, the Arabian Oryx is still considered rare in the Arabian peninsula.

Photo by: DGNC_MECA

The Arabian Tahr is a protected species by law in Oman but estimates of its numbers in the wild are lacking. Since 1980, the Diwan of Royal Court has been breeding the species in captivity. Threats had been identified as poaching for live trading outside the country, competition with feral and domestic livestock especially during the drought periods, predation by wolves and eagles and fragmentation of habitats due to road construction and coal mining on mountains.

Fewer than 250 Arabian Leopards roam the mountainous regions of Oman. It is listed in the IUCN Red List as Critically Endangered and in CITES Appendix 1. Threats to the species include habitat destruction through overgrazing by local livestock, quarrying and construction of roads; poaching and hunting of prey species.

Table 5 below shows the 19 confirmed species of the marine mammals of Oman:

Table 5. Cetaceans of Oman and their conservation status. Codes are: DD – Data Deficient; EN - Endangered; LC - Least Concern; VU – vulnerable; NT – Near Threatened

Common Name	Scientific Name	IUCN Red List Category
Mysticete whales		
Bryde's whales	<i>Balaenoptera edeni cf brydei</i>	DD
Blue whale	<i>B. musculus</i>	EN
Humpback whale	<i>Megaptera novaeangliae</i>	LC, but regionally EN
Odontocete whales and dolphins		
Sperm whale	<i>Physeter macrocephalus</i>	VU
Dwarf sperm whale	<i>Kogia sima</i>	DD
Cuvier's beaked whale	<i>Ziphius cavirostris</i>	LC
Long-beaked common dolphin	<i>Delphinus capensis</i>	DD
Pygmy killer whale	<i>Feresa attenuata</i>	DD
Spinner dolphin	<i>Stenella longirostris</i>	DD
Striped dolphin	<i>Stenella coeruleoalba</i>	LC
Pantropical spotted dolphin	<i>S. attenuata</i>	LC
Rough-toothed dolphin	<i>Steno bredanensis</i>	LC
Indo-pacific bottlenose dolphin	<i>Tursiops aduncus</i>	DD
Common bottlenose dolphin	<i>Tursiops truncatus</i>	LC
Risso's dolphin	<i>Grampus griseus</i>	LC
Killer whale	<i>Orcinus orca</i>	DD
Melon-headed whale	<i>Peponocephala electra</i>	LC
False killer whale	<i>Pseudorca crassidens</i>	DD
Indo-Pacific humpback dolphin	<i>Sousa chinensis</i>	NT

Source: Baldwin (2003) and Oman Cetacean Database records, 2009; www.iucnredlist.org

It should be noted that the Red Data List categories provided above represent global status, but it is likely, as has now been officially accepted by IUCN for the humpback whale (see section 3.1 of this report), that some species may be shown to be more severely threatened if revision of this status on a regional basis was to be undertaken.

It is possible, indeed probable, that other species occur in Oman that have yet to be confirmed. Of the unconfirmed records of species in Oman, most have been discounted based on erroneous identification and/or lack of any other historic evidence of occurrence in the Northern Indian Ocean basin. Such species include Fin Whale (*Balaenoptera*

physalus), Sei Whale (*B. borealis*) and Minke Whale (*B. acutorostrata*), certainly do not occur in Oman's waters, though occasional vagrant remains a remote possibility. However, there are other species, for example several species of Beaked Whales, that are highly likely to occur but have not yet been recorded. There are also other species (such as the short-finned pilot whale (*Globicephala macrorhynchus*)) that are known to occur in other parts of the Northern Indian Ocean (e.g. Maldives, Somalia), but have not yet been confirmed to occur in Oman.

The taxonomic status of many of the confirmed species remains unresolved, either in a global sense or a regional sense, or both. Taxonomic investigations had focused on study of mitochondrial DNA of individuals sampled in Oman and/or through cranial morphological analysis from beached specimens collected in Oman, focusing on the following species:

- Brydes Whale
- Blue Whale
- Humpback Whale
- Long-beaked Common Dolphin
- Spinner Dolphin
- Indo-Pacific Humpback Dolphin

Other species have additionally been sampled, but these samples either remain in storage awaiting analysis and/or results are still too few in number to provide any conclusions about status. It is worth noting here, however, that several species that belong to globally unresolved species complexes show clear indication of possible regional endemism and scientific argument has been presented for the sub-specific status of some species in the region (e.g. Blue Whale, *Balaenoptera musculus indica* and Long-beaked Common Dolphin, *Delphinus capensis tropicalis*), whilst others also show regional genetic and/or morphological differences that are supported by published scientific evidence (e.g. *Sousa chinensis*, *Megaptera novaeangliae* and *Stenella longirostris*).

In Mussandam, Indo-Pacific Humpback Dolphins are seen in the Strait of Hormuz. Baleen whales while Dugong are found in the Arabian Gulf (*personal communication*). Occasional injury from the large volume of ship, dhow and small boat traffic may disturb these marine mammals, with accompanying underwater noise and pollution.

Threats to the Cetaceans: Threats to marine mammals in Oman are well-documented (Salm, *et al* 1993, Baldwin, *et al* 1999, Minton, 2004) which include the following:

- Interaction with fisheries gear, including bycatch and ghost-netting
- Strikes from shipping traffic associated with some of the busiest shipping lanes in the world
- Habitat loss and degradation associated with fisheries, coastal development and offshore shipping traffic
- Noise associated with shipping traffic, offshore seismic exploration and offshore military operations

- Disturbance and noise by recreational boats and dedicated whale/dolphin watching tour operations
- Pollution from hydrocarbons and other contaminants, especially those associated with increased coastal industrial development
- Lack of dedicated species or habitat protection programs

Threats to some large whales are acting on already depleted populations due to the illegal whaling in Omani waters in the mid to late 1960's when large numbers of Brydes, Blue, Humpback and Sperm whales were caught. Genetic analysis of sampled Humpback Whales in Oman indicates the possibility of a genetic bottleneck coincident with this whaling period and a continued decline in the population today (Baldwin, 2009).

Photo identification studies of Humpback Whales in Oman have also revealed scarring on individuals that are attributed to previous interaction with fisheries gear. Scarring is evident on 30- 40% of all live whales encountered. This extremely high incident of fisheries gear interaction suggests this to be a major threat to Humpback Whales (and probably other coastal cetacean species) in Oman and possibly a contributing factor to the lack of recovery of this species in Oman in spite of a global recovery of the species as a whole.

Fisheries monitoring, especially to detect, record, report and respond to by catch is urgently required. Monitoring of collisions of vessels with wildlife is also required, including recording and reporting mechanisms. This could be complemented by acoustic monitoring for cetaceans to help avert such collisions, especially in areas of current and predicted high shipping traffic, such as at the new approaches to Duqm and around shipping lanes in the Arabian Sea.

1.3.2.8 Fish.

Eighty-three species of sharks, rays and guitarfishes are found in Oman waters together with 905 species of bony fishes (DGNC-MECA, 2009). Several species of cartilaginous fishes are protected in Oman with Narrow Sawfish (*Anoxypristis cuspidata*) and Olive Sawfish (*Pristis zijsron*) listed as critically endangered in the IUCN Red List. Sharks had suffered from population decline due to overfishing. Mostly they are caught from incidental fishing. Shark fins are collected and being sought as a delicacy.

In mangroves, the small pupfish (*Aphanius dispar*) is very common and breeds in khwars and freshwater springs. Typical residents of mangroves are the milkfish (*Chanos chanos*), mullet, glassfish, *Ambassis natalensis*, gobies, grunts, and tigerperch (*Terapon jarbua*).

1.3.2.9 Corals.

Within its territorial waters, Oman's hard coral (scleractinian) fauna now includes 132 species distributed in 15 Families (Claereboudt, 2009). Several species remains unidentified: most notably perhaps the *Montipora* species building the very large reef near Barr Al Hikman. Coral reefs may still be in pristine condition in the country's protected areas (see Fig. 9) but have suffered recent damage from various causes especially Cyclone Gonu of 2007 and the HABs event of 2008-2009.



Fig. 9. Undisturbed coral reef of Dimaniyat Islands Nature Reserve still abound.

Photo by H. Al Nabhani

Several coral species are considered rare (*Acropora nasuta*, *Montipora Cfdigitata*, *Madracis kirbyi*, *Favia favus*, *Acanthastrea maxima*, *Porites decasepta*, and *Psammocora ramosa* (DGNC, 2009; Veron, 2000, Claereboudt, 2009) and there are at least 10 endemic species. All species of corals are classified under CITES 2 category where trading is determined by the country's Managing Authority.

Several new records for the country were made in Dhofar: particularly a very unusual set of *Tubipora musica* colonies. Which normally have a dark red skeleton and here were complete white. Several colonies of *Pavona minuta* were also observed near Hino (Mirbat) in a single embayments and several specimen of *Fungia scabra* were collected at 22m near Sadah. A couple of specimen of *Goniastrea* were also observed and photographed. The coast between Mirbat and Sadh is particularly rich and has a very unusual community structure. Several species of *Acropora*, *Favites*, *Favia* and *Porites* have also been observed and collected for the first time and their identification is currently underway. Perhaps another 10-15 species of corals are awaiting to be collected in the Dhofar region.

Trends

Cyclone Gonu had a profound effect on many coral communities near Muscat with 1000's of square meters of reef heavily affected. In some areas all branching species have disappeared and complete communities (e.g. Sifah) have been obliterated. In Fall 2008 and Spring 2009, a massive dinoflagellate bloom of *Cochlodinium polykrikoides* was responsible for the direct (toxicity) or indirect (oxygen depletion) of many communities, particularly in Musandam. Communities already strongly affected by Cyclone Gonu were even more distressed by this second environmental disturbance and in summer 2009, the combination with high insolation with low wind mixing led to extreme warming of the surface water leading to massive bleaching of the coral community in later summer.

Threats

Fishing practices remains unfortunately a major contributor to the local destruction of corals. In Dhofar, entanglements by fishing lines and litter (rice bags, plastic bags) represent the most direct threats to coral colonies.

1.3.2.10 Other Invertebrates.

A repository of the country's collections of insects and other invertebrates exist in the Oman Natural History Museum. The museum houses specimens of land mollusks, isopods and arachnids, so far considered as one the best collections in the country. More field explorations, collections and taxonomic studies are needed to fully describe the country's invertebrate fauna. Taxonomists are also limited in number to study major invertebrate groups. Checklists of species are available from the following sources:

- 18 species of isopods with nine endemic species and one endemic genus, *Omanodillo* (Crustacea: Oniscidea; Gardner, 2000)
- 40 species and subspecies of scorpions (Arachnida: Scorpions; Gardner, 2000)
- 221 sp of insects plus eight species of gastropods (DGNC, 2009)
- 58 species of sandy beach macrofauna (polychaetes, oligochaetes, crustaceans and mollusks: McLachlan, *et al.*, 1998)
- 182 species diatoms, dictyocha, dinoflagellates and cyanobacteria (Al Azri, 2009)

Coral Reefs. Small coral reefs are found in sheltered areas with a rocky substrate. Older *Porites* reefs have huge individual colonies that represent more than 300 years of continuous growth. There is evidence of periodic, widespread death of corals particularly the branching forms. *Pocillopora damicornis*, *Montipora* and *Pavoan cactus* also build small patch of reefs. Most rocky coastal environments supported scattered colonies of both hard and soft corals, offering food and shelter to numerous fishes and spiny lobsters and many attached marine creatures. They form an almost continuous cover in the less exposed areas. They are valuable to fisheries.

Mollusks. Fifty-eight species had been recorded from the mangroves and tidal channels. Among the gastropods are cowries, ceriths, dog whelks, dove shells, olives, moon shell and conch. Bivalves include Venus Clams and ark shells. Attached to mangrove roots are oysters, vermitids and rock shells. The large horn shell or mud snail, *Terebralia palustris* is exclusively found in the northwest.

Aquaculture: MAF established the aquaculture laboratory in 1992 with the following projects: Experimental shrimp and shellfish culture of *Penaeus indicus*, *P. monodon*, *P. japonicus*, *Pinctada margaritifera*, *P. radiata* and *Mytilus pictus*. They also experimented on Finfish cage culture (*Sparus aurata*, *Acanthopagrus cuvieri*) and Abalone pilot seed production of *Haliot mariae*.

Crustaceans. Forty-three crustacean species had been documented in the mangrove areas of Oman with the majority of these found in other intertidal habitats such as mudflats and rocky shores. The Large Land Crab (*Cardisoma carnifex*) thrives in khwars of Dhofar while the tidal inlets support the sand crabs (*Dotilla* and *Scopimera*) in the

north but absent in the south. The large marsh crab (*Neosarmatium meinerti*) is found on trees only at Mahawt Island. Of commercial value are the White Shrimp (*Penaeus indicus*) and Mud Crabs (*Scylla serrata*) having small fragile populations in such ecosystem but thought they can not support commercial fishery.

Echinoderms. As part of a project on Sea Cucumber aquaculture, funded by the fisheries Research Fund, the distribution of species of echinoderms has also been partially investigated. So far, Claereboudt (2009) had identified 16 species, probably five or 10 more maybe found. Similar to corals, Dhofar communities are richer (12 species) than the Sea of Oman (eight species) or Musandam (six species). Sixteen species of sea-urchins (including three irregular) had been identified though several species remain unidentified. Three irregular sea urchin fauna species remained almost undiscovered in the Sultanate, significant effort needs to be done to fill this void. Nineteen species of sea stars have been recorded, but there are several more species particularly in the smaller ones (*Asterina*) that need to be identified. Only about four of these sea stars are present in the Sea of Oman, all others are found in Dhofar. Only three species of crinoids have been recorded, two in Musandam, one in Muscat and three in Dhofar.

Trends. Globally, the population of echinoderms suffered from both the hurricane Gonu and the toxic algal bloom of 2009. After Gonu, there was a strong decline of *Diadema* sea urchin on most reefs, however, because of the abundance of food (algal turf) in the months and years after Gonu, the recovery of *Diadema* has been rapid. The same is true for Holothuroidea. The starfish population remained apparently little affected.

It is interesting to note that in all cases, the species richness is higher in Dhofar. An interesting observation is the strong decline of the *Acanthaster planci* population both in the Sea of Oman and in the Arabian Sea. In middle to late 2000s, population near Muscat for instance was between 20-40/20min dives whereas in 2007, 2008 and 2009, it was often less than 1/20min of survey dive. There seem to be a slight increase in the number of feeding scars in the last six months suggesting perhaps the return of an outbreak.

Threats. Echinoderms are usually adaptable and since many have cryptic life habits, they are not directly endangered by human activities. Except for sea cucumber, *Holothuria scabra*, a very valuable species found only near Mahout (Al-Wusta Region) was fished exhaustively since 2005. The Ministry of Fisheries Wealth tried to curb the trend by establishing a temporary ban and a small scale aquaculture program. Other sea cucumber species with commercial potential (*Holothuria atra*, *Stichopus variegatus*, *Holothuria nobilis*) are at risk.

1.3.3 Genetic Diversity

The country has a multitude of local cultivars and landraces of various crops like date palm, lime, coconut, pomegranate, wheat, barley, alfalfa, garlic and lime that suitably grow in mostly arid environment. Through the years, farmers had practiced selecting varieties that provide them better harvests. Among the varieties of crops are found in Table 6.

Table 6. Local crop cultivars and landraces in Oman. (Adopted from Nadaf, *et al.*, 2006)

Crop Species	Cultivars/Landraces
Wheat (<i>Triticum aestivum</i>)	Coolah, Saraya, Hamira, Waledi, Missani
Barley (<i>Hordeum vulgare</i>)	Bathini, Doraqui
Corn (<i>Zea mays</i>)	White, Red, Yellow
Sorghum (<i>Sorghum bicolor</i>)	Red, White
Pearl Millet (<i>Pennisetum glaucum</i>)	Tall, Local
Alfalfa (<i>Medicago sativa</i>)	Bathini, Interior, Sharqiya, Rustaq, Quriati
Cowpea (<i>Vigna unguiculata</i>)	Brown, Black, Mottled
Safflower (<i>Carthamus tinctorius</i>)	Local
Chickpea (<i>Cicer arietinum</i>)	Local
Sesame (<i>Sesamum indicum</i>)	Local
Toabcco (<i>Nicotiana tabacum</i>)	Suwaida, Musdaria, Fannahia, Omalin, Hitathi
Sugarcane (<i>Saccharum officinarum</i>)	Bahlavi, Nizwavi, Dhofari
Cotton (<i>Gossypium arboretum</i>)	Brown
Garlic (<i>Allium sativum</i>)	Bahla, Rustaq, Tanuf, Jamar
Onion (<i>Allium cepa</i>)	Local
Sweet melon (<i>Cucumis melo</i>)	Local
Carrot (<i>Daucus carota</i>)	Local
Cucumber (<i>Cucumis sativus</i>)	Local
Sweet potato (<i>Ipomoea batatas</i>)	Red, White
Radish (<i>Raphanus sativus</i>)	Local
Mango (<i>Mangifera indica</i>)	Al-ward, Al-hokh, Al-halqoom, Quairate-15, Rumais-89, Muscati
Ber (<i>Zizipus mauritiana</i>)	Seeded, seedless (Maqatmani)
Guava (<i>Psidium guajava</i>)	Red, White
Papaya (<i>Carica papaya</i>)	Local, Seedy strains
Banana (<i>Musa sp.</i>)	Fard, Barshi, Nagal, Somali, Malendi, Red
Pomegranate (<i>Punica granatum</i>)	Malasi, Jabal akhdhar
Grape (<i>Vitis vinifera</i>)	Black, White
Acid Lime (<i>Citrus aurantifolia</i>)	Local (lomy)
Sweet Lime (<i>Citrus limetta</i>)	Burgab, Daire
Coconut (<i>Cocos nucifera</i>)	Local accessions
Date Palm (<i>Phoenix dactylifera</i>)	167 accessions

The Ministry of Agriculture established Jemah Research Station in 1992 as the country's first tissue culture laboratory to replace on a long term 3.1 million trees of economically important cultivars. Later, SQU put up its tissue culture laboratories to carry out researches involving varieties of crops. Among the varieties being studied are: date, mango, wheat, barley, chickpea and forage species. SQU's biotechnology program included tissue culture of 46 cultivars of date palm (24 are Omanis) as well as tissue culture of banana, potato, pineapple, strawberry and Omani alfalfa (Al Mamari, 2010). The university is involved in long term disease detection and characterization through DNA finger printing and disease diagnosis.

Plant conservation in Oman has been started in 1980. Accessions in crops such as alfalfa, wheat, barley, chickpea, fenugreek, coriander and broad bean were collected by the

Ministry of Agriculture and Fisheries all over the country. All seeds were preserved in the Plant Genetic Resources Laboratory of the Agriculture Production Research Center at Rumais. This had been part of the Arabian Peninsula Program. Later, germplasm collection was conducted in North Oman for forage and medicinal plant species where as many as 60 taxa of herbaria samples were collected. The collection project was concerned on the propagation of stubbles or tillers of grass species, cuttings and seeds. As guide for the collectors, interviews were conducted with herders, farmers rearing livestock and local residents who are knowledgeable of indigenous medicine. Presently, plant breeding programs are busy in the introduction and selection of crop species and in many research activities about the crops.

There about 2,000 horses in the Sultanate, 350 of which are pure-bred Arab horses, 150 are thoroughbreds while 1,500 are pure-bred Omani horses. His Majesty, Sultan Qaboos himself is a horse-breeding enthusiast. In fact, a Directorate-General of the Royal Stables has been created under the Diwan of Royal Court to be responsible in the supervision of scientific breeding and rearing of horses. His horse breeding facility is based in Muscat but another breeding department was established in Salalah concentrating on the breeding of pure-bred Arab horses. The Royal Stables is a member of the World Arab Horse Organization and breed many kinds of pure bred and thorough bred horses from finest available blood lines.

As traditionally practiced in Oman, camel breeding has become popular principally for camel racing purposes. Under directions from His Majesty, a Directorate-General of Camel Affairs was similarly established in the Diwan of Royal Court in 1989. The camel center is located in Wilayat Barka at Fulajj and equipped with modern race tracks and camel pens. Camel breeding and racing are highly esteemed in the country.

Chapter 2. The Current Status of the National Biodiversity Strategy and Action Plan

In this Chapter, and according to Article (6A) of the Convention on Biological Diversity CBD, a general overview of the implementation of the National Biodiversity Strategy and Action Plan, which the Sultanate of Oman has decided to implement, and information on the progress of the implementation of the procedures included in the Action Plan, as well as an assessment of the effectiveness of the implemented National Strategy and Action Plan and the challenges and obstacles facing the implementation of its objectives.

2.1 General Description.

The Sultanate of Oman devotes great attention to the preservation of biodiversity at the national and global levels. In conformation of that, it officially acceded to the Convention on the Biological Diversity in 1994 in accordance with Royal Decree No. 119/94. In compliance with the main membership obligations and responsibilities in this Convention, and according to Article (6A) of the Convention, the Government of the Sultanate prepared the project for the National Biodiversity Strategy and Action Plan (the Strategy) with the support of the Global Environment Facility GEF and in cooperation with the International Union for the Conservation of Nature and Natural Resources (IUCN). The (former) Ministry of Regional Municipalities, Environment and Water Resources, in its capacity as the authority entrusted with the protection and conservation of biodiversity in the Sultanate, coordinated with all the specialized agencies in the Sultanate to prepare the Strategy and identify the procedures required from every agency in accordance with the commitments included in the Convention and aiming at the sustainable use of biological resources.

In compliance with Article (6B), the Sultanate has adopted integral, multi-sector directions that depends on incorporating considerations of ecosystem protection and management to eliminate reduce loss of biodiversity and promote its sustainable use in all the development plans projects of the different relevant Government and non-Government organizations and agencies. Since biodiversity conservation is a responsibility shared by most Government agencies in the Sultanate, the development of the Strategy required active participation to achieve integration among all the targeted sectors and ensure complete coordination between these sectors during the implementation of the National Strategy Action Plan.

Accordingly, a Steering Committee was formulated to include 14 members representing 14 Government agencies, together with 6 technical committees consisting of 70 members from these agencies who gathered the scientific data and developed the proposals and visions for drawing up and preparing the general framework of the Strategy, taking into consideration the viewpoints and visions of the relevant agencies in both the Government and the Private sectors with the guarantee that the Strategy is expressive of the national directions and trends regarding the protection of the environment and the biodiversity.

Based on a proposal from the members of the Strategy's Steering Committee, a preliminary visualization was prepared for the early steps of the Strategy's project activities, taking into account the general framework of the project in the agreement between the sponsoring agency and the Government of the Sultanate of Oman, the setbacks that postponed the commencement of the project and the desire that this project becomes an Omani example that makes use of the successful experience in this domain. The implementation of this project took two years, between 1999 and 2000.

The Strategy defined the national objective for the preservation and sustainable use of biodiversity, which relies on the realization of the Omani citizens of the importance of preserving environmental health and safety in accordance with the Islamic directives for the conservation of biodiversity within the global framework and based on the fact that the ecosystems in the Sultanate are considered fragile and vulnerable and are facing many challenges.

The Strategy illustrates the political directions as well as the basic rules, principles and guidelines which the Sultanate can use to direct the development process hand in hand with the preservation of biodiversity to contribute in achieving the biodiversity objective of 2010. The Strategy document includes nine main objectives, which are:

- * Protection of natural habitats and productive, renewable resources for rational and sustainable utilization.
- * Conservation of natural habitat environments and the biodiversity of fauna and flora, particularly rare species and those of special significance.
- * Providing a high-quality natural environment for recreational and touristic activities.
- * Improvement of knowledge on ecosystems and elevation of resource management capabilities.
- * Raising awareness on the importance of biodiversity conservation and the sustainable use of biological resources.
- * Passing legislation to ensure biodiversity conservation and the sustainable use of biological resources.
- * Building a system of incentives to encourage the activities of biodiversity conservation and the creation of job opportunities for the locals.
- * Equal distribution of the returns yielded from the sustainable use of resources at the local and regional levels, including genetic resources.
- * Promoting regional and international cooperation in the fields of biodiversity conservation and the sustainable use of natural resources.

In compliance with the identification of national priorities for the field of biodiversity and derived from the Strategy, an assessment and an inventory were carried out for what is available in the Sultanate. This is considered one of the effective elements within this Strategy to identify the projects of priority in the fields of biodiversity conservation included in the Strategy in order to develop a national plan for mobilization of resources to implement these projects in coordination with the various national institutions.

Many options have been identified in the National Strategy to be used as guidelines and in order to facilitate the implementation process classified into 15 topics. Each of these topics includes main objectives and a series of priority procedures (Annexes 1, 2 and 5). The Strategy includes about 145 strategic options, and 81 strategic decisions of priority, which were made for the targeted sectors and realized as procedures. The Document of the Strategy and the implementation of the Action Plan was issued in the year 2000 in accordance with the Decision made by the Cabinet during its session No. 20/2000 held on 26 September 2000.

After the ratification and publishing of the Strategy Document, Workshops were organized to introduce the Strategy in which representatives from the different targeted sectors participated. Subsequently, the Action Plan implementation mechanism required active joint work and regular consultation by all the concerned sectors to keep abreast with the challenges, obstacles and updates that occurred in the face of the implementation of the activities proposed in the Action Plan. The National Biodiversity Committee decided that all agencies specializing in the management of biodiversity shall submit an annual report to the authority responsible for biodiversity conservation, which is the Ministry of Environment and Climate Affairs, on the progress made in the implementation of their relevant plans and programs.

2.2 Objectives and Indicators.

Although the objectives of the Strategy were consistent with those of the Convention (Annexes 2, 3, 4 and 5), progress made in the implementation of the projects listed in the National Action Plan were assessed according to the results achieved in reality (Annex 5) due to the lack of national methodologies, mechanisms and indicators of performance for the assessment and monitoring process.

2.3 Relation to the Convention.

Drawing upon the Convention, the National Biodiversity Strategy and the Action Plan implementation projects were prepared in cooperation with the Government agencies in the Sultanate. The Strategy included several proposed strategic options, most of which are within the framework of the Convention (Annexes 2 and 5).

Topics 2-15 of the National Action Plan represent joint projects between the targeted sectors, such as: fisheries, education, agriculture, urban planning, water resources, energy resources, mineral resources, tourism, industry, technology and services, economy and social development (Annexes 2 and 5).

2.4 Progress made in Project Implementation.

Since biodiversity conservation is a shared responsibility between most Government agencies in the Sultanate, these agencies have already prepared their biodiversity plans and programs that were implemented, and still are, through the Sixth (2001-2005) and Seventh Five-Year Plans (2006-2010) for National Development.

To get a clear view of the current status of the Strategy, Tables have been laid out to summarize the level of progress made in implementing each of the objectives defined in the Strategy (Annex 5). This allows assessment of the procedures taken and the ones that must be taken to achieve the biodiversity objective for 2010.

2.5 Financing.

It is difficult to get external financing for projects because the Sultanate of Oman is an oil-producing country. Therefore, financing of the projects of the National Action Plan is done through the Sultanate's general budget. However, total financing of the projects is unavailable because of the multitude and divergence of the agencies responsible for implementation.

2.6 Examples of Projects and Obstacles

2.6.1 Summary of Projects

*** Mangrove Trees Transplantation Project**

Due to the importance of mangrove trees and their natural habitats, the Sultanate of Oman collaborated with the Japanese International Cooperation Agency in 2000 to implement the "Transplantation of Mangrove Trees and Rehabilitation of their Natural Habitats" project. The first nursery for the multiplication of mangrove trees in Al-Qurum Nature Park Reserve in Muscat Governorate was built in 2000, and another one was built in November 2001 in the same location with an automatic irrigation system that depends on the tidal irrigation and with a capacity of about 22,000 seedlings a year in November 2001. In 2002, another nursery was built with a similar design and system in Khawr Al-Bateah in Wilayat Sur in A'Sharqiyah Region.

In May 2003, the locals were involved in the transplantation activities to educate them about the importance and benefits of mangrove trees. Since the beginning of the project in 2000 up to 2009, about 400,000 seedlings have been transplanted.

*** The Nubian Ibex Project**

Commencement date: 1987

Main objectives: monitoring and studying the Nubian Ibex in Wadi A'Sireen.

Project summary: constant monitoring of the numbers of the Nubian Ibex and collecting data by the staff of the Arabian Oryx Project. Satellite monitoring equipment was used starting from the year 2001.

*** The Hubara Bustard Project**

Commencement date: 1999

Main objectives: monitoring and studying the Hubara Bustard bird in the Arabian Oryx Sanctuary AOS.

Project summary: in accordance with the Memorandum of Understanding with the Environmental Research and Wildlife Development Agency ERWDA (Abu Dhabi, United Arab Emirates), surveys and research were conducted in Ja'aluni area, where remote monitoring satellite system was used. Other surveys and research projects are under way.

*** The Arabian Leopard Project**

Commencement date: 1997

Main objective: survey and feasibility study to confirm the existence of the Arabian Leopard in Dhofar Mountains, particularly Jabal Samhan Nature Reserve.

*** The Blanford Fox Project**

Commencement date: 2002

Main objective: survey of the living patterns of the Blanford Fox in Northern Oman through a collaborative program with the former Ministry of Regional Municipalities, Environment and Water Resources. The Blanford Fox was first spotted in Al-Hajar A'Sharqi Mountains in July 2002.

*** Project: Wildlife Monitoring with Trap Cameras**

Trap cameras were set up in Jabal Samhan Nature Reserve in April 2002, and samples from 17 leopard were collected individually. The trap cameras showed samples of the Arabian gazelle, the Arabian Fox, Blanford Fox, the Nubian Ibex, the striped honey badger and the wild cat. The trap cameras in Al-Qamar Mountains and the adjacent villages captured the Arabian leopard in two locations.

*** Project: Implementation of the National Coral Reef Management Plan**

Coral reefs have been suffering for some time from extensive deterioration and damage in their environment from the different natural and human impacts, such as dumping fishing nets, anchors and ropes, recreational activities, littering and ignoring beach

setbacks when constructing coastal buildings. To implement the National Coral Reef Management Plan and to have an accurate visualization of coral reef development, a survey was carried out in the Sultanate in 1996 to identify the main threats to coral reef environments.

In 1998, the Artificial Coral Reefs Project was commenced in Mina Al-Fahal in collaboration with Petroleum Development Oman PDO. During phase one of the project, about 40 artificial coral Reef Balls were distributed in Mina Al-Fahal Island. To complete the project, efforts were carried out to continue to monitor those corals colony growth rates and deploy mooring buoys and artificial coral Reef Balls were placed in the same area. The number of artificial reef corals modules distributed until the end of 2004 reached about 130 Reef Balls.

In 2003, coral Reef Balls were distributed in a number of affected areas, including selected areas in the Damaniyat Islands, where about 250 Reef Balls were distributed. In 2005, about 90 Reef Balls were distributed in the Damaniyat Islands.

Furthermore, the growth of coral reefs in those areas are occasionally monitored and so is the growth of algae and sea life in general. Results show that the project is a success considering that the coral colonies on Reef Balls have grown well but suffered damage from Cyclone Gonu in 2007. A new coral reefs and Reef Ball corals monitoring project has been initiated in 2010 between MECA and PDO.

*** The Museum of Natural History**

The Museum of Natural History was opened on 30 December 1985. It consists of five display halls and five sections for preservation and archiving. Annex (6) gives a brief background of the Museum's activities.

*** Successful Biodiversity Projects by the Fisheries Sector**

The Ministry of Fisheries has carried out several biodiversity projects that contribute in the implementation of the Strategy's National Action Plan. Annex (7) lists some examples of these projects.

*** Biodiversity Scientific Research**

Sultan Qaboos University has conducted lots of biodiversity scientific research. Annex (8) lists some examples of this research.

*** The Role of the Media in Raising Environmental Awareness on Biodiversity Conservation**

The attention given by the Omani Media to the environment is derived from the concern shown by the Omani Government in this respect and because of the significance of the

environment to the life of individuals and communities in being the basis for true development.

The media has focused in this field on instilling the principle of environmental preservation among members of the community as well as raising awareness continuously to educate the community on the efforts exerted by the Government in preserving the features and biodiversity of the Omani environment.

Moreover, the Omani media pays great attention to biodiversity issues in its different programs. Many environmental issues are focused on, mainly biodiversity in land, water and agriculture. Annex (9) lists some examples of the role of the media in raising environmental awareness on biodiversity conservation.

*** Biodiversity Concepts in the Omani Curriculum**

The Ministry of Education in the Sultanate of Oman took importance in environmental education by incorporating its concepts in the curricula of all educational levels to establish constant environmental learning. Annex (10) lists examples of how the curricula of (elementary, preparatory and secondary) schools and of basic education incorporate environmental concepts.

2.6.2 Obstacles.

The following are some obstacles and challenges that faced the implementation process:

- * Insufficient coordination between Government agencies on following up the implementation of the Strategy and its Action Plan.
- * Insufficient financial and human potentials and lack of financial support mechanisms for biodiversity conservation and development by the Government agencies responsible for implementing the Action Plan projects.
- * Insufficient institutional capabilities and lack of adequate methodologies, tools and mechanisms for assessment and monitoring and of knowledge for evaluating the status of biodiversity components in the Sultanate.
- * Lack of performance indicators for evaluating the progress made in implementing the projects listed in the Strategy and its Action Plan and whether or not these projects have contributed in improving biodiversity components.
- * Insufficient scientific research on biodiversity due to insufficient financial and human resources and lack of financial incentives.
- * Insufficient regional and international cooperation in implementing the Convention. Technical and scientific cooperation has not been enhanced with the other members of the Convention.

- * Dispersal of efforts made in nature conservation among many Government agencies with more than one agency supervising nature reserves and no coordination mechanisms, as well as lack of administrative and financial independence and an administrative structure for nature reserves.
- * Non-implementation of nature reserve management plans due to lack of financial and human resources and insufficient financial support mechanisms.
- * Insufficient legislative frameworks for enhancing sustainable practices in the field of biodiversity.
- * Lack of mechanism for the transfer of and adaptation with suitable and affordable technologies.
- * Limited participation by the local communities in biodiversity management, development and conservation.

2.7 Effectiveness of the National Biodiversity Strategy and Action Plan

Programs and projects related to biodiversity have been implemented through a joint process that involved the participation of different Government sectors. However, this process is limited by a lack of coordination tools held by the agency responsible for the coordination process and between all the agencies in the Sultanate specialized in the assessment, monitoring and follow up of the activities related to biodiversity.

It is particularly difficult to determine whether or not the changes in the current status of biodiversity presented in Chapter One were a result of the measures taken for the implementation of the National Biodiversity Strategy and Action Plan, because of:

- * Lack of knowledge and adequate monitoring methodologies, tools and mechanisms and shortage of biodiversity research programs, which resulted in giving fractionated information on the current status of biodiversity components in the Sultanate.
- * Lack of performance indicators for evaluating the progress made in the implementation of the procedures proposed in the Action Plan.
- * Shortage of Government support and investment in building the capacity necessary for biodiversity management, conservation and development.

The measures taken in the National Biodiversity Strategy and Action Plan contribute towards tackling the threats imposed on biodiversity. However, many obstacles and challenges have emerged (see Annex 11) since the ratification of the Strategy's document in 2001 due to the environmental problems resulting from the rapid national development and human interventions. This situation calls for reconsideration and upgrade of the

current Strategy's contents to tackle the new threats imposed on biodiversity. The current Strategy can be developed as follows:

- * Development and creation of more effective coordination and follow up methods and mechanisms for the assessment, monitoring and follow up of the progress made in the implementation of the Action Plan.
- * Carrying out extended consultations with the different Government sectors to gather more information, identify major obstacles and propose more suggestions on moving forward.
- * Consideration of the goals and objectives of the Convention on Biological Diversity and its indicators.
- * Consideration of the importance of achieving solidarity and integration between environmental conventions and biodiversity action plans.
- * Evaluating the current obstacles and challenges and the opportunities included in the strategies and action plans of the Sultanate's different sectors in order to provide the necessary information and data for the new National Strategy project.
- * Complete assessment and inventory of the current status of biodiversity and development of effective monitoring methodologies, mechanisms and indicators for biodiversity components.
- * Developing performance indicators for evaluating the effectiveness of the applied measures.
- * Provision of financial and human resources for the projects proposed in the Action Plan.
- * Enhancing the National Biodiversity Committee which specializes in the comprehensive review and assessment of the Strategy following a preliminary implementation period of five years. The Committee held only one meeting in 2002.

2.8 Information required in the Decisions of the 8th Meeting of the Conference of the Parties

Decision	Achievement
<p>Ministerial Decision No. 8/5 Article 8 (j) on the progress made in achieving national participation by native and local communities</p>	<p>Establishment of the Environment Society of Oman (ESO). ESO carrying out several environmental projects, including coral reef cleaning and buoy installation for fishing boat anchorage to help eliminate the negative impacts on coral reefs. Oman Women’s Society taking part in several environmental projects, including the Mangrove Trees Transplantation Project. Establishment of a society for Al-Batinah farmers to participate in agricultural development projects. Formation of local committees for maritime laws in the coastal Wilayat to involve the community in the management of fisheries and benefit from its knowledge and experience in this field. Involvement of local communities in the management of nature reserves.</p>
<p>Ministerial Decision No. 8/21 (marine and coastal biodiversity – deep seabed) on identifying the activities and operations of potentially harmful impacts on the ecological systems of deep seabed and the immediate management measures of such practices in the ecosystems of threatened deep seabed for the sustainable preservation and use of resources.</p>	<p>There are damaging practices and behaviours by fishermen that harm the ecological systems of the deep seabed and the species in these habitats. Such practices include the uncontrolled dredging by large fishing ships. Therefore, the Sultanate took immediate measures to stop such practices for the sustainable preservation, use and management of fisheries, including:</p> <ul style="list-style-type: none"> -Accession of the Sultanate of Oman to the United Nations Convention on the Law of the Sea (UNCLOS) in 1982. -Approval of the special agreement on the implementation of UNCLOS made on 10 December 1982 regarding the preservation and management of straddling fish stocks in accordance with Royal Decree No. (10/2007). -Adoption of the Agreement to Promote Compliance with International Conservation and Management. Measures by Fishing Vessels on the High Seas, made in 1993, to which the Sultanate acceded in accordance with Royal Decree No. (100/2006). -Implementation of a monitoring plan with a regulatory mechanism. -Implementation of the project of the qualitative and quantitative distribution of marine wealth in the Sultanate. It provides a database on fish and marine species in the Omani waters together with illustrations and scientific references and classifications that ensure they belong to the Sultanate. This project, which ends in 2010, targets about 1,500 species by the end of its plan. -Implementation of research projects to study species of economic importance in the Sultanate. 13 demersal fish species were studied within a plan that provides a database on species biology and

	<p>fisheries in two phases, as well as surface fish, like kingfish, migrating tuna, sardine, <i>Sima</i> and <i>Dhala'a</i>.</p> <p>-Implementation of the kingfish project that aims at identifying species of kingfish in the Omani waters and how connected they are to the stocks in neighbouring countries.</p> <p>-Implementation of the shark management project that aims at evaluating the numbers of sharks and their distribution in the Omani waters and gather the technical and biological data through which a proposal can be made to establish reserves and determine fishing seasons.</p> <p>-Implementation of research projects to study crustaceans, especially lobsters and shrimps. For example, lobster fisheries were studied biologically and morphometrically together with estimations of the current stocks and how affected they are from overfishing. Lobsters were studied in two phases: the first phase included the biological study: measuring the length at the first sexual maturity and using special electronic models and programs to create estimations of the current stock and the hypothetical age of the lobsters. The second phase is complementary to the first phase and included estimation of the lobster stock, status and impacts from overfishing.</p> <p>-Implementation of a survey project for the Arabian Sea fisheries and a joint GCC project for the Arabian Gulf and Oman Gulf to estimate the biomass of benthic resources and build a complete database on marine species and their geographical and quantitative distribution through controlled marine surveys.</p> <p>-Preparation of a regulation for the establishment of commercial fisheries that includes many technical aspects.</p> <p>-Implementation of a project for the management of the fish sector based on the economic species and aiming at rebuilding and increasing the fish stock in Al-Batinah Region and enhancing fishing opportunities by using industrial facilities built in the seabed.</p> <p>-Implementation of several campaigns targeting sea life. These include seabed cleaning across the Sultanate and coral reef cleaning to preserve this integral ecosystem of great economic, social and touristic importance in cooperation with divers from the Ministry of Environment and Climate Affairs, several Government agencies and diving clubs in the Sultanate.</p> <p>-The Sultanate has devoted great attention to commercial fishing, especially dredging. Therefore, specific fishing areas were identified in the Arabian Sea at a distance of 10 nautical miles from Omani beaches and at a depth of more than 50 meters. This procedure is considered a safety net since at there are no coral reefs at this depth.</p> <p>-Controlling incidents of random fishing by identifying unwanted shapes and sizes that negatively affect the marine environment.</p> <p>-From a development perspective, the Sultanate is implementing a number of research and development projects to eliminate current</p>
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	<p>impacts of dredge fishing on fish diversity and the marine environment by improving dredging nets, such as tools for turtle ousting and random fishing reduction. In general, the marine fishing law points out the special attention given by the Sultanate towards the marine environment and how to protect it against all kinds of negative impacts.</p>
<p>Ministerial Decision No. 8/22 (marine and coastal biodiversity – comprehensive management of marine and coastal areas) on measures taken to enhance the implementation of the comprehensive management of marine and coastal areas</p>	<p>Preparation and implementation of a management plan for coastal areas that includes implementing certain projects for every area as well as monitoring and combating beach erosion and restoring beaches.</p> <p>Preparation and implementation of the national plan for the management of coral reefs, which included implementing several projects, like distribution of artificial Reef Balls in selective locations.</p> <p>Preparation and implementation of the national plan for the management and rehabilitation of mangrove trees, which included implementing relevant environmental projects, such as the mangrove trees transplantation project.</p>

Chapter 3. Mainstreaming of Biodiversity Considerations

This Chapter dwells on the integration of biodiversity conservation and sustainable use into directly relevant sector and cross-sector plans, programs and policies of the country. For the purpose of this chapter, communications with leading stakeholders of the country for biodiversity was conducted in order to solicit as much information as possible on how they accept and adopt biodiversity in their systems. SQU represented the academic institution principally from their contribution in the advancement of biodiversity research. Experts were requested for updates of developments in their fields where they unselfishly shared their data for this national report. Ministries of Heritage and Culture, Agriculture, Fisheries Wealth, Diwan of Royal Court and other ministries were contacted. ESO representing the non-government organization was also tapped.

3.1 Extent and Process of Integration

3.1.1 Sector and Cross Sector Integration

Sultan Qaboos University and Ministry of Heritage and Culture. SQU and the Ministry of Heritage and Culture both keep scientific specimens and a limited number of live plant collections. MECA has close working relationship with these agencies in terms of research and formulation of national policies on the conservation of the country's biodiversity. Housed in the Ministry of Heritage and Culture is the National Herbarium where 14,000 plus collections of plant specimens from over 1000 species of plants are kept in their herbarium together with some live plant specimens at the backyard. Within the Ministry is the Oman Museum of Natural History where a large collection of shells, vertebrate and invertebrate skeleton collections and fossils are kept. These are on display for public viewing enhancing people's knowledge of the country's biodiversity. A recently concluded project on classification of marine algae in the southern coasts of Oman had been completed by the museum further adding knowledge on this group. Research projects with the museum and SQU include the country's biodiversity and nature reserves (see Annex 5 for the list). Conduct of research had been coordinated closely with the Ministry where some key technical persons were directly involved as in survey work for the turtles and birds of prey. The museum and university were recently tapped for updating information on MECA's biodiversity list for which they unselfishly shared what they have.

Ministry of Agriculture and Ministry of Fisheries Wealth. These Ministries are in close communication with MECA in terms of consultation on matters pertaining to permitting on use of certain species particularly the endangered ones. Studies and field surveys on plant genetic resources for food and agriculture had been carried out in the Sultanate. Twenty locations of natural pastures covering 171 ha are in the monitoring supervision of the Ministry of Agriculture. The goal of the Ministry is to protect and preserve the diversity of pasture and grasses including the wild plant species and agricultural crops. Local breeds of vegetables are being raised in the farms through the cooperation of farmers. A National Gene Bank was established and developed through a

Seed Technology Unit established by the Ministry. One hundred eighty six varieties of date palm trees together with mango, Omani banana varieties, citrus, medicinal plants, shrubs and trees were housed in the field gene banks of Wilayat Bahla and Wilayat Barka. The Ministry is also working on the propagation of wheat and barley varieties in the hope of obtaining superior varieties of these cereals.

Fishing gear and methods development project had been carried out by the Ministry of Fisheries Wealth taking into consideration the species selective ability of the methods. The Ministry is also involved in lobster fisheries project, shrimps, crustacean and abalone farming and modernizing the fisheries statistical system which are directed towards the conservation of the fishery resources.

Diwan of Royal Court. Occasionally, the Diwan of Royal Court which handles similar environment projects is consulting MECA on biodiversity matters. His Excellency, Sultan Qaboos bin Said is himself an environmentalist and a nature lover. It has become imperative that all his ministers and supporters imbibe the principles of nature conservation in all their programs. All conservation programs pertaining to biodiversity had been supported by the Sultan, with the bulk of budget for the various projects being funded by him. In fact most of the big projects originated in the Diwan, to name a few.....

About 250 heads of Arabian Oryx are being kept in captivity in Jaaluni within the Arabian Oryx Sanctuary (AOS) where 20% of fence completed. A further 250 heads thrive in the Omani Mammals Breeding Center in Barka, Muscat. The project actively participated in a regional initiative to develop strategy for the conservation of Arabian Oryx. Benefited within the AOS are the Arabian Gazelles where they freely graze in the field. The Royal Oman Police were deployed in the area for patrolling purposes.

Currently, the Arabian Tahr is being bred in captivity at the Omani mammal Breeding Center. Rangers of the Office for Conservation and Environment of Diwan set up a "Nature Reserve" in Wadi Serin to conserve the Arabian Tahr. A management plan is being developed for the Wadi Serin Reserve. The rangers are also working closely with rangers of MECA in monitoring the Arabian Tahr in Jabal Qahwan where both are concerned with the protection of the species.

Also bred in captivity at the Omani Mammal Breeding Center, the first group of Arabian Leopard was successfully established in 1985. Both rangers of MECA and Diwan worked with Biosphere Expeditions in the mountains of Mussandam in 2006 and 2007 and in Dhofar in 2008-2009 where populations had been monitored by camera trapping and satellite tracking. The expeditions brought local awareness of leopard conservation.

Quite recently, the Diwan of Royal Court also signed a Memorandum of Understanding with the Earthwatch Institute regarding four programs, two of which are concerning the Arabian Leopard and Arabian Tahr. Though the programs have not started yet, the Memorandum of Understanding will be transferred to the recently created National Centre for Field Studies in Conservation of the Environment. Under the supervision of Diwan is the Oman Botanic Garden (OBG) which targets to complete the checklist of

Plants of Oman. It develops protocols for propagation, cultivation and plant conservation of all native plants. Around 30% of the 261 species of rare and threatened plants of the country are in the ex situ collection of the garden. The garden is also working towards the cultivation and preservation of the genetic crop diversity and documentation of the associated local knowledge. The garden includes conservation and the importance of plant biodiversity into all of its education programs and communications. The garden is part of a regional network of botanic gardens and member of the Arabian Plant Specialist Group. OBG has produced a comprehensive Red List of plants in the Sultanate of Oman. It conducts regular field research. It has propagated 330 species of plants and has grown more than 60,000 plants. A seed bank has been established in coordination with Millennium Seed Bank Project founded by Royal Botanic Gardens in Kew, England.

The Diwan has also been involved with the Sooty Falcon Survey where 10% of the species global population is breeding on the islands in the Sea of Omn. In 2009, surveys were made in Dimaniyat and Fahal Islands revealing 36 and 40 nesting pairs, respectively.

Ministry of Defense. The Royal Oman Police and the military cooperate accordingly on protection measures. Likewise, in the media, a strong promotion program for biodiversity appreciation is constantly being aired or published to reach for a larger public.

Ministry of Information and Ministry of Tourism. Oman's unique wildlife and nature reserves are key attractions of the country and as such are being featured and promoted by both the Ministries of Information and Tourism. They publish the nation's facts and figures in their website and other forms to entice local and foreign tourists and largely to provide general knowledge. Ecotourism in Oman is promoted vigorously by the Ministry of Tourism online, on print media and other venues. The more popular wildlife like the Oryx, Gazelle, Turtle and Leopard and famous places and reserves of the country are focused in the ministry's attractions for ecotourism.

Ministry of Education/Ministry of Higher Education. In cooperation with MECA, the Ministry of Education took the lead in incorporating messages of biodiversity conservation in the curriculum of schools (Grades 1-12) with many schools participating in various environmental awareness programs of the government. At different grade levels, school children are taught of the basics of environment and an appreciation of biodiversity. Beyond grade school, formal courses are offered in the Bachelor of Science program in Environmental Biology at Sultan Qaboos University. In the same university, a Master of Science program in Environmental Science is still in the pipeline. Diploma/BS in Environmental Science program is now instituted at the Higher College of Technology through the Ministry of Higher Education. Though the program's emphasis will be in the applied science aspect of environment, biodiversity courses will still be highlighted.

Environment Society of Oman (ESO). Founded in 2004, it is the sole Omani NGO that supports the government campaign for environment conservation and protection on national scale. ESO has engaged in various projects that enhance environment and

biodiversity awareness that compliment national and regional knowledge and information data base. This NGO has launched research projects on whales, dolphins and turtles in Omani waters and a project on frankincense with government and international supports. ESO engaged itself in educating the public about the importance of Arabian Tahr, native plants particularly trees, economic/aesthetic importance of Oman's cultural and natural landscapes. ESO is instrumental in organizing clean up campaigns and awareness building meetings.

3.1.2 Program Integration

Conservation of biodiversity has become one of the environmental activities of development programs of Oman. It aimed for the best planning and implementation for the benefit of the Omani environment and protection of all its components. In 1974, the Office of the Advisor for Conservation of Environment in the Diwan of Royal Court was established. The Diwan is directly under His Majesty's directive, such office played a role in spreading interest in the environment and natural resources. It initiated the development of Arabian Oryx reintroduction program in Jiddat Al Harasis.

The Ministry of Environment was first established in 1984 which became the Ministry of Regional Municipalities, Environment and Water Resources in 2001 but became a separate Ministry of Environment and Climate Affairs in 2007. The emergence of the 1992 Earth Summit paved the way for the Ministry to be engaged in biodiversity protection. The Sultanate became a signatory to the Convention of Biological Diversity which prompted the Ministry to produce its National Biodiversity Strategy and Action Plan in 2001, a national effort to conserve its biodiversity and the sustainable use of the biological resources. Thereafter, National Reports for the CBD were submitted to meet the requirements as a member signatory country. After IUCN's study on major environmental problems in Oman, the National Conservation Strategy was formulated giving rise to proposals for protecting coastal zones natural resources. Management plans were developed to cover the 3,165 km coasts of Musandam, Al Batinah, Muscat, Sharqiya and Dhofar. In particular, the lagoons or khwars being fragile ecosystems and biodiversity rich areas had received national attention. In fact some of them were proclaimed as protected areas.

Marine habitats of the Arabian Sea coast of Oman include key environments of international significance including,

1. the turtle nesting beaches of Ras Al Hadd and Masirah Island,
2. migratory bird feeding and nesting grounds of Barr Al Hikman,
3. suspected resident, breeding populations of the humpback whale,
4. a unique, monospecific coral reef off Barr Al Hikman,
5. wetlands including mangroves.

A major boost to efforts by the Sultanate of Oman to reduce oil (tar ball) contamination of its coastline was met by the successful submission to the International Maritime Organization (IMO) at the first pass in 2002 for designation of Special Area status for the Arabian Sea coast of Oman. Once the obligations to IMO to provide Reception Facilities and other requirements are met, the Special Area of the Arabian Sea coasts will come into

force. This will allow Oman to issue specific mandatory methods for protection of its marine environment against oil pollution and other discharges from ships and tankers. So far, Oman had been vigilant in monitoring its territorial waters from polluting local, regional and international ships and tankers to protect its sensitive coasts and beaches.

In 1992, UNEP classified Oman as among arid countries in the world having 95.8% of its space being affected by desertification. The Sultanate has identified four regions of desertification: Governorate of Dhofar, Sharqiya Region, Jebel Al Akhdar and Al Wusta Plains. A National Plan for Combating Desertification was developed in 1993 for which RD 8/2003 was passed issuing the law for grasslands and management of animal resources. It required the replanting of deteriorated lands and their protection against overgrazing.

3.1.3 Policy Integration

Being an environmentalist himself, His Majesty's ensured that the laws of the land will address effectively the protection needs of the country's biodiversity. Perhaps, the very first law affecting biodiversity was Royal Decree 38/75 proclaiming Qurum Area as an open protected area followed by RD 26/79 which was about the law of national gardens and protected natural areas. Royal Decree No. 10/82 issued in 1982 proclaims the law on conservation of the environment and prevention of pollution. This law committed the importance and need to provide the greatest possible protection of nation's natural wealth and avoid immediate or long term damage or side effects which may appear as a result of the various development projects to be executed throughout the Sultanate.

In addition, a number of other regulatory legislations were passed that integrate biodiversity, to wit: RD 36/94 establishing the Arabian Oryx Sanctuary; RD 23/96 establishing Dimaniyat Islands Natural Reserve; RD 25/96 establishment of the Turtle Reserve; RD 48/97 established Jabal Samahan Reserve in Dhofar; RD 49/97 established the Khwar Reserves in the Salalah Coast; RD 50/97 established Saleel Natural Park; RD 114/2001 was issued as the law on conservation of the environment and prevention of pollution which superseded RD 10/82; and RD 6/2003 decreed the law on nature reserves and wildlife. In support of Royal Decrees, various Ministerial Decisions were likewise issued particularly on management guidelines for specific proclaimed nature reserves. Protection measures for wildlife through banning of killing, hunting and catching of wild animals and birds was also contained in MD 2/2002.

3.2 Mainstreaming of Biodiversity

For many years, population surveys of Arabian Tahr, Arabian Leopard, Sooty Falcons and Marine Turtles have been conducted providing a wealth of scientific data. Being all flagship species, efforts to monitor had provided protection of other species and the different habitats and ecosystem associated with the species, deemed beneficial for the conservation of biodiversity. In the same light, propagation of 350 Omani plant species which are mostly endemic species and 30 % of which are in rare and threatened status have found a secured habitat in the Oman Botanic Gardens. The Diwan of Royal Court had been instrumental in the implementation of this kind of project.

The opening of Oman Natural History Museum in 1985 had paved the way for public education on biodiversity. Its holdings of herbarium, insects, shell, skeleton and fossil specimens had enriched the museum collections providing materials for display. Visitors, particularly the school children, became more exposed to learning about the country's biodiversity. It also became a venue for conducting valuable research by local and international investigators.

Various fishery projects had also emphasized appreciation of Oman fish resources. There were specific projects on abalone, shrimps, crustaceans, kingfish, sharks, marine algae, fish marketing and others that underscore economic benefits for the fishing communities.

Information on biodiversity conservation has effectively been spread to a larger segment of the society by way of multi-media. It was the fastest way to reach the general public and for them to understand government efforts in conserving biodiversity. Several programs on radio, television and print media had been disseminated. Many documentaries on biodiversity have been featured and had reached both local and international viewers.

3.3 Inclusion of Biodiversity in EIA and Other Assessments

Royal Decree No. 10/82 entitled "Law on Conservation of the Environment and Prevention of Pollution" paves the way for prescribing all development projects of Oman to prepare an environmental impact study. This was further strengthened by R.D. 114/2001 which is the law on conservation of the environment and prevention of pollution requiring a full EIA before an environmental permit is issued. Eight groups of projects had been identified: industrial, mining, agricultural, food, service, marine and coastal, tourism and light industries. The EIA process is based on this particular principle: EIA is a process to help decision makers to protect, conserve and manage Oman's environment according to the principles of sustainable development, thereby achieving or maintaining human well being, a healthy environment and a sound economy.

Baseline study requires listing of all species and habitat types within the project area and vicinities and for which rare and protected species are to be highlighted. Species and habitat types encountered in field surveys as well as from secondary records are presented in the EIA report. Mitigation measures and environmental protection opportunities are presented in the Environmental Management Plan (EMP) reducing potential impacts by the project on biodiversity. The EIAs are thoroughly scrutinized by the Ministry as to its soundness and acceptability before any environmental permit is granted.

Before Environmental Permits are issued, adoption of the EIA requirements had been mandatory for all development projects. Unfortunately, lack of manpower in the Ministry resulted in many projects not being monitored closely. In spite of this, few projects strictly adhered in the implementation of their Environmental Management Plan as evidenced traceable in their progress reports. One outstanding applicant is Sohar Power Desalination Plant who was granted the Final Environmental Permit in 2008. An

initial site visit conducted by the staff from MECA's Directorate of Environmental Affairs evaluated favorably the project's compliance to the conditions set in the permit. They religiously submitted the required quarterly report thereafter. In fact, they were already granted a second Final Environmental Permit which proved their dedication to strictly adhere to the conditions set in the permit. Likewise, Petroleum Development of Oman (PDO) has proved its project's worth to be awarded the environmental permit for oil exploration. They submitted a full-scale EIA to the satisfaction of MECA reviewers and for which a Final Environmental Permit was granted. Such permit is only granted when major issues regarding project implementation are thoroughly addressed.

3.4 Analysis of Outcomes

During the time when the Sultanate of Oman became a signatory of the Convention of Biological Diversity and when it formulated its NBSAP, the country had since then imbibed the concepts and practices in biodiversity conservation. It has become the inspiration of MECA and adopted it in many of its decision-making endeavors to always provide priority and consider the interest of biodiversity in the country. New laws had been created that will perpetually protect and will directly address the needs of the country's flora and fauna. It strengthened further the Ministry's justification in preserving its declared nature reserves by proposing more funding to be allotted for each reserve. It further keeps the eyes of the Ministry in considering other sites for declaring as protected areas realizing that indeed unique biodiversity should be conserved for posterity.

Because of the deepening international interest in biodiversity, MECA's Directorate of Nature Conservation has been leading in addressing the country's quest for conserving its biodiversity. Two years ago, the directorate had redesigned its Biodiversity Department which now comprise four sections:

- 1) Biodiversity Development,
- 2) Combating Desertification,
- 3) Biological Database, and
- 4) Wildlife Rehabilitation and Reproduction Centers.

The Department was instrumental in forging mutual agreements between countries to protect wildlife that are common in their territories to include the Arabian Oryx, gazelles, migratory birds, turtles, whales and dolphins and others. It periodically updates its list of traded species in close consultation with the university, museum and concerned ministries. As a new signatory country to CITES, the Directorate is still in the process of preparation for formulating its policies and guidelines to regulate the trade and transit of protected species. At present, the Directorate lacks support staff and space to accommodate the CITES program hampering its progression. Likewise, the Marine Environment Conservation Department of the Directorate has been regulating the issuance of marine permits that will ensure no heavy tourist use like diving in marine reserves to ensure no disturbance on the coral reefs and breeding fishes. Its deployment to date of over 300 artificial reef masses in Dimaniyat, Fahal Islands and other coastal areas had produced good results in coral reef growth and increase in fish stock. The department

conducts periodic beach clean up in Dimaniyat and Masirah Islands where they actively involve the local citizens through partnership with the Environment Society of Oman (ESO). Such beach clean up events promote good public image for the Ministry and consciousness towards maintaining the integrity of the marine ecosystem.

Oman had been actively participating in the many workshops conducted by the Regional Organization for the Protection of the Marine Environment (ROPME) which include all the GCC countries, Iran and Iraq. Since its inception in 1979, the Ministry has been actively participating in various workshops on topics about the red tide, coral reef, mangrove and mussels. It has tailored most of its marine and coastal programs on ROPME's thrusts.

Three departments in the Directorate (Biodiversity, Nature Reserves, Marine Environment Conservation) all worked together to regularly conduct turtle census in all the marine reserves. However, several years of census data had never been analyzed to become useful for the management of the turtle species in the country nor the voluminous census data on Oryx, Gazelles, Tahr, Ibex, Leopard, Foxes, and others also waiting for attention. The Directorate lacks suitable technical staff to handle the processing of wildlife census data. On similar light, baseline data on biodiversity generated by almost all the EIA reports submitted to MECA had not been organized nor analyzed. These data could have already served as kick off information on biodiversity of important sites in the country.

Recently, the directorate published new editions of the Nature Reserves in the Sultanate of Oman and A Field Guide to the Larger Wild Terrestrial Mammals of Oman to update data and information in the publications. These publications target the general public to promote the appreciation of the country's nature reserves and wildlife. ESO likewise published books for appreciating biodiversity which include *The Native Plants of Oman* by Clive Windbow, *Landscaping with Omani Wild Trees* by David Insall, *Birdlife in Oman* by Hanne and Jens Eriksen and *The Natural History of Oman* by Martin Fisher.

Perhaps biodiversity conservation had already been built-in in the culture of MECA for quite sometime. Such culture is also assumed already existing in SQU which lives by its laurel and prestige as the country's top academic institution. Apparently, other ministries may just be starting to feel or internalize the key importance of biodiversity in their system instead of just for the sake of abiding biodiversity laws of the country. Credit should be due to non-government entities like the ESO that boldly advocated for the conservation of biodiversity but fully supporting the government's program. Thus, it is implied that there will always be consciousness to inject biodiversity importance on matters that will be beneficial for the Oman environment. Though moving at a slow phase, it is envisioned that goals to conserve Oman's biodiversity would still be attained in the very near future.

Chapter 4. Conclusions

Table 7 below and Annex 5 summarize the estimated progress towards the biodiversity targets of Oman for 2010. A discussion of these results is given below:

Table 7. Progress towards the 2010 Biodiversity Target for the Sultanate of Oman.

Goals and targets	Progress towards the target	Activities	Achievements	Level of Assessment
Protect the components of biodiversity				
<i>Goal 1. Promote the conservation of biodiversity of ecosystems, habitats and biomes</i>				
Target 1.1: At least 10% of each of the world's ecological regions effectively conserved			The summed area of the 15 declared nature reserves of the Sultanate corresponds to at least 2.6% of the country's territory. Recommended 55 other areas are in the process of review and evaluation with strongest support by stakeholders for Barr Al Hikman and Jabal Akhdar being proposed as nature reserves.	
Target 1.2: Areas of particular importance to biodiversity protected			CITES permitting system for the country is presently being established. Guidelines for biosafety and bioprospecting are equally being attended to as well.	
<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			Twenty percent completion of fencing of the Arabian Oryx Sanctuary; a new management plan is being developed for the Oryx in a fenced area. Regular monitoring by rangers of Office for Conservation of the Environment (Diwan) of one of the three main populations of Arabian Tahr, a management plan is currently being developed; Arabian Leopard population is being monitored by camera-trapping and satellite tracking; Oman Botanic Garden has propagated 350 of the 1200 species of Omani flora.	
Target 2.2: Status of threatened species improved			So far, the population of Oryx in captive condition has grown in numbers that breeding program was temporarily discontinued for economic reasons. Until a new management plan is formulated for the species, a definite site then will be identified to reintroduce captive bred animals. Data for captive breeding other protected species are unavailable to make safe conclusion on their	

	status.
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Goal 3. Promote the conservation of genetic diversity

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	Twenty-four Omani cultivars of Dates (<i>Phoenix dactylifera</i>) are being studied in the Date Palm Research Center of the Ministry of Agriculture; other crops in their research program include different varieties of Oman mango, wheat, barley, chickpea and annual/perennial forages.
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Promote sustainable use

Goal 4. Promote sustainable use and consumption

Target 4.1 Biodiversity-based products derived from sources that are sustainably managed, and production areas managed consistent with the conservation of biodiversity	Majority of the country's agricultural lands are managed in a sustainable manner whereby different varieties of crops are better utilized and conserved. Research institutions such as SQU and the Ministry of Agriculture and Fisheries were instrumental in preserving various accessions and cultivars.
Target 4.2 Unsustainable consumption, of biological resources, or that impacts upon biodiversity, reduced	MECA and MAF are still struggling to contain rampant bad practices in fishing where fishermen occasionally catch turtles and dolphins; overgrazing by camels, cattle, goats and feral donkeys had threatened many species of vegetation and competed with local wildlife; over harvesting of trees and bushes causing desertification.
Target 4.3 No species of wild flora or fauna endangered by international trade	It is forbidden in the country to hunt, kill, take, possess or trade wildlife. Isolated reports on local wildlife hunting for food (i.e., turtles, gazelle, Houbara Buzzard) poaching) or for falconry (certain eagles and falcons) are received by authorities, further reducing the species' population and abundance.

Address threats to biodiversity

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

Target 5.1 Rate of loss and degradation of natural habitats decreased	Screening of development projects through EIA filter had at least halted the unwanted destruction of wild habitats and wildlife therein
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Goal 6. Control threats from invasive alien species

Target 6.1 Pathways for major potential alien invasive species controlled	At least practiced in Salalah, Dhofar Governorate is the uprooting of Mesquite (<i>Prosopis juliflora</i>) on areas invaded by this species, so far the practice had been sustained and able to control Mesquite population. .
Target 6.2 Management plans in place for major alien species that threaten ecosystem, habitats or species	Management plans for declared nature reserves and other wilderness areas specified strict prohibition of introducing exotic species but only endemic or native species are considered, i.e., reforestation or landscaping. It is now being followed. This is also being practiced in the implementation of the Environmental Management Plan as an EIA requirement.

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

Target 7.1 Maintain and enhance resilience of the components of biodiversity to adapt to climate change	MECA imposes a 50-300 m setback lines for development on beach areas to protect coastal biodiversity as contained in a ministerial decision. It is also a caution for any expected sea level rise. Efforts to reforest mangroves in certain <i>khwars</i> through intensive transplantation activities have brought some success. Thus, restoring the integrity of important lagoons in the country despite the felt impact of world climate change.
Target 7.2 Reduce pollution and its impacts on biodiversity	New EIA requirement from the MECA has expanded to include impact of projects on climate which generated consciousness on how pollutants may affect biodiversity and climate; its strict implementation at least now guarantees reduction in use pollutants

Maintain goods and services from biodiversity to support human well-being

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

Target 8.1 Capacity of ecosystems to deliver goods and services maintained	So far, there has been a freely flow of delivery of goods and services in the country. Except for the case of the marine ecosystem whereby several incidences of algal bloom had occurred in the Sea of Oman which resulted in many fish kills. Scientists are still studying for reasons why the red tide phenomenon happened in marine environment.
Target 8.2 Biological resources that support sustainable livelihoods, local food security and health care,	Honey collection from bee farms and in the wild have supported local livelihoods but on very limited scale.

especially of poor people maintained	
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Protect traditional knowledge, innovations and practices
Goal 9. Maintain socio-cultural diversity of indigenous and local communities

Target 9.1 Protect traditional knowledge, innovations and practices	Full respect on traditional knowledge and practices had been afforded to the local people particularly on their production and harvesting methods.
Target 9.2 Protect the rights of indigenous and local communities over their traditional knowledge, innovations and practices, including their rights to benefit-sharing	Fully respected and adopted, local communities are properly consulted whenever there will be planned developments in their areas and where their interests are at stake.

Ensure the fair and equitable sharing of benefits
<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 CBD and its relevant provisions	Farmers have access to the different varieties of crops as recommended by the Ministry of Agriculture.
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 CBD and its relevant provisions	Completed researches on genetic resources studies conducted at SQU and Ministry of Agriculture and Fisheries are published accordingly. Publications are available at their libraries and copies are also sent to concerned government agencies, academe and NGOs.

Ensure provision of adequate resources

<i>Goal 11. Parties have improved financial, human, scientific</i>
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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	MECA receives its share of allocations from the Ministry of Finance to fund its proposed projects on a five-year basis. In turn, MECA has to distribute the funds to various directorates to support approved projects. For the period 2005-2008, DGNC projects on establishment and maintenance of wildlife breeding center and nursery and support of NBSAP's
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Article 20	various activities for Oman obtain the funding.	
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	Technology generated from research findings in SQU and MAF are published and shared to various government agencies and NGOs. SQU and UNESCO forged a MOA on marine biotechnology transfer. SQU also cooperates with international institutions (universities and research councils) on exchange of technologies.	

4.1. Progress Towards the 2010 Target

Table 7 above and Annex 5 list the degree of accomplishments of the different projects that were identified in the NBSAP of 2001. In general, efforts to conserve biodiversity had been rewarding but still progressing through the country's protected areas where protection of endangered species in both terrestrial and marine habitats had been in the range of 45-65 percent accomplishment.

Most recent addition to Oman's nature conservation law was R.D. 6/2003 *Law on the Conservation of Nature Reserves and Wildlife*. It further reinforced the nation's program for protecting biodiversity in the reserves. New areas have been recommended for declaration as reserves but are still awaiting implementation. Protection of endangered species through *ex situ* conservation has been actively engaged into by leading stakeholders from the Government and NGO's. The Oman Botanic Garden, Oryx Captive Breeding Centre and Oman Zoo are established under the management of the Diwan of Royal Court. Elsewhere in the country small-scaled captive stations have been set up where Gazelles, Arabian Tahr, and other wild mammals are kept.

Monitoring activities for marine life, fisheries, terrestrial and aquatic vegetation were struggling because of certain administrative difficulties. Initial conservation efforts included the issuance of guidelines for Environmental Impact Assessment (EIA) submission with details on biodiversity required from baseline surveys, assessments and suggested mitigations of impacts on flora, fauna and habitats. The adoption of EIA in many project developments in the country has been in the system for nearly 30 years. The passage of R.D. No. 10/82 entitled *Law on Conservation of the Environment and Prevention of Pollution* outlined the need for EIAs for development projects. When projects proliferated, it was fortified by the imposition of R.D. 114/2001 (see Article 16). Thereafter, the EIA system has been embraced and formalized by the many sectors of the government. There was the realization that biodiversity conservation should be built into many environmental projects. In addition to these safeguards, other efforts include the publication of materials to appreciate the country's biodiversity and the reserves, and the attendance of Ministries at International Conventions on biodiversity conservation.

Sound farming practices especially on water conservation techniques, arresting soil erosion and the use of safe pesticides and chemical fertilizers have been addressed in the agriculture sector. A Directorate-General office was created to address animal

production and quarantine needs. Gene banks for leading crops, pasture and grass species were designated for safe keeping and posterity.

Greater efforts on sewage treatment such as the Muscat Waste Water Project and efforts to avoid the discharge of wastes in *khawrs* in Batinah and Salalah coasts have been addressed to promote a better environment.

The recent institution of the Oman Research Council has paved the way to pursue interest in scientific research including the country's biodiversity. Currently, SQU leads in biodiversity research with an appreciable accomplishment in basic investigations. A coordinated research effort among stakeholders is still to be seen.

4.2 Progress towards the Goals and Objectives of the Strategic Plan of the Convention

The country is well aware of its responsibility to conserve its biodiversity as signified in its promulgated laws pertaining to the protection of the national reserves, its flora and fauna and other resources. Even for non-declared reserves, the Government has expressed its serious concern in protecting the integrity of Oman environment. MECA employs full time rangers to patrol and protect important wilderness areas such as the landscapes and seascapes of Musandam, Masirah Island, Barr Al Hikman, Hallaniyat Islands and many other places. However, collective efforts of rangers have not entirely halted intruders that poach on plants, animals, artifacts in their areas of responsibility. Problems on logistics, lack of training and dedication to work, ambiguous programs for the rangers are among the causes that hamper the proper execution of their duties.

Many sectors of the government and non-government entities had actively participated in the campaign to conserve its national treasures. Various projects and efforts had been implemented which highlighted the importance of biodiversity in particular and environment in general. However, obstacles had hampered the realization of goals and objectives of such efforts. Among the obstacles indicated are insufficient coordination between agencies and also the regional cooperation, insufficient funds and manpower to pursue programs and projects, not enough sectors to conduct research on biodiversity, lack of monitoring and evaluation scheme, outdated management plans and limited participation by local communities. Perhaps, all these obstacles are resulting from a half-hearted will power of concerned entities or from limited understanding of the relevance of biodiversity.

4.3 Conclusions and Recommendations

Oman has welcomed the implementation of the agreements of CBD. Adopting the message of the convention in the country was not an easy task but it was absorbed gradually in many government sectors. Perhaps, some sectors are still hesitant to totally acquire it or perhaps some are still in the process of acceptance.

Among the successful or near successful actions engaged by the country are the following: mangrove reforestation project, captive breeding of some endangered species,

establishment of a botanic garden, selected researches on biodiversity, consideration of biodiversity in EIAs and assessments and incorporating biodiversity conservation in education. Capacity building in the form of training is still not a priority yet and a long way yet to realization.

More relevant workshops and conferences on biodiversity conservation in the national level should be encouraged. In-house workshops for biodiversity projects should be a regular activity of concerned directorates. Strong research cooperation among government and non-government agencies as well as with neighboring countries or region will be required.

MECA should take the leadership in upholding the desire of the country to conserve its biodiversity. It should be able to coordinate efforts of various stakeholders to serve the interest of the Sultanate. The Ministry should prioritize its recommended reserves and be able to institutionalize them as soon as possible. Management Plans should be a requirement before a reserve is declared as a protected area. In the case of existing Management Plans these should be revised or updated in order to best respond to the needs of the reserves. There is need for more realistic and acceptable budgets for the reserves. It is imperative that the Ministry invest in manpower development for capacity building. Similarly, a program to address the needs of captive breeding and other *ex situ* facilities of Oman should be implemented.

An intensive campaign utilizing the media would also be a great help to promote the national program of biodiversity conservation. The Ministry of Tourism and Ministry of Information should take the lead in this campaign alongside with other government bodies. The future success of all management efforts still lies with the quality of research output for which SQU is leading in this endeavor. Other interest groups should be expected to actively participate in defined research programs that are hoped to generate management applications for conserving the country's biodiversity.

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Appendix 1 – Information concerning reporting Party and preparation of national report

A. Reporting Party

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Date of submission	

B. Process of preparation of national report

H.E. Minister Hommoud bin Faisal Al Busaidi, Minister of Environment and Climate Affairs in Oman, issued a Ministerial Decree No. 33/2009 dated 08 August 2009 for the formation of a working team to prepare the CBD-Fourth National Report. The team was composed of the following:

- Mr. Salem Al Saadi, Director, Biodiversity Department, DGNC; team leader
- Dr. Roberto P. Rubio, Nature Reserve Expert, DGNC; member
- Dr. Barry P. Jupp, Marine Pollution Monitoring Expert, DGEA; member
- Ms. Thuraya Al Sariri, Director Marine Environment Conservation Department, DGNC; member
- Dr. Ahmed Al Saidi, Nature Reserve Specialist, DGNC; member

Mr. Ahmed Al Shukaeli, Section Head, Rehabilitation and Breeding Center, Biodiversity Department, DGNC; member
Mr. Saleh Al Nahamoosh, Section Head Biodiversity Department, DGNC; member
Mr. Salem Al Rubaei, Nature Reserve Specialist, DGNC; team editor

The initial meeting of the group discussed the process to be adopted following the guidelines of the CBD for the Fourth National Report. The team met every day for about two hours in the first week to finalize the responsibility of the members. All the governmental agencies which are biodiversity related have been asked to submit their activities report on Biodiversity implementation as it mentioned in the NBSAP. Writing of Chapter 1 required the contacting of leading experts (see Appendix 2) working on their specific species groups and requesting them for their inputs/contributions for the report. For uniformity, a format of response was forwarded to them. Contacted experts were given a month to send in their responses after which their inputs were consolidated and integrated mainly in Chapter 1 and partially in other chapters.

In Chapter 2, the parties were requested to provide an overview of progress made in the implementation of priority activities or actions as well as a review of successes and obstacles encountered in the implementation. Since the implementation of the strategy is a multi-sectoral activity, therefore, official letters had been sent to all sectors concerned for the provision of the following information:

- Progress made in the implementation of projects or activities related to the strategic and a brief description of the current status.
- A description of the extent to which biodiversity has been integrated in each sector.
- The main obstacles encountered during the implementation and the action has been taken to overcome the obstacles identified.

As a requirement of the Ministry, an Arabic version of the whole Report is currently being prepared.

Appendix 2 - Further Sources of Information

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Appendix 3. Annexes

Annex 1. Proposed Strategic Options and Priority Measures

No.	Subject		Number of proposed strategic option	Number of priority measures
1	Conservation of natural resources	Protected areas	11	5
		Threatened species	7	4
		Conservation outside the parameters of natural environments	11	2
2	Terrestrial and freshwater species		2	1
3	Marine species and fisheries		17	7
4	Terrestrial and aquatic plants		9	4
5	Agricultural resources		11	24
6	Energy resources		11	1
7	Mineral resources		5	3
8	Industry, technology and services	Biotechnology and biosafety	4	1
		Tourism	2	1
9	Urban environment		7	5
10	Water resources		15	8
11	Environmental emergencies		3	1
12	Participation of local communities and the Private Sector		5	2
13	Social values	Awareness, guidance, education, research and training	6	3
		Environmental Impact Assessment EIA	3	1
		Institutional and legal framework	4	4
14	Quality of life		10	3
15	Spiritual values		2	1
Total			145	81

Annex 2. Oman Biodiversity Strategy and the Convention on Biological Diversity

Subject	Priority measures for achieving the proposed goals	Convention on Biological Diversity
<p>1. Conservation of natural resources</p> <p>a. Protected areas</p> <p>b. Threatened species</p> <p>c. Conservation outside the parameters of natural environments</p>	<p>a. Issuing the proposed legislation for nature conservation areas.</p> <p>b. Review and implementation of management plans for current protected areas.</p> <p>c. Defining new protected areas.</p> <p>d. Economic assessment of resources.</p> <p>e. Establishment of a national database.</p> <p>f. Developing a national program for assessment and recovery of endangered species.</p> <p>g. Application of the Red List criteria.</p> <p>h. Establishment of a plant genetic resources center.</p> <p>i. Identifying and gathering species in need of protection to grow or multiply.</p>	<p>Articles (1, 8, 9)</p>
<p>2. Terrestrial and freshwater species</p>	<p>a. Establishment of a national database on ecosystems, nature conservation areas and threatened species.</p>	<p>Articles (1, 8, 9)</p>
<p>3. Marine species and fisheries</p>	<p>a. Preparation of a comprehensive plan for monitoring, controlling and combating commercial fishing.</p> <p>b. Developing a program for the management of certain targeted fish species.</p> <p>c. Drawing up guidelines on the import of exotic species for fish culture processes.</p> <p>d. Management of coastal areas – implementation of certain projects in each area.</p> <p>e. Management of coastal areas – monitoring and combating beach erosion and restoring beaches.</p> <p>f. Encouraging and supporting fish research and statistics.</p> <p>g. Enhancing productive management and marketing in the fish sector.</p>	<p>Articles (1, 7, 9, 10)</p>
<p>4. Terrestrial and aquatic plants</p>	<p>a. Enhancing services of pasture management, forest rehabilitation and combating desertification.</p> <p>b. Plant survey and assessment of the current status of desertification.</p> <p>c. Management of pastures and forests in the Southern Region.</p> <p>d. Stabilizing and re-plantation of sand dunes.</p>	<p>Articles (1, 7, 9, 10)</p>

5. Agricultural resources	<ul style="list-style-type: none"> a. Establishment of a plant genetic resources center. b. Establishment of a specialized Department or DG of animal production and health and a veterinary laboratory for the production and import of serums and training Omani employees. c. Adoption and implementation of education and management systems that consider environmental aspects. d. Studying soil and plant pollution resulted from utilization of agricultural lands. e. Reclamation of agricultural lands and rationalization of the use of irrigation water. f. Conducting studies on agricultural management. g. Comprehensive development of Al-Najd area in Dhofar. h. Enhancing research on new and alternative crops. i. Implementation of a trial project on organic agriculture. j. Livestock and meat marketing. k. Helping farmers to increase productivity and conserve water resources. 	Articles (1, 7, 9, 10, 14)
6. Energy Resources	<ul style="list-style-type: none"> a. Developing a program for compensating the locations of natural habitats affected by energy exploration and transport activities. 	Articles (10, 11)
7. Mineral resources	<ul style="list-style-type: none"> a. Feasibility study and expenses and benefits of making existing national industries and mining more compatible with environmental sanitation. b. Drawing up environmental guidelines for mining activities. c. Preparation of an action plan for the treatment of Sohar Mine waste. 	Articles (7, 9, 10, 14)
8. Industry, technology and services a. Biotechnology and biosafety b. Tourism	<ul style="list-style-type: none"> a. Preparation and implementation of a biosafety strategy and action plan according to the International Protocol on Biosafety. b. Conducting an economic feasibility study on tourism in Oman. 	Articles (15, 10, 32)
9. Urban environment (cities)	<ul style="list-style-type: none"> a. Benefiting from and building on the success of the Residential Strategy and the Family Planning Program. b. Regional land use plans. c. Incorporating environmental considerations in socio-economic planning. 	Articles (1, 6, 7, 8, 9, 10)

		<p>d. Developing a road construction policy that complies with environmental requirements.</p> <p>e. Studying the current and future potential environmental risks of urban developments to create alternatives for building healthy and sustainable urban communities.</p> <p>f. Following the guidelines of the Ministry of Regional Municipalities and Environment on land use and new constructions and the protection of landscape locations and traditional buildings.</p>	
10. Water resources		<p>a. Development of agricultural reformation.</p> <p>b. Studying, evaluating and monitoring Regional water resources.</p> <p>c. Development of groundwater resources.</p> <p>d. Preparation and implementation of drought emergency plans.</p> <p>e. Expansion of the range of wastewater collection, treatment and reuse processes.</p> <p>f. Implementing a system for water portioning and distribution per sector (including the environment).</p> <p>g. Preparation and implementation of procedures for the management of demand on irrigation water by wells.</p> <p>h. Development of agricultural reformation to improve water use effectiveness and boost economic returns.</p> <p>i. Raising public awareness and implementing educational programs to promote Government environmental policies.</p>	Articles (1, 9, 10, 12, 13)
11. Environmental emergencies		<p>a. Uniting and enhancing organizational responsibilities for the management of natural disasters.</p>	Articles (9, 10, 12)
12. Participation of local communities and the Private Sector		<p>a. Program for motivating initiatives on biodiversity conservation and management.</p> <p>b. Defining procedures for compensation and most adequate incentives that lead to the protection of the environment.</p>	Article (11)
13. Social values		<p>a. Environmental awareness program</p> <p>b. Supporting academic (fundamental) research at Sultan Qaboos University in the conservation and use of natural resources, environmental activities and public health.</p> <p>c. Establishment of a central laboratory for scientific and environmental analyses.</p>	Articles (12, 13)
14. Quality of life		<p>a. Incorporating natural resources accounts in the</p>	Articles

	<p>Sultanate's national accounts system.</p> <p>b. Incorporating environmental considerations in socio-economic planning.</p> <p>c. Setting up vocational health services at the Ministry of Health.</p>	(6, 9, 10)
15. Spiritual values	a. Incorporating the concept of biodiversity conservation in the current Islamic studies.	Articles (12, 13)

Annex 3. Aims and Objectives of the Action Plan for Protected Areas

Aims	Objectives	Accomplishments
Aim 1-1: Establishing and enhancing the national and regional systems of protected areas.	By 2010: Creating a highly-adequate and integral global system for protected areas, based on a national and regional system and contributing in: 1)- the objective of the Strategy of the United Nations Sustainable Program, 2)- the development aims of the millennium, and 3)- the global strategy on flora conservation.	Noticeable accomplishment: 15 nature reserves were established on an area of about 9,000 square km, 3% of the Sultanate's area. Work is underway to establish more nature reserves.
Aim 1-2: Incorporating protected areas into terrestrial and marine landscapes and into sectors related to the conservation of ecosystems.	By 2015: All protected areas shall be connected to terrestrial and marine landscapes through applying the ecosystem methodology.	Slight accomplishment: three protected areas were established that include terrestrial and marine landscapes, they are: Turtle Reserve, Al-Dimaniyat Islands Reserve and Jabal Samhan Nature Reserve.
Aim 1-3: Establishing and enhancing regional networks for protected areas between neighbouring countries and joint cooperation for the management of these joint protected areas.	By 2010: Regional networks for protected areas shall be established among neighbouring countries.	There are regional trends, especially in GCC countries, to establish joint protected areas and cooperation. Work is still underway in this regard.
Aim 1-4: Significant improvement in the planning and management of protected areas.	By 2012: All protected areas shall have effective management used extensively in location planning on scientific basis to include: - aims and objectives of biodiversity; - administrative strategies; - monitoring programs; and - long-term management plan.	Modest accomplishment: Not much progress has been made in developing effective, scientifically-based management plans for protected areas.
Aim 1-5: Elimination and mitigation of the negative impacts	By 2008: An effective mechanism shall be developed to identify, eliminate and mitigate the	Tangible accomplishment: Several environmental legislations were made,

from the main threats on protected areas.	negative impacts from the main threats on protected areas.	most importantly Royal Decree No. (6/2003) on Nature Reserves and Wildlife Conservation.
Aim 2-1: Encouraging equal division of returns from the sustainable use of biological resources.	By 2008: Developing effective mechanisms for equal division of returns and costs of establishing nature reserves.	No mechanisms developed to accomplish this objective.
Aim 2-2: Enhancing the participation of native local communities and stakeholders.	By 2008: Achieving complete and effective participation of native local communities with full respect and recognition to their rights and responsibilities in accordance with the National Law and the current international obligations and involving relevant stakeholders in the management of existing protected areas and the establishment and management of new ones.	Modest progress has been made in involving local residents in the design and implementation of management plans for protected areas. However, the governmentGovernment of Oman is continuously working with local residents to establish new protected areas across the Sultanate's Regions. Thus, there is a current trend to establish around 50 new nature reserves, which reflects the Sultanate's keen interest in biodiversity conservation. Moreover, wildlife rangers for the current monitoring units were selected from areas inside the parameters of nature reserves and from adjacent areas, which also reflects the Sultanate's devotion towards involving the local residents in conservation activities.
Aim 3-1: Providing an enabling policy and a socio-economic institutional environment for protected areas.	By 2008: Policies related to biodiversity conservation shall be reviewed, including the use and implementation of evaluations and socio-economic incentives to provide a supporting environment that leads to the establishment of and more effective management of protected areas.	No tangible progress has been made in this respect despite the formulation of a national committee under Royal Decree No. (6/2003) for proposal of policies for preservation of nature reserves and conservation and management of wildlife.

<p>Aim 3-2: Capacity building in the planning, establishment and management of protected areas.</p>	<p>By 2010: Implementation of comprehensive programs for capacity building for individuals, communities and institutions.</p>	<p>Tangible progress has been made in the area of capacity building. Members of national manpower in the field of biodiversity conservation have been given numerous training courses and workshops as well as international conferences and meetings.</p>
<p>Aim 3-3: Development, application and transfer of adequate technologies within the parameters of protected areas.</p>	<p>By 2010: Adequate technologies shall be transferred for effective management providing that a noticeable progress is made bearing in mind the resolutions of the Conference of the Parties on Technology Transfer and Cooperation.</p>	<p>No tangible progress has been made in the area of technology transfer due to lack of a proper mechanism.</p>
<p>Aim 3-4: Provision of financial support for national and regional protected areas in a sustainable manner.</p>	<p>By 2008: Provision of financial resources, technology and other resources to ensure sufficient and effective management of national and regional protected areas.</p>	<p>Noticeable progress has been made in this respect. A development budget has been earmarked in the national development plan for biodiversity development and management in the Sultanate. It includes requisites like monitoring equipment, administrative and financial independency for nature reserves and capacity building in nature conservation.</p>
<p>Aim 3-5: Enhancing communication and public education and awareness.</p>	<p>By 2008: A noticeable progress shall be made in educating the public on the importance of protected areas.</p>	<p>A tangible progress has been made in this respect. In 2008, for example, 195 items on the environment and nature conservation were broadcasted, including live and recorded radio interviews, as well as 98 news reports on the local news and programs, the issuance of 37 issues of <i>Man and the Environment</i> magazine and its</p>

		supplement <i>Friends of the Environment</i> from 2001 to 2009, printing numerous leaflets and canvas bags and organizing several educational exhibitions.
Aim 4-1: Development and adoption of standard practices for national and regional protected areas.	By 2008: Standard practices shall be developed for successful planning, selection and management of national and regional protected areas.	A tangible progress has been made in this area. The standards for selection of nature reserves have been defined in Royal Decree No. (3/2006) and guidance was sought from the IUCN report on proposed protected areas in Oman. Moreover, consideration was made of the IUCN standards of protected areas.
Aim 4-2: Evaluation of management quality of protected areas and methods of improvement.	By 2010: A methodology for monitoring and assessment of management quality of protected areas shall be adopted and implemented.	No progress had been made in this regard due to insufficient institutional capacities in these areas.
Aim 4-3: Evaluation and monitoring of the status quo of biodiversity in protected areas.	By 2010: Establishment of national and regional systems for enabling effective monitoring of ecologies in protected areas and assessment of the status quo of biodiversity as well as assisting in the evaluation of the progress made in fulfilling the objectives of the CBD.	
Aim 4-4: Validating the contribution of scientific knowledge in the establishment and effectiveness of protected areas.	By 2010: Scientific knowledge shall be developed regarding protected areas to contribute in the effective establishment and management of such areas.	

Annex 4 Global Strategy for Plant Conservation Targets and objectives

Targets	What has been achieved
<p>Target 1: Develop a Widely Accessible Working List of Known Plant Species as a Step Towards Conservation of a Complete World Flora.</p>	<ul style="list-style-type: none"> • Lists of the names of plants targeted and exposed to various risks, including overgrazing, and such plants have been stated in the lists according to the importance of compiling them as of high/medium/less significance, by referring to the competent authorities and scientists in this field. 68 genetic entries had been collected including 28 species of local grass, trees and shrubs. Plant samples were collected with the aim of documenting and developing plant diversity. • A project to develop and prepare plant diversity in the Sultanate was implemented. • A Guide to wild herbal plants species and varieties in the Sultanate was prepared for the use in identification of species and varieties that were inventoried in the various regions of the Sultanate so as to prepare the plant genetic resources distribution map.
<p>Target 2: A preliminary assessment of the conservation status of all known plant species at the national, regional and international levels.</p>	<ul style="list-style-type: none"> • A preliminary assessment and breeding project of collected genetic resources was initiated to provide the appropriate genetic material for researchers and interested persons, as well as for exchange with the local and other international institutions, where an experiment for assessment and breeding of the seeds of (<i>Cenchrus ciliaris</i>, <i>Coelachyrum piercii</i>) which was collected during the program of compilation of genetic resources in collaboration with ICARDA was conducted. Phase one primary objective is to produce seeds for the purpose of use in re-vegetation and future rehabilitation. • A Field Gene Bank in Plant Genetic Resources was established. • Plant genetic resources for crops, fruits, forage trees and plants, medicinal and aromatic plants was inventoried and compiled. • A project to renew the cultivation and breeding of crop seeds and plants was carried out so as to maintain its vitality as a natural source of genes

	<p>for such plants.</p> <ul style="list-style-type: none"> • A project to exploit of genes and desired traits in the wild species in the different field researches and experiments was implemented.
<p>Target 3: Development of models with protocols for plant conservation and sustainable use, based on research and practical experience.</p>	<ul style="list-style-type: none"> • Several studies and researches on plant biodiversity and development of methods and means which will contribute to the sustainability were conducted, for example the following researches were conducted: • Conservation of the <i>Juniperus excelsa</i> forests in Hajr Mountains of northern Oman. The results of this research were published by the researchers D. M. Fischer, D. A. S. Gardner, and D. S. A. Ghadhanfar. • A research project on the protection and conservation of populations of olive trees in the northern Oman Hajr Mountains supervised by Dr. Reginald Victor. • Research projects were implemented to select local grass species and their productivity of green material per unit area compared to the different irrigation systems. • Implementation of improved Omani wheat breeds program. • Implementation of research projects to test different grass species under conditions of non-living environmental stresses (salinity and temperature) and living environmental stresses (insects and diseases). • A project was implemented to describe medicinal and aromatic plants so as to compile information on traditional medicine practice. • A project was implemented to equip and update the gene bank of palm trees in Wadi Quriyat, so as to preserve, prepare and update the Omani genetic fingerprinting of date palm local breeds and varieties in addition to complete the compilation and re-afforestation of varieties in the current gene bank.
<p>Target 4: At least 10% of each of the world's ecological regions effectively conserved.</p>	<ul style="list-style-type: none"> • A genetic resources laboratory project was implemented and the infrastructure necessary to equip the current laboratory was provided. The laboratory will carry out testing to describe and determine the seed vigor. The laboratory will also

	<p>contain seeds and plants' parts storage facilities for several periods of time, in addition to the possibility of separation, drying and processing of seeds grains and others.</p> <ul style="list-style-type: none"> • A program to collect and classify target seeds of grass and legume forages in Dhofar in collaboration with the International Center for Agricultural Research in Dry Areas (ICARDA) was finalized within the Arabian Peninsula Regional Program (APRP). During which 11 target locations in Salalah, Raikhyout and Dhalkout were covered and 40 of the seeds and plant samples were collected.
Target 5: Protection of 50% of the most important areas of plant diversity in the world is assured.	<ul style="list-style-type: none"> • Rehabilitation of varieties and species threatened with extinction or degradation due to overgrazing or some bad practices. In north Oman, an area of 40000 m was planted and this area was fenced in Majees, Kobbarah and Dhanaq. In Dhofar Governorate there are about 25 enclosed areas, of which nearly 22 were planted with 175 thousand local and forage trees and shrubs. A complex was established for germplasm, which covers 10 acres, to grow all local existing species and for the purpose of collection and conservation of such species and germplasm as well as seed production.
Target 6: At least 30% of production lands managed consistent with the conservation of biodiversity.	<ul style="list-style-type: none"> • A program to collect and classify target seeds of grass and legume forages, local trees, and shrubs in collaboration with the International Center for Agricultural Research in Dry Areas (ICARDA) was finalized within the Arabian Peninsula Regional Program (APRP).
Target 7: 60% of the Worlds' endangered species conserved in situ.	<ul style="list-style-type: none"> • A Law on the Protection of Agricultural Derivatives was issued. • consultative meeting on sustainable use of plant genetic resources and conservation to the plant genetic resources experts in cooperation with the concerned international organizations was organized. • Law on Agricultural Quarantine was issued. • Agriculture Law was issued; it ensures amendment and organization of the crop structure in the Sultanate and protection of the local plant

	genetic resources from degradation and thus protection of its biodiversity.
Target 8: 60% of threatened plant species in accessible ex-situ collections, and 10% of them included in rehabilitation and breeding programs.	<ul style="list-style-type: none"> • Oman Botanic Garden was established in 2006 on an area of about 420 hectares to assist in reversing what was lost of traditional knowledge of plants and protect plant in the Sultanate. It was developed to conserve and display researches of plants and traditional knowledge related to plants in Oman, which became a destination for local and international visitors as it is considered a center for learning and entertainment. • A team of botanists had carried out 100 field trips over two years to the various regions of the Sultanate to collect plants, samples, seeds and seedlings. The Oman Botanic Garden was capable, through two years of work, of growing and including 327 plant species. The horticultural team was also capable of cultivation of 51500 plant were accommodate in the new nursery on the garden site, which includes four plastic tubes to grow plants, (2) greenhouses, administration offices, flowers nursery and plants breeding nursery. It is now considered the largest documented Arab collection of plants in the world. • National Herbs and Plants Reserve was established. It includes 14500 samples of vascular plants (monocotyledons and bicotyledon) in addition to other families such as algal (algae), water algae (mosses), seaweed and fungi.
Target 9: 70% 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"> • Seeds and Plant Genetic Resources Laboratory which aims to collection, conservation and sustainable use of plant genetic resources was established. • To prepare and provide genetic resources necessary data through development of database inputs to ensure the safekeeping and use by all specialists and interested in this field, and avoid duplication of work. • A project to equip and update the Palm gene bank in Wadi Quriyat was implemented, which aims to maintain, prepare and update the Omani genetic fingerprinting of date palm local breeds and varieties in addition to complete the compilation

	and re-afforestation of varieties in the current gene bank.
Target 10: Management plans in place for at least 100 species of major alien species that threaten plants and their natural habitats.	<ul style="list-style-type: none"> • Several programs and campaigns were implemented to eradicate the <i>Prosopis juliflora</i> trees.
Objective 11: No species of wild flora endangered by International Trade.	<ul style="list-style-type: none"> • All exported plants shall be subject to the provisions, laws and procedures of the Convention of International Trade in Endangered Species of Wild Flora and Fauna (CITES).
Target 12: 30% of plant-based products derived from sources that are sustainably managed.	<ul style="list-style-type: none"> • Medicinal and aromatic plants description project was initiated, which aim to collect information on herbs and medicinal plants associated with the practice of traditional medicine, as well as the preparation of fragrances and traditional beauty accessories. • A research project was conducted on the effectiveness of the use of some sub-tropical plants components as insecticide to the white flies larvae (<i>Bemisia Tobaci</i>) by the use of the leaves and seeds juice of eight plant species as a natural insecticide to avoid the adverse impacts of the use of pesticides on crops and underground water.
Target 13: The decline of plant resources and associated indigenous and local knowledge and innovations that support sustainable livelihoods, local food security and health care, halted. >	<ul style="list-style-type: none"> • Seed Technology Unit was established in the Sultanate with the following main objectives: <ul style="list-style-type: none"> ▪ Support agricultural development and provide an important part of the basic requirements of the vegetation cover, in cooperation with the International Center for Agricultural Research. ▪ Organize activities related to seeds such as export, import and propose laws organizing them. ▪ Link local institutions with their related seed technology regional and global counterparts. ▪ Prepare development programs to maintain the endangered Omani

	<p>varieties of seeds.</p> <ul style="list-style-type: none"> ▪ Unite the efforts of the public and private sectors in the field of seeds research.
<p>Target 14: The importance of plant diversity and the need for its conservation incorporated into environmental education and public awareness programs.</p>	<ul style="list-style-type: none"> • Many radio programs related to conservation of biodiversity were broadcasted, in addition to that (37) editions of Man and The Environment magazine and its supplement Friends of the Environment were issued during the period from 2001 to 2009, which contain educational materials dealing with the field of conservation of plant diversity, a lot of pamphlets and bags were printed, in addition to the many awareness exhibitions.
<p>Target 15: The number of trained people working in facilities for plants conservation is increased.</p>	<ul style="list-style-type: none"> • The training Omani cadres in the field of plant genetic resources was initiated, which aims to qualify a number of Omani cadres to carry out all activities related to conservation and sustainable use of plant genetic resources.
<p>Target 16: Networks for plants conservation activities established or strengthened at the national, regional and international levels.</p>	<ul style="list-style-type: none"> • Fence plants were increased which amounted to 26 fences in a total area of 780 acres in most parts of the Governorate of Dhofar. This had led to significant impact by keeping many of the herbs and shrubs in their habitats. • The establishment of nature reserves to protect native vegetation, for example, Jabel Samhan Nature Reserve and Al Saleel natural Park.

Annex 5. Progress made in the Implementation of the Projects included in the National Biodiversity Action Plan

Strategic Target	The rate which has been achieved				Progress made in implementing the action plan projects
	>45%	45%-65%	65-85%	<85%	
: Conservation of Natural Resources (Protected Areas)					
Issue regulations and provide funding and implementation sources and mechanisms to the current protected areas management plans					<ul style="list-style-type: none"> Royal Decree No. 6/2003 issuing Law on the Conservation of Nature Reserves and Wildlife. Ministerial Decision No. 3/2002 organization the Khawrs Reserves of Dhofar Coast. Ministerial Decision No. 55/2006 organization Turtles Reserve. Ministerial Decision No. 56/2006 organization Dimaniyat Islands Nature Reserve. Ministerial Decision No. 110/2007 issuing the Executive Regulations of the Law on the Conservation of Nature Reserves and Wildlife. Poor progress in the implementation of the nature reserves management plans due to lack of financial resources. Wildlife rangers were appointed from the nature reserves local population so as to be involved in the conservation of nature and wildlife. Some of the protected sites were contracted to the private companies to invest in under supervision of the ministry and recruitment of staff from the local population.
Monitoring and control of biodiversity, including the assessment of the natural and human resources in protected areas.		√			<ul style="list-style-type: none"> Establishment of 44 rangers units for regular monitoring activities of wildlife in general and filling out wildlife watching cards during the rangers work. Preparation of scientific reports on some endangered species. An ongoing program to inventory and tag sea turtles. Wild animals bred in captivity tagging project.
Monitoring of harmful invasive species and elimination.		√			<ul style="list-style-type: none"> Several studies and meetings between the concerned authorities were

					held to discuss the problem of invasive species.
Monitoring National Scenic Reserves, in particular the impacts of human activities to ensure that such activities do not adversely affect the fundamental features of their ecosystems.					<ul style="list-style-type: none"> • A unit to protect wildlife and monitor human activities consisting of (7) rangers in Al Saleel Natural Park was established. • A section to assess development projects was established by Ministerial Decision No. (154/2006) concerning the organizational divisions of the Ministry of Environment and Climate Affairs and assessing the environmental impacts of development projects on nature reserves.
Expanding the establishment of rangers units and capacity development by education and learning through training programs.					<ul style="list-style-type: none"> • Establishment of 44 rangers units for monitoring and conservation of wildlife in the various regions of the Sultanate equipped with the necessary equipment, in which (187) wildlife rangers and (10) reserves' supervisors work. • number of training courses and workshops to train rangers were conducted.
Start conducting studies to assess the traditional conservation systems.					<ul style="list-style-type: none"> • There is no study on the assessment of traditional conservation systems.
Restoration of the degraded habitats within the protected areas and the adjacent corridors and lands.					<ul style="list-style-type: none"> • Work is under way on implementation of three projects to combat desertification. • Work is under way on propagation of local wild flora in order to pave the way for their reforestation.
Expansion of local population participation in the management, designing and preparation of the natural conservation areas.					<ul style="list-style-type: none"> • Wildlife rangers selected from within or around protected areas, will be involved in the management of nature reserves. • Local population sometimes will be involved in proposal of natural sites to be proclaimed as nature reserves.
Increase the environmental and socio-economic values of protected areas by raising the benefits of the population within and around these areas.					<ul style="list-style-type: none"> • Selection Process of wildlife rangers always from within the local communities. • There is an increase in the socio-economic values to the local population within and around the Turtles Reserve, Al Saleel Natural

					Park, the Arabian Oryx Sanctuary, and Jabel Samhan Nature Reserve.
Develop measures necessary for specifying the legal responsibilities and liabilities related to the control of human activities within the protected areas.					<ul style="list-style-type: none"> • Royal Decree No. 6/2003 issued the Law on Conservation of Nature Reserves and wildlife. • Ministerial Decision No. 3/2002 organizing The Khawrs Reserves of Dhofar Coast. • Ministerial Decision No. 55/2006 organizing the Turtle Reserve. • Ministerial Decree No. 56/2006 organizing the Dimaniyat Islands Nature Reserve. • Ministerial Decision No. 110/2007 issuing the Executive Regulations of the Law on the Conservation of Nature Reserves and Wildlife.
Develop criteria for the control of the establishment of protected areas (with particular reference to the vulnerable ecosystems).			√		<ul style="list-style-type: none"> • Royal Decree No. 6/2003 issued the Law on Conservation of Nature Reserves and Wildlife, which organizes the mechanism of proclaiming protected areas, and which included the formation of a committee from the concerned authorities to study projects submitted by the Ministry concerning nature reserves. • A national study in collaboration with the World Conservation Union (IUCN) was conducted on priority areas of ecological importance. • The standards of the IUCN on nature reserves were taken as guidance.
: Conservation of natural resources (threatened species)					
Carry out regular monitoring activities to endangered species.					<ul style="list-style-type: none"> • Establishment of 44 rangers units for monitoring and conservation of wildlife in the various regions of the Sultanate equipped with the necessary equipment, in which (187) wildlife rangers and (10) reserves' supervisors work. • Establishment of a rangers unit which consists of (7) wildlife rangers within the Arabian Oryx Sanctuary to protect and monitor the Oryx (<i>Oryx leucoryx</i>). • Establishment of a rangers unit within Sareen Reserve to monitor and protect the Arabian Tahr (<i>Arabitragus jayakari</i>). • The Arabian Leopard was monitored, especially in Dhofar Governorate by camera trapping and Satellite tracking. A survey was conducted to

				<p>see the natural occurrence of the Arabian Leopard in Musandam Governorate during the period (2006-2007) and in North East Mountains of Dhofar Governorate during the period (2008-2009). This survey confirmed the existence of the Arabian Leopard in Dhofar Governorate, but there is no evidence of its presence in Musandam Governorate.</p> <ul style="list-style-type: none"> • Establishment of a rangers unit within the Turtles Reserve to monitor, protect, inventory and tag turtles nesting on the reserve beaches. • Establishment of a rangers unit within the Dimaniyat Islands Nature Reserve to monitor human activities in the reserve. • Establishment of a ranger unit within Al Saleel Nature Reserve to protect and monitor the Arabian Gazelle and the tree and vegetation cover spreading in the reserve. • Establishment of a ranger unit within Jabel Samhan Nature Reserve to protect and monitor the Arabian leopard, as well as wild flora and trees in the reserve. • Establishment of a ranger unit in Jabel Qahwan, As Sharqiyah Region to protect and monitor the Arabian Tahr. • Filling more than one hundred thousand wildlife watching cards. • Tagging more than one hundred thousand turtles in Ras Al Hadd Turtle Reserve. • Continue implementation of the Arabian Oryx reintroduction project in the Arabian Oryx Sanctuary in Jalouni, Al Wusta Region, where about 250 animals currently were reintroduced, and a new sanctuary management plan was developed. So far, 20% of the sanctuary was fenced and a number of wildlife rangers to monitor and inventory within the sanctuary were appointed.
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Develop and examine proposals for local wild animals breeding and reintroduction in areas where their numbers declined.		√			
Application of protection measures to the rare endangered and exposed to extinction flora and fauna species.					<ul style="list-style-type: none"> • Royal Decree No. 6/2003 issued the Law on Conservation of Nature Reserves and wildlife • Ministerial Decision No. 110/2007 issued the Executive Regulations of the Law on Conservation of Nature Reserves and wildlife. • Ministerial Decision No. 101/2002 prohibiting killing, hunting or capture of wild animals and birds. • The wildlife rangers in the Arabian Oryx Sanctuary and Royal Oman Police shall protect the Oryx. • The wildlife rangers in the Turtles Reserve shall protect the nesting sea turtles on the reserve beaches. • The wildlife rangers in Jabel Samhan Nature Reserve shall protect the Arabian leopard and the local plants and trees. • The wildlife rangers in the Dimaniyat Islands Reserve shall protect the coral reefs and birds nesting sites in the reserve. • The wildlife rangers in the Sareen Reserve shall protect the Arabian Tahr. • Oman Botanical Garden was established to conserve Omani native plants, where until now about 30 rare and endangered plants were bred.
Monitor illegal trade in live mammals, apply procedures governing the prevention and tighten their control.		√			<ul style="list-style-type: none"> • This is done by both the Ministry of Agriculture and the Ministry of Environment and Climate Affairs.
The Sultanate accession to the Convention on International Trade in Endangered Species of Wild Flora and Fauna, and the Convention on Migratory Species (CMS).		√			<ul style="list-style-type: none"> • The Sultanate acceded to the Convention on International Trade in Endangered Species of Wild Flora and Fauna in 2007. • So far it did not accede to the Convention on Migratory Species (CMS).

Halt the development and activities that threaten critical natural habitats.		√				<ul style="list-style-type: none"> Omani laws do not allow the establishment of any development project in critical natural habitats and an environmental impact assessment study is required to each project taking into consideration the critical natural habitats and others.
Identify certain areas of protection within the settlements' centers.	√					<ul style="list-style-type: none"> Jabel Samhan Nature Reserve to protect the Arabian leopard and some endemic local plants. Jabel Qahwan and Sareen areas to protect the Arabian Tahr.
Establishment of a National Database.						
: Conservation of natural resources (ex-situ conservation)						
Develop licensing procedures, operation and periodic inspections regulations to licensed zoos and wild animals' private properties.	√					<ul style="list-style-type: none"> This is done by both the Ministry of Agriculture and the Ministry of Environment and Climate Affairs.
Strengthen private crop plants genes banks.		√				<ul style="list-style-type: none"> Establishment of the range plant genetic field in the Sultanate of Oman in the General Directorate for Agricultural Research of the Ministry of Agriculture in Rumais. Establishment of a number of genes fields/ bank for fruit trees such as palms, dates, mango, lemon and banana and deciduous fruit trees.
Establishment of a center for plants genetic resources.		√				<ul style="list-style-type: none"> Create Seeds and Genetic Resources Research Laboratory in the General Directorate of Agricultural and Animal Research.
Implement a project to collect seeds from the different regions of the Sultanate during various seasons.	√					<ul style="list-style-type: none"> Several projects have been implemented with some local bodies such as Sultan Qaboos University.
Conduct local studies on the ex-situ, semi-natural and artificial conservation methods to Omani plants species.	√					<ul style="list-style-type: none"> This event has not been completed in a regular manner.
II: Land and fresh water biology						
Consider the possibility of the Sultanate to sign the Convention on Migratory Species (Bonn Convention).						<ul style="list-style-type: none"> Not signed yet.
III: Marine Biology and Fisheries						
						<ul style="list-style-type: none"> In this regard some research studies in collaboration with the Ministry of Fisheries Wealth and experts in the Faculty of Marine Science,

<p>Ensure that current levels of fishing and practices will not damage the marine environment and will be sustainable, and in particular attention shall be given to fishing practices of large predatory fish such as sharks and kingfish.</p>	√			<p>Sultan Qaboos University. These research studies were designed to support our knowledge of the large species of bony fish and cartilaginous, evaluate their stock through evaluation parameters such as determining the breeding seasons and other biological features. Annex 13 reviews summary of the study of Kingfish and Annex 14 reviews the study of sharks.</p> <ul style="list-style-type: none"> • The Sultanate of Oman has endeavored to ensure sustainability of fisheries and protect the environment in which they live through the issuance of various laws and regulations governing fishing practices. <p><u>Fishing equipment and methods:</u></p> <ul style="list-style-type: none"> • Prohibition of the use of bottom trawling method to catch demersals fish. • Decision to regulate fence nets on small pelagic fish by determining the fishing practice period and prohibition of their use in mangrove growth areas, coral reefs, khawrs and their entrances. • Prevention of the use of explosives and toxic materials...etc. • Prevention of the use of nylon nets (Scorpio) and mesh nets in fishing. • Work is under way on implementation of a consultancy study on the economical and environmental feasibility of using the method of fence net on large fish. • In the field of protection of marine resources, the Sultanate of Oman has fixed fishing seasons for economically important fish species such as lobster, shrimp and abalone. • The Sultanate of Oman is currently considering the application of fisheries management plan for kingfish and sharks and dissemination at the regional level. Marine Fishing Law prohibits separation of shark fins on boat or beaches so as to prevent misuse. • The Sultanate of Oman is examining ways to prepare shark fisheries protection national plan. It should be noted that the Ministry of Fisheries Wealth is in the process of finalizing the preparation of new regulations for the Marine Fishing Law which will address many issues that concern the environmental aspect in the practice of fishing.
<p>Reduce the levels of fishing undesired species in particular (dolphins and turtles), especially in areas of high density such as Ras Al Hadd, Masirah and Barr Al Hikman.</p>	√			<ul style="list-style-type: none"> • Issue of a legal legislation under the Royal Decree (6/2003) concerning the Law on Conservation of Nature Reserves and Wildlife, prohibiting

				<p>hunting of endangered species, which include marine life (dolphins and turtles).</p> <ul style="list-style-type: none"> Monitoring and conservation of marine life is carried out by Marine Environment Conservation Department of the Ministry of Environment and Climate Affairs in collaboration with the Ministry of Fisheries.
<p>Improve methods of handling and storage of fish (to use ice on ships for example).</p>		√		<ul style="list-style-type: none"> The Sultanate of Oman has made great steps in the methods of handling fish at all stages from the beginning of fishing through landing sites, fish transport and marketing. Here are some aspects that have been done in this context: The Ministry of Fisheries Wealth has issued regulations and legislations concerning the organization of the fisheries sector in terms of quality control such as Fish Quality Control Regulations No. (12/2009), Regulations on Terms and Conditions and Specifications of Vehicles Transporting and Marketing living Aquatic Wealth No. (29/2004), Terms and Conditions of commercial fishing vessels equipped for preservation and handling of fish and their products No. (121/98) and the Ministerial Decision No. (7/2001) on the Controls Governing the manufacture, sale, purchase and import of fishing boats and vessels. The Ministry of Fisheries Wealth has also set up the necessary infrastructure such as facilitating the construction of fishing ports and their annexes, providing support to fishermen to get fishing boats in conformity with the requirements of quality control and provision of fish keeping boxes. The Sultanate of Oman, believing in the importance of fish quality control and to ensure the proper application of the quality control concepts, has established the fish quality control center, which carries out direct supervision so as to implement the quality control regulation and legislations. Research projects were implemented such as determination of the fish quality in the areas of landing, companies and fish processing factories to improve the quality of fish in the Sultanate, and the control project on the presence of heavy metals and chemical contaminants in the marine biological system in the Sultanate, a summary of (Annex 15). The Sultanate has exerted many efforts to maintain the quality of fish in the Sultanate, through the adoption of the quality control standards and conditions including the use of ice on vessels and during handling of fish in the landing areas, during processing and marketing.

				<ul style="list-style-type: none"> • Support fishermen with equipment that helps to maintain fish quality, such as fish preservation box. • Encourage the establishment of ice plants in the Sultanate.
<p>Encourage fishing in deep water to ease pressure on fish stocks in coastal waters.</p>	√			<ul style="list-style-type: none"> • As it is known in most of the world's seas, the fishing activity is concentrated on the continental shelf up to 200 meters depth, which is characterized by an abundance of fisheries biodiversity. This led to the degradation of many fish stocks and the nature reserves were affected accordingly. Consequently the Sultanate of Oman enacted legislation to organize fishing practices and thus developed decisions to enforced such as requiring trawlers fishing up to depths of more than 10 miles, also to incorporate the policy of encouraging companies operating in the commercial fishing sector to adopt projects of high seas fishing in the coming plan of the Ministry of Fisheries, and this is based on preliminary results of the fishery resources survey project in the Arabian Sea, which came out with initial results of the availability of fish stocks off the coast of Oman in the Arabian Sea to depths far away. • Sultanate of Oman has introduced a fishing fleet, i.e. the new coastal fishing fleet, where it started giving licenses to operate fishing vessels ranging in length from 14 - 30 meters in order to relieve pressure on inshore fisheries at distances of less than 8 nautical miles, especially as these spaces are utilized by almost 14000 artisan fishing boats in addition to the 672 artisan fishing vessels. • The middle-scale fishing units support project (25-28 feet) and the boats support project (28-36 feet) serve this goal through the introduction of larger boats with suitable fishing equipment in locations off the sites where artisan fishers have resulted in great pressure and depletion in some locations. • The reduction of the use of illegal fishing has a deep impact in the selective production of fish stocks in such a manner that serves stocks, preserves small fish, and raises the efficiency of these tools so that large fish of high-quality can be picked. In this field studies were conducted to develop fishing gear (Annex16). With respect to the use of nets in fishing lobster, the study has come with appropriate recommendations for fishing lobster (Annex 17).

<p>Reduce the use of illegal fishing gear such as trawls and nets and to use nets in catching lobster and fishing in other seasons is a common practice resulting in catching females particularly lobster.</p>	<p>√</p>			<ul style="list-style-type: none"> • The reduction of the use of illegal fishing has a deep impact in the selective production of fish stocks in such a manner that serves stocks, preserves small fish, and raises the efficiency of these tools so that large fish of high-quality can be picked. In this field studies were conducted to developed fishing gear (Annex16). With respect to the use of nets in fishing lobster, the study has reached appropriate recommendations for fishing lobster (Annex 17). • Prohibition of the use of drift and mesh nets in fishing, also the use of explosives, toxic materials and others was also banned, and the fishing of lobster is authorized by cages only during the fixed and authorized season.
<p>Prepare and implement a plan for monitoring and control of commercial fishing (MCS). Development of a pilot project to such plan with the aim of preparation of a national system for the control of commercial and occupational fishing with a system of fines that benefits the plan and to be used for development, training and guidance purposes.</p>	<p>√</p>			<ul style="list-style-type: none"> • Control over the fisheries plays an important role in maintaining fish stocks, where control teams prevent violations of the fishermen through the ongoing monitoring patrols and apprehension of offenders, seizure of illegal fishing gear and illegal catch of marine resources. • Destruction of prohibited equipment and methods. • All violations to be referred to the judicial authorities. • All fines to be referred to the concerned government authorities. • Control of the vessels means determining to what extend commercial fishing vessels are committed to laws and regulations prescribed by the Ministry of Fisheries Wealth and this can be done through: • Direct control system by assigning one or more observers to monitor the vessel during its voyage. • Control by satellite using remote sensing (VMS) ,which is one of the modern control systems, and according to the plan; the system has been applied in the first phase on commercial fishing vessels and will be applied in the later stages on coastal fishing vessels.
<p>Identify and protect high commercial value fish breeding areas, such as kingfish and demersal species.</p>				<ul style="list-style-type: none"> • For demersal fish, the protection of this marine wealth depends in particular on following the system of setting seasons and determining fishing effort in line with the quantity available for exploitation. • The Sultanate is exerting great efforts to implement biological and

				<p>statistical research for several significant demersal fish species, which are aimed at by the fishing activity in particular, such as rock-cod, scavengers, and others.</p> <ul style="list-style-type: none"> The results of studies and researches were used in taking appropriate action to protect the stock.
Increase the marine protected areas, ensure that the current and future protected areas are managed efficiently and provide the necessary funding sources.	√			<ul style="list-style-type: none"> Only one marine reserve so far was proclaimed, i.e. the Dimaniyat Islands Nature Reserve. There trend of the decision-maker in the Sultanate is to increase the area of nature reserves.
				<p>The Sultanate of Oman has given special attention to the marine environment through the enactment of environmental laws and legislations, conducting research and studies and preparing plans to protect the marine environment. The ministry has taken great steps in the protection and conservation of marine biological resources through implementation of coastal zone management plans as follows: --</p> <ul style="list-style-type: none"> Implementation of the coral reefs management plan, by launching coral reefs cleaning campaigns, where (5) campaigns in various coastal areas were implemented. Installation of mooring buoys for boats, where (28) buoys were installed, as follows: 12 buoys in Bandar Khairan, 10 in the Dimaniyat Islands Reserve, 4 in the Governorate of Musandam (Khawr Sham). Implementations of the mangrove habitats management and rehabilitation plan. Marine environment monitoring project, which is based on taking annual samples from the marine environment in the various governorates and regions of the Sultanate and the analysis of such samples to monitor pollutants and compare them with previous results

Implement the Coastal Zones Management Action Plan Project.	√			<p>so as to determine the marine environment status.</p> <ul style="list-style-type: none"> • Evaluation of applications for various development projects to be set up in the marine environment, give technical comments on environmental impact assessment studies of such projects and development of the necessary requirements to reduce environmental impact. • team will carry out periodical inspection to the Sultanate beaches to prevent any illegal actions and also will organize inspection campaigns by boats to the shoreline so as to monitor the diving clubs and ensure that the divers adhere to the terms and conditions. • A working group was formed to study the causes of mass mortality of marine mammals so as to develop a contingency plan for the study of the causes of marine mammals' mortality and a database on the incidents of marine mammals' mortality. • The ministry has developed expertise of a number of staff working in the field of rehabilitation of mangrove forests' habitats, where 5 staff members were send to Japan to develop their national capacities in the field of conservation and rehabilitation of mangroves' forests. • 20 Employees were trained in the field of diving so as to participate in coral reefs cleaning campaigns.
				<ul style="list-style-type: none"> • The Sultanate of Oman studies the Environmental Impact Assessment (EIA) so as to issue environmental permits to coastal projects. • Issuance of a Ministerial Decision No. (40/2009) concerning the Regulations for Controlling Diving outside the Parameters of the Marine Areas, where the ministry is issuing (3) types of permits to practice diving activity as follows: <ul style="list-style-type: none"> • Permits to practice diving activity to the clubs.

Support and develop eco-tourism and sustainable use of coastal areas.	√				<ul style="list-style-type: none"> • Individuals annual diving permits. • Individual diving permits. <p>Regulations organize the tourism activity to those who practice diving in the marine environment.</p>
Development of the national expertise in the field of coastal and marine environment, natural resources management, and establishment of effective control units.		√			<ul style="list-style-type: none"> • The Sultanate of Oman has developed the expertise of a number of staff working in the field of rehabilitation of mangrove forests' habitats, where 5 staff members were send to Japan to develop their national capacity in the field of conservation and rehabilitation of mangroves' forests. • 20 Employees were trained in the field of diving so as to participate in coral reefs cleaning campaigns.
Study and document the marine experiences and practices.					<ul style="list-style-type: none"> • The Ministry of Fisheries Wealth collects data from all the Sultanate coastal Governorates and regions to document the traditions and customs of local artisan fishing sector, and work is under way on the revision and the publication of these traditions and customs. • Preparations are under way for the formation of local marine traditions committees in the Sultanate's coastal Wilayat, which will include in their membership a group of elder fishermen, some of them are accredited traditions men while others are sheikhs and dignitaries. The Ministry of Fisheries Wealth seeks the assistance of this entire group when it intends to adopt a decision organizing artisan fishing, where it requests the opinion of these committees prior to the issue of a decision, then it examines such opinions and make appropriate amendments to the decisions and then issue them. The assistance of these committees is also sought to educate fishermen in all matters of interest to the artisan sector, whether regulatory or administrative. • This is an indication of involvement in the management of fisheries resources including the Ministry of Fisheries, beneficiaries and employees in the sector. For example, the local marine traditions committees requested change in the lobster fishing season to be in March and April of each year, after they noticed in the catch of the

					<p>previous fixed season that there was a presence of lobsters loaded with large quantities of eggs and some of them are small and not suitable for fishing; therefore a ministerial decision was issued to set a new fishing season, which in the opinion of local marine traditions committees, is more appropriate.</p>
Establishment of a network for monitoring coral reefs and other coastal vulnerable habitats.		√			<ul style="list-style-type: none"> In of the threats that the coral reefs confronting due to their growth and the deterioration of some coral colonies due to natural or human conditions, the ministry has implemented a project (the artificial coral reefs) to create an alternative system to the lost habitats of the coral reefs by deployment of almost five hundred artificial coral reefs moulds in Al Fahal island and the Dimaniyat Islands. The project was successful.
Protection of the marine habitats that support fish production (especially coral reefs, sea grass and mangroves).		√			<ul style="list-style-type: none"> Mangroves are the most important environmental features that characterize the marine environment in the Sultanate, because they are one of the important natural resources that maintain the environmental balance and homes for many other marine organisms, in addition to that they are considered areas of scenic value. In order to preserve mangrove trees in the Sultanate and conserve them from deterioration, the ministry has implemented Mangrove trees Implantation and Khawrs Rehabilitate Project as follows: <ul style="list-style-type: none"> Establishment of four permanent nurseries in Muscat Governorate, Dhofar Governorate and As Sharqiyah South region. Rehabilitation of several khawrs and implantation of trees in various regions, where almost 420,000 thousand seedlings were implanted.
Conduct a study on the potential impacts of climate change on the coastal habitats including beaches, sand, marshes, mangroves and coral reefs.		√			<ul style="list-style-type: none"> Scientific researches to study the impact of climate change on mangrove environments, including the following: <ul style="list-style-type: none"> Al-Saidi, A. 2009. Observational studies of canopy-scale variation in the microclimatic diverse of photosynthesis. Doctoral Thesis, Kagoshima University. Pp.157. Al Saidi, A., Fukuzawa, Y., M., Baba, S and Kawamitsu, Y. 2009. Temporal and vertical variations in photosynthesis diverse in mangrove

<p>Encourage fishermen to choose production techniques and appropriate services without affecting their competitive activity</p>	<p>√</p>			<p>canopies, Okinawa, Japan. Plant Prod. Sci. 12: 336-340.</p> <ul style="list-style-type: none"> • The Ministry of Fisheries Wealthis endeavoring to aware artisan fisherman and develops techniques and methods of fishing for him. • Provision of the necessary support so as to develop the fisherman potentialities and raise the value of his productivity, where support is provided to him to obtain boats equipment that helps in maintaining the quality of fish such as the fish keeping box, together with fishing assisting equipment such as lever and depths detector. • The implementation of several research projects, in which the Ministry of Fisheries Wealthto provide support to fishermen in the form of larger fishing boats equipped with all necessary equipment to increase production, reduce waste and improve the quality of the product, as well as navigational devices, and this is provided by both projects that support medium fishing units (25- 28 feet) and boats support project (28-36 feet). In addition to the equipment support project which assist in fishing operations and fish marketing, which supports the artisan fisherman, and the latter project supports fish transporters by providing them vehicles with automatic refrigeration that maintains the quality of the fish for longer periods and help to raise the value of this product. • Adoption of the idea of providing support, provided that the support is directed especially to full-time fishermen, who are differentiated by the Ministry of Fisheries Wealthfrom those who consider the profession of fishing no more than a hobby and a source of additional income beside their jobs in the government or private sector. • The accuracy of statistical data has an important role in the preparation of the development and research plans and programs, therefore the Ministry of Fisheries Wealthincluded fishery statistics in its priorities by developing it and studying its impediments and challenges. This was started by implementation of a project updating the statistical fishery system as a platform for the development of the fisheries sector; find attached herewith the project objectives and executive summary (Annex 17). • the Ministry of Fisheries Wealthpaid great attention to the research and the provision of fishery statistics, as this aspect is considered an
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Enhance and support fishery research and statistics		√			<p>important pillar that supports actions and building legislation for the sustainability of fish stocks and good exploitation, and perhaps the establishment of the Directorate-General for Fisheries Research and its research centers in addition to a fishery statistics department are the significant proof of this interest.</p> <ul style="list-style-type: none"> • The agricultural development and fisheries fund is one of the main pillars in this respect as it provides financial support to fishery researches and studies and thus it is a major contributor in this context. • The Ministry of Fisheries Wealthover the past five years conducted many studies on fish markets in order to assess the shortcomings inherent in the present market structure and explore the willingness of the Omani industry to accept some changes, and the Ministry of Fisheries' studies included two elements: Description and evaluation of the structure of the fish markets in the Sultanate and the statistical analysis of prices in different markets to assess the degree of integration between these markets. • The establishment of a new wholesale fish market in order to provide to fishermen sales opportunities in the Sultanate, and in turn provide similar opportunities to the exporters, manufacturers, truck drivers and traders. • The research programs and projects implemented by the Ministry most of them are based on deriving determinants, including the identification of the studied species breeding seasons, assessment of the current stock, and knowledge of the fisheries situation whether there is depletion (over fishing) or not, and what are the patterns that will ensure preservation and conservation of these fisheries and types of over fishing, where the legislation and provisions should be built on scientific grounds and this can be through the implementation of research projects and to make sure of the problems under discussion. Fisheries Research is a first series of the policy formulation and application of the systems necessary to preserve the fishery, followed by the application of the recommendations of the projects implemented in accordance with the vision of decision makers, taking into account other social, economic aspects and all the consequences of implementing such recommendations.
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Strengthen the productivity management and marketing in the fish sector	√			<ul style="list-style-type: none"> • Examples of such projects: phase one of the demersals study projects addressed seven species, i.e. rock-cod, meagre, grey mullet, cutlass fish, santer bream, cuttlefish and scavenger, and phase two addressed six species: silver grunt, marbled spinefoot, scad, siah, natal sea bream and soldierbream, as well as the study of lobster, shrimp, sea cucumber and octopus fisheries, and the Sultanate has carried out many programs and studies within its priorities to the issues facing the fisheries sector on which legislation and administration are based. • Scientific studies have confirmed the need to take immediate and urgent measures so as to remedy the situation which has become alarming in this important fish resource. Recommendations to ban hunting abalone for three years were raised and have become a reality with the collaboration of the other competent authorities (financial, legislative). • Fishing seasons have been fixed for a number of economically important fish species such as lobster and shrimp. • Abalone fishing to be halted for three years (2008-2010) to re-assess the status of the stock, determine appropriate action and the type of proper management. Studies and surveys conducted on abalone stock confirmed huge decrease in the annual catches of abalone due to the deterioration of the stock resulting from the fishing targeting it in such a manner contravening the season of its breeding, as well as its fishing methods, techniques and equipment. • Develop appropriate administrative measures for the protection of sea cucumber fisheries. • The Sultanate currently is studying implementation of kingfish fisheries management plan and dissemination at the regional level due to its migratory nature. • Work is under way to prepare a shark fisheries protection national plan, based on the results of studies and scientific research being conducted. • Ban of the use of trawling to catch demersals species • The introduction of any fish species not found in the Omani environment requires the approval of the Ministry of Fisheries, where some of the Articles of the Regulations for aquaculture and farmed fish
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Preparation of a program for the management of some targeted fish species		√			<p>quality control in Article (10): Aquaculture licensed institutions is prohibited to farming fish not present in the Omani environment unless after obtaining a permit from the concerned authority.</p> <ul style="list-style-type: none"> • Article (9) states that: Licensed imported fish for fish farming must meet the following conditions: • To be produced under the supervision of a scientific or professional institution. • Be accompanied with a certificate of origin, health certificate showing they are free of diseases issued by a government veterinary agency in the country of origin and authenticated by the Embassy of the Sultanate of Oman in such country or any other entity acceptable to the concerned authority. • Be subject to the procedures of the veterinary quarantine and monitoring by the concerned authority, when reaching the Sultanate of Oman. • Small imported fish must be placed into separate pools, as determined by the concerned authority for each batch, so as to prevent the spread of disease to the rest of farmed fish. • The report on the National Strategic Plan for Sustainable Development in the Sultanate of Oman, which had been prepared by FAO in September 2007 indicated that one of the possible ways of fish farming is to create a species of fish in water bodies outside the natural boundaries or in areas of natural boundaries of stocks of natural fish different from the farmed stocks in terms of genes, what is so-called genetic mobility. • Oman is characterized by the abundance and diversity of fish stocks, where there are more than 1000 species of fish and various marine organisms, but according to the studies and surveys conducted in the Omani waters there is a large number of species, which can be divided according to a number of grounds, including the structural composition of the species, where the estimates of the fish stocks in the Omani waters indicate that the available quantity is estimated at (5307000) tons of which (4.75%) surface fish (25% in Oman Sea and 75% in the Arabian Sea), and (10.65%) demersals fish (17% in the Oman Sea and 83% in the Arabian Sea), while the finer fish (84.65%) are found
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<p>Preparation of guidelines on the import of alien species for fish farming (according to the guidelines of the FAO)</p>	<p>√</p>			<p>(90% in Oman Sea and 10% in the Arabian Sea). The Quantity of exploitable fish according to a survey of fish stock is estimated at (278) thousand tons, while the quantity of fish yield through 2008 about 145 thousand tons representing about (52%0 of the exploitable quantity. Demersal fisheries constitute the highest proportion of fish stocks available in the Sultanate, and it is ranked first by (45%) of the total fisheries. The production of large surface fish is ranked second by (25%) and mostly consists of migratory tuna fish, yellowfin tuna and kingfish, followed by small surface fish (23%). The shark represents (4%) and finally the crustaceans and mollusks are the smallest percentage of the total production, representing (3%) of the total fisheries in the Sultanate.</p> <ul style="list-style-type: none"> • With regard to distribution and circulation of small surface fish, the average stock is 252500 thousand tons, where 63 thousand tons of this stock is exploited annually, i.e. (25%). These surveys estimate that the small surface fish are clearly present in commercial quantities, and indicate that the two types of the surface fish are sardines (<i>Sardinella longiceps</i>) and (<i>Decapterus russelli</i>) representing (73%) of the exploitable stock of surface fish. The large concentration in the area between Masirah Island and Ras Madarka of about (189500) tons, and smaller concentration was in the area between Muscat and Ras Al Hadd of about (9) thousand tons. • These species in this way can be divided to a number of classes as follows: • Cartilaginous fish (<i>Chondrychthyes</i>), which is characterized by its structure, teeth and fins and consists of the sharks family and Chimaeriformes, where (77) species of this class are found in the Oman Sea versus (57) species in the Arabian Sea and (43) species in the waters of the Omani coast of the Arabian Gulf. • Bony fish (<i>Osteochthyes</i>), is characterized by its bony structure, and consist of most of the world fish species such as demersals fish, emperor, santer bream and grouper and other species, as well as large surface fish such as tuna and kingfish, as there are approximately (869) species of bony fish found in the Sea of Oman, (760) species in the Arabian Sea coastline, and(473) species in the Omani coasts of the
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<p>Status quo in the distribution and abundance of fish species of economic importance</p>	<p>√</p>				<p>Arabian Gulf.</p> <ul style="list-style-type: none"> • Crustaceans class such as crabs and lobster of all species, as well as shrimp which is characterized by the presence of a couple of antennae and the outer protective shield surrounding the animal. • Cephalopoda or mollusks class, are usually underdeveloped animals in their composition and consist of cuttlefish and octopus. • Other classes those are not common in the Omani waters such as echinoderms such as the sea cucumbers species, turtles, shellfish and starfish. • If the ratio of species to families is calculated for each of the bony fish and cartilaginous populations in the three seas in Oman, it seems that the higher ratio is in the Oman Sea, followed by the Arabian Sea and then the coasts of the Arabian Gulf. It is clear that the Oman Sea area is the richest than all the coasts of the Arabian Gulf and the Arabian Sea, and at the same time, the Arabian Sea is an area open on the Indian Ocean where there is the upwelling phenomenon which makes it rich in nutrients and a point of attraction for different fish species. It could be argued here that the previously analyzed studies are the only available studies in the Sultanate, which included the three seas. • The Ministry of Fisheries is closely monitoring rapidly depleted species such as lobster, shrimp and sea cucumber stocks. It has conducted research projects to assess their stocks, determine their breeding seasons and biological features with the purpose of making recommendations that govern the methods of their catch, for example, the lobster study was conducted in two phases. Phase one study included the basic biology of the lobster from 2003-2005 in the Al Wusta region and Dhofar Governorate and found that the annual lobster yield continued to decline by about (80%) since 1990. The percentages of samples under the legal length of the shield (80 mm) range between 63.73% in 2003 78.24% in 2005. The relationship between the length and weight indicated that females have a faster growth rate than the male samples. The study also included some other biological features such as determining the length at the first reproductive maturity, and the application of some of the computer models and programs by finding the parameters that are used to
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Actions taken to reduce threats to fish biodiversity in the deep seabed		√			<p>estimate the current stock and assess the life span of the lobster.</p> <ul style="list-style-type: none"> As for phase two, which was complementary to phase one, the lobster stock was estimated and the status of the stock in case of an increase or decrease in fishing effort was stated. Phase two report has issued some important recommendations in the management of lobster fisheries in the Sultanate.
: Terrestrial and aquatic plants					
Impose penalties for cutting trees without a license.		√			<ul style="list-style-type: none"> Royal Decree No. (6/2003) issuing the law on Nature Reserves and Conservation of Wildlife has imposed firm penalties for cutting down or destroying any protected plants of an amount not less than R.O. 10 and not exceeding R.O. 500.
Ensure the use of native trees in reforestation projects.		√			<ul style="list-style-type: none"> Native trees such as <i>Acacia tortillis</i> and <i>Ziziphus spina-christi</i> and <i>Prosopis cineraria</i> of Oman and others in the propagation projects of wild plants.
Enhance rangeland management services	√				<ul style="list-style-type: none"> Maintenance and rehabilitation of (22) pastoral fences and establishment of pastoral resources database.
Establishment of plants' nurseries to serve the various administrative areas	√				<ul style="list-style-type: none"> Establishment of (5) pastoral nurseries to produce more than (70) thousand seedlings annually.
Preparation and study of the proposals to ensure the propagation of native populations in regions where these populations depleted	√				<ul style="list-style-type: none"> Oman Botanic Garden was established. A comprehensive Oman plants red list was prepared Currently propagation of about 350 species out of 1200 species of Oman plants. So far also about 60 thousand plants out of 350 thousand estimated plants for Oman Botanic Garden were planted.

: Agricultural Resources					
Establishment of a specialized department or directorate general for animal production and health and veterinary laboratory to carry out the responsibilities of production and import of vaccines and training of Omani citizens	√				<ul style="list-style-type: none"> • There a Directorate General of Livestock, under the umbrella of the Ministry of Agriculture, in addition to the Animal Production and Animal Health Research Center and it has a number of specialized research laboratories such as the viral diseases research laboratory, the bacterial disease research laboratory, the parasitic diseases research laboratory and the biochemistry and toxicology laboratory and pathology laboratory.
Intensify research on species and varieties that are drought tolerant and pest resistant	√				<ul style="list-style-type: none"> • During the period (2001-2009) a number of plant species and varieties tolerant to salinity and drought were achieved, especially pastoral plants and banana resistance to disease and studies are under way for mango.
Continue research efforts aimed at raising the productivity of various species in agricultural research stations	√				<ul style="list-style-type: none"> • A number of agricultural researches aimed at raising productivity especially vegetables and fodders were conducted and some of the results were disseminated among farmers.
Prevent the spread of plant and animal species diseases by enhancing agricultural quarantine and remedial measures and providing sufficient number of trained staff and utilities	√				<ul style="list-style-type: none"> • Within the Seventh Five Year Plan (2006-2010), which serve this target: • Strengthening the capacity of quarantine. • Establishment of a number of agricultural and veterinary quarantines. • Establishment and development of the infrastructure of veterinary quarantines.
Register and disseminate the traditional knowledge, which aims at sustainable use of resources	√				<ul style="list-style-type: none"> • The Sultanate of Oman has implemented a number of development programs and projects within the context of the study of the institutional frameworks connected with the agricultural development.
Encourage implementation of environmentally sound farming practices that restrict planting water loving grasses and vegetations which require large quantities of water	√				<ul style="list-style-type: none"> • A project was launched to transfer grass from Al Batinah region to the Najd with the aim to reduce cultivation of alfalfa in Al Batinah region within the limits of 13 thousand acres.
Encourage implementation of environmentally sound farming practices which prevent cultivation of perennial crops and focus on seasonal crops that require less water	√				<ul style="list-style-type: none"> • Several species and varieties of forage crops with low water requirements or high-efficiency in the consumption of irrigation water were identified and recommended to farmers.

Encourage implementation of environmentally sound farming practices which restrict the use of pesticides and chemical fertilizers	√			<ul style="list-style-type: none"> • Researches necessary for the use of environment-friendly pesticides are under way in the Toxicology Research Laboratory at the Directorate General of Agricultural and Animal Researches.
Adoption and implementation of systems for breeding and management taking into account the environmental aspects and should include a test of crop pattern suitable for available quantities of water	√			<ul style="list-style-type: none"> • An advisory study was conducted by the United Nations Food and Agriculture Organization on options and policy alternatives for the cultivation of fodder crops in Al Batinah region in Oman.
Encourage implementation of environmentally sound farming practices which prevent soil erosion.	√			<ul style="list-style-type: none"> • Implementation of a project to protect agricultural land from erosion is underway within the Seventh Fifth Year Plan (2006-2010).
Adoption and implementation of systems for breeding and management taking into account the environmental aspects and should include methods of spreading herbs around the plants to save soil moisture	√			<ul style="list-style-type: none"> • Research in this field is conducted and transfer and dissemination among farmers is underway.
Adoption and implementation of systems for breeding and management taking into account the environmental aspects and should include the use of organic fertilizers instead of chemicals	√			<ul style="list-style-type: none"> • Preliminary research in the field of organic fertilizers instead of chemicals is underway.
Adoption and implementation of systems for breeding and management taking into account the environmental aspects and should include the introduction of mixed farming to incorporate elements of flora and fauna				<ul style="list-style-type: none"> • Preliminary research in the field of introduction of mixed farming to incorporate elements of flora and fauna is underway.
Adoption and implementation of systems for breeding and management taking into account the environmental aspects and should include the production and use of herbs and the remaining portions of crops and organic manure as fertilizer	√			<ul style="list-style-type: none"> • Preliminary research in this field was conducted and planning for the dissemination of such technologies among farmers is underway.
Adoption and implementation of systems for breeding and management taking into account environmental aspects and should include the				

agricultural and pastoral rotations	√				<ul style="list-style-type: none"> • Preparation of such agricultural systems is underway.
Adoption and implementation of systems for breeding and management taking into account the environmental aspects and should include the extensive use of improved seeds	√				<ul style="list-style-type: none"> • research on the development of wheat and barley as strategic crops is underway, it is hoped to obtain improved varieties of wheat during the agricultural season (2010-2011).
Adoption and implementation of systems for breeding and management taking into account the environmental aspects and should include improving the efficiency and management of irrigation water					<ul style="list-style-type: none"> • A number of researches on no-till cultivation were conducted and some conclusions were achieved which may be applied in the fields of farmers.
Study of soil contamination and vegetation resulting from use of agricultural land		√			<ul style="list-style-type: none"> • There are preliminary studies on the subject.
Reclamation of agricultural land and rational use of irrigation water					<ul style="list-style-type: none"> • Distribution and provision of modern irrigation systems to farmers.
Implementation of an integrated development to the Najd in Dhofar Governorate	√				<ul style="list-style-type: none"> • Finalization of the establishment of a Fodder Production Company in the Najd area is underway.
Assisting farmers to increase productivity and conserve water resources	√				<ul style="list-style-type: none"> • Distribution and the provision of modern irrigation systems to farmers
: Energy Resources					
Ensure protection of biodiversity when implementing energy options					<ul style="list-style-type: none"> • When implementing any project all environmental permits and the

(preparation and adoption of a national energy policy aiming at rational use and identification of economically and environmentally sound options to the country. The new policy- in particular - shall identify the relationship between energy and other natural resources, particularly renewable energy and manufactured minerals.	√				study of environmental impact assessment are taken into account and biodiversity is among these studies, in addition to that, the Petroleum Development Oman has conducted a survey of biodiversity in which it identified environmentally vulnerable sites.
Encourage access to information on biodiversity and the development and application of researches in the energy sector.	√				<ul style="list-style-type: none"> Companies conduct environmental assessment studies to any project, especially in new fields and these studies contain potential impacts on animals and trees in the area. The PDO is monitoring the health of marine life in Ras Al Hamra, studying use of alternative energy to reduce consumption and use of close circuit to generate electricity by taking advantage of heat from turbines to generate steam and thus reduce use of gas.
Encourage recycling and reuse of waste resulting from the development in the energy sector.	√				<ul style="list-style-type: none"> The PDO separates wastes for future recycling such as wood and tires. The company follows the method of wastes reduction and recycling.
Ensure restoration of areas used as facilities for energy production as soon as the facilities and locations are closed.	√				<ul style="list-style-type: none"> The PDO is carrying out an on-going monitoring to its operation sites so as to restore them after completion of work: such as filling up wells at the end of production, as well as leveling and.
The Petroleum Development Oman and other companies operating in the field of oil shall notify the Ministry of Environment and Climate Affairs of any oil spill or flow.	√				<ul style="list-style-type: none"> Oil companies always notify the Ministry of Environment and Climate Affairs of any oil spills in addition to submission of a periodical report on the environmental performance including a report on oil spills.
Develop a program to compensate natural habitats affected by the exploration and transfer of energy activities	√				<ul style="list-style-type: none"> Oil companies exert every effort to conserve endangered flora and fauna habitats as a result of proximity to work. Companies also are trying to plant trees in labor camps within their concession areas. They also contribute to the rehabilitation of the environment in collaboration with the Ministry of Environment and Climate Affairs. Occidental of Oman has rehabilitated a lake used as birds protected area in Safa.

Encourage efforts to produce lead-free petrol products as contribution to clean air.		√				<ul style="list-style-type: none"> • Unleaded gasoline is currently produced in the Sultanate.
Introduction of the principle of protection of biodiversity in energy policies	√					<ul style="list-style-type: none"> • One of the objectives of the oil companies operating in the Sultanate is the protection of the environment and reduction of the damages that affect the environment.
: Mineral Resources						
Maintain balance between development and environment protection.						
: Industry, Technology and Services (biotechnology and biosafety)						
Preparation of a training program on biotechnology.		√				<ul style="list-style-type: none"> • There is a master program in Environmental Science. • There is a Bachelor program of Science in Environmental Biology. • Courses in the various faculties of Sultan Qaboos University, teaching relevant environmental sciences were introduced in each of the Faculty of Arts (Geography), agricultural sciences, and the Faculty of Engineering.
Increase university resources in the field of biotechnology research and development.		√				<ul style="list-style-type: none"> • A section in the Sultan Qaboos University was established specialized in biotechnology. • Many scientific researches in biology were conducted. Annex No. (8), reviews some examples of research in the field of biodiversity.
Include the concept of genetic diversity, its importance and its applications in genetic engineering and technology in educational curricula.		√				<ul style="list-style-type: none"> • The Ministry of Education in the Sultanate of Oman was keen to integrate environmental education concepts in the curricula in the various academic books of all stages of education so that the benefit will continue. Annex No. (10), reviews some examples on integration of the biodiversity concept in the curriculum.
: Industry, Technology and Services (tourism)						
All tourist projects, prior to granting the required environmental permits, shall be subject to environmental assessment.						
: Urban Environment (urban environment)						

Expansion of the existing sewage networks in the cities of the Sultanate.	√				<ul style="list-style-type: none"> The Sixth Five-Year Plan of the Sultanate of Oman has established integrated projects in some Wilayat (networks + stations) and the Seventh Five Year Plan (2006-2010) expanded those projects and initiated new ones.
Plantation of green belts, natural forests and parks for the purpose of recreation near cities and as a means of improvement of the residents quality of life, in addition to its conservation to the diversity of indigenous plants and also to provide an additional habitat for wild animals.	√				<ul style="list-style-type: none"> Projects of afforestation and green areas plantation were implemented on public roads and some locations in each of Willayat Barka, Al Musana'a, Mahadha and Ibri.
Increase monitoring and inspection of sewage treatment plants and waste disposal sites.		√			<ul style="list-style-type: none"> The Sultanate carries out maintenance and operation of sewage projects and this work is entrusted to companies specialized in this area, where the Ministry of Regional Municipalities and Water Resources, conduct periodical follow-up. As with regard to waste disposal sites, there is almost daily monitoring to the sites by the regional municipalities in the regions.
Inspection of septic tanks and holding tanks.	√				<ul style="list-style-type: none"> Periodical inspection is carried out to septic tanks and holding tanks.
Prevent discharge of waste in khawrs particularly Al Batinah and Salalah coasts.			√		<ul style="list-style-type: none"> Laws and regulations were enacted and they impose specific fines so as to prevent dumping of waste (liquid and solid) in places other than the designated ones.
XI Water Resources					
Rationalization of water consumption and reduction of pumping to achieve sustainable development.					
: Environmental Emergencies					
Direct attention to be paid to nature and environmental security so as to support the objectives of sustainable development.					
: Involvement of the community members, civil society organizations and the private sector					
Encourage managers, farmers and fishermen to choose the appropriate production and services techniques without affecting their competitive activity.		√			During the Seventh Five Year Plan the following was approved:

					<ul style="list-style-type: none"> • A project to encourage farmers and provide agricultural extension services was approved. • A Project to transfer technology to farmers was approved.
: Social values (awareness, guidance, education, research and training)					
Encourage and support basic and applied scientific researches related to biodiversity with the aim of finding new ways appropriate to local conditions and compatible with the aspirations of the country's development.			√		<ul style="list-style-type: none"> • There are basic and applied researches related to biodiversity funded by His Majesty Sultan Qaboos bin Said, in addition to financial support from the Sultan Qaboos University's budget for each of the Faculties of Arts, agricultural sciences and engineering. • Support to the basic and applied researches in the field of environment in the faculties of Arts, agricultural sciences and engineering. • There are some joint researches with friendly universities with joint financial support. • Support for holding internal scientific conferences with the contribution of some government and private sectors, and an example of those conferences (Conference of Mountains, and the Conference of Coastal Erosion).
Continue to encourage, support and conduct field studies and researches to identify the distribution and correlation of the known varieties and those not registered and classified.		√			<ul style="list-style-type: none"> • The Center for Environmental Studies, Sultan Qaboos University played a significant role in cooperation with the various units of the university as well as the faculties of Agricultural Sciences and Science to conduct environmental research, surveys and related field studies.
Expand and strengthen the facilities of the Natural History Museum in the Ministry of National Heritage and Culture and enhance its human capabilities.		√			<ul style="list-style-type: none"> • Facilities of the Natural History Museum were expanded (Annex No. 6).
XV: Social values, (environmental impact assessment, EIA)					
Continue to use the current English draft documents and issue new periodical supplements in Arabic.		√			<ul style="list-style-type: none"> • The current draft documents in English are used.
: Social values (the institutional and legal framework)					
Revision, compilation and integration of laws and regulations of the					<ul style="list-style-type: none"> • The Sultanate's government is in the process of updating the legislation

environment and resource uses in the Sultanate of Oman.		√			on Biodiversity in order to keep abreast of developments at both the local and international levels. Annex No. (12), reviews some of the examples.
Adoption of legal texts in the areas where resources management is required.		√			<ul style="list-style-type: none"> • Legal legislations for most nature reserves were issued (Annex No. 12).
Continue regional cooperation at the level of the GCC countries and other neighboring countries in joint projects and programs aimed at protection of the environment.	√				<ul style="list-style-type: none"> • Coordination between the Gulf countries, regarding the launch of some projects aimed at nature conservation through the initiation of the Green Gulf is underway.
: The quality of life					
include the natural resources accounting in the system of national accounts of the Sultanate of Oman.	√				<ul style="list-style-type: none"> • This is done through coordination between the Ministry of Environment and Climate Affairs, the Ministry of National Economy and the Ministry of Social Development. • The Sultanate of Oman pays great attention to the child in order to grow up in a social, health, culture and civilization environment, and these efforts are represented in the implementation of a range of programs aimed at pre-school (i.e. nursery period) as an important period in the child's life for upbringing him socially, psychologically and educationally. • Many of the voluntary social centers for the disabled in different regions of the Sultanate were established. The aims of these centers, in addition to providing rehabilitative services to children, is to increase awareness among citizens about the importance of voluntary work and integrating disabled children in society, and such institutions to receive and provide care to disabled children from the age of (14 years) for those various disabilities. • Care and Rehabilitation Section for Disabled Children was established and it receives children of the age (3-14 years) to children with movement disorders resulting from some form of cerebral palsy so as to help them achieve the maximum possible degree of self-reliance, and this section is to provide medical care and physiotherapy for the disabled. • Children's Care Home was established, and it includes those children in

					<p>need of care, where care services in full are provided.</p> <ul style="list-style-type: none"> • Care Association for disabled children was established. • The Sultanate of Oman has promoted the women's levels in all social, economic and cultural fields and activated their participation in the process of comprehensive development of the country through preparation and development of programs aimed at training and qualifying women so that they can perform their desired role. In this context a symposium on Omani women was organized and it came with important results, the activation of which is underway. • Initiatives to improve the economic conditions of women and provide them with assistance were launched, for example (in the case of widowhood, orphan hood, divorce and other cases, where she has the rights to social welfare stated in the Social Security law). • Many of the Omani women's Associations were established in the various regions of the Sultanate. • Raise the level of women in social and cultural fields through lectures, ceremonies and exhibitions. • Omani women are involved in services related to the local environment through cooperation with public and private institutions.
: Spiritual values					
<p>Include the current Islamic Studies, the teachings of Islam associated with the biodiversity conservation.</p>	√				<ul style="list-style-type: none"> • This is done by meaningful religious awareness related to the contents of biodiversity, through lectures, religious lessons and Friday sermons in the different regions of the Sultanate.

Annex 6. Natural History Museum

The Natural History Museum was opened on December 30, 1985, and consists of five galleries, five preservation sections and archives, as follows: -

- Galleries:
 - "Oman the country's diverse terrain."
 - "Oman wild animals diversity" Hall.
 - Whales" Hall.
 - Oman through geological ages" two Halls.
- Preservation and archives sections are:
 - National Herbarium of Oman.
 - National Insect collection.
 - National Shell Collection.
 - National Skeleton Collection.
 - National Fossil Collection.

These collections were developed so that now includes the best samples of wildlife in the Sultanate, it has also become a core reference for studies on environmental variations, as well as a destination for scientists and researchers who are hosted by environment governmental institutions in addition to science curricula development experts and postgraduate students.

- Reasons for preserving such collections are:
- Indexing environmental variations in the Sultanate.
- Keeping samples for studies and present and future displays.
- Establishing a database that will help researchers and specialists in preparation of reports and references on biodiversity in the Sultanate.

1. National Herbarium of Oman:

It includes 14,500 samples of vascular plants (monocotyledons and bicotyledons) in addition to other algal (algae), water algae (mosses), seaweed and fungi.

2. National Shell Collection:

It is a valuable record of mollusks found in the Sultanate and is used in studies about the shells in Oman, and includes 20000 samples categorized into several classes.

3. National Skeleton Collection:

It includes samples of the vertebrate and invertebrate animals' skeletons from the various regions of the Sultanate. They are solid skeleton vertebrates, and soft skeletons vertebrates and invertebrates.

4. National Fossil Collection:

It now consists of 184 samples kept for future displays in the museum, where part of such samples were studied by geologists of Petroleum Development Oman.

- Project for the study and classification of marine algae in the southern coast of the Sultanate:

This project, which took nearly five years with funding from the Darwin Initiative Grants Program of the British government and in cooperation with the British Natural History Museum and the University of Michigan plants reserve, America, was finalized.

Annex 7. Concrete examples of successful Projects in the field of Fisheries

Project	Objectives
Traditional fishing boats specifications, types and number.	<ul style="list-style-type: none"> To know the actual number of traditional fishing boats and collect information of direct relevance for planning and statistics purposes.
Shrimp and other crustaceans farming project.	<ul style="list-style-type: none"> Study and determine the availability of small shrimp and collect them from their natural breeding areas for use in soil experiments until they reach the market size. Conduct several experiments to determine the nutritional requirements of shrimp and study the composition of local diets so as to lower the production costs. Conduct test to the artificial shrimp hatching.
Experimental farm project for finfish farm in Bandar Khairan.	<ul style="list-style-type: none"> Assess the feasibility of farming finfish species in the Omani waters. Training Omani cadres in the field of fish farming.
Abalone farming project and an experimental hatchery production of abalone in Wilayat Mirbat.	<ul style="list-style-type: none"> Design a basic model for the hatchery production of abalone (hatchery). Raise the efficiency of Omani researchers in this field.
Fisheries biology and assessment of shrimp store in the Gulf of Masirah.	<ul style="list-style-type: none"> Collect biological samples and data on shrimp quantitative and artisanal fishing effort. Compile young larvae to determine their temporary abundance and quantity. Conduct a statistical survey by dredging to determine the catch rates of small shrimp and follow-up during the different months.
Biological and economic studies for the development and application of a dynamic economic model so as to manage kingfish fisheries.	<ul style="list-style-type: none"> Identify the structure of the stock in the Sultanate and neighboring countries. Study the biology of reproduction. Study nutrition and how to feed fish. Re-analysis of old data for each of the fish catch and fishing effort so as to obtain growth and mortality rates as well as to estimate the size of fish stocks.
Competitive exported fresh and frozen fish project (for analysis of the GATT Agreement on health).	<ul style="list-style-type: none"> An economic study on the importance of fish export. Assess the benefits to the fisheries sector from the adoption of a quality control management system. Economic analysis of the cost data survey.
Survey of marine algae in the Omani waters project.	<ul style="list-style-type: none"> Identify and describe the types of marine algae in the Omani waters.

	<ul style="list-style-type: none"> • Identify the quantities of algae species and their distribution in the Omani waters. • Measure the seasonal variation in the distribution and abundance of sea grass in the Omani waters.
The impact of handling on the quality of the local dried sardines and its use as animals feed.	<ul style="list-style-type: none"> • Evaluation of the impact of handling on the quality and nutritional value of dried sardines as animal feed. • Use of dried sardines as feed rich with energy and protein and slow decomposition in the production of cows' milk.
Project to evaluate the economic and social conditions of the artisanal fishermen.	<ul style="list-style-type: none"> • Provision of social and economic information to assist in decision-making on the development of the fisheries sector. • Assess the artisanal fishermen sustainability in the profession.
Project to develop legislative and administrative framework of the fisheries.	<ul style="list-style-type: none"> • Development of the legislative and administrative framework of the fisheries. • Establishment of local fisheries' committees with the participation of fishermen and workers in the fisheries sector.
Project to identify the quality of fish in the areas of fish landings and the fish companies.	<ul style="list-style-type: none"> • Establish a database to identify the degree of the quality of fish. • Establish standard formats for computer systems to be used by the fish factories.
Environmental studies project on coastal waters and the siting of fish farms.	<ul style="list-style-type: none"> • Study environmental factors and conditions of Omani waters in each region. • Study the type and abundance of fish eggs and larvae, and identify spawning areas in the Omani waters. • Classify toxic phytoplankton and identify their locations and the seasonality of blooms.
Project for the management of commercial demersal fisheries by study of its biology and evaluation of its stock.	<ul style="list-style-type: none"> • Establishment of a database of species, varieties, ages, lengths, weights, and other basic data of marine fishing necessary for the identification and assessment of fish stocks.
Project for the organization of coral reefs and enhancement of the fish stock in Al- Batinah region.	<ul style="list-style-type: none"> • Assess the current status of artificial coral reefs through their locations on the map to identify the actual number of artificial reefs, collect data showing their users and beneficiaries, and their social status so as to identify the problems surrounding them at the level of villages Willayat. • Train Omani cadres in Al- Batinah region to monitor the artificial reefs and ensure that they are in

	<p>consistency with the regulations and laws.</p> <ul style="list-style-type: none"> • Develop an action plan for the management of artificial reefs.
The youth ships project	<ul style="list-style-type: none"> • Experiment of a sophisticated system to exploit the fisheries based on modernization of the artisanal fishing fleet.
Project for integration of the fish markets in the Sultanate of Oman.	<ul style="list-style-type: none"> • Analysis of the fishermen markets' structures and components. • Analysis of the prices and outcomes of such markets. • Analysis of the rate of integration between the fishermen markets in the Sultanate and wholesale markets in neighboring countries.
Project for the development of the fishing equipment and methods.	<ul style="list-style-type: none"> • Assessment of the fishing methods used in artisanal fishing sector and estimate their environmental and economic effectiveness. • Adoption of modern fishing methods suited to the exploitation of living aquatic resources in the waters of the Sultanate and fit the artisanal fishing sector.
Project for survey and exploitation of the resources of sharks.	<ul style="list-style-type: none"> • Assess the shark species in Omani waters, review and provide the species distribution and determine the biological data. • Study the fishing gear and effort exerted in shark fishing and determine the degree of the commercial and recreational targeted and non-targeted catch and the fishing seasons as well.
Development of the food used in farming.	<ul style="list-style-type: none"> • Identify the nutritional requirements and optimal level of food (protein, energy) of some fish of significance to farming. • A special formula for this type of fish under the conditions of Oman and to be experimented on a larger scale with economic assessment to it.
Abalone Fisheries Management Project.	<ul style="list-style-type: none"> • Abalone acquires great economic importance as a source of livelihood for a large number of fishermen in Dhofar Governorate, Sultanate of Oman. The increase in prices of this economic resource has resulted in intensive fishing operations, thus putting considerable pressure on its fisheries in the Omani waters. A lot of problems have emerged, such as fishing of small sizes, which did not reach sexual maturity and flipping the rocks which considered a preferred environment for the stability of the larvae, thus destructing the abalone natural habitats, and reducing the survival rates, as well as the off-season excessive diving, which leads to the

	<p>catch of mothers carrying eggs during the breeding seasons and therefore do not leave sufficient numbers for breeding. In addition to conditions associated with environmental changes. For the maintenance of abalone fisheries, the government has taken the following actions:</p> <ul style="list-style-type: none"> • Ensure optimum utilization of the portion available for extraction and increase the economic value of the catch. • Stop the deterioration of production and reduce the catch of small abalone. • Establishment of a divers integrated socio-economic database. • The Ministry of Fisheries, started to pay the financial aid the abalone divers and traders, as stated in the Ministerial Decision No. (24/2008) concerning the prohibition of hunting and trading of abalone for three years 2008/2009/2010 within the context of the project for the management of abalone fisheries.
<p>A research project to develop systems to follow-up the applied behaviors of fisheries legislation.</p>	<ul style="list-style-type: none"> • Develop the application of a system for MCS in accordance with the fisheries sector. • Provision of a database including the environmental, geographic and social conditions of the coasts of Oman. • Identify types of violations to the legislation and laws and their impact on the marine environment and fish stocks.
<p>Fisheries Sector Management Project, on the basis of economic species.</p>	<ul style="list-style-type: none"> • rebuilding of fish stocks in Al Batinah region by increasing fish stocks and enhancing opportunities for fishing, using industrial facilities built in the bottom of the sea.

Annex 8. Scientific Researches related to Biodiversity

Research projects that have been implemented in various faculties at Sultan Qaboos University.

- Khawrs and springs of the Dhofar Governorate: Survey and Monitoring Studies .
- Maintenance of Al-El'alan forest in the Hajar Mountains of northern Oman, the results of this research were published by researchers Dr. M. Fischer, Dr. A. Q. Gardner, Dr. S. A. Ghazanfar.
- Eco-physiological studies of marine turtles. Researched and published by Dr. Abdulaziz Al-Kindi, and Dr. Ayman Mahmoud
- The Arabian Leopard Reserve; a research project by Dr. A. Burton in collaboration with Dr. Andrew Spalton.
- asters thesis, entitled *Science of the Arabian Tahr*, (1999)..
- A research project on the prevention and maintenance of olive trees in the northern of Oman Al-Hajar Mountains by Dr. Reginald Victor.
- Two international events have been organized with GEF / TWNSO and Sultan Qaboos University in the 12-25 April 2002 covering a series of papers and researches related to biodiversity in North African countries and the Middle East.
- Organized a workshop of environmental indicators to be used within the parameters of regional planning.
- Geo-environmental conference 4-7 March 2000 under the slogan of a secure environment in the third millennium, organized by the Faculty of Engineering, Sultan Qaboos University with the participation of UNESCO and many local and international participants.
- Research project to assess and modeling the fate of oil spills in coastal areas in 2001 -2002.
- Assess the effects of waste dumps and landfills in Muscat.
- Claereboudt, M.R. (2004?) Reefs and reef corals of northern Oman. Al-Roya publishing. 307pp. Muscat, Oman.
- Research project on the sources of coastal wastes in the areas of Muscat and Batinah.
- Research project aimed to identify the ways of using coral as an indicator to measure the impact of metal pollution in the marine environment.
- Pollution of heavy metals and their impact on sediment macrofauna in Mina Al-Fahal Port area (1998, 2001, 2003).
- Nature, spread and the ability to adapt fresh water fish, including species presented for breeding purposes.
- Bio-magnification patterns and the formation of species population in the areas of extremely exploitation in comparison with areas of little exploitation.
- A research project on how to manage fish stocks of kingfish including the biological, ecological data accumulation and economic development in order to reach the method to achieve sustainable use.
- Research project on the efficiency of using some components of the sub-tropical plants as insecticide against the larvae of termite

(*Bemisia Tobaci*) through the use of leaf juice and seeds of eight species of plants and using them as a natural insecticide to avoid the adverse effects of using synthetic pesticides on crops and on the stock of underground water. A field study for Al-Dakhliyah and Al-Wusta regions (Duqm) showed the importance and nutritional value of this species in the meals. It explored the role of traditional methods in fishing and its impact on the sustainable use and the effects in the formation of caves and rocks which have been discovered and the possibility of linking them with the practices of prehistoric ages.

- Depicted on rocks of Ibex hunting (Rock Art) in Oman.
- Research on depicted on rocks about Ostrich bird in Oman, which is published in (Adumatic) in April 2001, submitted by Dr. Ali Al-Tijani Al-Mahi to survey the forms of depicted rocks which found in Wadi Al-Sahtan at Al-Jabal Al-AKhdar.
- Conservation and utilization of plant genetic resources in Oman. H. Esehie & N. Al-Saady, CAMS, SQU: 2007 – on-going
- Characterisation, evaluation and conservation of indigenous animal genetic resources in the Sultanate of Oman. Dr. O. Gafaar, CAMS, SQU: 2008 – on-going
- The role of zooplankton in controlling the bloom-formation in Oman water bodies. Dr. A. Al-Azri, CAMS, SQU: 2009 – on-going.
- A database on the Arabian Sea ecosystem. Dr. S. Piontkovski, CAMS, SQU: 2009 –on-going.
- Non-toxic anti-fouling compounds from marine bacteria. Dr. S. Dobretsov., CAMS, SQU: 2009 –on-going.
- Diversity, stocks and feasibility of sea-cucumber aquaculture in Oman. Dr. M. Claereboudt, CAMS, SQU, 2008 – on-going.

Geological and Fossil discoveries that have been found

- Fossils show the appearance of elephants before 30 million years at Aidom in Jebel Dhofar.
- Fossils closer to the rhinos before 34 million year at Aidom in Jebel Dhofar which are the oldest in the world.
- Fossils of Dinosaurs (Thirobodm family), 65 million years ago in Al-Khood.
- Rare Coral components at Jabal Ja'lan in Sur.
- Discoveries of various microscopic fossils at Wadi Massawa in Jabal Ja'lan.
- Forms of rare fossils in Al-Wusta Region.
- Important Cave discoveries in Dhofar and and Al-Dakhliyah region.

Annex 9. The role of Multimedia in dissemination of Environmental Awareness on Biodiversity Conservation

The interest of Omani media on environment comes from the interest of its wise government in this area. The environment has great importance in the life of individuals and the society, which is considered as the base for all development, so without good environment there will be no real development.

The media attention in this area is to implant the principle of environment conservation among the community and permanent awareness and educating the community of the efforts done by the government in order to maintain the environment in Oman and its biodiversity.

Omani media pays considerable attention to biodiversity issues in its various programs, focusing on many environmental issues, where the most important issues are wild, maritime and agriculture biodiversity.

Radio Sultanate of Oman: --

1. News article: --

Four daily News bulletins are broadcast from Radio Sultanate of Oman, and five news briefs of the most important news in addition to end of day news bulletin and local news, they demonstrate the issues and problems of the environment locally, and internationally.

2. Development programs: --

Radio Sultanate of Oman offers several development programs that expresses in a way or another to cover news on the environment and issues including: environment and life, our wealth of water, the world of the family, *Al-Ayen Al-Saherah (Our Good Land)*, Oman, a appointment with tomorrow, health for all, municipality and community, Education Forum, etc.

Addressing environmental issues differs according to the program: The program "the world of the family" deals with the issue of family on one hand, and a case of environmental media on the other hand, and highlight how water conservation and non-wasteful use with an indication of the importance of water in the life of family, community. *Health for All* program educate individuals to maintain environmental health on basis that our health is our environment. The *Al-Ayen Al-Saherah* program shows the role of Royal Oman Police, including the Coast Guard which maintains the security of the beaches and coastlines of Oman and is also involved in oil spill response providing vessels and personnel for oil spill operations in coastal areas.

The following Table lists various programs that pay attention to the environment and its issues:

Program name	Environmental issues addressed
Environment and life	15-minute weekly program, talking about the problems and global issues affecting our planet and the solutions offered to solve these problems such as erosion of the ozone layer and the problems of desertification and other environmental problems.
World of the Environment	A weekly 15-minute program deals with environmental disasters and climate change affecting the life and living organisms and also addresses the Sultanate's efforts in the field of environmental protection and conservation.
The environment around us	A weekly 15-minute program, deals with some local environmental issues and try to discuss them with specialists and experts and competent authorities.
Environmental enlightenment	A daily 5 minutes program, each episode dealing with specific environmental issue, environmental and natural life as well as environmental and cosmic phenomena, plant and animal effects and environmental balance in addition to the efforts and interests of the Sultanate in the field of environment.
Green hands	A 15-minute Program addresses the issues of agricultural biological diversity and the diversity of plant and animal species, indicating the efforts of the competent authorities in the preservation of this wealth.
Municipality and community	A weekly 15-minute Program, which cares of maintaining hygiene and safety, and intended to induce the citizens to cooperate with the various municipal services.
Our good land	A weekly 15-minute Program, talking about the fishery, agricultural, animal and the ideal method should work and the means to develop these resources.
Tourism throughout my country	A weekly 30-minute Program addresses tourist attractions in the Sultanate through field visits. The program also highlights aspects of the natural and aesthetic heritage and love of God by our beautiful country.
Child's world	A weekly 30-minute Program, trying to correct some misconceptions of children's behaviors through everyday situations and broadcast environmental awareness among young people.
Religious Programs	Radio Sultanate of Oman is keen to address environmental issues and problems through religious programs as Ahadeeth, which plays a huge role in persuasion through media.
Awareness messages	Radio Sultanate of Oman is keen to provide educational messages addressed to all sectors of public opinion on various issues and environmental problems.
Drama skits	Radio Sultanate of Oman realizes the role of drama in shaping public opinion, so many environmental issues have been made, which seeks to create the views toward new environmental issues or strengthen the positive trends to preserve the environment or to change negative attitudes that harm the environment.

Sultanate of Oman Television

1. News article: --

The Sultanate of Oman Television broadcasts seven News bulletins, and four Headline news programs, which also generally deal with the Sultanate's activities and efforts in the field of the environment as well as reviewing major local and international environmental issues and problems.

2. Development programs: --

Oman TV offers several development programs aimed more or less to the environment and its issues, they deal with environmental issues according to the program. The *Al-Ayen Al-Saheerah* program deals with environmental issues through the inclusion of topics such as agriculture and maintaining water resources and attention to gardening. The *My City* program shows a number of environmental issues and the role of municipalities. The *Dohat Altrbia* program addresses educational issues and creates environmental awareness. The *Qahwat Al-Sabah* program allocates specific topics about Omani environment, biodiversity and the most important legislation and laws published in this area.

The following table shows some of the programs that pay attention to the environment and its issues:

Program name	Environmental issues addressed
Together to protect the environment	A weekly 60-minute program addresses the most important issues of environment and biodiversity by raising the issue and inviting specialists in the field of environment to clarify this issue for the citizens and the people who phone to get out convictions for the citizens to cooperate with environmental agencies and conservation achievements.
Environmental Break	A three-minutes Program (broadcast between the programs of the day), and highlights the care and attention given by the Sultanate to maintain the cleanliness of the environment and the safety of wildlife and biological diversity.
The Omani Environment	A daily 15-minute program, in the form of poetry, drama, documentary competition talking about the environment in all welayats of the Sultanate such as reservations, caves, valleys, animals, plants, beaches, and islands linked to dramatic scenes taking place between members of Omani family talking about the subject of each episode.
My City Program	A bimonthly,60-minute,Program addresses the beauty of Muscat city and the importance of maintaining the city in general and topics of implantation, gardens and car parks, and many other topics in addition to the various events hosted in Muscat.
Our Good Land	A monthly 30-minute program cares of crops, local agricultural products, and how to increase and address the problems and diseases that affect crops, also aims to aware farmers to develop the field of agriculture and to identify problems and solutions in the agricultural and also the program addresses Marine and Fisheries.
Tourism in my	A weekly 60-minute program, aims develop tourism in the Sultanate and the

country	promotion of tourist sites through network facilities and tourist attractions in the various governorates of the Sultanate, and the program depends on visits to every region in the Sultanate and presents a report to show the area landscapes and aesthetic that needs to be identified .
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3 Documentaries

Oman TV also produces many documentary films that describe the Omani environment and shows the details of wildlife in the Sultanate's plains, mountains, *wadis*, caves, beaches and reserves. These films focus on the diversity of wild animals and plants; some of them are listed below:

Movie Name	Environmental issues discussed
Documentary film titled Oman 2002	A 60-minute film addresses the biodiversity and pristine nature in the Sultanate which differ through coastal areas, reserves, caves, sand plains and mountains. The film reflects our natural wealth into our natural environment.
A documentary film about Oman's islands	A 60-minute documentary film that shows biodiversity in the Omani islands.
Documentary film about the beaches	A 60-minute documentary film, shows the beaches of Oman. The film expresses the biodiversity of beaches in Oman.
A documentary film about natural reserves	Documentary film of 60 minutes talking about the natural reserves and biodiversity therein.
A documentary film entitled <i>Villages and Cities</i> .	A 60-minute film talks about the area between Quryat and Qalhat and coastal zone and is interested in film and manifestations of biodiversity in this region both in terms of beaches or bays, plants, animals and landscapes in that region.
A documentary film about Al-Ashkhara region	A 60-minute film that shows the unique biological diversity of Barr Al-Hikman such as wild plants, animals, and natural configurations that give the beauty to that region.
A documentary film about hyrax	A 60-minute film that discusses the forms of life and the evolution of this animal and the way of living and its whereabouts in the Sultanate and its life with other animals in the area.

Omani press: --

The Omani newspapers and magazines focused on local Omani environmental issues and cover all environmental events in order to disseminate environmental awareness among the society.

a. Newspapers: --

Newspaper Name	Environmental issues addressed by the Newspaper
Oman Newspaper	Oman Newspaper allocated a page about the environment every Monday about local and international environmental problems, biodiversity in the Sultanate and discusses the most important environmental projects done by the environmental agencies.
Alshabibah Newspaper	Alshabibah Newspaper allocated a page about the environment every Monday. It provides information on the biodiversity of plant, animal and water and various environmental issues are presented.
Al-Watan Newspaper	Al-Watan Newspaper publishes many local investigations and articles about the environment among the issues of the week and not in a specific day. These articles are published in order to spread environmental awareness and to show citizens several forms of biodiversity and the need to maintain it.

b. Local Omani Magazines: --

Name of the Magazine	Environmental issues addressed by the
Man and the Environment Magazine	A quarterly magazine issued by the Ministry of Environment and Climate Affairs It talks about Omani Environment. It deals with environmental issues and provides studies and researches on biodiversity about the environment in Oman. It is available in both Arabic and English languages.
Muscat Magazine	A quarterly magazine issued by Muscat Municipality, and talks about municipality works. It presents local, regional, Arabian and international issues, and forms of modernization and development in Arab cities and the global and special pages for the environment and its issues and forms of biological diversity not only in the Sultanate but even some forms of diversity fungal in nature in the Arab countries and the world and studies environmental issues through detailed and scientific methods by specialists in the environment field.
Akhbar Sharekatana Magazine	A quarterly magazine issued by Petroleum Development Oman, discusses the forms of biodiversity, land, sea, vegetation, animals and plants. It expresses the company's role in preserving the Omani environment.
Resalat Al-Masjed Magazine	A quarterly magazine published by Sultan Qaboos Center for Islamic culture. It deals with environmental issues from the religious point of view to clarify the role of Islam in preserving the environment. It has been covering some of the environmental events, where the magazine sponsored the conference "Environment in the shari'a and law, which discusses the attention for the environment in the Holy Quran and the Sunnah.
Jund Oman	A monthly magazine issued by the Directorate of Moral Guidance

Magazine	and Public Relations, Ministry of Defense. There is a whole page devoted to the environment and forms of wildlife in the states and regions of Oman.
Al-Nahthah Magazine	Weekly magazine published by Dar al-Nahda publishers, and there is a page devoted to the environment by stating information about environmental issues and the most important forms of environmental technology to overcome the problems of the environment and conservation.
Our Good Land Magazine	Magazine issued by the Ministry of Agriculture, provides information on the forms of agricultural biological diversity and plant species and sustainable use, and address the agricultural pests that threaten some types of crops in the Sultanate.
Al-Haras Magazine	A quarterly magazine published by the Royal Guard of Oman. It has many pages talks about the environment and diversity of plant, water and beautiful nature in the Sultanate of Oman.

The Omani media, both audio and visual, works continuously to deliver the environmental message to the society by covering all environmental activities carried out in the Sultanate.

Annex 10. Concepts of Biodiversity in the Omani Educational Curriculum

The Ministry of Education in the Sultanate of Oman is keen to integrate environmental education concepts into the curriculum in all different stages of education. The following table shows examples of implying such topics into the curricula of education (primary and preparatory and secondary) and the basic education of environmental concepts.

Grade: III		Subject: Social Studies
Unit	Subject	Concept
Family	The concept of family	The desert – the sandy desert – the rocky desert - the desert environment - Oasis - grazing.
Natural phenomena in the Omani environment	Sea and the Gulf and the Strait	
	Plain and hill and mountain	
Natural resources in my environment	Desert and Oasis	
	Water	Environment - water - water pollution - Man - Animal - Plant - Falaj
	The sun and the soil	Sun - Soil
	Plants and animals	Plants, animals, pets, wild animals
	renewable natural materials, and non-renewable	Renewable materials, non-renewable materials
Grade: IV		Article: Social Studies
Unit	Subject	Concept
The globe	Oceans and seas	Ocean - Sea - bays
The continents	Environments of continents	The continent - Forests - swamps - grass (savanna) - Desert - Mountains - Rivers - snow - environments
Sultanate of Oman	Location and topography of the Sultanate of Oman	
Water in the Sultanate of Oman	Water in our lives	
	Spring water	
	Aflaj	
	Water pollution	
	Rationalization of water consumption	
Grade: V Article: Social Studies		
Unit	Subject	Concept
Arabs and their natural environments	origins of the Arabs and their homeland	Range - Water Resources

	Geographical location of the Arab motherland and its features	Ocean - Sea - bays - Maritime Straits
	Plains in the Arab World	
	Mountains in the Arab World	
	Plateaus in the Arab World	Agricultural oases - springs - Wells - Highlands - fertility
	Sandy deserts in the Arab World	
	Water resources in the Arab World	
	Soil and vegetation in the Arab World	
	The problems of the city and the countryside and the desert	
	Industry and Energy in the Arab World	Fishing, logging Renewable energy: Waterfalls -- Non-renewable energy: Oil - gas - coal - nuclear energy
Geosphere	layers of the earth planet and their relationship to man	Ocean - Sea - bays
	The emergence of the mountains	The continent - Forestry - swamps - grass (savanna) - Desert - Mountains - Rivers - snow - environments
	River erosion and the resulting forms	
	Erosion by the sea waves, and the resulting forms	
	Erosion by the sea waves, and the resulting forms	
	Wind erosion and the resulting shapes	
The atmosphere and hydrosphere	Hydrosphere and its problems	
The biosphere and ecosystems	Components of the biosphere and its significance	Ecosystem - natural vegetation - wildlife – pine forests - tropical forest -forests of the Mediterranean region - photosynthesis - soil erosion - the extinction of protected animals
	Factors affecting the distribution of the terrestrial environment	
	Tropical rain forest environment	Tropical rainforest - deforestation
Grade: VI Article : Social Studies		
Unit	Subject	Concept
The biosphere and ecosystems	Tropical environment of long grass (savanna)	Long grass Environment
	Hot desert environment	Hot desert environment
	Soil erosion	Soil erosion - runoff - water canals

		- grooves - Fluids - Logging - overgrazing - windbreaks - terraced stone - regular grazing
	Degradation of natural vegetation	Forest - grass - air pollution
Grade: VII Article: Social Studies		
Unit	Subject	Concept
Ancient civilizations in Oman and the Arabian Peninsula	The emergence of ancient civilizations in the Arab World Ancient civilizations in Oman Ancient civilizations in the Arabian Peninsula	
Population Geography	The concept of population geography	- Scarcity of natural resources.
	population density	- Natural resources.
	Population Problem	- Marine water resources - environmental degradation - the marine environment - the ecological balance.
Lifestyles and the needs of population	Rural settlement and urban	Forest - collection and capture - Agriculture - primitive agriculture - intensive farming - agriculture, agro-wide - modern agriculture – hunting & grazing - the stage of Agriculture - domestication of animals for the countryside.
	Rural problems	
Grade: VIII Article: Social Studies		
Unit	Subject	Concept
Weather and Climate	Weather and Climate	- Vegetation
	Climatic regions	- Tropical region - oases.
Water	Water Resources	- Seas and oceans - underground water - brackish groundwater
	Water uses and related activities	- Fisheries.
	Water Problems	- Pollution of water - drain water - water deficit - water salinity
	Water resources in the Sultanate of Oman	- Springs - Falaj - Falaj Dawdi - Desertification – artesian wells - wells - groundwater surface - deep groundwater.
Grade: X article: Social Studies		
Unit	Subject	Concept
The emergence of earth and its formation	The emergence of the earth	- Tropical plants
	Internal factors that contribute in the formation of the Earth	

	surface	
External factors influencing the formation of the surface of Earth	Wind erosion	- Wind erosion.
	Water erosion	
	Marine erosion	- Coast – the shore - the tides.
Problems and environmental hazards	Global warming	- The natural environment.
	Desertification	Desertification - overgrazing - marginal land - slight desertification - high Desertification – very high Desertification - fertilizing the earth - green belts - windbreaks.
The dangers of earthquakes and volcanoes		
Grade: XI article: Social Studies		
Unit	Subject	Concept
Genius of the place and the population	Oman	- Upland - chains dirt - mountain ranges, coastal plains - Oasis Interior - sandy areas.
Natural Resources	Natural resources and their types	- Natural resources - forest - pasture - fisheries - non-renewable resources - depletion of natural resources.
	Mineral resources and soil and how to manage them	- Sustainability of the soil - organic agriculture - contour tillage.
Energy Resources		
Agriculture and Industry	Concept and development of agriculture	
	The impact of industry on the environment	Friend to the Environment
Tourism	Importance and types of tourism	- Tourism Environment - reserves - turtles reserve
	The concept of tourism	- Environmental variation
	Economic and environmental impacts of tourism	- Pollution of marine animals.
Grade: Article XII: This is a national pedigree and Glory		
Unit	Subject	Concept
the Omani Environment between population growth and impacts of development	Global Environment, global issue and national awakening	- Sustainable development - marine environment - the coastal environment - Environment plains - desert environment - semi-seasonal environment - the urban environment - biodiversity.
	Water is essential for life. Between scarcity and consumption.	- Mountain

	Population growth and urbanization... Potential environmental impacts	Decrease in pasture - the ecosystem - natural cleansing
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Annex 11. Examples of the proposed Challenges and Solutions

The obstacles and challenges that have been identified included increase in the number of animals above the natural grazing capacity in Dhofar Governorate, where the number of animals increased about 2-3 times of the assumed grazing load of Dhofar Mountains. This has created an urgent need to prepare a national strategy to develop natural pastures and sustainable development of livestock in Dhofar, where the strategy was prepared aiming at proper management of natural pastures and achieving balance between them and the livestock through:

1. Analysis of the current situation of natural pastures.
2. Inventory and registration of livestock.
3. Re-distribution of livestock in order to achieve compatibility between animal species and natural pasture in each region.
4. Broadening the rangeland by plantation.

• Executive Plan of the Strategy

1. Development program including the following projects:
 - a. Livestock breeders' registry project.
 - b. Project to reduce the herd number.
 - c. Project to replace the local breeds of cattle with another with better productivity.
2. Guiding program including the following projects:
 - a. Fallow pasture project.
 - b. Rangelands development and management project.
 - c. Cattle and camel herds' management project.
3. Research program to develop natural pastures.

• What has been implemented:

The methodology of work imposed that implementation of projects should be according to their importance and relationship to the preservation of natural resources of rangelands and desertification control in one hand and the availability of potentials on the other hand. Therefore the following was carried out:

- Phase one of the livestock breeders' registry project was finalized through the inventory and tagging of camels in Dhofar Governorate.
- The implementation of the project to reduce the herd numbers was initiated.
- The draft law was prepared on pastures and livestock management, which has the aims of the rationalization, regulation and maintenance of the use of pastoral resources and the sustainable development of livestock
- The reduction of the number of animals depending on rangeland was commenced through an integrated program for the marketing of surplus stock within and outside the Sultanate.

- Increasing the plant fences; this amounted to 26 fences of a total area of 780 acres in most parts of the Governorate of Dhofar, and these had a significant impact in keeping many of the herbs and shrubs protected in their natural habitat.

Also new threats to wildlife in the nature reserves were identified and this is seen in an escalation of the hunting problem. One example is the problem of hunting the Arabian Oryx, which the reintroduction project of the Arabian Oryx in Al Wusta region has faced. Therefore, a summary of the issue is given below:

Background on the Arabian Oryx Reintroduction Project:

General Activities	
	<ul style="list-style-type: none"> • Establishment of the Arabian Oryx project in Ja'aluni, Al Wusta Region. • The first herd of Oryx was brought to the Sultanate in 1980, and released in the wilderness in 1982. • The total number of Oryx in the wilderness amounted to 450 head in 1995.
	<ul style="list-style-type: none"> • The establishment of the Arabian Oryx Sanctuary by Royal Decree No. 4 /1994. • Proclamation of the Sanctuary as a UNESCO World Heritage Site.
	<ul style="list-style-type: none"> • The theft of Arabian Oryx started in February where during the period from 1996 to 2007, more than 200 head of live Oryx were stolen from the Sanctuary. • Deployment of Sultan Oman Armed Forces in the Sanctuary to stop intervention in the wildlife Sanctuary, with elements of it and Royal Oman Police found in the Sanctuary since then.
	<ul style="list-style-type: none"> • Royal Oman Police took the task of providing protection to the Oryx as from January 2002.
	<ul style="list-style-type: none"> • A task force of police from the local population in the Al Wusta region was formed, where 32 individuals were appointed in addition to an officer.
	<ul style="list-style-type: none"> • Construction of a field center for the new force of the Royal Oman Police at Al Ajaiz.
	<ul style="list-style-type: none"> • The Sanctuary was area reduced from 34000 square kilometers to 2824.3 square kilometers by Royal Decree No. 11/2007 m.
2009	<ul style="list-style-type: none"> • Fencing of the Sanctuary.

The current situation	Strengths	Weaknesses
<ul style="list-style-type: none"> • The current estimated number of Oryx is 20 in the wilderness and over 240 in captivity. • It is estimated that 90% of the gazelle, bustard, Nubian ibex and hares were taken by hunters. • More than 100 arrests of hunters were made, but hunting did not stop and now is heading towards the killing of animals to trade in their meat. 	<ul style="list-style-type: none"> • Field center staffed by the following personnel: <ol style="list-style-type: none"> a. 4 management staff. b. 2 scientific specialists. c. 28 wildlife rangers. d. 23 support staff. • Private security force for Oryx from Royal Oman Police is responsible for providing protection for the herds of Oryx. • The presence of rangers from the region. 	<ul style="list-style-type: none"> • There is no management plan for the Sanctuary. • It is an open area thus facilitating access, and easy hunting of Oryx and other animals by 4W vehicles. • The first years of the project witnessed wide support from the local community, but decreased sharply since the hunting started in 1999. • Lack of facilities for visitors.

This problem and others have created an urgent need to make stringent efforts to prevent their impacts. Therefore a National Committee comprising of members from senior government officials from various government agencies was formed to consider violations against wildlife within and outside the nature reserves. According to the recommendations of the Committee several measures to curb these abuses were taken, and the following table illustrates some of the proposed solutions:

Main obstacles	Proposed solutions
	<p>The importance of facilitating cooperation between all governmental and non-governmental organizations so as to plan, manage and develop nature reserves, by establishment of a committee comprising members from various government agencies, such as the Ministry of Environment and Climate Affairs, the Ministry of Tourism and the Office of Conservation of the Environment, and non-governmental organizations, such as the Environment Society of Oman and representatives of the local community and representatives of the private sector, such as Omran Co.. To this end the re-activation of the National Committee of Nature Reserves that has been formed by Royal Decree No. 6/2003 is recommended to promote the proper ways to start the development of</p>

Financial and human weakness in the agency entrusted with the responsibility of management and development of nature reserves.	constructive proposals for the management contexts mentioned above, and clarify and define the roles and responsibilities of each party.
	It is important also that nature reserves should enjoy good conservation and management so as to promote the economic growth at the local and national levels and create a range of direct and indirect economic benefits. The expected development of a number of tourism projects in protected areas will depend entirely on the conservation of the viable natural and cultural attractions of these areas. In order to maintain this infrastructure, it is necessary to increase government investment in the management of reserves with financial support and the provision of qualified staff.
	increase economic benefits to the local population through opening of investment in nature reserves, and activate coordination with the Ministry of Tourism to develop a mechanism and guidelines for eco-tourism, especially the importance of focusing on employment of local people in eco-tourism projects.
Lack of an independent management of nature reserves	entrust the responsibilities of management and operation of nature reserves to other government agencies and non-governmental organizations.
	provide a director, assistant director and specialists for each nature reserve.
	To stress the importance of clarifying the administrative structure, distribution of tasks and responsibilities, and annual action plan for each reserve.
	the importance of increasing the involvement of local communities in the management of reserves.
Increase of violations of wildlife in the protected areas.	preparation, revision and implementation of nature reserves management plans, and to involve the local communities in these areas to participate in its preparation.
	ensure protection of these reserves through safe fencing, intensified monitoring and entrusting the task of the external protection of these reserves to a security/military agency by virtue of its abilities and potentialities to conduct patrols and respond to offenders.
	provide the financial and human resources to manage and develop nature reserves.
	activate the provisions of the Law on Conservation of Nature Reserves and Wildlife issued by Royal Decree No. 6/2003.

Annex 12. Environmental Laws and Legislations related to Biodiversity

The Government of the Sultanate of Oman deliberately updated the legislation of biodiversity so as to keep pace with the new developments at the local and international levels. These legislations are represented by the following:

First: The laws:

1. Royal Decree No. 114/2001 issuing the Law on Conservation of the Environment and Prevention of Pollution:

Before the issuance of this law, the provisions and rules governing the conservation of the Omani environment in all its terms were stated in the Royal Decree No. 10/1982 issuing the Law on Conservation of the Environment and Prevention of Pollution. This Law underwent many amendments, the most important of which were the two amendments issued by Royal Decrees Nos. 111/1996 and 75/1998, which contained in their provisions protection of the biodiversity components and strict penalties on everyone causing degradation to nature conservation or wildlife areas, especially nature reserves.

To develop legislation in this field, which the Government of the Sultanate of Oman pursues within the national biodiversity strategy, the Royal Decree No. 114/2001 as issued grants multiple powers to take actions necessary to protect the soil and combat desertification. Those powers include prohibition of any chopping, uprooting or damaging any tree or shrub or herb of public forest without permit from the Ministry of Environment and Climate Affairs.

This law has ensured procedures and measures to protect nature conservation areas and tightened penalties against the degradation of these areas in any form or way and therefore, this legislation is more advanced than the previous legislation.

2. Royal Decree No. 6/2003 issuing the Law on Conservation of Nature Reserves and Wildlife:

In crowning the continued development of legislation in the field of biodiversity and the Government's desire to strengthen protection of wildlife the Law on Conservation of Nature Reserves and Wildlife was issued by Royal Decree No. 6/2003.

The above-mentioned law included the rules and provisions governing nature reserves and wildlife, which consist of comprehensive biodiversity components with the aim of preserving wildlife and marine species that characterize the Sultanate, especially endangered species.

Second: Ministerial Decisions: --

1. Ministerial Decision No. 169/2000 amending the Ministerial Decision No. 28/1993 concerning prohibition of chopping of green trees and shrubs or transfer of dry trees (firewood).
2. Ministerial Decision No. 3/2002 on the organization of Khawr Reserves in Salalah coast.
3. Ministerial Decision No. 101/2002 regarding prohibition of killing, hunting or capture of wild animals and birds.
4. Ministerial Decision No. 133/2000 regarding the management of turtles reserve was issued, including implementation of the management plan for this reserve.
5. Ministerial Decision No. 56/2006 on the organization of Dimaniyat Islands Nature Reserve. Ministerial Decision No. 132/2000 on the management of the Dimaniyat Islands Nature Reserve was issued including implementation of the management plan for this reserve.
6. Ministerial Decision No. 110/2007 issuing the Executive Regulations for the Law on Conservation of Nature Reserves and Wildlife.
7. Ministerial Decision No. 200/2000 issuing Regulations for Crushers, Quarries and Transport of Sand from the Coasts, Beaches and Wadis.

Annex 13. Biology and Estimations of Kingfish Fisheries in Oman

Kingfish (*Scomberomorus commerson*) is a very important source of traditional fisheries in Oman. However, official statistics collected since 1988 indicate a severe drop in landings – ten times less than it was in the eighties. These low levels require urgent assessment with provision of new scientific and socio-economic data to be the basis for management plans as well as support of a new management system for this fish stock. This project was a four-year research collaboration between the Marine Science Center of the Ministry of Fisheries and the College of Agricultural and Marine Science of Sultan Qaboos University.

The kingfish study comprised several biological aspects, including food, growth rate, reproduction, genetics, stock estimation and socioeconomic aspects as this resource is an important income to many fishermen in Oman.

Food: In this study, 778 samples were collected during the year 2000 from six locations in Oman to study stomach contents. The total length of the samples and the weight of the stomach and its contents were measured, and estimates were made for the stomach fullness and primary contents. The results showed that the relation between the length of the fish and the weight of the stomach contents is insignificant. This reflects large numbers of fish (70%) with empty or slightly filled stomachs. After analyzing the data of stomach fullness and contents, no relation was found between the locations of the samples and the changing seasons throughout the year.

The classification of the kingfish's stomach content from all the study locations showed that its main source of food fish is from the clupeidae family (sardines and anchovies), which represent (56%) of the analyzed samples. The orange spot trevally represented 10% of stomach contents. The movement and digestion of the primary stomach contents relatively rapidly contributed in the recording of low amounts of food (nutrients) in the stomach. The conclusion that kingfish prefer preying on clupeidae suggests that serious consideration should be given to regulating and limiting the massive annual catch of sardines and anchovies.

Growth: Kingfish age and growth patterns were defined from 1244 samples collected in six locations in Oman in the course of two years. Otoliths (calcified structures in the inner ear) from 962 samples were analyzed. Kingfish stocks vary in age groups (+10, +1, +2 years), which form about 90% of the total collected samples. The maximum vertebral length, weight and age of both genders was 166 cm, 4.04 kg and 20 years.

Reproduction: The kingfish seasonal reproduction pattern was defined in two areas in Oman. In the course of two years, 1,244 samples were collected through purchase from local fishermen in landing sites in the Arab Sea and the Sea of Oman. In addition, the weight of the female ovaries and male samples were recorded to the closest gram, the ovary maturity stages were defined visually and the fish length was measured to the closest centimeter. Analysis of sample lengths showed that male and female were equal in size in both areas, but the female stocks are more dominant in the Sea of Oman than in the Arab Sea.

The study also showed that female kingfish mature at a lower length and two months before the males reach sexual maturity in both areas. The fish collected from the Arab Sea, both male and female, are mature at a lower length (10 cm) and a younger age (6 months) than those of the Sea of Oman.

The analysis of the stages of reproduction and reproductive maturity shows that there is a season for the reproductive cycle that begins in February and ends in May or June, prior to the onset of summer. Stages of reproduction and growth also indicate that 40% of the landings in the Arabian Sea consist of fish in the first reproductive stage, whereas, in the Sea of Oman, 25% of the catch consists of fish in the active reproductive stage. There are several indications that kingfish stocks are under great pressure from over-fishing so it is necessary to take action to keep the stock intact.

Stock assessment: Kingfish stocks were assessed in Oman using the sample supply inventory and it was noted that there are differences in growth and mortality between the two genders. The mortality rates of the current stock was identified as 16% in females and 26% in males, which shows that kingfish stocks are being depleted with the possibility of young fish not being part of the stock in the future. A number of scenarios on identifying the smallest size and season closing were evaluated for these stocks in order to identify which scenario increases the supply of biomass without pressure on the rate of supplies to a good level of social economy among the fishermen. Closing the fishing season and identification of the lowest length of the catch is the most effective way to achieve this goal. It was proposed to close the season and determine the length of at least 45 cm vertebral length for both genders from March 1 to April 30 every year. This will increase the egg-laying biomass per unit to 29% for females and 40% for males, when compared to the situation of not fishing to a far range.

1.4 Annex 14. Survey and Exploitation of Shark Resources

The rate of landings of cartilaginous fish has grown substantially since 1960 because of the high prices and low stocks of desired demersal fish. In support of this increase, there is a growing demand for shark fins to supply the markets of East Asia for the preparation of soup made from shark fins, which was reflected in the increase of landing rates in areas characterized by deep-rooted traditional fisheries of cartilaginous fish in Oman.

Therefore, a unanimous agreement was made that there is an urgent need to control the fishing operations targeting cartilaginous fish. This approach adopted by the Food and Agriculture Organization of the United Nations FAO in November 1995, and of which the Sultanate is a signatory, proposes that each State operating shark fisheries shall create a *shark plan* to manage and regulate these fisheries. A vision of a project with a description of each State has been developed to organize shark fisheries management and find ways to develop strategies by which consumption is achieved in a sustainable manner. The main part of the development of an effective shark plan is to recognize the depth of the biological species of sharks as well as knowledge of the current status of cartilaginous fish stocks and practical knowledge of fishing, as well as knowledge of the nature of domestic consumption for shark products. All this is needed to create a sustainable and accurate management plan.

Unfortunately, the available biological information is not sufficient enough to enable the Sultanate and neighboring countries to manage the inventory of cartilaginous fish effectively in the region, and in many cases, species that are certainly to be found in the fishery are not known. Moreover, research on cartilaginous fish in the northern Indian Ocean is very limited, which is why the emergence of species and their movements and biology are neglected.

Taking all these issues into account and the recommendations made by the Food and Agriculture Organization FAO, the Ministry of Agriculture and Fisheries (now Ministry of Fisheries Wealth) decided to conduct a study on the biology of these fish along with the socio-economic statistics with financial aid from the Agricultural and Fishery Development Fund. During the first year of the project, exploratory field visits to the traditional fishing areas showed that the highest concentration of shark landing was in Dibbah (Musandam), Barka (Batinah), Seeb and Muttrah (Muscat), Sur (Sharqiya), Duqm (Wusta) and Raysut and Mirbat (Dhofar). Although the decision was made to collect biological information from these areas, data was collected in some cases from other areas wherever necessary. Moreover, longline fishing equipment was used to collect samples from areas beyond the traditional fishing zone at a depth of 100 to 200 meters off the coast of Muscat.

During the implementation phases of the project, all species of landed cartilaginous were identified and their lengths were measured. Samples were purchased in order to conduct necropsies to collect data on maturity, reproduction and age. Moreover, data was gathered on cartilaginous fish consumption by conducting personal interviews with fishermen, tradesmen, managers of large factories, field visits and visits to small factories cutting and drying fish.

Data was gathered from 4471 samples: 44 shark species, 9 sting ray fish species and 6 shovelnose ray species. Among the exciting results of the project was the discovery of two new species of shovelnose ray. In addition to the 44 shark species recorded for the first time by members of the project team, an additional species of shark and of sting ray fish were confirmed to exist in the Omani waters. Although the total number of species that were recorded were significant, but many of the species was recorded in small quantities and, in general, most of the cartilaginous fish represent a small percentage of species of milk shark, bigeye hound shark, spottail shark, slit eye shark, hardnose shark, blacktip shark, scalloped hammered shark and silky shark. There is a difference in the areas of diverse shark species. Muscat is the highest in diversity, followed by Musandam, while Al-Wusta has the lowest diversity. However, when landing is divided by regions and seasons, it clearly demonstrates that the diversity of species during different seasons of the year as well as timing for the highest and lowest level of species among regions.

The sizes of some specific shark species indicated a dramatic shift in the traditional shark fisheries, along with consistent information on the low rate of landings, which in turn refers to the exposure of shark fisheries in the Sultanate to over-exploitation. Indication was also made from the area where the large, slow-growing species have been replaced with smaller, fast-growing ones. However, the important and concerning thing is the on-going high rates of shark landings that include many juvenile fish removed from contributing to stock production of the group.

It was found that most species have an annual production cycle. Reproduction and breeding occur in spring and summer. On the other hand, for most of the exploited species in the Sultanate, such as (*R. acutus*), the breeding season runs continuously throughout the year. Productive factors in the majority of species showed full compatibility with studies done in other countries despite noting changes in sizes at maturity and at birth, and differences in growth rates were distinct.

It is already clear from the results of this project the existence of compelling evidence of the unsustainable exploitation of shark fisheries in the Sultanate. Thus, the appropriate measures must be adopted to avoid the deterioration of fisheries. Landings are highly over-utilized in the production of fins and meat only, which is not ideal in total. The sustainability of fisheries can be ensured without causing losses to the profits of fishermen and tradesmen through the process of landing and increased level of exploitation of these fish.

1.5 Annex 15. Monitoring project to determine the presence of Heavy Metals and Chemical Contaminants in the Ecosystem in the Sultanate of Oman

The aim of this project is to assess the status of heavy metals and chemical contaminants in the aquatic ecosystem in the Sultanate, as well as collect authenticated reliable database on the levels of heavy metals and chemicals to assist in the protection of the health of citizens through follow-up of the concentrations of pollutants in commercial fish in line with the standard international levels, and the contribution of this project in the protection of the environment through the assessment of the chemical contaminants levels.

The expected results at the end of this project is to determine the concentrations of heavy metals and chemical contaminants in fish tissues and sediments, as well as establish the follow-up program to pollutants in the targeted commercial fish, showing the accumulation of vital derivatives of these pollutants in relation to indicators of fish size (length and weight), the pollutants weight, and increase knowledge of the potential risks through the concentrations of contaminants.

Annex 16. Fishing gear and methods of Development Project

Traditional fisheries are an important part of the fisheries sector in Oman, the traditional fishing fleet consists of different types of boats such as Dhow wooden boat (small boat) and the wooden boat (hori) and fiberglass boats (fiberglass) and other types of boats. Through statistical data, it is noted that the Fiberglass boats dominate the fleet due to a low effort required to their maintenance in addition to their long life as they are mainly used for fishing by gill nets, cages and different fishing rods (fishhooks), as these nets are used along the Omani coast. The traditional fishermen operate fishing boats in coastal areas, which makes the continental shelf far from the scope of their work. Several measures have been taken to improve the current situation and bring a number of long lines vessels capable of exploiting the marine resources on the continental shelf. To develop fishing gear and methods, the implementation of this project through the execution of several objectives, including:

- The development of wooden ships used in the artisan fishing sector by raising their operational efficiency through the development of fishing gear in the current and future fishing operations.
- Assessment of fishing methods used in the artisan fishing and evaluation of their environmental and economical effectiveness as well.
- The development fishing gear and methods used in artisan fishing sector so as to be more effective.
- Establishment of a database on used and modern fishing gear and methods in Oman.

The evaluation of wooden ships equipment used in the artisan fishing found out that the development of this type of vessel by adding heavy and modern technical equipment used in fishing cannot be done because the body cannot carry heavy equipment and to the lack of sufficient places to set up navigational equipment. And as for the development of fishing gear and methods used in the fishing sector; a number of experiments have shown the results of the experiment on the use of bottom long lines that they could be effective in the fishing of economic demersals, and small fiberglass boats can be used to fishing long tail tuna by use of surface long lines. An outline of the basic requirements of modern fishing vessels was developed, as provided by the International Navigation Association to meet the security and safety of ships and their operators.

Experiments using cages that are made of plastic to catch lobster showed that the stock is exposed to depletion for various reasons, including the majority of fishermen use nets to catch lobster leading to the elimination of juvenile lobster and females laden with eggs; and fishing by cages has achieved great success in catching demersals fish of different species, noting that the cages have proved high fishing effectiveness, but their strength do not last long.

Annex 17. Study of Lobster Fisheries in the Sultanate of Oman

Phase two of the lobster fisheries study was successfully completed prior to the schedule. This final report shows the objectives, implementation plan, project results that lead to assess the status of the lobster resources in the Arabian Sea, Sultanate of Oman and to recommend management. Several new concepts were introduced during the phase two of the project, the upgrading of 12 elements in the project development plan, a system of evaluation of the results for each element, the early integration (1989-2002), phase one (2002-2005), the new data was collected for the phase two in the lobster Database, the evaluation based on the long-term database (1989-2007) and review and dissemination of results during the project rather than the post-project phase.

The average annual catch for the years 1999-2006 was within the limits of (20%) than what is stated for the end of the eighties, and the evaluation based on the 2003-2005 data. The biomass is suggested to be reduced (1047) tons according to the said catch or 2094 tons, assuming actual catch = 2 X the said catch. The maximum sustainable production is estimated about (276) tons per year, which requires a reduction in effort by (27%). Evaluation of the reproduction season by using 1989-2007 data shows a peak in re-production between May and January, with reduced breeding between

February and April and recommend a change in the opening of the fishing season for two months from October 25 - December 15 to March 1 - April 30.

Time analysis for the installation of lengths (2003-2007 data) supports the division of lobster fisheries in the Arabian Sea into two parts (Wusta region and Dhofar Governorate), where the two regions experienced a decline in the average size of the lobster that have been caught.

Tasks that must continue are: routine control of fishing, basic biological features, maintenance and development of the lobster database, and resource assessment to determine the status of stock every two years.

Annex 18. Project to modernize the Fisheries Statistical System as a basis for the Development of the Fisheries Sector

This project, which started in 2009 aimed at review of the method used to estimate the landings of artisan fishing and select the best method, as well as determine the sample size required to collect accurate artisan fishing data, and then design the update to the fisheries database for fish exports at border points to include the coordinator system and the method of automatic data submission with the Ministry of Fisheries.

This is followed by the design of the online form to collect data from commercial catch on ships and transport. It is expected that the project will arrive at significant results as follows:

1. The production and productivity field, there will be:

More accurate estimates of the quantities and prices of fisheries landed by artisan fishing.

More collection of accurate and faster data on commercial catch.

Assist the Directorate General of Customs in the coding of Omani fisheries and estimation and value of exported quantities.

Issue a fisheries statistic report more comprehensive and extensive than it is now.

2. The quality of production as it will provide more accurate and perfect data of collected fisheries statistics.
3. For the fisherman income, there will be more accurate data available for decision-makers on the fisheries sector, allowing them better tools for decision-making to maintain the income of fisherman and raise his productivity.
4. The project will operate to gain access to more accurate results for assessing the contribution of the fisheries sector in the GDP of the Sultanate, by updating the mechanism of estimating the landed fisheries quantities and value.
5. For the protection of natural resources, the project will provide more accurate data for decision-makers and researchers on the extent of exploitation of fish

stocks in the Sultanate through the issuance and updating of the indicators of production and effort by type of fish and the region.

6. Create new job opportunities in the industry through accurate data for the fisheries sector, which will determine the status of the stock in areas that did not reach the stage of its exploitation.

Annex 19. Registration and Publication of Traditional Knowledge that Aims at the Sustainable Use of Resources

The Sultanate of Oman has implemented a number of development projects programs and within the context of a study of institutional frameworks related to sustainable agriculture to develop, activate and strengthen its planning capacity, and then develop several programs to reflect the goals set out in this framework, as follows:

First: Within the context of management of land resources:

1. A total of 106 projects were implemented for the construction of flood walls, for farms located on the wadis courses.
2. A program was implemented to improve the agricultural soils properties for 1,620 farms by intensifying the cultivation of seasonal legumes crops and provision of appropriate fertilizer to increase soil fertility as well as training them in associated agricultural operations.

Second: Within the context of water resources management:

A total of 18 projects were implemented to develop the conventional farm systems in various regions of the Sultanate to use aflaj surplus water in additional areas and planting distances between palm trees by seasonal crops, which were estimated at about 210 acres.

Third: Within the context of vegetation resources management:

projects for the propagation and dissemination of cultivation of high-yield varieties of different vegetable crops, field crops and varieties of excellent fruit species were implemented, in addition to the distribution of approximately 250,000 seedlings of excellent Date palm varieties, also programs aimed at reducing post harvest losses in about (280) Date palm farms were implemented, in addition to the distribution of 97 units for the preparation, processing and packaging dates and the establishment of 12 rooms in the agricultural development departments and centers for fumigation against pests that affect them in storage of each one capacity of 11 tons, and also programs aimed at preservation of species and varieties of Omani various field and vegetable crops and the development of their cultivation and growth to ensure sustainable use and make it a source of genetic improvement because of their obvious adaptability to local circumstances of agricultural production in the Sultanate.

Fourth: Within the context of maintaining traditional knowledge and benefit from the inheritance of agricultural knowledge:

Several programs to inventory and document the inheritance of agricultural knowledge in all fields of agriculture and traditional manufacturing were implemented

and use them as a promising basis to the modern agricultural organization in the various fields of integrated management of land water and vegetation resources, as well as to develop work methods on projects of traditional agricultural and manufacturing of agricultural products in line with the Future Vision of Oman's Economy for the year 2020.

Annex 20. Integration of Biodiversity Considerations in the Agricultural Sector

Work is under way to implement some programs and projects in the agricultural sector (development/research) within the context of the Biodiversity Strategy in the Sultanate of Oman, including, for example, the following:

1. A number of studies and field surveys of plant genetic resources for food and agriculture, including wheat, barley, forage, legume crops for food and fodder and some vegetables and fruits crops were conducted.
2. There are 20 locations of protected areas, under the supervision of the Ministry of Agriculture, for natural pastures in Dhofar Governorate of a total area 171 hectares. They are monitored for the purpose of their preservation and protection of the diversity of pasture and grasses, as well as the wild plant species and agricultural crops.
3. There are several activities designed to keep local breeds of vegetables such as onions, garlic, cucumbers, sweet potatoes and other cereal crops such as wheat, barley and chickpeas in 2007 through the establishment of the fields at the farmers.
4. Seed Technology Unit was established and developed to become the National Gene bank.
5. A number of field gene banks, including Bank of genetic varieties of Omani date palm, which includes more than (186) varieties of date palm trees in Willayat Bahla, Field Gene Bank for Omani mango varieties, which includes more than 100 varieties and breeds, Field Gene Bank for Omani bananas varieties for more than 40 varieties, Gene Bank of Citrus in Jimah, Willayat Bahla, which includes more than 23 species, in addition to the Field Gene Bank for forests, pastoral and medicinal plants, shrubs and trees, in Rumais and Willayat Barka, which comprises about (100) species.
6. Work is under way to finalize the development of wheat and barley through the program of propagation, and it is hoped to obtain wheat varieties of high quality and high productivity during the agricultural season 2010-2011.

The most major important obstacle in the implementation of projects is the lack of qualified technical staff to carry out such projects related to biodiversity, which requires increasing the number of technical staff in the agricultural sector and qualifying them academically together with on the job training.

Annex 21. Incorporation of Biodiversity Action Plans in the Oil and Gas Sector

- Drilling sites of fluids collection are currently coated with impervious lining to protect the soil from pollution with chemicals.
- The Ministry of Oil and Gas, in coordination with the companies operating in the country in exploration and production of oil and gas in Oman, is

developing an annual plan for gas flaring, and the plan aims at regulation of the burning of gas.

- Production Water associated with drilling is currently injected in wells specifically drilled for the disposal of such water. Groundwater is protected by using iron casing for lining the well before reaching the area containing the oil in order to protect these waters from pollution by chemicals used in the wells' fluids. The uses of chemicals harmful to the environment in drilling fluids, when drilling to short depths, were also banned.
- Production and use of unleaded gasoline in equipment fuel, as well as reduction of the amount of sulfur in the diesel produced in the Sultanate.
- Application of the (Combined Cycle) in the production of electricity by using the heat from the turbines to produce steam and reduce the use of gas and burning it.

The major obstacles during the implementation of projects:

- Reduce the burning of gas and production water associated with oil while maintaining the level of oil production.
- The high cost of purification of water associated with the production of oil for reuse or disposal.
- The high cost of alternative energy use to manage the production and transfer energy.

On the priorities of oil and gas projects related to biodiversity

Projects implemented by Petroleum Development Oman during the period 2011-2015 are:

- Study and treatment of soil contaminated with oils and radioactive materials produced during the production of oil and gas in the company's operation facilities and areas surrounding the production of oil and gas.
- Pumping of production water associated with the drilling to discharge it in deeper depths rather than currently used shallow aquifer depths.
- Waste facilities management - the separation of waste when transporting and storage.
- Studies to reduce the burning of gas associated with oil production and use of solar energy for power production.
- Management of oil spills through oil pipelines when maintenance or change.
- Monitor air quality in the Mina Al Fahal area and work areas in the Interior.