

Sultanate Of Oman



National Biodiversity Strategy & Action Plan

# National Biodiversity Strategy & Action Plan



Ministry of Regional Municipalities,  
Environment & Water Resources

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## **Words of Inspiration**

“The conservation of the environment is the responsibility of all of us – a responsibility that knows no political boundaries. Therefore, man, wherever he lives, must contribute to this conservation and must order his life accordingly. This must be done in a planned, rational way and taking into consideration the numerous causes of pollution, whether natural, biological, industrial, chemical or physical.

We must set a limit to haphazard methods and protect what is left of our grazing lands and water resources against desertification and drought,.....”

**Qaboos bin Said**



*His Majesty Sultan Qaboos Bin Said*

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## **Members of Steering Committee:**

Mr. Ali Amur Al- Kyumi - MRMEWR  
Mr. Abdul Azez Salim Al- Harthy - MAF  
Mr. Ahmed Rashed Al- Mamari - MNE  
Dr. Andrew Spolton - DRC  
Mr. Haji Faker Al-Blushi - MSA&L  
Dr. Hamed Hashem Al- Dahab - MC&I  
Dr. Hamed Satha Al- Morgan - M Info.  
Dr. Mehdi Ahmed Jaafar - SQU  
Mr. Mohammed Ali Said - MC&I  
Mr. Mohammed Hamdan Al- Tobi - ME  
Mr. Mohammed Hamed Al- Masrori - MHEW  
Mrs. Najah Ahmed Thabit Alsaïd - MRMEWR  
Mr. Nasser Ali Al- Medalwi - MOG  
Mr. Saif Salim Al- Saidi - MI  
Mr. Salim Musalam Al- Saady - National Coordinator  
Mrs. Seddikah Ramadan Al- Haj Suliman - MNHC  
Mr. Soud Mohammed Al- Tamamy - MHE  
Mr. Sultan Saif Al- Saify - MHEW

## **Members of Drafting Committee:**

Mr. Salim Musalam Al- Saady - National Coordinator  
Mr. Abdulhameed Ahmed Al- Khatib - MRMEWR  
Mr. Ali Hussain Al-Lawatia - MAF  
Mr. Ibrahim Abdullah Al-Gadani - MRMEWR  
Dr. Mehdi Ahmed Jaafar - SQU  
Prof. Reginald Victor - SQU  
Mr. Simon Wilson - Marine Biologist

## **Members of Technical Committees:**

### **A- Socio-Economic Committee:**

Mr. Mohammed Abdullah Al- Moharami - MRMEWR  
Mrs. Aisha Abdullah Al- Alawi - MRMEWR  
Mr. Ali Hassan Abdullah - ME  
Miss. Dena Ramis Mahfod - MInfo.  
Mr. Hamed Gabr Al- Mahruky - MNE  
Mrs. Hanifah Darwesh Al- Zedjaly - MNE  
Mr. Juma Saleh Al Hashmy - ME  
Mr. Khamis Juma Al-Blushi - MHE  
Mr. Mohammed Khalfan Al-shuali - MRMEWR  
Mr. Mohammed Khlfan Al- shedi - ME  
Mr. Mohammed Saif Al-Busaedi - ME  
Mr. Said Ahmed Al Mukadam - MRMEWR  
Mr. Salim Ali Al- Saadi - MRMEWR  
Mrs. Samira Saeed Al- Ojaili - MRMEWR

### **B- Water Committee:**

Mr. Ahmed Mohammed Al- Sabahi - MRMEWR  
Mr. Ali Mubarak Al- Amri - MRMEWR  
Mr. Said Nasser Al- Saadi - MRMEWR  
Mr. Saleh Said Al- Shoukri - MRMEWR  
Mr. Suliman Nasser Al- Akzami - MRMEWR  
Mr. Sultan Ahmed Al- Harthy - MHEW

### **C- Agro- Biodiversity Committee:**

Mr. Ali Hussain Al-Lawatia - MAF  
Mr. Abdullah Dawood Al- Zedjali - MAF  
Dr. Abdulmohsin Hassan An'nady - MAF  
Dr. Alameen Abdulmajed Alameen - MAF  
Dr. Athman Ali Saed Ahmed - MAF  
Dr. Hamzah Alamen Abdulrahman - MAF  
Dr. Mohammed Abdullah Saleh - MAF  
Dr. Mohammed Ahmed Al-Haaj Hadad - MAF  
Dr. Namrood Dawood Binyameen - MAF  
Mr. Said Hamed Al- Alawi - MAF  
Dr. Saleem Qasem Sahib Nidaf - MAF  
Dr. Sameeh Saed Mustafa - MAF  
Mr. Soud Saif Al- Habsi - MAF  
Dr. Taj As'ser Essa Ali - MAF  
Mr. Yacob Mansor Al- Rqashy - MAF  
Mr. Yousif Mohammed Al- Raesy - MAF

### **D- Laws and Legislations Committee:**

Mr. Yahya Mohammed Al- Gasani - MRMEWR  
Mr. Ibrahim Abdullah Al-Gadani - MRMEWR  
Mr. Mahmood Zaki Hassan - MRMEWR

### **E- Marine Committee**

Dr. Moustafa M. Fouda - SQU  
Mr. Ali Nassir Al-Azri - MAF  
Prof. Anton McLachlan - SQU  
Dr. Barry Jupp - SQU  
Dr. Ewen McLean - SQU  
Mr. Hamad Mohammed Al-Gheilani - MAF  
Mr. Manie Grobler - MRMEWR  
Dr. Michel Claereboudt - SQU  
Mr. Nasser Issa Al-Maskari - MRMEWR  
Dr. Shareef Siddeek - SQU  
Mr. Simon Wilson - Marine Biologist  
Dr. Stephen Goddard - SQU

### **F- Terrestrial And freshwater Committee**

Prof. Reginald Victor - SQU  
Mrs. Amina Abdullah Al-Farsi - SQU  
Dr. Anette Patzelt - SQU  
Dr. Aysha Hasan Al-Khayat - SQU  
Mr. David Insall - MRMEWR  
Dr. Derek Roberts - SQU  
Dr. Drew Gardner - SQU  
Dr. Jens Eriksen - SQU  
Mr. Kalid Juma Al-Rasbi - DRC  
Mr. Manie Grobler - MRMEWR  
Mr. Richard Wood - DRC

Names order : Chairman of committee followed by members names in alphabetical order.

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## PREAMBLE

### The Convention on Biological Diversity

Biological diversity refers to “the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems”.

As a result of human activities, biological diversity is being eroded at an alarming rate. This accelerating decline of biological diversity threatens the ecological, economical, spiritual, recreational and cultural benefits that we currently derive from the Earth’s living resources.

Acknowledging these threats, the world community successfully negotiated the United Nations Convention on Biological Diversity that was opened for signature by world leaders at the United Nations Conference on the Environment and Development (UNCED) in Rio de Janeiro, Brazil, in June 1992.

The Sultanate of Oman signed the convention in June 1992 and ratified it in December 1994. The Convention builds on and echoes the philosophy of predecessors such as *Caring for the Earth, A Strategy for Sustainable Living*, published in 1991, *Our Common Future* (the Brundtland Report), published in 1987, and the *World Conservation Strategy*, published in 1980. All are based on the principle of sustainable use of resources.

#### **The objectives of the Convention are:**

- the conservation of biodiversity;
- the sustainable use of biological resources; and
- the fair and equitable sharing of benefits arising from the use of genetic resources.

These objectives echo the three pillars of sustainable development, ecological integrity, economic sustainability and social equity. The Biodiversity Convention conveys an understanding of the relationship between human activity and the natural world and the need to sustain the integrity of ecosystems. Implementation of the Convention will require a significant shift in the way we use and manage natural ecosystems. A co-operative, cross-sectoral approach, based on partnerships, must be adopted within and among the nations of the world.

diversification of the economy away from oil to other productive sectors and accelerating privatisation have exerted greater pressure on natural resources.

The potential impacts of this new development plan on Oman's biodiversity is likely to be profound and far reaching. These include impacts from increased requirements of land for housing, industry, mineral exploitation, tourism development and the production of more food. Despite stringent environmental licensing procedures some habitat will be threatened severely. Increase in livestock holdings in favourable rangelands will threaten grazing resources. Increase in pressure to search for minerals as oil and gas reserves begin to diminish creates an added need to address biodiversity conservation in the context of sustainable development.

This National Biodiversity Strategy and Action Plan constitutes a major contribution to the country's development plan. Land, water, pasture, terrestrial and marine ecosystems, wildlife and aquatic resources are central to agriculture, fisheries and tourism development. Habitat protection, natural resource conservation and sustainable use options offer significant opportunities for demonstrating that conservation of biodiversity represents a vital investment in future sustainability of Oman's economic and social development.

## **A Portrait of Biodiversity in Oman**

The Sultanate of Oman has a land area of 309500 km<sup>2</sup> consisting of gravel desert plains, areas of sand and mountain ranges, and is bordered by 3165 km of coastline. It supports an estimated human population of 2.3 million. Despite an arid climate over most of the country, it is an area of relatively high biodiversity, especially in the regions of higher precipitation, through seasonal rainfall and where the south-west monsoon produces fog or continuous rainfall. Distinct bio-geographic regions support species found in Iran and Pakistan in the northern half of the country; with increasing influence of African species further south. There are also a number of relict species, both from former climates and from tectonic separation of land masses.

Terrestrial biodiversity is an important component of Oman's biodiversity. Range lands and woodlands in this country are found to harbour a diverse array of different plant species, more than 1208 of which have been identified so far. The existence of many tree types and grasses common to different ecological zones have also been classified and this vegetation cover, particularly trees, helps to halt soil erosion and desertification. The plant communities include 78 endemic species. The existence of a relatively large number of animals in this region can be attributed to the geographic and climatic characteristics and, subsequently, the diversity of life it is able to sustain.

The mammalian fauna of Oman includes the Arabian Gazelle, Wolf, Striped Hyenas, Arabian Leopard, Ibex, Masirah Hare Arabian Oryx, Arabian Tahr, Desert Fox, and Caracal Caracal among many other species. More than 461 species of birds have been identified, some of which are residents, and others stop in Oman while migrating from Africa, Asia, Europe and the Mediterranean. There are also more than 75 species of reptiles and thousands of species of invertebrates. Terrestrial diversity is complemented by rich marine diversity which is reflected in the array of marine and coastal life, particularly those of fish. A wide variety of vertebrates, invertebrates, more than 20 species/subspecies of whales and dolphins, and porpoises and more than 75 species of coral have been recorded so far. In addition, five species of marine turtles of which four nest along the coasts of Oman are of interest to both scientists and tourists. Of these, Green turtle with a nesting population of more than 13000, exist in the Ras Al Had area alone.

Furthermore, the Maserah Island is home to one of the largest nesting population of Loggerheads in the world.

There are five regionally endemic and one nationally endemic mammal species, six nationally endemic species of reptiles and amphibians, and 26 species and subspecies of scorpions and possibly two species of tail-less spiders. Several of these species are currently at risk.

Agriculture, livestock production and fisheries constitute an important part of Oman's economy. Main agricultural products include fruits, fodder, vegetables and grain crops. Native plants are also used to produce handicraft, medicines and household items. Animal production is largely based on goats, sheep, cattle, and poultry. Fisheries provide significant direct economic benefits representing 1% of GDP and ranks first among the non-oil exports.

## **The Role of Biodiversity Economies**

Following the discovery of oil, bringing Oman into the upper middle income per capita bracket, a rapid programme of development was embarked on in 1975, followed by a series of five-year development plans leading to a sharp increase in the standard of living through the provision of basic infrastructures, including health, education, housing, road building and many other needs. The long range development strategy (Economic Vision-Oman 2020) initiated a move to diversify the economy away from dependence on diminishing oil reserves and towards creating an infrastructure of manufacturing industry, the exploitation of other fossil sources of wealth, agriculture as well as tourism. During

this period, the population has grown at an estimated rate of almost 3% exerting a growing pressure on the country's limited resources.

The scarcity of renewable resources which currently are under threat and degradation accompanied with aggressive development programmes justify the initiation of an action plan that is not only conserving the biological resources but also recovering the ecosystems to maintain more resources for a sustainable development to improve quality of life and secure social welfare. This implies that any loss in human welfare is a cost the society should pay from the living standard already attained.

The diversification of the economy in Oman depends heavily on the sustainability of non-oil renewable resources which have been playing a vital role in the development plans through their contribution in the production process and GDP to assess the economic significance of biodiversity in Oman. The action plan adopted a methodology to evaluate the role of renewable resources in the national economy.

#### **The main findings of economic valuation approach are:**

- 1- The objective of diversifying the sources of national income in Oman development strategy (Oman 2020) attaches high economic value to the renewable resources through the proposed increase in the GDP share of the non-oil resources.

To consider only the production sector that comprises agriculture, fisheries and manufacturing which all depends heavily on biological resources as input, we can deduce the following significances:

- a) The need to increase the contribution of non-oil sectors to the GDP from (61.8%) at the end of the fourth five year development plan to (67.8%) at the end of the fifth five year plan, and to increase the quota of commodity production sector (from non-oil sectors) from 11.3% to 17.1% for the same period.
  - b) By intensifying agricultural development, its contribution to NGP increased from 1.9% during the period (1976-1985) to 3.3% during the period (1986-1993), and in 1997 it increased to 8.4%. The contribution from Fisheries is expected to increase from 1% to 2% by the end of 2000. The fifth five year plan (1996-2000) forecast is that the annual rate of growth for agriculture and fisheries sector shall be (3.3%) and its share in NGP (3.3%).
- 2- These are promising rather than exaggerated figures, and they are so because there is a parallel line of investment on conservation to keep natural resources active and productive.

- 3- Total investment allocated in the fifth five – years plan (on-going and new projects) for renewable resources (agriculture, fisheries, water) together with pollution abatement accounted for about R.O 230 mil representing 13% of gross investment of the public sector. If investment in oil, gas, minerals are also included the percentage would become around 18%. A case that provide another empirical evidence on the economic value attached to biodiversity resources.
- 4- The annual income from fishing was about R.O 10.6 million for the period 91- 98. In the year 1997 it reached R.O 14.0 million, net value added increased from 24.7 mil in 1994 to 42.0 mil in 1998. Total value of fish exportation during 1985 – 1998 ranges between R.O 7.8 to 20.0 million.
- 5- Value of agricultural exports raised by 8.6% annually during 1988 – 1993. As total products is expected to increase from 1170 m/t in 1998 to 1844 m/t in 2020. It is expected that the value of crops exported will increase accordingly.
- 6- Meat production is projected to increase from 10.0 m/t in year 2000 to 13.5 and 18.2 m/t for the years 2010 and 2020 respectively.

These projections pose important role to conservation of rangeland and desertification abatement.

- 7- Food demand in Oman is projected to increase by growth rates ranging of about 2% for (wheat, dates), 1% for (rice, fish), 3% for (vegetable, milk, poultry, fruit, red meat). These projections emphasize the need for the conservation of livestock, fish harvesting and water.

Finally, if biological resources are not conserved no body would argue that development could be sustained and welfare of the people will be maintained. It should be stressed that all species have an economic value which is consumption, production or supporting the existence of other species which are normally used for nation's well being.

## THE STRATEGY

### An Islamic Vision of Biodiversity

Islam asks mankind to understand and know the creation of God. Consequently, respect it and deal with it in a sustainable way. For ALLAH has created every things in this universe for a reason and has assigned each an important role to play. Non was created in vain or without a purpose.

God declares in the Holy Quran " we have not created heavens and the earth and all that is between them carelessly. We have not created them but for truth .... ". Sura (44), verses (38 & 39)

Recognizing the importance of all creatures in their mere existence and the role they play according to God's wisdom for creation is an Islamic duty.

ALLAH Almighty also tells us that all things were created in due proportion and measure, both quantitatively and qualitatively.

God says In the Holy Quran " Verily, all things have me created by measure" sura (54), verse (49). And also says " everything to him is measured " sura (13), verse (8).

ALLAH has mandated individuals to sustainably use the natural resources " Eat and drink, but waste not by excess; verily, he loves not the excessive". Sura (7), verse (31).

ALLAH also says and do not cause corruption in the earth, when it has been set in order". Sura (7), verse (56).

In the saying and the tradition of the prophet Mohamed (peace be upon him) we are asked to respect all created beings. " Do not cut a tree a cow except for eating".

" It a Muslim plants a tree from which a bird or human beings or an animal will feed, he shall be rewarded".

The ultimate aim of Islam is therefore, the universal common good of all created- beings.

The Sultanate of Oman being an Islamic country, the people of Oman share this vision to protect and conserve biological diversity by creating "A society that is conscious of the role and issues related to biological diversity, convinced of its responsibilities toward future generations and determined to sustainably use natural resources in harmony with all other living things in accordance with the laws of Islam."

## **Mission:**

“To conserve the biological diversity of the Sultanate and its marine environment, in accordance with the articles of the Convention on Biological Diversity, for the benefit of the present and future generations of Omanis and for mankind as a whole, with respect to the guiding principles of Islam.”

## **Main strategic goals:**

- Safeguard habitats and productive renewable resources for rational and sustainable exploitation.
- Conserve habitat, plant and animal diversity especially of those uncommon and also of special interest;
- Provide a high quality natural environment for recreational and tourist activities;
- Improve the understanding of ecosystems and increase resource management capability;
- advocate the need to conserve biodiversity and use biological resources in a sustainable manner;
- Develop legislation that insures the conservation of biodiversity and the sustainable use of biological resources;
- Develop incentives that will promote, biodiversity conservation and Provide employment for local people;
- Equitably share the benefits of sustainable resources including genetic resources at local and regional levels.

Promote regional and international collaboration on biodiversity conservation and sustainability of natural resources.

## **Guiding Principles**

- Biodiversity has ecological, economic, social, cultural and intrinsic values.
- Islam teaches us that all life forms, including humans are ultimately connected to all other life forms.
- The people of Oman depend on biodiversity and have a responsibility to contribute to biodiversity conservation and to use biological resources in a sustainable manner.
- All Omani people should be encouraged to understand and appreciate the value of biodiversity and to participate in decisions involving the use of our air, water, land and other resources.

- An ecological approach to resource management is central to conserving biodiversity and using our biological resources in a sustainable manner.
- Development decisions must reflect ecological, economic, social, cultural and spiritual values.
- Healthy, ecosystems and the maintenance of natural processes are prerequisites for the *in-situ* conservation of biodiversity and the sustainable use of biological resources.
- *Ex situ* measures are required to support the conservation of some species and populations that are essential to ensure the sustainable use of many agricultural, woodland and aquatic resources.
- The knowledge, innovations and practices of pastoral and local communities should be respected, and their use and maintenance carried out with the support and involvement of these communities.
- The conservation of biodiversity and the sustainable use of biological resources should be carried out using the best knowledge available and approaches refined as new knowledge is gained.
- The conservation of biodiversity and the sustainable use of biological resources requires local, national and global co-operation and a sharing of knowledge, costs and benefits.

### **Implementation of the National Biodiversity Strategy and Action Plan:**

The Biodiversity Strategy and Action Plan is viewed to be an ongoing, continuous and cyclical process, and the actions outlined in the strategy get implemented along the line on national development and in light of the regional and international context. In this way, the national planners will become the national implementers so that biodiversity conservation becomes sustainable and its management can thus positively affect the national economy and the livelihood of the people of Oman. Proposed mechanisms for implementing the National Biodiversity Strategy and Action Plan include:

- The creation of a permanent interdepartmental biodiversity steering Committee and National Biodiversity office which will be responsible for :
  - the filing of an annual national report on policies, activities and plans aimed at implementing the Strategy;
  - co-ordinating the implementation of national and international elements of the Strategy;

- recommend measures to permit and encourage non-government participation in the implementation of the Strategy;
- regular reporting on the status of biodiversity; and,
- revision of the strategy after an initial implementation phase of five years.

## Theme 1. Conservation of Natural Resources

### 1.1 Protected areas

A protected area is a geographically defined area, which is designated or regulated and managed to achieve specific conservation objectives. In Oman, a total of 14 areas of approximately 29844 km<sup>2</sup> have been legally designated for protection (as Sanctuaries, Nature Reserves or Natural Parks). The areas (from 0.6 km<sup>2</sup> to 24,785 km<sup>2</sup>) include fragile ecosystems of conservation value (e.g. Juniper woodlands, *khawrs* (lagoons) in southern region, *qurms* (mangroves) in northern and southern Oman, thermal springs, specific islands and offshore areas). Management plans have been drawn up for 12 of the areas, but not one has yet been promulgated, funded or implemented, although discussions with concerned ministries are progressing to a positive conclusion. Furthermore, proposals have been prepared or are in the final stage of preparation for 8 other sites.

Considerable protection of habitat has been achieved through the environmental permit system under Royal Decree 10/82, mostly through the voluntary co-operation by concerned agency and not through management planning and implementation of management plan. Expansion of ranger units has improved the protection of conservation areas and wildlife to some extent. Biodiversity conservation is still severely threatened by economic development in various forms. Several protected areas are subjected to unrestricted grazing by livestock, unmanaged fishing pressure, habitat degradation and disturbance from human activities and feral animals. The role of Scenic Reserve as a measure of economic development through sustainable ecotourism is under consideration. Traditional conservation areas and traditional mechanisms for the sustainable use of biodiversity may contribute to the protection of selected habitats.

#### Key Issues

- Increasing pressures on nature conservation areas and ecosystems as a result of expansion in agriculture, fisheries, road building , tourism and urbanisation.
- Lack of or incomplete implementation of management plans for existing protected areas.

- Incomplete network of protected areas.
- Poor involvement of the public in the design and implementation of management plans.
- Insufficient financing.

### **Objectives:**

- Maintain and develop an integrated, representative and sustainable network of protected areas that will ensure the preservation of biodiversity.
- Conserve plant and animal diversity in existing and proposed protected areas.

### **Options:**

- Promulgation, funding and implementation of management plans for existing protected areas.
- Monitoring biodiversity including natural impact assessments and human impact assessments in protected areas.
- Removing intrusive species.
- Monitoring National Scenic Reserve Areas, especially those that will be open for development and for tourism to make sure that these activities will not damage the basic structure of these ecosystems.
- Ranger unit expansion to link capacity building with knowledge base by providing training programs.
- Commission studies to evaluate sustainable, traditional conservation systems.
- Restoration of degraded habitats within protected areas and in adjacent lands and corridors.
- Broadening participation of the local population in the design, demarcation and management of natural conservation areas.
- Enhancement of the ecological, economic and social value of protected areas by increasing the benefits to people in and around these areas.
- Development of liability measures to control human activities within protected areas.
- Formulation of criteria governing the establishment of protected areas (with particular reference to fragile ecosystems).

### **Priority Actions:**

- 1.1.1 Promulgation of the proposed legislation on Nature Conservation Areas and strict implementation of legislation for wildlife protection, nature conservation and protected areas as stipulated by Royal Decrees and ministerial decisions.

- 1.1.2 Revision and implementation of management plans for existing protected areas. (These plans shall be developed with the participation and to the benefit of local communities).
- 1.1.3 Designation of new protected areas (including sites of special scientific interest).
- 1.1.4 Economical evaluation and assessment of resources and potential development of revenue-base activities for each protected areas.
- 1.1.5 Creation of a database on ecosystems, nature conservation areas and species at risk.

## 1.2 Endangered species

It is estimated that 136 plant species or varieties occurring in Oman are currently at risk. Of these, 80% are found in southern Oman. In all, there are 100 endemic and regionally endemic species, of which 63 are in Dhofar, 12 in central Oman and 25 in the northern mountains. These exclude 22 non described species which are likely to be endemics to Oman. Endemism is high in the southern region and 46% of these endemics here are also endangered. The major centres of endemism are the Northern Oman mountains including Musandam region, Limestone plateau of Central Oman and the escarpment woodlands of Dhofar. All these regions are of extreme conservation importance and support unique flora (e.g. *Juniperus excelsa polycarpus*, *Olea europea*, *Ceratonia oreothauma oreothauma*). The major threats to the terrestrial flora are encroachment caused by habitation, cultivation, landscape gardening, livestock husbandry, oil and gas industry, overgrazing, pollution, off-road driving, etc.

Oman is also host to a number of rare animal species that need protection. Terrestrial mammals at risk include the reintroduced Arabian Oryx, the Arabian Leopard, Muscat and Reem Gazelles, Masirah Hare, the Nubian Ibex, the Arabian Tahr, the Grey Wolf, the Sand Fox, the Caracal Caracal, and Striped Hyena. Marine mammals occurring in Oman and listed as vulnerable by IUCN include the Sperm Whale and the Humpback Whale. The endangered species of birds that visit Oman on a regular basis and need protection are Ferruginous Duck, Great Spotted Eagle, Imperial Eagle, Lesser Kestrel, Sociable Plover, Slender-billed Curlew, White-eyed Gull and Golden-winged Grosbeak. Major threats come from habitat destruction caused by poor land use practices especially around small coastal lagoons in densely inhabited areas and introduction of alien species such as the Common Mynas. One species of scorpion *Vachoniolus* sp. is reported as severely threatened, as well as the four species of marine turtles found in the country and possibly three endemic lizards. Data is lacking for several other taxa. Threats to these animals

include poaching, egg collecting, predation by feral animals (cats and dogs), pollution, accidental fisheries by-catch and habitat destruction.

### **Key Issues:**

- Lack of enforcement of protection measures.
- Little systematic population monitoring of most species.
- Lack of information on the status and habitat requirements of species at risk
- Habitat destruction caused by activities associated with development.
- The Sultanate has not yet become a party to the CITES although measures and provisions to observe CITES and TRAFIC are pursued.

### **Objectives:**

- Ensure the protection, conservation and recovery of vulnerable, threatened or endangered plant and animal species

### **Options:**

- Undertaking systematic monitoring activities for species at risk.
- Implementing protection measures for rare and vulnerable plant and animal species threatened with disappearance or extinction.
- Examining the illegal trade in live mammals from Oman and implement measures to curb it.
- Accession of Oman to the Convention on International Trade in Endangered Species (CITES) and the Convention on Migratory Species (CMS).
- Prohibiting development and activities that threaten critical habitats.
- Identifying specific protection areas at centres of endemism.
- Establishment of a national database.

### **Priority Actions:**

#### 1.2.1 National assessment and recovery program for species at risk:

- evaluation of the status of species likely to be at risk.
- systematic monitoring of critically endangered species.
- development and implementation of recovery programs.
- measures ensuring the protection of critical habitats.

- 1.2.2 National database on ecosystems, nature conservation areas and species at risk.
- 1.2.3 Application of IUCN Red List Criteria for all groups and continued production of National Redlists.
- 1.2.4 Continued Implementation of In-Depth Studies of the Biological, Ecological and Management Aspects of Omani Turtles (NCS Projects ENR 11 and ENR 8).

### 1.3 Ex-situ conservation

*Ex-situ* conservation should be considered as a viable method for the protection of species at risk. In the Sultanate, *ex-situ* measures for the large mammal species occur at the Arabian Oryx Sancturay and Omani Mammal Breeding Centre (OMBC). Both suffer from lack of funding, inadequate veterinary and scientific support and ambitious definition of their goals. There are administrative overlaps that prevent these from achieving their potential as a national treasure for *ex situ* conservation and repositories for genetic material.

*Ex-situ* conservation of wild flora is neglected in Oman despite major threats facing plant species. Except for a small botanical garden in the Sultan Qaboos University, and Natural History Museum there are no botanical gardens in the country. There are numerous parks, but none of these parks are entirely devoted to the collection and propagation of native Oman plants. On the contrary, these parks are repositories for a large collection of exotic plants. The primary purpose of these parks is recreation and not conservation.

Some vegetable, grain, forage and fruit crops have been indigenous and known to be grown in the Sultanate since time immemorial for diet and commercial food or for animal feed purposes. Recently, several biotic, abiotic and social factors are posing serious threats to the survival and existence of these indigenous crop species. Consequently, if not protected in the near future, they may go extinct, leading to invaluable loss for the nation. *Ex situ* conservation may be the solution to this acute problem. National efforts were focused to collect and conserve local Date Palm cultivars since the beginning of 1980. The main gene bank is located in Wadi Quriat in the Interior region which has more than 168 of local Date Palm cultivars collected from different regions.

The Sultanate has two herbaria, one at the Oman Natural History Museum (ONHM) and the other at the Sultan Qaboos University. Over the years several plant collectors have gone through this country and some have collected seeds of Oman plants, which are stored in places like the Kew Gardens in the United Kingdom. However, a well-curated seed collection does not exist anywhere in the country, with the exception of the Date Palm.

### **Key Issues:**

- Absence of conservatories for national biodiversity.
- Absence of integrated *ex situ* conservation strategy and management plans.
- Incomplete representation of cultivars in existing gene banks.
- Administrative overlap.

### **Objectives:**

- Conserve *ex-situ* vulnerable, threatened or exceptional elements of natural or agricultural components of biological diversity.
- Ensure *ex-situ* conservation of natural and agricultural biodiversity.

### **Options:**

- Assistance in carrying out or evaluating environmental assessments for all development projects to establish zoos in the Sultanate.
- Developing licensing procedures, operating regulations and regular inspections of permitted zoos as well as all private collections of wild animals
- Expansion of OMBC facilities including veterinary and scientific support through funding.
- Proposals to officially recognise OMBC and Arabian Oryx Sanctuary as repositories for genetic resources.
- Strengthening Crop Plants Gene Banks.
- Establishment of a Plant Genetic Resources Centre.
- Nation-wide seed-collecting project in various seasons.
- Germination studies testing seed viability in different environmental conditions.
- Local community involvement in *ex situ* conservation practices.
- Establishment of botanical gardens over varied, natural, seminatural and man-made landscapes for native Oman plants.
- Expansion of existing parks to include a botanical garden that could support nurseries growing native plants including medicinal plants.

### **Priority Actions:**

- 1.3.1 Establishment of a Plant Genetic Resources Centre.
- 1.3.2 Identification and Collection of Species in need of protection for breeding or propagation.

## Theme 2. Terrestrial and Freshwater Faunas

The terrestrial and freshwater faunas of Oman include thousands of species of invertebrates. Information on these taxa is very poor except for some groups of insect, mollusks and arachnids. Among vertebrates, there are seven species of freshwater fish not including several exotics that have started establishing populations in the wild, two species of amphibians, 89 species of reptiles of which six are national endemics, 461 species of birds and 54 species of mammals. In addition, there are numerous species of bacteria and fungi.

Large animals are of obvious interest because of their value in conservation and as potential attractions for ecotourism. However, the other animals play an essential role in the foodwebs of ecosystems. Their positions in trophic links are essential for the existence of animals in subsequent trophic level. In an arid zone, links in foodwebs are few and the disappearance of a single link has severe consequences to the ecosystem functioning. Some animals are economically important (e.g. pollinators like butterflies and bees) Some animals are also important because of their role as biological control agents. Example are, carnivores controlling rodent pests, bats preying on biting insects and fish predators of mosquito larvae. Therefore the biodiversity conservation of these animals are essential.

Even if hunting is banned in Oman and law protects all birds and mammals, illegal hunting and poaching still occur regularly. Habitat alteration and encroachment caused by inappropriate land use, pollution and biological invasions have led to population decreases in several species (see section 1.2). Many recent activities associated with urbanisation and development alter habitats. Construction of recharge dams and roads for example, have severe impacts on habitats. Similarly, activities associated with mining, oil production and agriculture also physically impair habitats. Alteration of wadi courses and changes in the drainage characteristics of catchments impact both aquatic and terrestrial biodiversity.

At times, the effects of habitat alteration on biodiversity are indirect. The salinisation of groundwater in the coastal areas of Oman is a typical example. In this case, the alteration of a terrestrial habitat for intensive agriculture results in the overuse of water facilitating seawater intrusion. This in turn causes the salinisation of groundwater, which affects both freshwater and terrestrial biodiversity.

The improper application and handling of pesticide has a negative impact on aquatic biodiversity as well as deleterious effects on non target species of arthropods, fish, reptiles, amphibians and birds.

The introduction of alien species is also a problem of special concern for local wildlife. Common Crows and introduced Common Mynas, still rare 15 years ago, have expanded to the detriment of local bird populations. Tilapia introduced for aquaculture or mosquito control in water systems have escaped into the wild leading to the disappearing of local fish. not to mention the introduced insect responsible for the lime tree disease.

Information on bird observations, reptiles and amphibians are available in separate databases kept at PDO or at Sultan Qaboos University. An excellent collection of insects is kept in the natural History Museum, Ministry of Heritage and Culture. Despite these efforts, information is still scarce on many taxonomic groups and trends in animal populations are either not documented or poorly understood.

### **Key Issues:**

- Lack of information on the status of wildlife.
- Habitat destruction, rangeland degradation and pollution
- Invasions of alien species

### **Objectives:**

- Support projects on systematic of animal groups poorly known in Oman.
- Establish population monitoring for vertebrate species of conservation and ecotourism importance.
- Expand the capacity of Natural History Museum for reference collections.
- Man-power shortage in the Museum should be rectified by employing Omani biologists.
- Promote interaction between Oman and international authorities on various animal groups.
- Ensure full co-operation between the Natural History Museum, MRMEWR and Sultan Qaboos University to study the Oman's Faunas.

### **Options:**

- Consideration of Oman's becoming a signatory party to the Convention on Migratory Species (The Bonn Convention).
- Establish a working group to examine threats from animal species invasion and draw up action plans to tackle those currently causing concern.

### **Priority Action:**

- National database on ecosystems, nature conservation areas and species at risk

## **Theme 3. Marine Life and Fisheries**

The marine and fisheries resources of Oman are immense and diverse due to its coastal tropical habitats, large exclusive economic zone, broad climatic spectrum, and its unique geographic location in the upwelling region of the north-western Indian Ocean. Fisheries provide significant direct economic benefits to Omani society, representing 1% of GDP and ranking first among the non-oil exports.

The marine biota is not generally well known except for a few groups, such as fishes (1142 species known from Omani waters), seaweeds (232 species), and corals (75 species). There are insufficient data on the distribution, abundance and biology of many species. Despite their recognised importance for sustainable fisheries, marine and coastal habitats are threatened by both natural and man-made impacts. Natural impacts include coastal erosion, siltation, and large water temperature fluctuations. Human impacts include activities such as coastal urban and residential development, fishing, recreation and tourism, oil and gas industry, desalination plants, etc. Aquaculture is set to expand in Oman in the near future yet there are no guidelines regulating the importation of exotic species for culture, the scope for environmental impact studies and environmental standards required for fish-farms. Under these conditions, the development of marine aquaculture raises the question of potential negative impacts of introduced alien species on native fish-stocks.

The Omani coastline is strewn with beaches, mangroves, coastal lagoons, tidal inlets and sinkholes that play a major role in ecosystem productivity. This coastline is critical habitat to numerous species and must be protected accordingly. Coral reefs have been affected by lost and abandoned nets, fishing traps, anchor damage, littering, predation by the Crown of Thorns Starfish, coastal construction, oil pollution. Similarly mangroves have been affected by overgrazing, urbanisation, coastal development, littering and pollution. Human activities are expected to increase in the future as more large projects are either underway or planned around the major coastal cities.

### **Key Issues:**

- Overfishing
- High levels of fisheries waste and poor quality of catch
- Unsustainable levels of by-catch, particularly wildlife species

- Habitat damage arising from fishing gear and practices
- Inadequate fisheries monitoring, surveillance and control system
- Marine habitats under represented in protected areas system

### **Objectives:**

- To ensure sustainable capture fisheries (Overfishing, impact on non-target species and habitat damage).
- Protection of marine habitats that support fisheries production (particularly coral reefs, seagrasses and mangroves).

### **Options:**

- Establish that existing fishing practices and levels of fishing effort cause no damage to the marine environment and are sustainable. Of particular concern are fisheries of large predatory fishes such as sharks and kingfish.
- Reduce levels of by-catch, of wildlife species particularly cetaceans and turtles especially where high densities of wildlife occur e.g. Ra's Al Hadd, Masirah & Barr Al Hickman/Ghubbat Hashish.
- Improve handling and storage of fish (e.g. use of ice on board).
- Encourage fishing in offshore areas while reducing fishing effort on inshore stocks to relieve pressure on inshore fish stocks.
- Stricter control of illegal fishing gears such as drift nets, monofilament nets, and tangle nets in the lobster fishery. Fishing out of season is also a common practice, resulting in egg-bearing females being taken during the closed season, particularly in the lobster fishery.
- Habitat damage results from trawling in shallow water, as well as the action of lost/abandoned gillnets in reef areas.
- Develop and implement a full Monitoring, Surveillance and Control (MSC) plan for industrial fishing. Establish a working pilot scheme for (MSC) of artisanal fishery leading towards an effective national system controlling industrial and artisanal sector with fines returning to the MCS system for upgrading, training, and extension.
- Identify and protect coastal spawning grounds for commercially important species including kingfish and demersal species e.g. groupers, emperors and breams.
- Sign UN agreement on Straddling and High Migratory Fish Stocks, UN Driftnet Resolution, and FAO Code of Conduct for Responsible Fisheries.
- Establish community management networks to take responsibility for community

resources e.g. fishing grounds. Encourage the Code of the Sea as a means of community management.

- Increase coverage of marine protected areas system and ensure that existing and future protected areas are effectively managed and have adequate core funding for their operation.
- Support and promote ecotourism and sustainable utilisation in coastal areas.
- Develop significant Omani expertise in coastal and marine ecology, natural resource management and a capable ranger force.
- Traditional marine knowledge and practices should be studied and recorded.
- Updating oil spill contingency plan.
- Improve EIA system by incorporating the calculation of environmental economic values.
- Undertake study to assess feasibility of 'zero habitat loss' policy in regard of development and sensitive habitats.
- Establish monitoring network for coral reefs and other sensitive coastal habitats.
- Undertake study of the potential effects of climate change on coastal habitats including beaches, dunes, sabkha, mangroves and coral reefs.

### **Priority Actions:**

- 3.1 Development of a full Monitoring Surveillance and Control (MSC) Plan for industrial fishing and establishment of a working pilot scheme for MSC of artisanal fishery.
- 3.2 Management programs for target fish species.
- 3.3 Development of Guidelines for the import of alien species for aquaculture (using FAO/ICES guidelines).
- 3.4 Coastal Zone management - Implementation of Specific Projects for Each Region (NCS Project ENR 4).
- 3.5 Coastal Zone Management - Restoration, Erosion Control and Monitoring (NCS Project ENR 6).
- 3.6 Strengthening of Marine Fisheries Research and Statistics (NCS Project AF 12).
- 3.7 Strengthening of Fish Production Management and Marketing (NCS Project AF 14).

## Theme 4. Terrestrial and Aquatic Flora

The natural vegetation of Oman consists of evergreen and deciduous woodlands, drought-deciduous open thorn woodlands, sclerophyllous and succulent shrubland, dwarf shrubland and open xeromorphic grassland. So far, 1204 species of vascular plants are known. In addition, there are 14 species of liverworts, 30 species of mosses, 35 species of lichens and 55 species of marine macroalgae. Of the vascular plant, 100 are endemic to the country or the region and several are at risk (see section 1.2). Species richness of the northern mountains is about 600 species, of the central limestone plateau about 200 species and of the escarpment woodlands of southern Oman about 850 species.

Several species of wild plant are collected for their medicinal, cosmetic or feeding qualities while some species of tree are felled for animal feed, fire wood or domestic use. For example, *Juniperus macropoda* of the Juniper woodland of the Central range of the Western Hajar mountains, which are unique to the Arabian Peninsula for their ability to catch water from the fog and replenish water tables, are facing excessive cutting and grazing. A similar situation is observed for species such as *Mearua crassifolia*, *Olea africana*, *Tecomella undulata*, *Delonix elata*, *Sageretia spiciflora*,

*Moringa peregina*, etc.

In Oman the threats to plant species diversity and vegetation cover can be inferred from land use, rangeland degradation and pollution. Increase in grazing pressure, particularly by camels, is the most ubiquitous and pernicious threat to plant diversity and cover, leading to soil erosion and desertification. The threat of introduced exotic species is beginning to be noticeable, especially with highly invasive species such as *Prosopis juliflora*. This could threaten species with restricted ranges and may contribute to extinction of endemic species and subspecies. Another fast growing tree, *Leucaena leucocephala*, which is now cultivated in home gardens and on the sides of the roads may create problems as it is colonising natural habitats.

In several regions of the country, traditional area-based conservation systems such as the Hamiyah, contribute to the protection of natural vegetation. In true Hamiyah, for example, entry of domestic animals is forbidden at any time of the year and the area is used primarily for seasonal hand-cutting of animal fodder. Regardless of its initial success as a traditional conservation effort, the Hamiyah is not very much in practice currently.

### **Key Issues:**

- Over-harvesting of trees for timber and firewood production.
- Over-grazing and depletion of nutritive grasses.
- Desertification and desert creep.
- Expansion of invasive species.

### **Objectives:**

- Ensure the sustainable use of all wild plant and tree species.
- Protection of woodlands from all human impact.
- Promote reforestation and prohibition of logging.

### **Options:**

- Impose strict penalties for illegal tree logging.
- Promote existing traditional conservation systems.
- Co-ordinate biodiversity project planning with that of the National Action Plan to combat desertification, in accordance with the Convention on Desertification.
- Ensure the use of native tree species in reforestation projects.
- Establish a working group to examine threats from plant species invasion and draw up action plans to tackle those currently causing concern.
- Develop existing facilities for propagating of native trees and other native plants for landscaping and biodiversity conservation in public places.
- Establish plant nurseries to serve each administrative region.
- Consider all proposals for the re-introduction of plant taxa to areas where they have become extinct.
- Plan proposals to augment local populations where they have become depleted.

### **Priority Actions:**

- 4.1 Strengthening services of range management, reforestation and halting of desertification (NCS Project AF 3).
- 4.2 Vegetation survey and assessment of the current status of desertification (NPACD Project No. 22).
- 4.3 Range and woodland management in the southern region (NPACD Project No. 1).
- 4.4 Sand dune stabilisation and revegetation (NPACD Project No.2).

## Theme 5. Agriculture Resources

The Sultanate of Oman, being the third largest country in the Arabian Peninsula, has about 73 741,59 ha of agricultural land under cultivation of which fruits occupy as high as 58,33% followed by perennial fodder (24,10%), vegetables (9,57%) and grain crops (8,00%). The total production, however, is shared highest by perennial fodder including alfalfa (62,16%) followed by fruits (19,61%), vegetables (16,34%) and grain crops (1,89%). Some vegetable, grain, forage and fruit crops have been indigenous and known to be grown in the Sultanate since time immemorial for diet and commercial food or feed purpose. Recently, several biotic, abiotic and social factors are posing serious threat for the very survival and existence of these indigenous crop species (e.g. acid lime, alfalfa, date palm). Consequently, if not protected in near future, they may go extinct leading to invaluable loss for the nation. To this end, an in situ conservation program was established in 1993 for local vegetables and field crop species (e.g. garlic, onion, carrot, cucumber, melon, wheat, sorghum, sesame, etc.).

The Sultanate also has a diverse range of domesticated animal species particularly goats, sheep, cattle, and poultry. These different types of animals are well adapted to Oman environmental conditions and this is mainly due to both natural and artificial selection that was going on for several generations in different regions of the Sultanate. The Ministry of Agriculture and Fisheries had put a great emphasis on the livestock sector. The ministry had also executed plans and extension programs that resulted in enhancing the productivity of different species of livestock. Furthermore, the ministry also established livestock research stations at three different locations namely Rumais, Salalah and Wadi Quriyat. The Rumais station was involved with studies on animal nutrition and utilisation of agricultural by-products such as date palm leaves and sardines. Furthermore, crossbreeding programs of local cattle, sheep and goat with imported European breeds were also carried out at this station. The Salalah research station conducts improvement programs on Dhofari cattle and goat. And finally the Wadi Quriyat station executes applied animal breeding improvement program on local sheep and goat. This program is considered to be a pioneer study in the area of genetic improvement of local sheep and goat utilising selection techniques.

As a result of these efforts the livestock population increased from 1025227 heads in 1982 to 1408178 heads in 1993. The results of 1993 census showed that the rates of annual increase were 7,0%, 6,3%, 3,4%, and 2,1% for sheep, cattle, camel and goats respectively.

### **Key Issues:**

- Over-grazing and depletion of nutritive grasses.
- Soil pollution by fertilisers and pesticides.
- Destruction of pollinating insects and honey bees by pesticides.
- Pollution of crops and fodder as a result of excess application of pesticide or harmful chemicals.
- Expansion of diseases in valuable agricultural crops.
- Dissemination of animal diseases.
- Constraints in the selection and application of appropriate technology.

### **Objectives:**

- Ensure the sustainable development of cultivation, animal production, pastoral activities and aquaculture.
- Protect agriculture resources from biotic stresses and indiscriminate utilisation.
- Ensure technology and information transfer to farmers, livestock producers and fish growers.
- Improve the marketing and pricing systems for producers.

### **Options:**

- Promote the maintenance/expansion of the system of selling and buying cattle by weight instead of per head, to encourage the emphasis on quality before quantity, and hence to release pressure on natural pastures.
- Provide food security through imports and buffer storage on the basic strategic commodities.
- Promote the integration between research, preventive, and curative measures as well as management activities in land, crop and animal production.
- Achieve self-sufficiency only in those commodities where there are believed to be clear comparative advantages.
- Intensify research on species and types of drought and pest resistant crops.
- Continue research efforts aimed at enhancing the productivity of the different species at Agricultural Research Stations.
- Prevent the propagation of diseases in crop and animal varieties by strengthening quarantine and curative measures and providing adequate trained personnel and facilities.

- Documentation and dissemination of traditional knowledge promoting sustainable use of resources.
- Promote the implementation of environmentally sound agriculture practices that would:
  - Restrict the cultivation of grass and other water-intensive plants,
  - Limit the growing of permanent crops and concentrate on less water intensive seasonal ones,
  - Restrict the use of chemical pesticides and fertilisers,
  - Prevent soil erosion.

### **In Dhofar Mountains:**

- to translocate commercial fodder farms from Salalah Plain to the Najd area by granting adequate incentives such as larger areas, measured access to water sources and development subsidies;
- to motivate big pastoral producers to shift to the Najd and practice mixed farming after proving its success through a pilot project;
- to reintroduce the autumn rotation in the Jarbeeb area at the foot of Dhofar Mountains and to persuade and motivate herdsman to adapt to rotational grazing to stimulate regrowth of valuable grass species;
- to link subsidies to herdsman and farmers with their acceptance and implementation of the proposed reforms and innovations;

### **In Sharqyah Sands and the South Western Parts of Al-Sharqyah:**

- to motivate farmers to grow shelter-belts for the halting of desert creep. Land and water permits may be linked up with this condition;
- to rationalise urban planning and link it up with town perimeter protection with green belts;
- to start developing the newly discovered water sources in the area and to use it as a basis for integrated area development with anti-desertification measures as major components;
- to encourage mixed farming in order to minimise the impacts of over-grazing;
- to introduce the system of pastoral rotational grazing.

### **In Jabal-Al-Akhdar:**

- to introduce watershed management measures;
- to prepare adequate land use plans before starting the implementation of the proposed development plans in the area, and before the building of new infrastructure, particularly roads;
- to introduce ecological farming especially shelter-belts and to improve on contour farming practiced in the Jabal.

### **In the Desert and Semi-Desert areas of the central Plains:**

- to study the dynamics of wind blown sands into the region;
- to utilise brackish water in growing economic trees and developing pastures and to regard this as a long-term investment;
- to rationalise grazing and water resource distribution.

### **Priority Actions:**

- 5.1 Establishment of Plant Genetic Resources Center.
- 5.2 Creation of a Specialised Animal Production and Health Department and Directorate, and a Veterinary Laboratory within the Ministry of Agriculture and Fisheries (to take over the responsibility for producing and importing vaccines and the training of Omani Staff).
- 5.3 Adoption and Implementation of Cultural and Management Systems Respectful of the Environment including:
  - mulching, to conserve humidity in the soil;
  - the selection of a crop structure that is suitable to the available amount of water;
  - use of organic fertilisers instead of chemical ones;
  - the introduction of mixed farming to integrate the animal and plant elements;
  - the production and use of silage from crop residues and green manure;
  - the introduction of crop rotations and pastoral rotational grazing;
  - more use of improved seeds;
  - improving irrigation water management and efficiency;
  - avoiding deep ploughing in shallow soils and planting shelter-belts to prevent erosion.

may contaminate agricultural land, soil and freshwater sources and underground reserves. The burning of fuel and gas causes air pollution (lead emissions, smog) that adversely affect species and ecosystems. Waste lubrication oil is not recycled and often discharged in unauthorised sites.

### **Key Issues:**

- Pollution and threat to natural habitats.
- lack of permanent monitoring of oil tankers off shore.
- Lack of sufficient deballasting reception facilities.
- Inefficient methods for purifying atmospheric air from gass emissions and detrimental vapours.
- Inadequacy of oil waste recycling.

### **Objectives:**

- Boost cooperation with relevant authorities and apply measures which aim to minimize the negative impacts of energy - related activities.
- Promote biodiversity preservation in energy resource development, and rehabilitate affected ecosystems and sites affected by energy development.

### **Options:**

- Adopt the formulation of a clear national energy strategy ensuring the protection of biodiversity and identify the inter-relationships between Energy and other natural resources, particularly renewable ones.
- Encourage biodiversity - related knowledge acquisition and research and their application in the energy sector.
- Ensure that the areas used for drilling and production are restored, once the facilities and sites have been shut down.
- Companies working in energy exploration and production and their contractors must prepare periodic environmental reports covering details of their treatment to harmful and hazardous materials resulting from such activities.
- Energy companies have to prepare precautionary plans to tackle any leak or spill that might result from damage or accident.
- Prepare specifications for underground tanks to safeguard them from corrosion.
- Encourage the establishment of private facilities for reception of waste from oil tankers.

- Encourage companies to make use of treated oil and other materials waste.
- Designate special sites for collection of grease and oil waste, and improve facilities for their recycling and safe disposal.
- Encourage efforts to produce lead-free fuel and promote its use within shortest period.
- Increase monitoring and control measures for pollution sources.

#### **Priority Actions:**

- 6.1 Establishment of a habitat compensation program for sites affected by energy exploration and transportation activities.

### **Theme 7. Mineral Resources**

Copper, chromite, gold, silver, manganese, celestite, kaolin, barytes, fluorspar, gypsum, salt, bauxite, uranium, silica, limestone, dolomite, various clays, ornamental stones, gabbro, aggregate and silt are the main minerals and rocks found in commercial quantities in Oman. The exploration is an on going process and many other minerals may be discovered in future. The government has no plans at present to invest in the development of minerals other than copper, chromite and gold. The private sector is however encouraged exploring and developing the rest of the mineral deposits.

Mineral resource exploitation activities may pose some threat to natural habitats and wildlife in general in case if it is not addressed properly.

Seepage from transformation plants may pollute fresh water reserves and soil if not addressed efficiently.

#### **Key Issues:**

- Damage and pollution of natural habitats.
- Lack of consideration for biodiversity protection in mining activities.

#### **Objectives:**

- Support mineral resource development activities that have an EIS and management plan.
- Support measures that are apt to minimize the impact of mining-related activities on biological diversity and favor the rehabilitation of affected ecosystems.
- Promote the rehabilitation of sites affected by mining resource development.

### **Options:**

- Maintain a balance between development and protection of environment.
- Integrating the protection of biological diversity into energy and mining policies.
- Making sure disposal sites do not contaminate species and ecosystems.
- Ensuring that the area used for mineral resource production facilities is restored once the facilities and site have been shut down.
- Strict implementation of mitigation measures identified in EIA through regular inspection and monitoring.

### **Priority Actions:**

- 7.1 Study on the feasibility, costs and benefits of correcting existing manufacturing and mineral industries for environmental soundness (NCS Project IC 1).
- 7.2 Development of Environmental Guidelines for Mining Activities.
- 7.3 Action Plan to Clean-up Sohar Mine Wastes (including groundwater plume).

## **Theme 8. Industry, Technology and Services**

### **8.1 Biotechnology and Biosafety**

Humans have been manipulating organisms and exploiting their biological processes to make or do things for thousands of years. The earlier forms of biotechnology -selectively breeding animals and plants and using micro organisms to make, a variety products- have been adapted by many, if not all, societies around the world and steadily improved over time., These traditional or conventional techniques are still used today in rural areas and industry alike and differ merely in sophistication and scale.

In the last thirty years, new, more powerful techniques have emerged to supplement the traditional techniques. Some of these new techniques -tissue culture, cell fusion, embryo transfer, recombinant DNA technology and novel bioprocessing techniques- have enabled scientists to grow whole organisms from single cells, fuse, different cell types to create hybrids with the qualities of both parent cells, impregnate animals with embryos from other valuable animals, isolate genes from one organisms to insert them into another and process things such as food and waste, more efficiently. Some modern biotechnological techniques are presently being used to help conserve biological diversity and sustainably use its components, in particular, genetic resources.

But to many people genetic engineering is biotechnology. With genetic engineering techniques, a gene for a particular trait from one organism can be directly inserted into another, even if the two organisms are not from the same species. This is a major advance over conventional plant and animal breeding. The potential power of genetic engineering has captured the imagination of many, and heightened concern over the ethics, use, and safety for humans and the environment and the socio-economic impact of its products.

Biotechnology potentially offers great benefits for human welfare. Many people however are concerned that greater use of the products of biotechnology is not without risks to biological diversity and human health. Such risks will have to be identified and appropriately managed or controlled before new product enter the environment.

The Convention on Biological Diversity and the newly adopted protocol on biosafety require each contracting party to take steps to regulate, manage or control the risks to biological diversity and human health posed by the use and release of living modified organisms (LMOs) that are likely to have adverse environmental impacts. Parties may implement a program to address the risks through a hierarchy of measures - regulation, management or other means of control.

In Oman, traditional biotechnology have been in use for hundreds of year for plant and animal selection, cheese and bread production. Modern biotechnology is however underdeveloped despite its immense potential.

### **Key Issues:**

- Lack of capacity in the field of modern biotechnology.
- Lack of protection measures against living modified organisms.

### **Objectives:**

- Develop biotechnology while preventing environmental and health hazards associated with the use and release of living modified organisms.

### **Options:**

- Development of biotechnology training program.
- Increase financial resources for the University to conduct biotechnology research and development.
- Establishment of a gene and germ cell bank.

- Augment the concept of genetic diversity, its importance and application in genetic engineering and technology in the educational curricula.

### **Priority Actions:**

- 8.1.1 Development and implementation of a biosafety strategy and action plan in compliance with the international protocol on biosafety.

## **8.2 Tourism**

Tourism has recently been fully accepted as a means of diversifying the national economy. This opens up new opportunities to show that nature conservation is positive economic development. Oman's wildlife offers some scope for wildlife tourism, even though it is relatively inaccessible and less spectacular than that of some countries. However the planned major scenic protected areas such as those in Adh Dhahirah, Jebel al Akhdhar and Sharqiyah regions represent a huge asset for disciplined conventional tourism. The cost of protection, mainly through planning, is minimal whilst the main infrastructure, the natural landscape unique to Oman and given by Almighty God, is already in place. Within these vast and beautiful areas lie important wildlife habitats that can be zoned as nature reserves. Cultural heritage forms an integral part of their marketable resources. The whole can bring wealth to local people whose resources they will then protect. However tourism can have adverse environmental impacts. Uncontrolled vehicle movement causes disturbance, dust pollution and damage to thin desert top-soils. Roads built to develop tourism may give access to sensitive wildlife habitat to people who may damage vegetation, collect threatened plants or leave litter or to others who may move in large number of domestic animals for grazing. In coastal areas uncontrolled tourists may damage coral reefs with anchors. Fast boats and jetskis may disturb or kill turtles and dolphins, whilst lights at camping parties on beaches may disturb laying turtles or disorientate hatchlings. Caving parties may leave behind litter and other human waste. Dune-driving damages desert vegetation. Bird sites are sensitive to even low levels of human disturbance.

Therefore tourism in environmentally sensitive areas must be established on the basis of prior study of ecosystems, planning, legal designation and consultation with local people. Effective protection must be in place before tourist activity is allowed to develop and cause permanent damage to ecosystems.

### **Key Issues:**

- Major economic opportunities created by protected scenic reserves for controlled conventional tourism.
- Pollution, disturbance and physical damage caused by tourists.
- Local participation and investment in tourism projects.

### **Objectives:**

- Ensuring environmental factors are fully taken into account in the development of tourism strategies and masterplans.

### **Options:**

- All tourist projects to be subject to environmental assessment prior to grant of environmental permit.
- Promotion of environmentally friendly tourism projects to demonstrate the economic benefits of nature protection.

### **Priority Actions:**

- 8.2.1 Completion of the Priority Action Plan for Tourism Development, in co-operation with all concerned agencies, with special attention paid to:
- Benefits from legal designation of the planned scenic reserves.
  - Impacts on Omani employment with emphasis on benefits to rural communities in scenic rural areas.
  - Impacts on scarce water resources.
  - Impacts on landscapes and mitigation measures.
  - Impacts on ecosystems.
  - Impacts on caves.

## **Theme 9. Urban Environment**

The population of Oman is currently estimated around 2,3 million people with a annual growth rate of a bit less than 3%. The concentration of population living in Muscat is high and increasing. In 1998, the Batinah Region and the capital area alone held over 51% of the Omani population. Urban population was 53,6% of total. This rapid urbanisation brings in the usual problems associated with high concentrations of people: litter and waste management, water use, housing, infrastructures, and services development at the expense of natural habitat, air pollution, etc. Rural areas also have

their share of similar environmental problems associated with human presence and activities.

### **Key Issues:**

- High population growth rate and consumption patterns.
- Litter and waste generated as a result of high consumption levels.
- Problems of disposing of liquid and solid waste (pollution of drinking water wells from the traditional and modern sewage systems).
- Expansion of development projects at the expense of cultivable land and natural habitats.

### **Objectives:**

- Take full account of environmental considerations in the socio-economic planning process and in the identification of alternatives and priorities.
- Strengthen regional planning (by establishing active and effective planning units in the regions and government and semi-government sectors).
- Build on the outstanding achievement of the National birth spacing and family planning campaigns and maintain a long-term balance between supply and demand of commodities requiring scarce natural resources.

### **Options:**

- Expand on the existing sewerage networks in the cities of the Sultanate.
- Encouraging detailed land-use planning to co-ordinate development that takes ecosystem into account.
- Minimising consequential degradation of ecosystems through unplanned road proliferation and maximising the environmental benefits from well-planned road networks.
- Providing green belts areas of natural woodland and or other natural parkland for recreation near urban settlements, as a means of improving the quality of life of urban dwellers, as well as to maintain the diversity of native plant species whilst providing additional habitat for wild fauna.
- Increased monitoring and frequency of inspections at sewage treatment plants and waste disposal sites.
- Inspection of septic tanks and holding tanks.
- Increased vigilance at fly tipping of waste, particularly in khors on the Batinah and Salalah coasts.

### **Priority Actions:**

- 9.1 Integrated Regional Land Use Plans (NCS Project AF 9).
- 9.2 Incorporating Environmental Considerations into Socio-Economic Planning (NCS Project DP 2).
- 9.3 Development of Policy for Road Building as Related to the Environment as well as the endorsement of MRMEWR's guidelines on road building projects (NCS Project ENR 21)
- 9.4 A Study of the Present and Potential Environmental Hazards in Urban Areas, Leading to the Preparation of Alternative Models for Sustainably Healthy Urban Communities (NCS Project ENR 22)
- 9.5 Endorsement of MRMEWR Guidelines on land use and new constructions, and protecting scenic sites and traditional buildings.

## **Theme 10. Water Resources**

The climate of the Sultanate ranges from arid in coastal and mountain areas to extremely arid in Central Oman. The southwest monsoon influences the extreme south and southeast coast of Oman. Two distinct seasons occur, winter (November to April) and summer (May to October).

Mean annual temperatures are typically between 26° C and 29° C throughout the lowland area of the Sultanate, but maximum daily temperatures rise to above 40°C during the summer months. Rainfall varies from less than 50 mm in Central Oman, rising to over 300 mm in the Northern Oman Mountains and shows wide year-on-year variation.

Oman has virtually no permanent, potable, surface water resources apart from perennial springs which emerge from fractured limestone aquifers in the Northern Oman Mountains and the Dhofar Jabels. Wadi flows are usually confined to short periods of a few hours or a few days after heavy rainstorms.

Wadi Dayqah is unique in having a perennial surface flow over a distance of more than 30 km, but this flow and other similar, smaller surface water flows are sustained by groundwater discharge. Intermittent wadi flows are however, an important source of recharge for alluvial aquifers within the coastal and interior plains.

Traditional domestic and agricultural water supplies relied upon groundwater resources tapped by aflaj or shallow hand dug wells. The technologies available limited both the

quantity of water available and where it could be obtained, as they had for centuries. Settlement patterns were thus well established and only the area of land irrigated varied, as falaj flow permitted. Water resource development was in long-term equilibrium with use. Indeed, the self-regulating nature of aflaj prevented over-use.

The development process in Oman has created additional demands on water resources. This has been met by increased abstraction which has been greatly facilitated by the introduction of new drilling and pumping technology. The equilibrium that existed between water use and availability has been disturbed and it is now clear that, in some areas of the Sultanate, water demand exceeds the long-term rate of natural recharge to the system. Both traditional falaj and new well supplies are now at risk of serious depletion. particularly during dry periods.

Oman now relies on fresh and brackish groundwater resources supplemented by desalination within the Capital Area, Musandam, Sur, Central Oman, Masirah Island and Al Halaaniyaat Islands.

However, the construction of large numbers of new wells throughout northern Oman and within the Salalah area, has resulted in rapid, unplanned development of groundwater resources whereby:

- In some areas water use now exceeds recharge and groundwater mining is occurring.
- Groundwater salinity is increasing due to saline intrusion in several coastal areas.
- Groundwater contamination is increasingly evident in agricultural and urban areas.
- An expanded agricultural sector now accounts for more than 90% of total fresh water use.

#### **Key Issues:**

- Overpumping of ground-water, especially for irrigation purposes; high levels of salinity particularly in coastal areas affected by saline intrusion.
- Pollution caused by agricultural, industrial and domestic activities.
- Overuse of fresh water in irrigating crops, ornamental trees, plants and landscapes for industrial and household purposes.
- Potential environmental impacts of water resource developments and other modifications to the natural system.
- Protection of phreatic vegetation (eg prosopis belts).
- Potential environmental impact of desalination on the marine environment.

- Lack of knowledge about the interaction between surface water and groundwater systems, for management and protection of the ecology of khawrs, springs other wetlands and sabkha areas throughout Oman.

### **Objectives:**

The concerned bodies of the water sector agreed, during the Vision 2020 Conference, on the following main objectives:

- Achieve balance between water uses and renewable water resources as well as protect them against exhaustion and pollution.
- Provide potable water to the citizens and furnish the ways to collect and reuse treated sewerage water.
- Provide water for industrial, commercial and agricultural uses within the limits and restrictions of the available resources in order to achieve sustainable development.

### **These objectives are echoed by the National Plan of Action to Combat Desertification**

(NPACD):

- To protect the existing available water resources which have been seriously affected by development.
- To control water salinisation resulting from different causes, with particular emphasis on the sea water intrusion problem in the coastal aquifers.
- To augment the depleted groundwater resources by artificial recharge and other non-conventional resources.
- To explore, assess, and develop new groundwater resources where possible.

### **Options:**

#### **To increase water availability and improve water security**

- Rationalise water consumption and reduce pumping to achieve a sustainable level of development.
- Introduce water quotas for agricultural use within specific areas or catchments according to the prevailing water situation and policy objectives.
- Promote modern irrigation techniques to improve agricultural water use efficiency.
- Maximise the use of brackish water resources in agriculture, e.g. for growing salinity tolerant trees, plants and pasture and in fish farming.

- Introduce and promote water conservation programs for urban water users.
- Introduce alternative methods of water harvesting and conservation of renewable water resources which are currently being lost as surface water runoff or groundwater discharge to the sea, or as flood flows into the interior.
- Encourage recycling and reuse of treated wastewater for economic crop production, guided by international experience.

### **To protect water quality and prevent/control pollution**

- Collect and treat sewerage and other waste waters before disposal.
- Relocate industrial enterprises which are known sources of groundwater pollution and prevent the establishment of new industries or activities which may cause pollution in water catchment areas (e.g. within wellfield protection zones).
- Establish additional wellfield protection zones to protect all urban domestic water supplies

### **Supporting activities and studies**

- Improve hydrologic monitoring and augment existing networks where appropriate.
- Expand groundwater quality monitoring programs and improve legislation and regulations to curb pollution.
- Further evaluate effectiveness and advantages and disadvantages of recharge dams.
- Determine the economic value of water for different uses to assist in the development of an optimum allocation policy and sector plans.
- Encourage private sector involvement in management of water projects such as desalination plants, water distribution networks and sewerage collection and water treatment systems.
- Extension services and public awareness programs

### **Priority Actions and Activities**

- 10.1- Promotion of agricultural reform Regional water resource investigation, assessment and monitoring.
- 10.2- Development of new water resources.
- 10.3- Development and implementation of drought contingency plans.
- 10.4- Extension of wastewater collection, treatment and reuse systems.
- 10.5- Introduction of Sector water allocations (including environment).

- 10.6- Development and implementation of Demand Management Measures for well irrigation.
- 10.7- Promotion of agricultural reform, to improve water use efficiency and enhance economic returns to water.
- 10.8- Enhancement of public awareness and education programs to promote government policy.

## **Theme 11. Environmental Emergencies**

The National Committee for Natural Disasters (NCND) prepared a Plan for emergency and disaster management, which included ministerial and sectoral responsibilities. In addition the Royal Oman Police prepared a draft strategy for National Defence which includes modalities and measures addressing both emergencies and disasters.

The strategy has distinguished between natural disasters (e.g. volcanic eruptions, hurricanes, earthquakes and floods) and man-made disasters (e.g. fires, civil aviation accidents, chemical pollution and radio-activity). Although marine oil spills have been recently included in the list of man-made disasters and the protection of coastal marine resources taken into consideration, it is observed that the terms of reference of the NCND do not yet include such natural disasters as drought, desertification, industrial disasters and desert locust epidemics and do not clearly consider the protection and rehabilitation of biodiversity sites and elements of significant value and importance.

In the proposed restructuring of the Environmental Affairs of the MRMEWR, it is envisaged that a new department for Disaster Management will be set up to be charged with the environmental aspects of these areas of natural disasters. However, since the MRMEWR will only be capable of tackling the technical environmental aspects of natural disasters, there would still be a need for working through the NCND to assure the operation and management aspects.

### **Key Issues:**

- Lack of integration of some natural disasters in existing emergency plans.
- Lack of consideration of the protection of biodiversity elements of significant importance in emergency plans.

### **Objectives:**

- Develop emergency plans for all type of natural disasters.
- Integrate the protection of biodiversity into emergency plans.

### Options:

- Direct attention to the security of nature and to environmental security in support of the objectives of sustainable development.
- Identification of biodiversity sites and elements of significant importance to be included in emergency plans (e.g. Arabian Oryx, *ex situ* collections, etc.)
- Enabling the MRMEWR and the Royal Oman Police to build up and strengthen their planning and operational capabilities as well as their inter-agency links and channels of action.

### Priority Actions:

11.1 Reconciling and Strengthening the Organisational and Operational Responsibilities of Disaster Management (NCS Project ES 1)

## **Theme 12. Participation of the Public, Non-Governmental Organisations and Private Sector**

According to the guiding principles of this strategy, the people of Oman have a responsibility to contribute to biodiversity conservation and to use biological resources in a sustainable manner. For doing so, all Omani people should be encouraged to understand and appreciate the value of biodiversity and to participate in decisions involving the use of our air, water, land and other resources.

Experience has shown that the involvement and participation of local communities and concerned stakeholders is a prerequisite for successful conservation and sustainable resource use initiatives.

### Key Issues:

- Insufficient participation and involvement of the population and private sector to biodiversity resource protection and management.
- Absence of active NGOs.
- Lack of incentive measures for conservation.

### Objectives:

- Encourage and support the participation of the public and private sector to efforts leading to conservation and sustainable use of biodiversity.

### **Options:**

- Encouraging the establishment of non-governmental organisations (NGO) to support wildlife conservation, including fund-raising for specific conservation projects.
- Using economic and financial incentives to encourage the public and private enterprises concerned to adopt environmentally sound processes and methods.
- Motivate entrepreneurs, farmers and fishermen to select appropriate production and service technologies without affecting their competitiveness.
- Providing compensatory incentives to those enterprises which employ relatively less profitable technologies and methods with relatively harmless impacts on the environment.
- Enlist the citizen's participation in setting the priorities for the projects of interest to them and in the conservation and management of natural resources.
- Encourage individual voluntary field work, including survey and monitoring, indirect support of ministries and government organisations concerned with biodiversity conservation.

### **Priority Actions:**

- 12.1 Private Initiative Promotion Programme for the Conservation and Management of Biodiversity (Creation of a National Endowment Fund for Nature Preservation).
- 12.2 Identification of Most Efficient Compensatory and Incentive Measures Leading to Environmental Protection.

## **Theme 13. Societal Values**

### **13.1 Public awareness, education, research and training**

Increasing public awareness of the importance of biological diversity is an essential element in guaranteeing the effectiveness and goals of the efforts exerted to conserve it and secure its sustainable use. Conservation efforts can only bear fruit when the members of the society understand that this biological is essential to their life. Human activity, if not governed by certain rules and regulation could lead to the deterioration or destruction of biodiversity.

Public education which is related to regular study in primary, preparatory and secondary schools and in the higher levels helps establish a positive base of behaviour towards the way by which children and adults alike deal with the environment. Technical training aimed at developing environmentally sound practices contributes to improve the sustainability and productivity of resource based activities.

While the implementation of the Convention on biological diversity necessitates the establishment and maintenance of programmes for scientific and technical education, the promotion and encouragement of research as well as the setting up of data base about the components of biodiversity and their uses, there is a continuous need for competent researchers and managers

**Key Issues:**

- Lack of environmental awareness in the public.
- Integration of environmental concepts in educational curricula.
- Shortage of manpower and expertise in the field of sustainable resource management.
- The infancy of basic research in all fields of protection and mode of utilisation of natural resources

**Objectives:**

- Continue to strengthen programmes of environmental awareness, through mass media, publications, exhibitions, seminars and, especially, direct contact with local people in areas of high biodiversity, including range areas of threatened species.
- Reinforce nature conservation and related environmental issues within the general educational syllabus of the Sultanate.
- Promote technical training and research in the field of biodiversity and resource management.

**Options:**

- Intensify environmental awareness programmes addressed to the business sector in co-operation with the Chamber of commerce and Industry, emphasising the fact that the freedom and the leading role given to the Omani private sector in economic development should always be qualified by their adherence to the requirements of environmental protection.
- Establishment of training programmes at all levels and in all sectors responsible for biodiversity conservation, including those, such as commercial companies, whose activities may threaten biodiversity.
- Invest in activities that will promote, train and qualify the Omani youth in nature conservation and sustainable resource management.

- Encourage and support basic and applied biodiversity-related scientific research with the aim of finding new methods adaptable to local conditions and consistent with the country's development aspirations.
- Continue to encourage, support and carry out field studies and research to identify the distribution and association of known taxa, and the hitherto unrecorded and described species.
- Expand and strengthen the facilities and staffing of the Oman Natural History Museum, Ministry of Natural Heritage, as:
  - A key educational and awareness facility for the dissemination of information to the public;
  - Providing the focal point for researchers using its national biodiversity collection of animal, plant and fossil specimens.

### **Priority Actions:**

- 13.1.1 Environmental Awareness Programme (NCS Projects ENR 12 and ENR 7).
- 13.1.2 Supporting Academic (Basic) Research on Natural Resource Conservation and Utilisation, Environmental and Public Health Activities in Sultan Qaboos University (NCS Project BR 1).
- 13.1.3 Setting up a Central Laboratory for Scientific Analysis (NCS Project ENR 14).

## **13.2 Environmental Impact Assessments**

An Environmental Impact Assessment (EIA) is a process which attempts to identify, predict and assess the likely consequences of proposed project activities on the environment and on man's health and well being, and to investigate and propose means for mitigating these consequences. The EIA is intended to provide for the protection, conservation and wise management of the environment through planning and informed decision-making.

Under the provisions of Article 13 of Royal Decree 71/89, proponents of new projects ("*Owners of new sources of work*") must submit an Environmental Impact Statement to obtain an Environmental Permit. In many cases simple small business and light industries will fulfill the requirements of the Royal Decree by filling out an Environmental Permit Application form and be subsequently issue an Environmental Permit with appropriate conditions. For large-scale potentially polluting industries a more comprehensive EIA study is required.

At the present time there is no official Arabic language EIA guideline. Instead an English language draft version prepared in 1998 is used. In addition, other companion documents and industry specific guidelines are available in the English language only. This lack of official Arabic guidelines may prevent investors and the public from understanding the objectives and benefits of the EIA process, and make it look like another example of bureaucratic “red tape”. Finally, there is no inventory or library of existing EIA studies that would be available to the public and facilitate distribution of the accumulated knowledge.

### **Key Issues:**

- Lack of official Arabic language EIA guidelines and supporting documents.
- Confusion about the objectives, benefits and requirements of the EIA process.
- Inaccessibility of the EIA documents and information regarding EIA's.

### **Objectives:**

- Issue official Arabic language EIA guidelines and supporting documents.
- Improve accessibility of the EIA studies and distribution of information regarding EIA's.
- Promote the EIA process as a method to protect the environment and maintain biodiversity.

### **Options:**

- Continue using the existing English language draft documents and develop periodical Arabic language updates.
- Issue the official Arabic language EIA guidelines and supporting documents, and periodically publish Arabic and English updates.
- Establish a library of EIA studies at the MRMEWR or in cooperation with Sultan Quaboos University to promote the EIA process and improve distribution of the information regarding EIA's.

### **Priority Actions:**

- 13.2.1 Issue official Arabic language EIA guidelines and supporting documents, and improve distribution of information regarding EIA's.

### 13.3 Institutional and legal framework

Addressing environmental and biodiversity issues is a complex endeavour that requires the concerted efforts of many government ministries. These ministries must also work closely with the university, museums, and technical institutes as well as the private sector. As it is the case within most governments around the world, their collective action often suffers from jurisdiction overlap, fragmentation, and inadequate co-ordination.

Existing legislation concerning biodiversity is generally adequate but important areas related to environment and resources are not adequately covered (e.g. pastures, biosafety, intellectual property, etc.). The penalties for offences against the environment and mismanagement of natural resources are, in most of the legislation, not sufficiently deterrent. National, regional and international actions related to conservation and resource uses have to be closely integrated and complemented.

#### Key Issues:

- Inadequate management standards in the different sectoral uses;
- Overlap, fragmentation and inadequate co-ordination between authorities responsible for the protection, conservation and management of resources;
- Inadequate legal coverage for biodiversity.
- Lack of integration between national and regional actions..

#### Objectives:

- Adopt adequate and efficient legislation and management standards for the protection and sustainable use of biodiversity and other natural resources.
- Enhance interdepartmental and intergovernmental co-ordination for the protection, conservation and management of resources.
- Confirm and strengthen the Sultanate's commitment to its role, rights and obligation for biodiversity conservation in the regional and international communities.
- Expand the base and scope of co-operation in the field of nature conservation and environmental protection.
- Welcome and encourage foreign investment committed to natural resources and environmental conservation while emphasising the Sultanate's policies aimed at maintaining her positive traditional principles and moral values.

### **Options:**

- Strengthen environmental control and monitoring institutions
- Review, integrate and implement environmental laws and raise the penalties to become sufficiently deterrent.
- Develop legislation, to cover the designation of small sites of importance to biodiversity as Sites of Special Scientific Interest (SSSI).
- Promote the application of integrated programme planning where the projects will be inter-sectorally, intrasectorally and regionally integrated.

### **Priority Actions:**

- 13.3.1 Revision, Consolidation and Integration of Environmental and Resource Utilisation Laws and Regulation in the Sultanate (NCS Project ENR 15) (in order to meet newly identified threats to biodiversity, especially import/export controls, trade in protected animal products and intellectual property rights, at the same time as reviewing penalties for offenders).
- 13.3.2 Adoption of Legal Texts in Required Areas of Resource Management (pastures, woodlands, protected areas, etc.).
- 13.3.3 Development and Adoption of a Legislation Protecting Sites of Special Scientific Interest.
- 13.3.4 Continued Implementation of Regional Co-operation of GCC and other Neighbouring Countries in Joint Projects and Programmes Aimed at Environmental Protection and Conservation of Common Natural Resources (NCS Project RC 1).

## **Theme 14. Quality of Life**

In recent years, the World Bank and the United Nations family, alerted by the mounting problems of the rapidly degraded and depleted natural resources (natural capital) of the world, have come to realise the shortcoming and inadequacies of the U.N. System of national Accounts (SNA) adopted by most countries of the world. It is now realised that failure to take account of the human and natural activities that deplete or degrade natural capital in the consumption side of the national accounts equations would not only distort the computed parameters of national income, but also defeat the objective of sustainable development which calls for meeting the needs of present generations

natural resources, especially renewable resources, and avoid investment in marginal areas.

- Balance investment between absolute protection that conserves natural resources without exposure to external influences, and productive conservation which will realise these objectives and strengthen productivity through the different production activities at the same time.
- Attach an economic value to critical (scarce) resources like water to induce the rationalisation of their uses.
- Incorporate environmental considerations at all planning stages and economic activities.
- Include in macroeconomic models the basic elements such as population and the size and uses of natural resources (any models that do not depend on realistic estimates of these variables would be merely academic exercises).
- Take account of social costs and environmental cost in the analysis of projects and their feasibility.
- Modify the organisation and classification of foreign trade accounts (exports and imports) to reflect the sectoral relationships (production, services, etc.) and the linkage with the use of resources (agriculture, animal production, food industries, fisheries, etc.).
- Attach higher priority to projects which aim at raising productivity vertically rather than horizontally, especially those projects that use scarce natural resources.

### **Priority Actions:**

- 14.1 Incorporating Natural Resource Accounts in the National Account System of Oman (NCS Project DP 1).
- 14.2 Incorporating Environmental Considerations into Socio-Economic Planning (NCS Project DP 2).
- 14.3 Establishment of an Occupational Health Service in the Ministry of Health (NCS Project HH 1).

## Theme 15. Spiritual Values

The conservation of the natural environment is an imperative commanded by God, the Lord and Sustainer of all beings. It is a matter of utmost importance to man, who is its subject, its end and its means. For protection of the natural environment from abuse by man leads to the welfare of man himself together with the welfare of all beings created by God.

What is certain is that the people of Oman received firm divine guidance under the Islamic Faith. Allah says in the Holy Qu'ran,

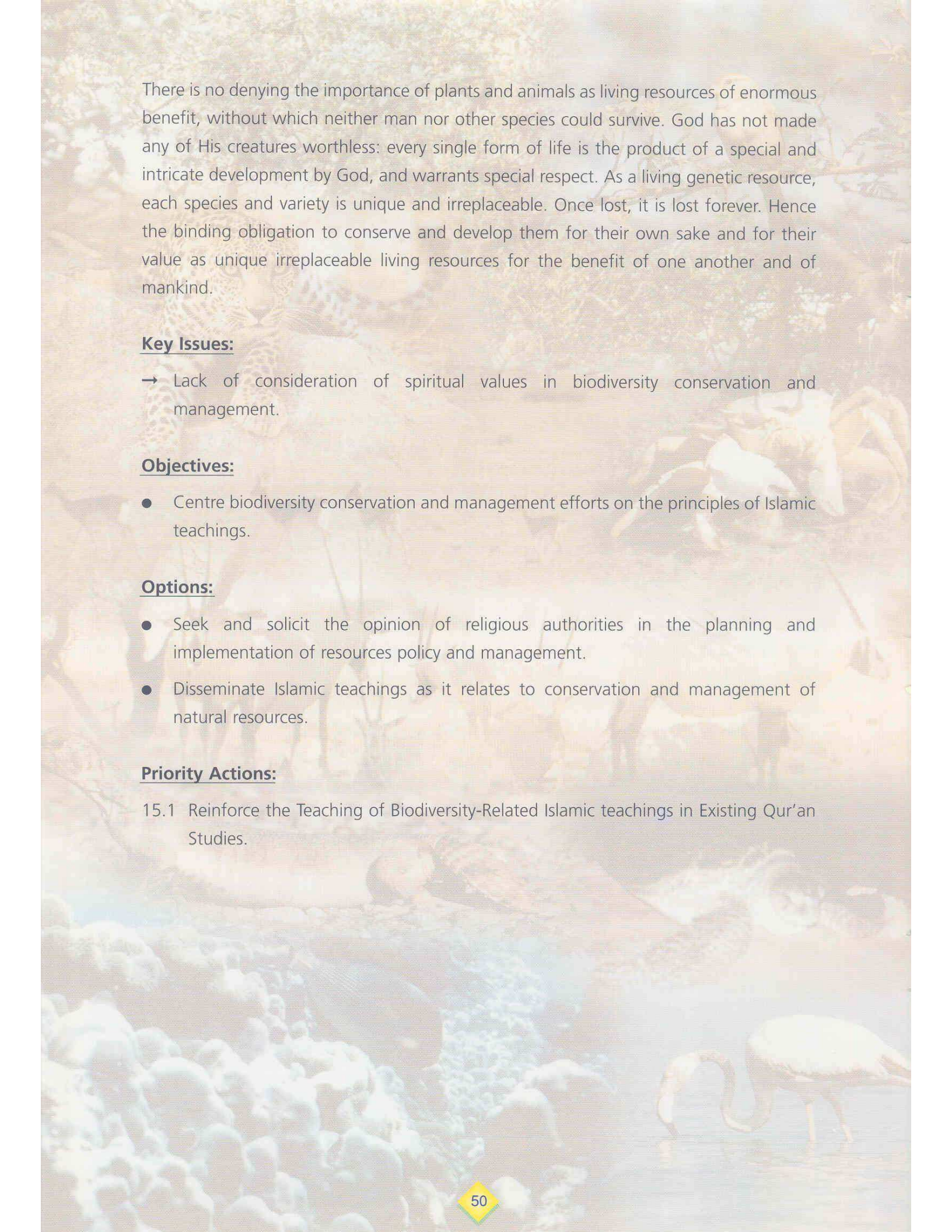
“It is he who produceth gardens with trellises, and without, and dates, and filth with produce of all kinds and olives and pomegranates, similar (in kind) and different (in variety). Eat of their fruit in their season but render the dues that are proper on the day that the harvest is gathered. But waste not by excess : for God loveth not the wasters.”

Many old Omani proverbs developed the theme which articulated a deep respect for all forms of life. Traditional rules were developed to conserve scarce resources, not merely to limit waste during a particular season as a moral issue but to ensure that breeding stock, seed stock and root stock would occupy the most fertile soil to await the next rain and the next growing season.

The ultimate objective of Islamic law is the universal common good of all created beings, encompassing both our immediate welfare in the present and our ultimate welfare in the hereafter. This objective of the universal common good is a distinctive characteristics of Islam. It means that no species or generation may be excluded from consideration in the course of planning and administration, but that each individual Muslim as well as the Muslim community must honestly strive toward the welfare of the whole.

God made water the basis and origin of life. Extravagance in using water is thus forbidden; this applies to private use as well as public, and whether the water is scarce or abundant. Since the atmosphere also performs essential functions, its conservation, pure and unpolluted, is an essential aspect of the conservation of life itself which is again one of the fundamental objectives of Islamic law.

If we would truly give thanks to the Creator, we are required to maintain the productivity of the soil, and not expose it to erosion by wind and flood; in building, grazing, and mining, we are required to follow practices which do not bring about its degradation but preserve and enhance its fertility.



There is no denying the importance of plants and animals as living resources of enormous benefit, without which neither man nor other species could survive. God has not made any of His creatures worthless: every single form of life is the product of a special and intricate development by God, and warrants special respect. As a living genetic resource, each species and variety is unique and irreplaceable. Once lost, it is lost forever. Hence the binding obligation to conserve and develop them for their own sake and for their value as unique irreplaceable living resources for the benefit of one another and of mankind.

**Key Issues:**

→ Lack of consideration of spiritual values in biodiversity conservation and management.

**Objectives:**

- Centre biodiversity conservation and management efforts on the principles of Islamic teachings.

**Options:**

- Seek and solicit the opinion of religious authorities in the planning and implementation of resources policy and management.
- Disseminate Islamic teachings as it relates to conservation and management of natural resources.

**Priority Actions:**

15.1 Reinforce the Teaching of Biodiversity-Related Islamic teachings in Existing Qur'an Studies.

### **1.3 Ex situ conservation**

- 1.3.1 Establishment of a Plant Genetic Resources Centre.
- 1.3.2 Identification and Collection of Species in Need of Protection for Breeding or Propagation.

## **Theme 2. Terrestrial and Freshwater Fauna**

- 2.1 Database on ecosystems, nature conservation areas and species at risk

## **Theme 3. Marine Life and Fisheries**

- 3.1 Development of a full Monitoring Surveillance and Control (MCS) Plan for industrial fishing and establishment of a working pilot scheme for MCS of artisanal fishery.
- 3.2 Management programs for target fish species.
- 3.3 Development of Guidelines for the import of alien species for aquaculture (using FAO/ICES guidelines).
- 3.4 Coastal Zone management - Implementation of Specific Projects for Each Region (NCS Project ENR 4).
- 3.5 Coastal Zone Management - Restoration, Erosion Control and Monitoring (NCS Project ENR 6).
- 3.6 Strengthening of Marine Fisheries Research and Statistics (NCS Project AF 12).
- 3.7 Strengthening of Fish Production Management and Marketing (NCS Project AF 13).

## **Theme 4. Terrestrial and Aquatic Flora**

- 4.1 Strengthening Services of range Management, Reforestation and Halting of Desertification (NCS Project AF 3).
- 4.2 Vegetation survey and assessment of the current status of desertification (NPACD Project No. 22).
- 4.3 Range and Woodland Management in the Southern Region (NPACD Project No.1).
- 4.4 Sand Dune Stabilisation and Revegetation (NPACD Project No.2).

## Theme 5. Agriculture Resources

- 5.1 Establishment of plant Genetic Resources Center.
- 5.2 Creation of a Specialised Animal Production and Health Department or Directorate, and a Veterinary Laboratory within the Ministry of Agriculture and Fisheries (to take over the responsibility for producing and importing vaccines and the training of Omani Staff).
- 5.3 Adoption and Implementation of Cultural and Management Systems Respectful of the Environment including:
  - mulching, to conserve humidity in the soil;
  - the selection of a crop structure that is suitable to the available amount of water;
  - use of organic fertilisers instead of chemical ones;
  - the introduction of mixed farming to integrate the animal and plant elements;
  - the production and use of silage from crop residues and green manure;
  - the introduction of crop rotations and pastoral rotational grazing;
  - more use of improved seeds;
  - improving irrigation water management and efficiency;
  - avoiding deep ploughing in shallow soils and planting shelter-belts to prevent erosion.
- 5.4 A Study of Soil and Plant Pollution Caused by Agricultural Practices (NCS Project ENR 9).
- 5.5 Reclamation of Farm Land and Rationalisation of Irrigation Water Use (NCS Project AF 1).
- 5.6 Strengthening Service of Range Management, Reforestation and Halting of Desertification (NCS project AF3).
- 5.7 Integrating Development of Dhofar Nejd (NCS Project AF 8).
- 5.8 Strengthening Research in New and Alternative Crops (NCS Project AF 11).
- 5.9 A Pilot Project of Organic Farming (NCS Project AF 14).
- 5.10 Livestock and Meat Marketing (NAPCD Project No. 15).
- 5.11 Assistance to Farmers to Increase Productivity and Conserve Water Resource (NAPCD Project No. 14).

## **Theme 6. Energy Resources**

- 6.1 Establishment of a habitat compensation program for sites affected by energy exploration and transportation activities.

## **Theme 7. Mineral Resources**

- 7.1 Study on the feasibility, costs and benefits of correcting existing manufacturing and mineral industries for environmental soundness (NCS Project IC 1).
- 7.2 Development of Environmental Guidelines for Mining Activities.
- 7.3 Action Plan to Clean-up Sohar Mine Wastes (including groundwater plume).

## **Theme 8. Industry, Technology and Services**

### **8.1 Biotechnology and Biosafety**

- 8.1.1 Development and implementation of a biosafety strategy and action plan in compliance with the international protocol on biosafety.

### **8.2 Tourism**

- 8.2.1 Completion of the Priority Action Plan for Tourism Development, in cooperation with all concerned agencies, with special attention paid to:-

- Benefits from legal designation of the planned scenic reserves.
- Impacts on Omani employment with emphasis on benefits to rural communities in scenic rural areas.
- Impacts on scarce water resources.
- Impact on landscapes and mitigation measures.
- Impacts on ecosystems.
- Impacts on caves.

## **Theme 9. Urban Environment**

- 9.1 Integrated Regional Land Use Plans (NCS Project AF 9).
- 9.2 Incorporating Environmental Considerations into Socio-Economic Planning (NCS Project DP 2).
- 9.3 Development of Policy for Road Building as Related to the Environment as well as the endorsement of MRME's guidelines on road building projects (NCS Project ENR 21).

## **Theme 13. Societal Values**

### **13.1 Public awareness, education, research and training**

- 13.1.1 Environmental Awareness Programme (NCS Projects ENR 12 and ENR 7).
- 13.1.2 Supporting Academic (Basic) Research on Natural Resource Conservation and Utilisation, Environmental and Public Health Activities in Sultan Qaboos University (NCS Project BR 1).
- 13.1.3 Setting up a Central Laboratory for Scientific Analysis (NCS Project ENR 14).

### **13.2 Environmental impact assessments**

- 13.2.1 Issue official Arabic language EIA guidelines and supporting documents, and improve distribution of information regarding EIAs.

### **13.3 Institutional and legal framework**

- 13.3.1 Revision, Consolidation and Integration of Environmental and Resource Utilisation Laws and Regulation in the Sultanate (NCS Project ENR 15) (in order to meet newly identified threats to biodiversity, especially import/export controls, trade in protected animal products and intellectual property rights, at the same time as reviewing penalties for offenders).
- 13.3.2 Adoption of Legal Texts in Required Areas of Resource Management (pastures, woodlands, protected areas, etc.).
- 13.3.3 Development and Adoption of a Legislation Protecting Sites of Special Scientific Interest.
- 13.3.4 Continued Implementation of Regional Co-operation of GCC and other Neighbouring Countries in Joint Projects and Programmes Aimed at Environmental Protection and Conservation of Common Natural Resources (NCS Project RC 1).

## **Theme 14. Quality of Life**

- 14.1 Incorporating Natural Resource Accounts in the National Account System of Oman (NCS Project DP 1).
- 14.2 Incorporating Environmental Considerations into Socio-Economic Planning (NCS Project DP 2).
- 14.3 Establishment of an Occupational Health Service in the Ministry of Health (NCS Project HH 1).

## **Theme 15. Spiritual Values**

- 15.1 Reinforce the Teaching of Biodiversity-Related Islamic Laws in Existing Qur'an Studies.

# National Biodiversity Strategy and Action Plan

## A National Endeavour to Conserve Biodiversity and Sustainably Use Biological Resources

The people of Oman recognise the need to maintain a healthy environment and is concerned about the degradation of ecosystems and loss of species and genetic diversity that result from human activities.

In accordance with Islamic teachings, Omani people believe in the maintenance of harmonious relations with the environment bearing evidence to God's creation.

Conservation of biodiversity is vital to Oman, where ecosystems are fragile and the renewable natural resources are scarce. The ecosystems of Oman are challenged by multiple interacting factors like excessive grazing, felling, soil erosion, over-fishing, desertification, land degradation and the associated loss of biological diversity. There is evidence that many aquatic and terrestrial species have either disappeared, or subjected to severe threats resulting from the deterioration of their habitats.

Given the current state of biodiversity, the Sultanate of Oman has realised the need for biodiversity conservation and environmental protection in its economic, agricultural and industrial productivity as a means towards sustainable development. In response, Oman has become a signatory to the Convention on Biological Diversity (CBD) in June 1992 in Earth Summit Conference in Rio de Janeiro Brazil, and has ratified it in 1994 by Royal Decree (119/94). It has also ratified other United Nations Conventions such as the Climate Change (UNFCCC) and Basel Convention.

As soon as the Convention was ratified, the Ministry of Regional Municipalities, Environment & Water Resources (MRMEWR) was designated as the key agency responsible for the development of a National Biodiversity Strategy and Action Plan to determine the measures required to meet the obligations of the Convention, and to enhance co-ordination of national efforts aimed at the conservation of biodiversity and the sustainable use of biological resources.

Since the conservation of biodiversity and sustainable use of its resources is a joint responsibility shared by most government bodies, several committees comprising representatives of the concerned bodies were set up to prepare this strategy. The adhoc committees took into consideration views and comments of relevant government and

private institutions, so as to ensure that the strategy reflects the entire national aspirations for environmental conservation and sustainable management of biodiversity.

The strategy is based on two main principles:-

That the conservation of wild life is not a task to be shouldered by the government alone, but a responsibility of all community members, and this principle is demonstrated in the Sultanate's keenness to involve as many bodies as possible in the protection of its biodiversity. While stressing the importance of regional and international cooperation, the Sultanate recognizes the primary role of its local communities towards the sustainable use of biological resources.

## **Executive Summary**

### **Implementing the Convention on Biological Diversity**

Biodiversity supports human societies ecologically, economically, culturally and spiritually. Despite its importance, ecosystems are degrading and the species and genetic diversity reducing at an alarming rate due to the impact of growing human population and increasing resource consumption.

The global decline of biodiversity is now recognised as one of the most serious environmental issues facing humanity. This inspired the global community to negotiate the United Nations Convention on Biological Diversity. Delegation from Oman actively participated in these negotiations and the Government of Oman signed the Convention in June 1992 and ratified it in 1994.

The three objectives of the Biodiversity Convention are:

- the conservation of biodiversity;
- the sustainable use of biological resources; and
- the fair and equitable sharing of benefits resulting from the use of genetic resources.

These objectives form the three pillars of sustainable development, ecological integrity, economic sustainability and social equity thus illustrating the nature and scope of the Convention. As a global instrument, it sets the stage for each nation to assess the adequacy of current efforts to conserve biodiversity and sustainable use of biological resources and to determine how inadequacies will be rectified.

One of the key obligations of the signatory parties to the Convention is to prepare a national biodiversity strategy and action plan. Thus, the National Biodiversity Strategy

and Action Plan is a response to this obligation. It has been developed to guide the implementation of the Biodiversity Convention in Oman. All strategic directions contained in the Strategy are relevant from a national perspective. The National Biodiversity Strategy and Action Plan recognises existing constitutional and legislative responsibilities for biodiversity in Oman. It also emphasises the importance of intergovernmental co-operation to create the policy, management and research to advance ecological management. National and regional governments, sectoral agencies, and other stakeholders including the members of the public, will pursue the implementation of the Strategy as guided by their administrative and fiscal capabilities.

## **Elements of the National Strategy and Action Plan**

### **Vision:**

The National Strategy and Action Plan presents a vision for Oman of:

A society that is conscious of the role and issues related to biological diversity, convinced of its responsibilities toward future generations and determined to sustainably use natural resources in harmony with all other living things in accordance with the teachings of Islam.

In support of this vision, the Strategy presents a series of guiding principles that provide a foundation for implementation.

The Strategy provides a framework for action that will enhance our ability to ensure productivity, diversity and integrity of our natural ecosystems and, as a result, our ability as a nation to develop sustainably. It promotes the conservation of biodiversity and the sustainable use of biological resources, and describes how we will complement international efforts to implement the Convention.

### **Mission:**

“To conserve the biological diversity of the Sultanate and its terrestrial and marine environment, in accordance with the articles of the Convention on Biological Diversity, for the benefit of the present and future generations of Omanis and for mankind as a whole, with respect to the guiding principles of Islam.”

### **Main strategic goals:**

- Safeguard habitats and productive renewable resources for rational and sustainable exploitation.

- Conserve habitat, plant and animal diversity especially of those uncommon and also of special interest;
- Provide a high quality natural environment for recreational and tourist activities;
- Improve the understanding of ecosystems and increase resource management capability;
- advocate the need to conserve biodiversity and use biological resources in a sustainable manner;
- Develop legislation that insures the conservation of biodiversity and the sustainable use of biological resources;
- Develop incentives that will promote, biodiversity conservation and Provide employment for local people;
- Equitably share the benefits of sustainable resources including genetic resources at local and regional levels.
- Promote regional and international collaboration on biodiversity conservation and sustainability of natural resources.

**Proposed mechanisms for implementation:**

- Creation of a permanent interministerial biodiversity steering Committee and National Biodiversity office which will be responsible for :
  - the filing of an annual national report on policies, activities and plans aimed at implementing the Strategy;
  - co-ordinating the implementation of national and international elements of the Strategy;
  - recommend measures to permit and encourage non-government participation in the implementation of the Strategy;
  - regular reporting on the status of biodiversity; and,
  - revision of the strategy after an initial implementation phase of five years.

The National Strategy and Action Plan proposes a series of priority actions that are classified according to the following themes involving most sectors of society:

- Conservation of Natural Resources (Protected areas, Endangered species, *Ex situ* conservation)
- Terrestrial and Freshwater Fauna
- Marine Life and Fisheries

- Terrestrial and Aquatic Flora
- Agriculture Resources
- Energy Resources
- Mineral Resources
- Industry, Technology and Services (Biotechnology and Biosafety, Tourism)
- Urban Environment
- Water Resources
- Environmental Emergencies
- Participation of the Public, Non-Governmental Organisations and Private Sector
- Societal Values (Public awareness, education and training; Environmental impact assessments; Institutional and legal framework)
- Quality of Life
- Spiritual Values