CONVENTION ON
BIOLOGICAL DIVERSITY

THE NATIONAL STRATEGY FOR CONSERVATION OF BIODIVERSITY IN THE KINGDOM OF SAUDI ARABIA

Prepared and Issued by
the
National Commission for Wildlife
Conservation and Development

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Preamble

The Kingdom of Saudi Arabia is committed to development and economic progress, however, this policy should not be at the expense of the valuable natural resources of the country. As custodians of the earth and all its living resources, we have a duty to protect this inheritance and manage it according to Islamic principles.

The National Biodiversity Strategy for the Kingdom of Saudi Arabia has aimed to introduce the conservation and sustainable use of our biodiversity into the national planning process by collecting and organizing relevant information and suggesting practical applications.

The Strategy is important because we have to make decisions every day which affect our environment at the individual, national and international levels, and it provides the basic information that is essential to sound decisions. The Strategy also provides a significant contribution to the Convention on Biological Diversity that Saudi Arabia has recently ratified.

I commend this document to the attention of all those who propose and implement development plans that affect our fragile environment.

Sultan Bin Abdulaziz

Crown Prince,
Deputy Prime Minister,
Minister of Defense and Aviation and Inspector General

Foreword

Biological Diversity, or biodiversity, has been described as the "infrastructure of life" because it deals with both the living and non-living elements and physical conditions on which life depends.

Natural systems are resilient, but as the impacts of development increase, our strategic goals to conserve and sustainably use them must also develop. The National Biodiversity Strategy for the Kingdom of Saudi Arabia provides those strategic goals and outlines some proposed actions for their implementation.

The Strategy puts forward the Islamic vision and principles that guide the conservation of life on Earth and confirms the sustainable use of biodiversity through introducing national institutions managing biodiversity.

The Kingdom of Saudi Arabia has ratified the Convention on Biological Diversity and fulfilled its obligation of preparing a National Biodiversity Strategy, as called for in Article 6(a). We are now preparing to integrate the conservation and sustainable use of biological diversity into all the relevant sectors of the government and non-governmental and national plans of the country, as called for in Article 6(b) of the Convention. This will require the preparation of detailed action plans by the ministries and institutions identified in the Strategy. It will also require cross-sectoral coordination among all parties concerned to effectively implement all the action plans.

I strongly recommend the goals of the Strategy to all government agencies and decision makers in Saudi Arabia, to development institutions concerned with development in the region and professional planners in the Kingdom and to implement it for the good of the Kingdom and its people and all life on Earth.

Saud Al-Faisal

Minister of Foreign Affairs
Managing Director of the National Commission for
Wildlife Conservation and Development (NCWCD)

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Introduction

The need to protect the natural environment with all its biological components from the harmful activities of man has existed as long as history has been recorded. However, the problem has been magnified because of our growing ability to destroy the environment. Unfortunately man's compliance with the teachings of Islam, and his responsibility of stewardship on earth, has been ignored.

Saudi Arabia is about 1,969,000 square kilometers and covers two thirds of the Arabian subcontinent. Key biological sites in Arabia include freshwater wetlands, isolated mountain massifs, juniper woodlands, marine islands, sea grass beds, mangrove thickets, coral reefs, salt marshes, algal beds, acacia woodlands, rawdahs (meadows) and wadis (valleys). As a result of their biological diversity and productivity, these key biological sites, or hotspots, are fundamental in the synergistic framework of associated ecosystems.

The elements of biodiversity, the flora and fauna, that make up these associated ecosystems are the building blocks of Saudi Arabia's living infrastructure. These living elements need to be supported by legal systems in addition to the ethical teachings of Islam and enriched by the indigenous knowledge and traditions of local people.

The National Biodiversity Strategy is depicted into five parts:

Part One introduces the purpose and scope of the Strategy which is to promote the conservation of biodiversity and the sustainable use of its resources by placing biodiversity at the core of national planning and development. The scope of the Strategy is broad and includes the protection, restoration, sustainable use, equitable sharing, and systematic monitoring of Saudi Arabia's biodiversity. Part One also contains an introduction to the Convention on Biological Diversity.

Part Two looks at the Islamic vision and basic principles guiding the conservation of biodiversity and stresses the fact that the conservation of the natural environment is an

imperative commanded by Allah. The protection of the natural environment from abuse by man leads tot he welfare of man himself together with the welfare of all other beings.

Part Three reviews the status of terrestrial biodiversity including plants and animals, amphibians, reptiles and insects. The status of marine and freshwater biodiversity are also covered. The major threats faced by each of these groups are discusses

Part Four contains seventeen strategic goals for the conservation and sustainable use of biodiversity that include in-situ conservation both inside and outside protected areas; ex-situ conservation; conserving and developing forests and woodlands, desert rangelands, living marine resources and agricultural biodiversity; botanic and zoological gardens regulating access to genetic resources in addition to national parks and introducing national biosafety standards; enacting environmental legislation, supporting scientific research, enhancing environmental education, and achieving socio-economic development; encouraging collaborative management and promoting cooperation for biodiversity; generating income from wildlife resources and developing ecotourism and nature-based tourism.

Part Five: deals with the mechanism for implementation of the Strategy and monitoring of the implementation. It stresses the fact that all the government agencies, non-governmental organizations, scientific institutions, and local stakeholders in Saudi Arabia will need to participate. The mechanism for implementing the strategy includes an organizational chart and a description of its components.

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Prof. Dr. Abdulaziz H. Abuzinada

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CHAPTER ONE
INTRODUCTION TO THE STRATEGY

Purpose and Scope of the National Strategy:

The purpose of the National Biodiversity Strategy is to promote the conservation of biodiversity and its sustainable use by placing biodiversity at the centre of national planning, development and extending the scope of the Strategy to include the protection, restoration, sustainable use, equitable sharing, an systematic monitoring.

Because the Strategy covers many issues and touches upon many interests, it will require the active participation of all the national sectors in Saudi Arabia. That is why the effective implementation of this Strategy will require a high level of political support to promote the integration of legislation, sectoral policies, as well as coordination between government, non-governmental organization, and the private sectors.

The Strategy planning process adopted a logical sequence:

1 - Consultations with the National Committee for Biodiversity

2 - Approval by the National Committee of Biodiversity of the Strategy outline

3 - Preparation of a Draft National Biodiversity Strategy

4 - Distribution of Draft Strategy for comments by all concerned parties in Saudi Arabia

5 - Finalization of the Strategy and incorporating all relevant suggested alterations

The Strategy was compiled based on the following sources of information:

1 - Available scientific studies and reports on biodiversity issues in Saudi Arabia

2 - Case studies on the conservation and use of biodiversity in Saudi Arabia

3 - Recommendations by the National Committee for Biodiversity

The Strategy has identified seventeen Strategic Goals to encompass the various sectors:

1 - Three strategic goals for the ex-and in-situ conservation of wildlife and wild habitats.

2 - Two strategic goals for the sustainable use of woodlands and rangelands.

3 - Three strategic goals for the conservation and sustainable use of living natural resources.

4 - Nine general strategic goals that provide direct support to biodiversity

The Strategy is the product of a participatory and consultative process that needs to continue well beyond the publication of this document to meet the evolving needs and requirements of Saudi Arabia.

As a Signee Party of the Convention on Biodiversity ,the Kingdom of Saudi Arabia is committed to adopt an indivisible integrated multisectoral orientation based on conserving and managing ecosystems so as to limit biodiversity loss. It is important to note in this respect that although the Convention is an International treaty it emphasizes the importance of taking national decisions.

The Convention on Biological Diversity

The Convention on Biological Diversity (CBD) was the first comprehensive international agreement committing governments to conserve and sustainably use the Earth's biological resources.

Saudi Arabia ratified the Convention on Biological Diversity in 2001. The Convention on Biological diversity is composed of 24 Articles. The following require special mention on the national level:

Article 1 of the CBD which states the principal objectives. These are:

1 - conservation of biological diversity

2 - sustainable use of its biological components and

3 - fare and equitable sharing of the benefits arising out of the utilization of genetic resources.

Article 6 of the CBD which calls on all parties to:

1 - develop national biodiversity strategies and action plans

2 - integrate the conservation of biodiversity into all the relevant sectors of the government as well as the national plans of the country.

Article 8 of the CBD is devoted to in-situ conservation and requires all contracting parties to do the following:

1 - establish a national system of protected areas

2 - create economic incentives to encourage conservation and sustainable use of biodiversity

3 - adopt procedures to assess the impacts of proposed projects on biodiversity

4 - protect rights of indigenous and local communities

Article 9 of the CBD is devoted to ex-situ conservation and requires that all contracting parties in so far as possible to do the following:

1 - establish gene banks such as seed banks, field banks (botanical gardens) and sperm and ova banks

2 - establish in-vitro plant tissue cultures and microbial culture collections

3 - establish captive breeding of animals and artificial propagation of plants and reintroduce them into their natural habitats

4 - collect living organisms for zoos, aquaria and botanic gardens.

Article 10 of the CBD which deals with the sustainable use of components of biological diversity by:

1 - integrating conservation and sustainable use into national decision making process

2 - adopting measures to avoid or minimize adverse impacts on biological diversity

3 - protecting and encouraging traditional use of biological resources

4 - supporting local populations to develop and implement remedial action in degraded areas where biological diversity has been notably reduced

5 - encouraging cooperation between governmental authorities and private sector in developing methods for sustainable uses of biological resources.

CHAPTER TWO
MANAGING AND IMPLEMENTING THE STRATEGY

Islamic Vision Guiding the Strategy

"There is no creature crawling on the earth, nor bird flying with its wings, but they are nations like yourselves". The Holy Qur'an, Surat Al-Anaam No. 83)

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

The Glorious Qur'an has made it clear that each thing and every creature in the universe, whether known to man or not, performs two major functions: a religious function in so far as it evidences the Maker's presence and infinite wisdom, power and grace; and a social function in the service of man and other created beings.

As we cannot be aware of the beneficial functions of all things created by Allah, we cannot base our conservation efforts solely on the economical benefits to man because this would lead to a distortion of the dynamic equilibrium set by Allah. Therefore we have to conserve and protect all beings created on their value as signs of the Creator, we cannot neglect anything, for every element and species has its individual and unique role to play in glorifying Allah and the conservation of life.

In seeking economic benefits, the contemporary generation has no right to undertake any activity that may have uncertain consequences and thereby sacrifice the needs of future generations. Similarly man should never eliminate any species of Allah's creation or bring about irreparable damage to the life sustaining ecosystems of the planet.

The all-inclusive approach of Islam to man, without any discrimination based on time, age,

place or race, and Islam's approach to the the welfare of theuniverse as a whole without excluding from consideration any of its parts; is the essence of the ecological consciousness that is so surely needed for the deliverance of the human race.

Principles for Conserving Biodiversity

The teachings of Islam promote all Endeavour's, local, regional and international, and calls for cocerted efforts in all fields to conserve, protect and rehabilitate the natural environment. The Kingdom issued the General Act for the Environment as well as other laws concerned with conservation of biodiversity with the goal of complying with item 23 of the Kingdom's Conistitution that calls for conservation of the environment, its protection and development, and avoid its pollution.

1 - Conservation of the natural environment is a moral and ethical imperative.
Environmental problems cannot be solved through knowledge and technology alone. Only moral conviction and ethical consciousness, on both individual and social levels, can motivate people to forgo some of the short term profits of this life, and to make personal sacrifices for the common good.

2 - Ethical teachings should be backed by legislation and implementation.
The force of law and political authority are indispensable to bring about justice and equity in the distribution of natural resources and in implementing the measures required for its protection and conservation.

3 - The development of the natural resources should be planned and implemented in accordance with what is implied by ecological laws and values. Planning for development should in every case include assessment of environmental impacts so as to minimize damage to the natural environment to the minimum acceptable level and to prevent depletion of its natural resources.

4 - Ecologically sustainable economic development necessitate the integration of

environmentally acceptable social and economic practices.
Conservation efforts divorced from sustainable development is neither socially acceptable nor economically viable. Fare distribution of natural resiources yield should be ensured for local communities who has the natural right to use them in accordance with the efforts they invest in the beneficial use and conservation of these resources.

5 - Scientific and technical knowledge of the natural environment and its conservation should continually be improved and developed since accurate information is indispensable to enlightened decisions for the conservation of the natural environment in collaboration with concerned parties. It will also help to avoid practices that lead to its destruction in accordance with the precautionary principle before harm occurs.

6 - Development projects undertaken in any one country should not lead to damage, harm or degradation in the natural environment of other countries. This implies thatnational, local or private development projects should not be implemented if they shall cause injury to others in neighboring countries.

7 - The natural environment and natural resources should not be subjected to any irreparable damage for the purpose of military or hostile actions. Man has no right to exploit or damage natural resources in such a way as to spoilit or harm the sources of subsistence for living beings, or expose them to destruction as may happen in military confrontations.

CHAPTER THREE
CURRENT STATUS OF, AND THREATS TO, BIODIVERSITY

1. Terrestrial Biodiversity

Background

Saudi Arabia is approximately 1,969,000 square kilometers occupying 2/3 of the Arabian Peninsula and extends from 32 12'N latitude on the Jordanian border in the north to 16 00'N latitude at the Yemani border in the south. It is bounded by the Red Sea in the west at 32 36' E longitudes, and the Arabian Gulf in the east at 56 00'E longitude.

Western Saudi Arabia is dominated by a mountain chain running the entire length of the country, known as the scarp of the Hejaz and Asir mountains and overlooks the fertile Tihama coastal plain to its west. It runs parallel to the Red Sea and rises to between 1300 - 3000 m. above the sea level.. This fertile crest falls towards the east as a desert plateau to the dry interior, or the Najd, containing the great sand deserts of the Empty quarter, Nafud and Dahna. The eastern region lies on the Arabian Gulf coast and contains salt flats.

Saudi Arabia enjoys a distinguished biogeographical location. It includes portions of two out of the eight known global terrestrial realms; namely the Palearctic and the Afrotropical. It is thus an area of great ecological significance.

Saudi Arabia divides naturally into seven terrestrial physiographic regions:

1 - Tihamah coastal plain along the Red Sea
2- Western Highlands
3 - Arabian Hinterland
4 - The Cuesta Region (Sedimentary Najd)
5 - Aeolian Sands
6 - As-Summan and Widyan Plateaus
7 - Arabian Gulf Coastal Region

Status of Terrestrial Flora

Saudi Arabia is generally an arid country with a few exceptional sub-humid regions on the southwestern escarpments and is divided into three distinctive geological units: the Saharo-Sindian, Somali-Masur, and Afro-Montane. The vegetation of the Saharo-Sindian region is sparse and about 60% of the vegetation, mainly in the low lying areas, is represented by annuals of which population density varies from year to year, depending on the amount of rainfall and the amount of seed deposits from previous years. The western region is rich in vegetation when compared to the central and eastern region. The northwestern mountains are rugged and floristically poorer than the southwestern mountains, with affinities to the Mediterranean and North African floristic regions. However, the entire southwestern region is the richest in terms of species diversity and contains the highest concentration of endemism, despite the fact that these high altitude areas are heavily populated with human settlements dating to ancient times.

The 2250 species of flora in Saudi Arabia belong to 132 families and 837 genera. about 105 species inhabit sand dunes, 90 are halophytes, 75 are trees and 12 are aquatic plants. Out of these species 40 are considered endemic, The influence of the floras of neighboring countries, particularly Yemen and Oman, is high on the flora of Saudi Arabia. About 20% of the flora, that include the rare and endemic species, are present in small populations in their respective niches.

Threats to Terrestrial Flora

1 - Degradation of Rangelands

The degradation of rangelands has accelerated in recent years and has reached a critical stage where the rangelands can no longer physically support the demands being made upon them by herders with increasing numbers of livestock. The frequency with which various reports refer to the poor state of the rangeland vegetation is because of its key role in the ecology of about 76% of the land area of Saudi Arabia. Rangelands cannot be used sustainably in their present state and the current practices of use. In other words, under the current levels of demand, the use of rangelands cannot meet the requirements of sustainable

use at all.

2 - Uncontrolled Cutting of Trees and Shrubs

The volume of wood consumed in the central region is very high. The destructive fuel wood gathering focuses on slow growing woody species. Plants such as *Acacia spp*, *Haloxylon persicum* and *Calligonum spp* are felled or grubbed out selectively and severely, thereby grossly modifying the physiognomic structure of the habitats and reducing plant cover.

3 - Accelerated Development Programs

There was a high increase in population number in the Kingdom as a result of the oil boom period of the last few decades. This resulted in the conversion of very large areas of virgin land in the Sarawat and Hijaz mountain sand of the Northern and Central regions to urban housing and agriculture.

4 - Years of Periodic Drought

Periodic drought has helped the abusive land practices to upset the sensitive ecological balance.. The damage is due to over-exploitation without any concern for natural processes that operate in such systems of drylands.

5 - Modern Agricultural Practices on Virgin Lands

The recent widespread mechanical cultivation and indiscriminate use of pesticides in many areas of Saudi Arabia has changed the natural habitats and reduced the population of wild plants and animals. Whole ecosystems are ceasing to function or will do so soon due to the loss of pollinators and predators and prays on which they depend as their food sources.

6 - Loss of Agricultural Terraces

The ancient sustainable practice of terraced agriculture proved an ally to biodiversity, but now many of these terraces are not maintained and have been washed away by rain. However, terraces that are abandoned but not eroded are excellent sites for biodiversity.

Status of Terrestrial Fauna

Mammals

A checklist of 98 species of mammals has been recorded from the Arabian peninsula. Of these, 76 species occur in Saudi Arabia.

Large mammals usually provide a good indication of the status of the other fauna and indeed the whole ecosystem. if their numbers are satisfactory this is likely to be true for all other vertebrates and invertebrates, and if the large mammals are under stress this is a good indicator that the situation of other plants and animals is not well.

The Arabian oryx, Oryx leucoryx ,was plentiful throughout Arabia in the 1800's, but its numbers continued to decrease in the 1900's until it became extinct in the wild in the 1970's. Praise be to Allah that some animals were kept in captivity and the captive-bred populations and a successful reintroduction program helped its return back to the wild. It is doing well in some nature reserves,

The two Gazelles species, the reem and idmi were reported as widespread and common in the 1930's. Heavy gazelle mortality was reported in the Hijaz in the early 1960's. The Nubian ibex survives at low densities in most of its historical range, and the caracal, wolf and hyena persist in low populations.

The lion was the first large mammal species known to have become extinct from the Arabian Peninsula in the early 1900's. The cheetah is probably extinct with the last authentic records from the 1950's.

Several wild mammal species pose commensalism problems for residents in the areas which they intrude, among them the the red foxes Vulpes Vulpes and the sacred baboons .

Birds

About 444 bird species have been recorded in Saudi Arabia, of which about 185 species are known to breed in the Kingdom. Of the breeding species - 45 are believed to be of Ethiopian origin, 30 of Asiatic origin with the remainder Palearctic.The Kingdom has 10 endemic

species of birds:

Palearctic - Philby's rock partridge Arabian red-legged partridge South Arabian wheatear Yemen linnet. Of the Indo-Malaysian species, the Arabian woodpecker, and of Afrotropical origin - Yemen thrush, Yemen warbler, Arabian waxbill, Arabian serin, Yemen serin.

Although most of the birds of Saudi Arabia have affinities with neighboring countries, it is most likely that at least five species originated in Arabia. These are the Arabian (Blandford's) warbler blanfordi, shining (Abyssinian) sunbird, white-breasted white eye, Ruppell's weaver and golden-winged grosbeak.

The bird life of Saudi Arabia has not been fully explored It is likely that new species will colonize Arabia from those coming through the strait of Hormuz between Oman and Iran, which is only 60 km wide, with islands reducing the distance by half, and the strait at Bab Al-Mandab between Yemen and Africa which does not exceed 29 km in width. This makes it easy for those specis to come across..

The Arabian Peninsula is functionally very significant for migrating birds from Asia, Europe and Africa. Thus a second source of colonization is from those migratory birds, a number of whom are now over wintering and even breeding in Saudi Arabia - rather than migrating further south due to the existence of extensively irrigated areas and the incidence of treated sewage water ponds around the major cities of Saudi Arabia.

The information on the status of the houbara bustard as a resident breeding bird needs more documentation. The Arabian bustard is a rare species in Saudi Arabia. Both bustard species are under serious threat from uncontrolled hunting and habitat loss.

There are also a number of species which have been introduced to Saudi Arabia that have established free ranging populations in rural and urban areas such as the ring-necked parakeet and house crow.

Amphibians and Reptiles
All of Saudi Arabia's 7 native amphibian species are restricted to freshwater seeps and ephemeral pools. They are the Tihamah toad, Dhofar toad, green toad. Arabian toad, Savigny's tree frog, Arabian water frog, Arabian skittering frog.

There are 45 species of terrestrial snakes in Saudi Arabia, of which 23 species are poisonous, and 10 species of sea snakes that are all poisonous. Because of the desert nature of the country, none of the terrestrial snakes are found in great numbers. Some species may be abundant. in very localized places

There are 67 species of lizards known from Saudi Arabia. The small-scaled dhubb is under pressure from hunting for its flesh.

Insects:

There are no complete studies on the insect species of Saudi Arabia. Zoological analysis of Arabian and Middle Eastern butterflies reveals species with Palearctic, Afrotropical and oriental affinities. Recorded are 8 endemic species in the Asir region and 23 sub-species in the Hijaz, Central Arabia, Eastern Arabia and Asir regions.

Threats of Terrestrial Fauna

1 - Over-grazing and wood-cutting
Over-grazing and destruction of trees and shrubs for firewood have led to shrinkage of terrestrial habitats in addition to weakening and mortality of wild animals, particularly among highly mobile species moving over large and remote areas.

2 - Overhunting
Hunting is a major threat especially when it is not controlled. In an age of powerful all terrain vehicles, guns and advanced technology, wildlife are easily tracked and killed. Overhunting is usually most devastating when added to the effects of overgrazing. In those situations wildlife populations become most vulnerable to hunting, particularly under drought, when they concentrate near water sources, while they are weak and less alert, Many times they are forced into areas denuded of cover where they have no shelter. Undoubtedly the rate of loss of large mammals in Saudi Arabia is high and serves as an indicator of the status of all fauna.

3 - Loss of Habitat
There are many factors contributing to loss of habitats .Most important are over-grazing and wood-cutting, agriculture and urban expansion at the expense of range lands and pollution or loss due to overexploitation of fresh water sources.

4 - Urban Expansion and Human Settlements
Population growth and urban expansion throughout Saudi Arabia pose a direct threat to terrestrial fauna. The problem is made worse by road building practices that do not consider environmental issues.

5 - Pollution of Water Sources

Pollution of freshwater sources from sewage, industrial waste, oil and agricultural fertilizers and pesticides, threatens wild fauna.

6 - Ėxpansion in Agricultural Lands

Expansion in agricultural lands which have been legally possed or else taken illegally into and around natural woodlands and rangelands resulted in a reduction or fragmentation of those woodlands and rangelands in a way that cause loss of habitats and wild animals.

7 - Indiscriminate Use of Pesticides

Improper and indiscriminate use of pesticides in agriculture and public health campaigns have killed large numbers of useful insects, birds and mammals.

Marine Biodiversity

Background

Saudi Arabia has about 1,850 km of coastline along the Red Sea and about 650 km of coastline along the Arabian Gulf. Considering the comparatively small sizes of the Red Sea and Arabian Gulf anything that affects biodiversity in one country will affect all others that share these two seas.

The Red Sea is one of the deepest regional seas in the world reaching 2500 meters in depth with an average of 500 meters. It is about 1930 km long and relatively narrow averaging about 280 km in width. It is a critical link between the Indian Ocean and the Mediterranean Sea. The entrance of the Red Sea at the Bab Al-Mandab Straits is 29 km wide and opens into the Indian Ocean. The continental shelf, the shallow coastal area is only about 100 meters deep, is narrow in the north and widens considerably in the south where it is over 100 km wide.

The Arabian Gulf is an extremely shallow and almost land-locked sea that is 1000 km long and 230-250 km wide and is roughly rectangular in shape. The entrance from the Gulf of Oman at the Strait of Hormuz is 60 km wide. The Gulf is shallow with an average depth of 35 meters and a maximum depth of 100 meters on the Iranian side. 18% of the area of the Gulf is less than 5 m deep. There is no continental shelf.

Both the Red Sea and Arabian Gulf play a principal role in the development of Saudi Arabia. This is largely due to their importance in petroleum exploration, production and transport. In addition to the development of an urban, commercial, and industrial base directly and indirectly connected with petroleum production and marketting.

Waters of both seas provide the Kingdom with desalinated fresh water. The fisheries represent another renewable resource of direct economic benefit to national development.

The coastal environment is of recreational value. Their water is rich ln species of reef forming corals with varying shapes and colours. in addition to colorful and exotically shaped fish such as the butterfly fish, angelfish and parrotfish, that inhabit the seas and reef of Saudi Arabia and is an underwater paradise for the naturalist, diver and photographer.

Status of Marine Flora

1) Inter-Tidal Habitats

A - Saltmarshes:

These elements of coastal wetland communities are poorly developed because of the scarcity of fresh water. Despite this scarcity they produced organic matter that are a source of food for many species.

Three principal vegetation types are recognized in these saltmarshes:

a - palm groves and fresh water reed swamps,

b - halophytic communities associated with periodic inundation by sea water, and

c - salt pans or sabkhas that are widespread and characterized by sparse halophytes and an algal/microbial mat.

B - Mangroves:

Widely scattered along the Red Sea coast. The mangroves are most intensive in the south where they benefit from greater wadi discharge and a more protected coastline. In the Arabian Gulf, mangroves are less widespread, less developed structurally and are under much greater threat from physical developments. There are two species of mangroves in Saudi Arabia, Avicennia marina (Shora or Gorm) is the most common and Rhizophora mucronata (Gindel), which is found in only eleven sites on the Red Sea coast.

C - Broad Inter-Tidal Flats and Sandy / Rocky Beaches:

This third biotope is important for turtle nesting, fishing and recreational activities.

2) Sub-Tidal Habitats

Sub-tidal habitats are of importance because they generate much of the energy in the coastal ecosystems from relatively small areas. It include

A - Sand and Mud Flats:

Widely distributed, especially in the Gulf covering about 95% of the sub-tidal zone. Algae and invertebrates, account for the greatest biomass in these large areas of relatively low productivity. Shrimp harvests are an important economic activity.

B - Seagrass Beds:

Seagrass beds look like underwater meadows and are among the most productive of the global ecosystems. Eleven species of all the seven known genera of seagrass occur in the Red Sea. There are three species in the Arabian Gulf.

Sea grasses have a fundamental role in primary production and the maintenance of fisheries. Many important species of fish shelter, feed and breed among the sea grasses. Beds of seagrass are also important for stabilizing the coasts and preventing them from being washed out. THey are the natural habitat for the endangered dugong and green turtle.

C - Algal Flats:

Algal flats are found in shallow waters in large bays along the Arabian Gulf coast and often occur in association with seagrass beds. These habitats are very productive and at the same time most susceptible to oil pollution.

Threats of Marine Flora

1 - Landfilling

One of the most disruptive activities to coastal and marine resources and damaging to marine ecosystems. It causes severe and permanent destruction of coastal habitats - such as loss of mangroves.

2 - Dredging

Like landfilling, dredging causes destruction of the marine resources in the dredged area and often has indirect negative impacts from increased sedimentation, which causes a long term destruction of plant and animal communities.

3 - Water Pollution

There are numerous sources of coastal water pollution, particularly along the Saudi Arabian Gulf coast, that threaten the viability of the commercial fisheries, marine natural resources and the destruction of regions of recreational values. The principle sources of pollution are:

- **Oil spills from oil tanker accidents**
- **ballast water from oil tankers containing oil chemicals and exotic fauna and flora**

-Pollution from industrial sources with some violation in connecting to the industrial discharge system in the industrial areas.

- **Pollution from residential sources coupled with lack of sufficient waste water treatment facilities. Treated discharges from sewage facilities alter the nutrient balance.**

4 - Future Human Activities

- **It is certain that the negative effects of human activities will continue on the marine environment.It is therefore important that environmental protection and managed coastal development become for sustainable development central to planning in the region. It is also important to mitigate the harmful effects of development on the environment, particularly development and activities associated with tourism. Development activities that conserve and enhance the natural resources of the coast should be encouraged..**

Status of Marine Fauna

Fish

Over 1280 species of fish have been recorded in the Red Sea and 542 species in the Arabian Gulf. Artisanal fishing is an important socio-economic occupation and 180 species have been recorded in the fish markets of the Red Sea and 110 species in the markets of the Arabian Gulf.

Among the saltwater fish, three of the groupers, namely the najil, hamour and roving grouper are of special economic importance and under pressure from overfishing. Sharks in general are threatened by the Asian shark fin market, while the humphead wrasse and bumphead parrotfish are common targets of spear fishing because of their size. The butterfly fishes are vulnerable to over harvesting from the growing trade in ornamental fish.

Molluscs and Crustaceans (other than shrimps)

The Gulf had an important traditional pearl fishing industry that has been in decline since the 1930's. Small quantities of clam, squid and octopus are caught and sold along the Red Sea coast. Three species of lobster are known from the Red Sea as well as two species of crabs that are sold in small quantities in local markets.

Birds

The Red Sea and Arabian Gulf coasts and their associated islands are globally important areas for birds whether they are Palearctic migrants, winter residents or resident breeding species. The tidal flats of the Arabian Gulf are considered among the worlds most important over-wintering areas. They are home to 1-2 million waders of 125 species. In addition, the Gulf is an important stop-over for millions of passage migrants of which 113 species have been recorded. The sooty falcon is a breeding summer visitor on marine islands in both the Red Sea and the Gulf.

Marine Turtles

There are 5 species of marine turtles in Saudi Arabia waters. They are:the green turtle (Red Sea/Gulf), hawksbill turtle (Red Sea/Gulf), loggerhead turtle (Red Sea/Gulf), olive ridley turtle (Red Sea), leatherback turtle (Red Sea). Both the green and hawksbill turtle occur

naturally in high numbers although they are regarded as endangered internationally. The hawksbill is associated with coral formations whereas the green turtle is associated with seagrass beds.

Marine Mammals

Dugong. *Dugong dugon*. Occurs naturally in high numbers in Saudi Arabian waters that are one of the two most important areas in the world for this internationally threatened species.

There are seven Dolphin species in Saudi Arbia. The common species of dolphins are the rough-toothed Dolphin *Delphinus steno* common Dolphin *Delphinus delphis*, striped Dolphin, plumbeous Dolphin *Sousa chinensis*, Risso's Dolphin, spotted *Stenella attenuata*, and bottle-nosed dolphins. In addition, the finless Dolphin porpoise is found in the Gulf.

Ten species of whales are reported to occur in Saudi Arabian waters two of which are Bryde's whale and the humpback whale. Recently, Mink Whale has been reported in the Red Sea.

Coral Reefs

Coral reefs are the most widespread biotope on the Red Sea coast, which is the northern extremity for reef forming corals. Reef development and species diversity peak in the central region where there are over 150 species of corals off Yanbu, compared with 30 in the Gulf of Aqaba and less than 10 in the southern most reefs. In the Red Sea 450 species of fish are commonly associated with coral reefs.

The coral are famous for their beauty and 250 species of Red Sea coral have been recorded. Coral reefs are less extensive in the Arabian Gulf where they occur around the six offshore islands and in numerous patches between As-Saffaniyah and Ras Tannourah. Coral reefs provide shelter and food for marine life, particularly economically important fish such as groupers and emperor bream.

Threats of Marine Fauna

1 - Water Pollution

There are numerous sources of coastal water pollution, particularly along the Saudi Arabian Gulf coast, that threaten the viability of the commercial fisheries, marine natural resources and the destruction of recreational values. The principle sources of such pollution are:

- **Oil spills from tanker accidents**
- **Chronic discharges of oil and other chemicals from heavy tanker traffic**
- **Pollution from industrial and residential resources**
- **Lack of sufficient waste water treatment facilities. It is well known that even**
- **treated discharges from sewage facilities alter the nutrient balance**
- **Increase in the rate of sedimentation that alters the seabed.**

2 - Air Pollution

The primary sources of air pollution n are the industrial facilities concentrated at various urban areas along both the Red Sea and Arabian Gulf coasts. The dust resulting from the cement factories at Yanbu has caused health problems for people as well as serious damage to nearby coral reefs and green turtle nesting sites.

3 - Solid Waste

It is common that industrial, commercial and residential waste and trash is dumped on the coast. The water spreads the litter along the entire Gulf coast and along parts of the Red Sea causing a health hazard and an aesthetic problem in recreational areas. Deposits of wood litter act as barriers to sea turtles nesting on the beaches.

4 – Over Fishing Practices

- **The intensive fishing activities in some areas of the Gulf threaten the marine fauna and have caused a decline of shrimp and hamour stocks, whereas**
- **Trawling causes damage to seagrass beds and coral reefs which are habitats for shrimp, dugong and sea turtles.**
- **Sea turtles get caught in nets that do not have an escape device,and are thus killed.**
- **Uncontrolled fishing that does not comply with the rules and regulations issued by the**

relevant authorities.

- **Anchoring on coral reefs damages productivity and attractiveness of corals.**

5 - Grazing, Deforestation, Agricultural Practices

- **Grazing of mangroves and coastal vegetation by camels and other livestock is causing serious damage to the coastal vegetation.**
- **Deforestation increases sediment loads in the freshwater runoff that reaches the sea.**
- **Removal of trees for firewood and for construction of migratory bird traps damages the coastal thickets.**

6 - Dredging and Landfilling

- **One of the activities most disruptive to coastal and marine resources which causes severe and permanent destruction of coastal habitats such as the loss of mangroves where marine fauna live and reproduce. Also inflicting indirect damage due to sedimentation.**
-
- **The long term effect on the coastal environment of dredging and landfilling is the destruction of valuable plant and animal communities.**

7 - Coral Bleaching

- **Mass coral mortality occurred due to bleaching in the central-northern Saudi Arabian Red Sea in late 1998, and in the Arabian Gulf in lagoon waters off Karan.**
- **Significant levels of coral mortality were recorded close to mainland of Farasan.**
- **Mean monthly sea surface temperatures were found to be unusually high (>32 C) three months prior to the first report of coral mortality.**

8 - Recreation and Tourism Activities

- **Sea birds and turtles often breed and nest in remote locations such as the islands where human presence disrupts their breeding and nesting activities, which leads to a decreasein their numbers.**
- **Hunting birds and sea turtles reduces viability of these populations.**
- **Collecting bird and turtle eggs to eat or sell is extremely destructive to those**

populations.

- **Pressures from recreational activities along the Arabian Gulf coast are not severe except for small coral islands and reefs.**
- **Pressures are severe along parts of the Red Sea coast where the reefs have been damaged by extensive food and souvenir collecting and spear fishing.**

9 - Future Human Activities

- **It is certain that an expansion of human activities will continue to exert pressure on the marine environment. It is therefore imperative to make environmental protection and managed coastal development central to the approach of planning for the future.**
- **It is important to mitigate the harmful effects of development on the environment and to**

encourage those development activities that conserve and enhance the natural resources of the coast.

- **Because of the increasing demand on nature based tourism sites, high standards will need to be enforced for the establishment and operation of those sites.**

Freshwater Biodiversity

Background

The scarcity of freshwater continues to be a major limiting factor to human development and natural biodiversity in Saudi Arabia.

Freshwater resources in Saudi Arabia are few and include:

a) natural sources of water: such as springs, seasonal streams, pools, wetlands and marshes around which human populations lived.

b) artificial sources of water: such as wells (of which there are 91,916 private and 5,345 Government wells), dams (about 190), irrigation canals fed by water pumped from deep underground aquifers to supply agricultural irrigation projects and expanding human demands, agricultural drainages, and treated effluent outflows.

c) desalination plants: of which there are 30 plants, producing 2.8 million cubic meters/day.

The Kingdom is classified as the top first country for desalination water production.

Saudi Arabia is the world's highest producer of desalinated water accounting for one third of world production. It is estimated that Saudi Arabia's water demand increased from 2.3 million cubic meters in 1980 to 30 million cubic meters in 2000 - due to an accelerated growth in population and vast development in the industrial, agricultural urban sectors.

Status of Freshwater Flora

Wherever water is naturally available or artificially supplied, the flora flourishes. In distant oases the natural flora can still be found relatively intact, however in areas around the cities and towns a number of introduced flora have established themselves to the detriment of local flora.

Status of Freshwater Fauna

Perhaps the most obvious, and certainly the most vulnerable, of the key biological sites in the arid landscapes of Saudi Arabia are the natural freshwater wetlands that include ponds, streams and springs, as well as artificial wetlands such as reservoirs and effluent streams outside urban areas and agricultural developments.

These freshwater wetlands attract and support a diverse assemblage of plants and animals and are important centers of endemism. The distribution of freshwater fish in Saudi Arabia is related to the availability of freshwater dispersal routes.

Indigenous species of freshwater fish, of which there are a number in the western mountains, are represented by three genera. The Cyprinian are of Asiatic origin, the Garr of European origin, while the Barbus complex is of an European and afro-Indian origin. Interestingly there is not a single species of freshwater fish common to the eastern and western drainages of the Asir.

All of Saudi Arabia's endemic freshwater fish species have been listed as key species, in view of their rareness, vulnerability and very limited habitats. *Acathobrama hadiahensis* is known

from only one location in Wadi Hadiya in the northern Hijaz, while *Barbus apoensis* has a very restricted range and is increasingly harvested for food.

Threats to Freshwater Flora and Fauna

1 - Increased Pumping rate

Continued pumping of non-renewable under-ground aquifers to irrigate crops with a high water requirements, endangers existence of flora and fauna of fresh-water.

2 - Pollution

Pollution of freshwater sources from sewage, industrial waste, oil and agricultural fertilizers and pesticides, endanger existence of flora and fauna of fresh-water.

3 - Loss of Fresh Water habitats

Loss of the freshwater habitats of fish, amphibians and insects that developed and bred in the western mountains of Saudi Arabia. of which many are endemic, will result in the elimination of these groups.

4 - Invasive alien species

Introduction of invasive alien species of flora and fauna that pose a threat to local indigenous fresh water species, and is made worse by the policy of stocking natural pools and dams with introduced table fish like tilapia.

5 - Salt accumulation

Rise in the level of dissolved salt from excessive irrigation of reclaimed lands kills the natural flora leaving only halophytes in their place.

Institutions and Governmental bodies concerned with Conservation of Biodiversity.

Several governmental organizations are involved in Conserving Biodiversity in the Kingdom of Saudi Arabia each within range of interest. Coordination between them is accomplished

via the Ministerial Committee on the Environment chaired by HRH Prince Sultan bin Abdulaziz Crown Prince, Deputy Prime Minster, Minister of Defense and Aviation and Inspector General. These organizations are:

Ministry of Defense and Aviation (Military Survey)
Ministry of Municipalities and Rural Affairs
Ministry of Interior
National Commission for Wildlife Conservation and Development
General Presidency for Meteorological and Environmental Protection
Ministry of Agriculture
Ministry of Higher Education (Saudi Universities)
Ministry of Economics and Planning
Ministry of Water
King Abdulaziz City for Science and Technology
Food and Medicine Commission
High Commission of Riyadh Development

To these governmental bodies are affiliated specialized Research Centers. These are:
First:
Centers affiliated to the National Commission for Wildlife Conservation and Development:-

- **National Wildlife Research Center (Taif)**
- **King Khaled Wildlife Research Center (Thumamah)**
- **Prince Mohammad Al-Sudairy Gazelles Research Center (Qassim)**
- **Training Center for Conservation of Natural Resources**

Second:
Centers affiliated to the Ministry of Agriculture:

- **National Center for Agricultural Research (Riyadh)**
- **Range and Animal Wealth Research Center (Al-Jouf)**
- **Agricultural Research Center (Jizan)**
- **Horticultural Research Center (Najraj)**

- **Palm- Grove and Dates Research Center (Al-Hasa)**

Third:

Centers affiliated to the General Presidency for Meteorological and Environmental Protection:

- **National Center for Meteorology and Environment**

Fourth:

Research Centers affiliated to Saudi Universities:

- **Prince Sultan Research Center for the Environment, Water and the Desert – King Saud University.**
- **Research Center – King Fahad University for Petroleum and Minerals**
- **Water Research Center – King Abdulaziz University**
- **Prince Sultan Center for Environmental and Touristic Studies – King Khaled University**

Fifth:

Centers affiliated to King Abdulaziz City for Science and Technology:

- **Natural Resources and Environmental Research Center.**

National Acts and Legislations Related to Conservation of Biodiversity:

Conservation of Wildlife is one of the principal factors in securing quality of the environment and its safety. Saudi Arabia issued a number of acts dealing with the environment, and charged various specialised governmental agencies with their implementation. In spite of the rapid development occurring in the fields of. agriculture, industry, economic, and social development projects and population increase, the Kingdom has executed these projects by applying the 5-year Development Plan approach that ensure no harm will be inflicted on the living natural resources and realize environmental safety through taking the environmental considerations when preparing and executing these projects. . (Article 32 of the Kingdom's

Constitution ascertained that the Kingdom should conserve, protect and develop the environment and prevent pollution. However, there is an obvious weakness in coordinating the efforts of the various agencies in implementing these acts which has led to degradation of many natural habitats and extinction of some wild species.

The Kingdome has issued a number of laws and legislations for conservation of biodiversity. These are listed in details in the tenth strategic goal of this strategy. .

The5-yearDevelopment Plans and their role in reducing threats to Biodiversity:

Biodiversity is defined as "richness of an area in its wild plants, animals and microorganisms, and their processes and environmental phenomena." These organisms are considered gene-resources, and hence a potential future alternative sources for food, medicine and clothing.

The Five Year Development Planning Iin Saudi Arabia started the first plan in 1390 H, concerned, of the development plans cared for the interrelationship between environment and development and the ideal way to use the natural resources without causing fundamental changes in the environmenta while conserve biodiversity.

In the consequtive 5 year development plans the general targets of the environment concerned sectors were translated into programs and projects aiming to environment and wildlife protection

In addition to, strategic targets and principles contained in these plans which emphasize environment and wildlife protection and how to avoid impacts of the development fast pace in the Kingdom at large. This is accomplished through execution of the development plans concurrently with conserving the nautral resources as a means of limiting environmental degradation..

The 5-year Development plans have identified the concerned agencies and their roles in protection. every one of these plans witnessed the statement of strategies suitable for each agency. .

CHAPTER FOUR
STRATEGIC GOALS FOR CONSERVATION AND SUSTAINABLE USE OF BIODIVERSITY

Strategic Goal 1
In-Situ Conservation - Inside Protected Areas

Strategic Goal

To protect terrestrial, marine and freshwater ecosystems by means of establishing a comprehensive system of protected areas for in-situ conservation of biodiversity in Saudi Arabia.

Hima Systems

The teachings of Islam affirm the need to conserve different areas of land for the benefit of all human beings. These areas are collectively called "himas" and have been recently called either "protected areas" or "wildlife reserves". Himas are one of the earliest known records of successful range management. and this idea of holding land in a reserved status appeared as a social practice and antedates Islam. It was later adopted by Islam and sanctioned by Shariah law to enforce application.

Himas play import roles in providing:

- **Rehabilitation of rangelands**
- **Stabilization and control of nomadic grazing**
- **Indicators of rangeland potential**
- **Better animal husbandry practices**
- **Proper management of water catchment areas**
- **Protection of Biodiversity**
- **Encouragement of Wild-Honey production**

Historically himas employed many sound land-use principles and realized many of the ecological and socio-economic ingredients now considered essential to the sustainable use of

renewable resources such as:

- **Allowing the controlled use of natural resources and making sure that those natural resources were conserved properly.**
- **Ensuring that the concept of himas is respected even though they were managed by local communities who relied on social sanctions in applying the rules.**
- **Allocating benefits from the himas among members of the community according to a system that the community perceived as being equitable.**

Criteria for Selection of Protected Areas

In designing Saudi Arabia's protected area system and evaluating sites for establishing a priority rating for the proclamation of additional protected areas, the NCWCD has adopted a set of environmental, socio-economic, and pragmatic criteria.

These criteria include:

- **Coverage of representative ecosystems**
- **Conservation of key biological sites**
- **Protection of existing key wildlife species**
- **Recognition of traditional and local conservation initiatives**
- **Value for rural development by providing economic benefits**
- **Value for environmental education and awareness**
- **An equitable geopolitical spread of protected areas in the Kingdom of Saudi Arabia**

Even though remarkable progress was made in establishing a system plan of protected areas from the early 1990', however a lack of inter-agency cooperation, failure to gain public support, and a delay in providing tangible benefits to local populations have all hindered the execution rate of this plan.

Thus by 2000 a total of only 14 protected areas, plus botanical reserves / sanctuaries in three NCWCD field research stations, had been decreed. The Ministry of Agriculture is catering for safety of certain species harboured within forest reserves, Rangelands and National Parks.

Trends in Protected Area Management

Formal wildlife protected areas in Saudi Arabia are recently established and have been in existence for only 15 years The exclusion of traditional resource users has led to conflicts within and around the reserves. In an effort to move away from the strict preservationist approach used in protected area management and in recognition of the importance of local community involvement and buffer zones, five management trends have emerged:

1. **decreased application of strict "Special Natural Reserve" zones**
   increased consultation with local communities
3- **increased use of "Resource Use Reserve" zones**
4- **increased employment of local people as rangers**
5- **increased contact between protected area managers, rangers and local communities.**

Proposed Action

1 - Select New Protected Areas
2 - Fill Gaps in the Protected Area System Plan
3 - Protect Key Biological Sites
4 - Achieve Representative Coverage of Biotopes
5 - Identify Viable Populations of Animals
6 - Continuing Ban on Hunting in Protected Areas
7- Continue reintroduction of principal wildlife species.
8- Continue preparation of management Plans and their implementation.
9- Appoint qualified managers for protected areas.
10- Promote Cooperation and Coordination between concerned agencies.
11- Establish Visitor Centres in all protected areas
12- Strengthen Traditional / Local Conservation Initiatives

13- Prepare public Awareness Programs addressing all general public sectors

Monitoring Indicators

1 - Increase / decrease in the number of officially recognized protected areas and their distribution in Saudi Arabia.

2 - Increase / decrease in the budget and number of trained and qualified staff to manage each of the protected areas.

3 - The situation of the protected area in relation to the desired goals set out in the management plan.

4 - Increase / decrease in the number and health of populations of flora and fauna in each of the protected areas including reintroductions.

5 - Increase / decrease in new educational and awareness literature about protected areas.

6 - Increase / decrease in the number of visitors to each of the protected areas and the facilities available for these visitors at each site. Increase / decrease in awareness of visitors regarding importance of conservation.

Responsible Institutions

The establishment and long term management of protected areas in Saudi Arabia is the responsibility of the National Commission for Wildlife Conservation and Development (NCWCD). The NCWCD approves the selection of sites to be protected, prepares a management plan for each area according to international standards, and organizes staff management training programs. This gives Saudi Arabia a uniform system of protected areas, with unified goals and standardized staff training programmes. considering the vast area of Saudi Arabia and its geographical and biological diversity, the task of creating a comprehensive system of properly managed protected areas is a formidable task requiring the full support of all the government ministries, scientific institutions and local organizations. That is why the theme of cooperation is repeatedly stressed as one of the main themes of the current biodiversity strategy.

The Ministry of Agriculture is actively undertaking protection of range and forestlands species threatened by extinction giving them a chance to reproduce. Also in accordance with its mandate, declare certain areas within the National Waters limits (islands) as protected in both Red Sea and Gulf, with regards to fishing and fishing seasons.

Strategic Goal 2

In-situ Conservation - Outside Protected Areas

Strategic Goal

To conserve and manage terrestrial, marine and freshwater biodiversity by securing the safety of wild populations of flora and fauna in their natural habitats outside the boundaries of recognized protected areas.

Background

It is easy to forget that biodiversity exists everywhere, and not only in protected areas. In fact, on a global basis, far more biodiversity is located in areas outside officially recognized protected areas which actually represent a small fraction of the State total area. Buffer zones and passages outside protected areas are critical because they prevent fragmentation of wildlife habitats and creation of isolated islands of wildlife.

In Saudi Arabia there are many areas rich in biodiversity. Some of those areas are considered "hotspots" where high concentrations of endemic endangered species because of exceptional loss of habitat. Ecologists believe that by conserving areas where both the need and the benefits from conservation measures are greatest, large-scale extinctions may be prevented. Major hotspots are already included in the system plan of protected areas in Saudi Arabia, but a large number of minor hotspot have not. Examples of these hotspots of biodiversity are found in wetlands, isolated mountain massifs, juniper woodlands, mangrove thickets, seagrass beds, coral reefs, and marine islands

The Ministry of Agriculture has cared for establishment of national parks in some distinctive aesthetic locations with the aim of conservation and providing visitors with needed essential

services. This has been undertaken since 1970's.A number of these national parks have been established and some more are underway. .

The main reasons we need to conserve biodiversity outside protected areas are to:

1 - Prevent further induced extinction of wild plants and animals by securing the safety of those wildlife populations from harmful human activities.

2 - Stabilize a viable population size of as many wild species of flora and fauna as feasible to maintain its strength and prevent an ecological imbalance. The existence of any ecosystem depends on the proportionate presence of its species.

3 - Reduce the rate of destruction of endemic plants many of which may disappear before they are studied or classified.

4- Protect the genetic diversity of wild populations of plants and animals, particularly those with economic value.

5- Preserve the microclimate of localized centers and "hotspots" of biodiversity. The woodlands and wadis of the mountains of Saudi Arabia support a multitude of important smaller flora and fauna.

Proposed Action

1 - Control rural Developments

2 - Introduce Environmental Impact Assessments (EIA's)

3 - Control Construction of Roads, and limit Dredging and Landfilling of coastal lands

4 - Promote Bio-Regional Planning

5 - Encourage Local Conservation of Hotspots of Biodiversity

6 - Encourage Sustainable Agriculture and Minimize Pesticides

7 - Control Pollution

8 - Control Wood Cutting

9 - Enforce the Hunting Law and the Law for controlling trade in wildlife species and their products.

10 - Enact New legislations to support conservation efforts and sustainable use of natural resources

Monitoring Indicators

1 - Change in the number of endangered species of terrestrial, marine and freshwater flora and fauna outside protected areas..

2 - Reappearance and growth of rare species of flora and fauna in terrestrial, marine and freshwater ecosystems.

3 - Changes in the overall number of species of terrestrial marine and freshwater wildlife and their increase per unit area.

4 - Level of enforcement of conservation legislations for all wildlife and the effective control of hunting.

5 - Changes in the value of wild harvested medicinal, aromatic and ornamental plants in comparison to domestically cultivated sources.

6 - Changes in grazing and wood cutting practices.

Responsible Institutions

All the Saudi Arabian Government Ministries, Commissions and Non-Governmental Organizations have a direct and/or indirect responsibility for the conservation of biodiversity outside protected areas.

Strategic Goal 3

Ex-situ Conservation

Strategic Goal

To conserve terrestrial, marine and freshwater biodiversity by securing the survival and growth of wild flora and fauna in botanic gardens, zoos, aquariums, public parks , gene banks and municipal parks..

Background

Whereas in-situ conservation accounts for most of the conservation work outside protected areas, there is an important ex-situ component involved, such as botanic gardens, zoos , gene banks and municipal parks in so far as to complement and support in-situ measures. since,

Historically, most ex-situ conservation was practiced far away from the country of origin.

Botanic Gardens

Botanic gardens around the world play important roles in science, horticulture and education. Recently they have also become important canters for biodiversity conservation playing a role in integrating conservation and development.

Of the 1846 botanic gardens in the world only 10 are found in the Middle East region. One of these is the educational botanic garden at the King Saud University in Riyadh. More botanic gardens need to be established in and around the major cities of Saudi Arabia where they can contribute to some or all of the following:

- **Development of National Strategies: Botanic gardens assist planners in the development of national strategic and programs for the conservation of biological diversity.**
- **Scientific identification and Monitoring: Botanic gardens gather new data and information and make it useable for conservation.**
- **Integrating Conservation: Botanic gardens play major roles in scientific research, species recovery, ecosystem management, surveys, reintroductions, uses of wild plant, public education and others needed for integration of conservation.**
- **In-situ Conservation: Botanic gardens, through their botanists, can assist in maintaining and managing areas of natural vegetation in protected areas.**
- **Ex-situ Conservation: Botanic gardens help in rescue of threatened species, produce material for reintroduction and habitat restoration.**
- **Research: Botanic gardens are active in promoting a wide range of conservation and scientific research on plants that include biotechnology, conservation genetics, ethnobotany, control of invasive alien species and propagation of local wild plants**
- **Training and Capacity Building: Botanic gardens provide training for botanic garden staff, university, students, school teachers, local communities and the general public.**
- **Public Education and Awareness: Botanic gardens provide suitable areas for using a variety of techniques such as guided tours, exhibitions, interpretive signs, internet, radio television and newspapers.**

- **Impact Assessment and Mitigation: Botanic gardens can utilize their staff and facilities to assess threats to biodiversity and offer solutions to resolving those threats.**

Zoological Gardens

The practice of keeping wild animals in captivity started centuries ago when kings and princes established private collections to house their growing numbers of local and exotic wild animals. These animals were acquired by way of hunting expeditions or as gifts from other rulers in near and faraway countries.

It is a fact that all captive animals in zoological parks that are on exhibit to the public, particularly the more intelligent apes, suffer from extensive pressures in captivity. However if they are well managed, properly fed, sufficiently exercised, their surroundings are kept clean and comfortable, and the disturbance from visitors is kept to a minimum, then it can be said that they perform an important conservation service by maintaining a living gene pool and an educational service by introducing people to wildlife.

Municipal Parks: These could have a role in ex-situ conservation because they:

a) spread allover Saudi Arabia

b) are in direct interests of local populations

c) directly represent the needs and aspirations of those communities

d) can make a good starting point for awareness campaigns for the conservation and sustainable use of biodiversity to local communities.

In the Middle East, as in most of the world, it is the municipalities of larger cities and towns that are responsible for the establishment and management of botanic gardens, wildlife or zoological parks, and public gardens for recreation. In Saudi Arabia, the municipal parks of the future need to combine the elements of a botanic garden, zoological park and recreational area. The need to amalgamate education with recreation is as important as amalgamating development with conservation. This help to enhance awareness between the people of the concept of nature and biodiversity conservation.

Gene Banks

It is an accepted fact that there is an urgent need to safeguard the world's plant and animal genetic resources. Among the body of techniques and facilities used for ex-situ conservation are gene banks that include seed banks, living field banks (botanic gardens) and sperm and ova banks.

Unfortunately most efforts to conserve, develop and use genetic resources are underfunded and understaffed. Some existing gene banks are totally inadequate and the loss of genetic diversity in the gene banks is as great as it is in the field.

However it is important for gene banks to be in the country of origin of the genetic material to preserve local genetic resources.

Proposed Action

1 - Expand the establishment of Botanic Gardens

2 - Expand the establishment of Zoological Gardens

3 - Expand the establishment of Municipal Parks and their development to serve ex-situ conservation

4 - Expand the establishment of Gene Banks

5 - Enact New Legislations for support of all above activities

Monitoring Indicators

1 - Increase / decrease in the number of endangered species of terrestrial, marine and freshwater flora and fauna outside protected areas.

2 - Reappearance of rare species of flora and fauna, which had disappeared in natural terrestrial, marine and freshwater ecosystems.

3 - Increase / decrease in the total number of species in botanic gardens, wildlife parks, municipal parks and gene banks.

Responsible Institutions

All the Saudi Arabian Government Ministries, Commissions and Non-Governmental

Organizations have a direct and/or indirect responsibility for the conservation of biodiversity outside protected areas and in particular.

Ministry of Agriculture
Ministry of Municipalities and Rural Affairs
National Commission for Wildlife Conservation and Development

Strategic Goal 4
Conserve and Develop Forests and Woodlands

Strategic Goal
To protect and rehabilitate the forests and woodlands of Saudi Arabia because of their important role in conserving top soil, replenishing scarce water resources, and providing scenic value to visitors.

Background
A thousand years ago the mountains of the Hijaz and Asir were much more densely covered with woodlands according to old records. Only remnants of those forests, estimated at 2.7 million hectares, still remain in the mountains of Saudi Arabia particularly in the remote, steep and inaccessible areas in addition to Raudats, Faidhats and Wadies and shei'abs..

Juniper Woodlands
These are one of the few densely wooded habitats in Saudi Arabia. They are concentrated in a narrow belt about 7,600 square kilometers in area. This belt runs along the crest of the Sarawat escarpment between Al-Bahah and the Yemen boundaries. Smaller juniper woodlands are found northward to Taif, and scattered populations of juniper exist on the summits of the Hijaz mountains all the way to the Jordanian border. The junipers in Saudi Arabia belong to two species:

1 - ***Juniperus phoenicea***

2 - ***Juniperus procera***

J. procera **thrives at altitudes of 2000 - 3000 meters, and are characterized by some of the highest species diversity and biomass in Saudi Arabia. They are important for the production of aerographic rain and for the preservation of soil integrity. They are also the biotope most favoured by Saudi citizens for nature based tourism.**
J. phoenices, **on the other hand, grows in Hijaz mountains at lower altitudes, north of Ta'if along the Tihamah plains.**

Extensive decline has been reported in the mountain juniper woodlands of Arabia. In the areas the decline is characterized by dieback at the lower altitudinal ranges of the woodlands and is a matter of concern. Available evidence indicates drought and/or climatological cause in addition to old age without removing dried branches for fuelwood.

Wild Olive Woodlands (*Olea chrysophylla*)
These woodlands grow on slopes that are 1500 - 2000 meters high and intermix with juniper stands. The olive woodlands contain the following species: *Olea chrysophylla* (wild olive), *Tarchonanthus comphoratus*, *Pistacia palaestina* (Butom), *Dodonaea augustifolia* (Shath), *Euclea schimperi*, and many others.

In addition to the mountain woodlands there are the arid woodlands, which are primarily acacias, and mangroves along the coasts.

Threats to Forest-lands

1 - Uncontrolled Severe Cutting of Trees and Shrubs for Fuel Wood
The volume of wood consumed in the central region of Saudi Arabia is high. Fuel wood gathering focuses on slow growing woody species such as *Acacia spp*. and *Haloxylon* which are felled or grubbed out selectively and severely. the destruction of trees and shrubs is not only a threat to those woody plants, but has a negative effect on microclimates.

2 - Cutting Live Branches to Feed Livestock

Coppicing or cutting live branches for feeding livestock has had a dramatic negative effect on the landscape. These negative effects are intensified by direct browsing of these trees by goats and camels .

3 - Uncontrolled Urban Expansion in Woodland Areas

The high increase in population numbers has led to the expansion in urbanization and establishment of residential regions at the expense of juniper woodlands.. This is most evident in the r southwestern region. . Seasonal forest fires become more prevalent as a result of rural expansion and human activities in these regions.

4 - Indiscriminate Use of Pesticides and Chemical Pollution

The use of pesticides should be restricted and the nessary measures should be implemented to ensure safe and appropriate use of pesticide. Similarly the discharging of hazardous wastes like acids and radioactive materials in forests should be prohibited. Agricultural research, in connection with biological control, and the application of the integrated best control should be encouraged.

Factors Limiting Expanding Forests and Woodlands

1 - Drought

Saudi Arabia falls within the arid desert belt, and its very dry climate limits natural regeneration and reforestation programs.

2 - High Cost of Reforestation Programs

Lack of water and high temperatures have increased the cost of reforestation programs in Saudi Arabia and limited the areas that have been replanted.

3 - Lack of Enough Qualified Foresters in Saudi Arabia

There are not enough qualified foresters to handle the forest expansion of reforestation programs that the State would like to implement.

Proposed Action

1 - Explain Benefits of Forests and Woodlands

2 - Expand Reforestation Programs in deteriorated areas

3 - Concentrate on production of transplants of Local Trees and shrubs

4 - Continue to Investigate Dieback in Juniper Trees and its combat

5 - Involve local people in Management of Natural Forests

6 - Intensify utilization of Remote Sensing and GIS Technology in management of woodlands

Monitoring Indicators

1 - Changes in area of natural forests and woodland in Saudi Arabia and level of natural regeneration from seeds in degraded areas.

2 - Increase / decrease in the rate of replanting local trees and shrubs.

3 - Increase / decrease in the level of public participation in the planting and protection of new forests and green-belt areas.

Responsible Institutions

The Ministry of Agriculture

The National Commission for Wildlife Conservation and Development (NCWCD)

King Abdulaziz City for Science and Technology (KACST)

Strategic Goal 5

Conserve and Develop Natural Rangelands

Strategic Goal

To manage and improve the natural rangelands of Saudi Arabia where the current practices of pastoralism are unsustainable.

Pastoralism

The area of the natural rangelands is estimated to cover about 170,000,000 hectare or about 1,700,000 sq km that is equivalent to about 76% of the total land area of Saudi Arabia. The average annual precipitation is less than 100 mm and the vegetation is composed of arid land grasses and shrubs.

Nomadic pastoralism developed over centuries in Saudi Arabia as a rational response to the erratic rainfall of the arid lands and the consequent fugitive nature of the vegetation. Pastoralism is considered the most widespread form of land use in Saudi Arabia.

Even though productivity of natural rangelands is usually low, traditional pastoralism allowed people to sustain themselves from their herds for many centuries. The availability of forage plants regulated livestock numbers that subsequently regulated human numbers. This served to maintain a dynamic equilibrium that was able to check any serious environmental degradation.

However, the introduction of water tankers, stock trucks, widespread boreholes, supplementary feeds and veterinary services has changed the nature of pastoralism. The numbers of livestock have increased far beyond the carrying capacity of the rangelands because they are no longer subject to starvation in times of drought, and are transported to far away areas following the rain . This depleted the resources of these rangelands because of severe overgrazing and reduced productivity and became overstressed beyond their ability to recoverdue to the unsustainable use of their limited resources..

All the above factors have contributed to the deterioration of the desert rangelands thereby causing further desertification. The results has been the widespread of undesirable thorny plants that are of no nutritional value to livestock at the expense of. The palatable shrubs and grasses that have become rare and some are threatened with extinction.

The economic importance of the natural rangelands lies in their ability to provide some of the bulk feed required to support the livestock sector in Saudi Arabia. The livestock figures for 1998 are 10,341,000 sheep 6,235,000 goats and 796,000 camels. Despite the efforts and programmes of the MA to develop rangelands, the plant cover of the desert rangelands

continues to deteriorated in Saudi Arabia. In fact, rangeland surveys in the 1970's indicated that 85% of the land was severely degraded.

The most obvious loss of the biodiversity of the natural rangelands is seen in the disappearance of the large mammals. This region was for hundreds of years a rich wildlife area with its gazelles, onagers, wolves, and other mammals. Some of those wild animals persisted until the early 1950's, at which time the use of 4x4 cars and uncontrolled mechanized hunting in addition to overgrazing by domestic livestock eliminated them all in a few decades.

Threats to natural rangelands

The major threats to the natural rangelands are:

1- Uncontrolled grazing by sheep, goats and camels exceeding carrying capacity limits.

2- Excessive harvest of woody trees and shrubs for firewood and coal

3- Conversion of the best productive rangelands to agricultural land.

4- Careless car-driving in desert areas

5- Long periods of drought and its frequency, magnified by overgrazing and wood-cutting

Proposed Action

1- Determine Carrying Capacities for rangelands and accordingly herd volume

2- Impose measures to prevent use of natural rangelands by private sector companies dealing in lifestock production.

3- Encourage the establishment of projects of sheep farms , depending on imported on locally grown green forage, to eventually prevent their use of natural rangelands to reduce pressure on them and halt their deterioration and eradication.

4- Make benefit from the Himas system by implementing it.

5- Implement Controlled Grazing Schedules through the Committees on Grazing Affairs,

6- Manage and control usage of Ground Water Reserves in agricukture and agricultural industry projects

Monitoring Indicators

1- Changes in the density and biodiversity of natural vegetation cover throughout the natural rangelands, particularly in the degraded and decertified areas.

2- Increase / decrease in number of palatable species for domestic livestock and hence the productivity of these lands.

3- Increase / decrease in the area of protected natural rangelands.

Responsible Institutions

The Ministry of Agriculture is the principle institution responsible for all aspects of rangelands management. The Ministry of Agricultural regularly reviews and evaluates its rangelands policies. The concepts of sustainable development and conservation of biodiversity are being introduced into rangeland management taking into consideration the local economic and social situation.

Strategic Goal 6

Conserve and Develop Living Marine Resources

Strategic Goal

To protect and conserve living marine resources in Saudi Arabia for their role in sustaining the fisheries and for the development of a viable tourism and marine recreation industry.

Background

Fish:

According to the Agricultural Statistical Year book the average fish harvest for Saudi Arabia for the period 1994-1998 was as follows:

a) Red Sea 25,600 tons per year,

b) Arabian Gulf 22,200 tons per year,

c) international waters 1,653 tons per year, and

d) fish farms 3,300 tons per year.

The production from fish farms has been on the increase since 1994 and reached an estimated 5,040 tons in 1998.

As a result of an increase in the demand for fish throughout Saudi Arabia, the number of fishing vessels increased from 7,220 in 1994 to 8,032 in 1998. About 23% of those vessels operate in the Arabian Gulf and 77% in the Red Sea. The number of people working in the fishing industry was about 20,347 in 1998. Of that figure 13,995 were fishermen and 5,807 were involved in the manufacture and commercialization of fish and fish products.

Marine Animals:

The harvest of shellfish, seabird eggs, and other animal products pose a problem in Saudi Arabia. Harvesting marine turtle eggs has been forbidden because of their endangered status. , However, it may be possible to permit harvest of seabird eggs on certain islands only once in the early part of the breeding season in such a way that it does not upset the natural balance of these birds.

Similar restrictions could be imposed to regulate the harvest of mollusks such as giant clams, tritons, top shells and pearl oysters. All the proceeding harvests require careful study by marine and wildlife biologists to evaluate their harvest before it is permitted. Such regulations would secure the good will and cooperation of local communities in conserving the marine biodiversity.

Threats to Marine Biodiversity

These threats have already been described under. "Threats to Marine Flora" and "Threats of Marine Fauna".

Proposed Action

1- Promote Cooperation between concerned agencies for Conservation of Marine life.

2- Limit Landfilling and Dredging Activities on coastal areas

3- Enforce Laws and Decrees that Regulate Fishing in Marine Waters

4- Control Overfishing Activities

5- Increase number of Research and Monitoring Marine Stations

6- Propagate Marine Species and Promote Fish Farming

7- Control Grazing of Mangroves and Coastal Vegetation

8- Control Pollution and treat all wastes before reaching seas

9- Enhance Environmental Awareness

10- Encourage Model Development Projects and Activities conserving marine resources

Monitoring Indicators

1- Changes in the number of species of marine flora and fauna particularly those are endangered.

2- Changes in the overall number of species of marine wildlife and their increase per unit area.

3- Changes in the level of mollusks and shellfish in relation to fish.

4- The Magnitude of coral bleaching.

5- Changes in the number of new marine protected areas.

6- Changes in rate and amounts of chemical and biological pollutants such as litter and tar balls on the shore, and in coastal shore erosion.

7- Changes in the number of marine research institutions, the qualifications of their staff and the quality and quantity of their publications.

Responsible Institutions

The Ministry of Agriculture / Fisheries Sector is responsible for marine fisheries sector and aquaculture farms. The National Commission for Wildlife Conservation and Development (NCWCD) is concerned with establishing and managing marine protected areas on both the Red Sea and Arabian gulf coasts.

Strategic Goal 7

Conserve and Develop Agricultural Biodiversity

Strategic Goal

To conserve local varieties of plants and local breeds of animals in Saudi Arabia, and to emphasize use of traditional agricultural systems in all fields of agricultural production.

Background

It is important to remember that all the plants and animals used in modern agricultural production have their origin in wild plants and animals. The domestic varieties of plants and breeds of animals we use today have been carefully selected for their containment of certain characters to fulfill man's needs. They remain in need of genetic material from their wild relatives to maintain their genetic quality and improve their productivity.

The wild progenitors of internationally cultivated commercial food crops are a valuable economic resource and an irreplaceable national treasure. Wild plants are the starting points of genetic improvement programs.

The local landrace varieties and their wild relatives are endangered with extinction because of imported varieties and absence of conservation measures for their protection. Some of the local breeds of sheep, goats, camels, horses and salukis began to disappear from the Kingdom. Once Saudi Arabia loses the local varieties and wild relatives On which it is partially dependant for production of its food crops and of its livestock, it will become totally dependent on foreign imports for its seeds, plants and animals.

The loss of the genetic material of local domestic plants and animals is not the only concern in the efforts to save agricultural biodiversity. There is a need to adopt sustainable agricultural production methods based on local and traditional practices such as agricultural terraces is essential. It has become very clear that many of the modern agricultural and water use practices have had detrimental effects on the long term productivity of land and depleted water resources in Saudi Arabia.

Current Land Use

The total land area of Saudi Arabia is approximately 1,969,000 square kilometers and according to the statistics of the Ministry of Agriculture the land use is as follows:

Cultivable land covers about 4,889,900 Km^2 = 488,990 hectare.

Reclaimable land covers about 37,850 Km^2 = 3,785,000 hectare.
Natural rangeland (pasture) covers about 170,000,000 Km^2 = 1,700,000 hectare.
Forests cover about 2,700,000 hectare = 27,000 Km^2 .

Some of the important agricultural crop production figures for 1999 are:

2.40 million tons of grain *	**3.60 million tons of forage**
1.20 million tons of fruits*	**2.65 million tons of vegetable**
0.94 million tons of milk*	**0.42 million tons of poultry meat**
0.16 million tons of red meat *	**0.06 million tons of fish meat**

Agricultural development has been accomplished largely through the generous use of subsidies and excessive use of non-renewable "fossil' water.

The Ministry of Agricultural regularly reviews and evaluates its agricultural policies and practices. The concepts of sustainable development and conservation of biodiversity are being introduced into agricultural policy taking into consideration the local economic and social conditions.

Agricultural Practices Necessary for Efficient Water Use
Water efficient agricultural practices are necessary to halt the excessive use of non-renewable water resources. The water saving practices include the introduction of more modern techniques such as greenhouses, drip irrigation in addition to the importance of rainwater harvesting, and restoration of traditional agricultural terraces.

Terrace agriculture epitomize a highly developed indigenous system of land use that has persisted for centuries in mountainous areas of the Middle East and is well adjusted to the environmental constrains to the region. The traditional system of terraces in the western mountains of Saudi Arabia is a very sophisticated method of soil conservation and water harvesting, in which catchments have been deliberately eroded to fill the terraces with fertile soil and collect the precipitated water. Crops were then irrigated by harvesting water from these and adjacent catchments, using furrows, diversion dykes and wells. Thus water

collected from a much larger areas to irrigate these terraces.. Construction of terraces during the past centuries and over many generations using massive inputs of human labour imposes an obligation on the present and future generations to conserve these artificial, yet environmentally sustainable ways of concentrating, land productivity and cultivation of crops and varieties which are most efficient in water consumption. .

Animal Genetic Resources

Saudi Arabia has a number of local strains of domestic animals that deserve to be protected because of their adaptation to the local environment. However, the intensification of agricultural production in the past few decades has led to the importation of many new animal strains that have replaced the local stocks. Not all these imported strains proved to be economical in the long run because of their lack of adaptability to local environmental conditions..

Among the local strains of domestic animals that are decreasing rapidly and are threatened with extinction locally are the Arabian horse, Arabian camel, Najdi sheep, baladi goat, and saluki hounds.

Threats of Agricultural Biodiversity

- **Intensive use of agricultural pesticides and chemical fertilizers**
- **Improper processing and re-use of agricultural by-products**
- **High rate of Migration of people from rural areas to the cities**
- **Genetic erosion through the replacement of wild and native species of plants and animals with exotic and "improved" species of varieties.**
- **Absence of sufficient protected areas where natural stands of the wild perogenitors of domestic plants can survive.**
- **Deterioration and loss of agricultural land productivity and desertification which have negatively affected vast areas of rainfed and irrigated agricultural land.**
- **Negligence of agricultural terraces that prevent soil erosion and floods rush in the hills and mountains of Saudi Arabia.**

Proposed Action

1- Rehabilitate deteriorated agricultural lands and Replant

2- Introduce Integrated Pest Management system

3- Review and Strengthen Present Laws and Legislation

4- Establish and Upgrade Seed Banks

5- Protect and Encourage Cultivation of Local Varieties.

6- Establish Special Protected Areas for genetic progenitors

7- Support Farmers with Local Breeds

8- Develop System for Agricultural Incentives

9- Develop Irrigation Practices to suit local conditions

10- Upgrade Agricultural Extension Services

11- Support Studies on Local breeds and Compile Database

12- Control export of Local Breeds

13- Encourage Organic Agriculture

Monitoring Indicators

General

1- Effective regulations pertaining to the import and safe use of chemical fertilizers and agricultural pesticides.

2- Adoption of Integrated Pest Management (IPM) in agricultural lands.

3- Development and proper certification of alternative traditional systems of agricultural production such as terraced and organic agriculture.

4- Extent of utilizing more local varieties and land races of commercial crops, as well as the increased use of under-utilized species.

5- Extent of the use of non-renewable fossil water.

6- Extent of the application of water efficient agricultural systems such as drip irrigation, and water harvesting.

7- Extent of implementing the principles of sustainable agriculture.

8- Increase / decrease in the number of farmers growing local varieties and land races of food crops.

9- Increase / decrease in number and size of seed and gene banks for the preservation of local food crops.

10- Increase / decrease in number of protected areas containing natural stands of local progenitors of major food crops.

11- Increase / decrease in the numbers of local breeds of domestic animals and farmers who keep them.

12- Number of government and private livestock breeding centers that specialize in local breeds of domestic animals.

Responsible Institutions

The Ministry of Agriculture (MA) is the principal institution responsible for all aspects of agricultural production in Saudi Arabia. The future of agricultural biodiversity rests with the MA which regularly reviews and evaluates its agricultural policies and practices.

Strategic Goal 8

Regulate Access to Genetic Resources

Strategic Goal

To regulate access to genetic resources and establish a fair and equitable sharing of benefits arising out of the utilization of those resources.

Background

The Convention on Biological Diversity (CBD) constitutes a prominent landmark in achieving the recognition of the importance of "raw" genetic materials, in the form of plants and animals and microorganisms, and the need to regulate access to samples of those resources and the knowledge related to their uses.

Prior to the CBD the principle of unrestricted access to genetic resources prevailed and was referred to as "free access". This derived from a de facto, rather than a de jure, acceptance on the part of the majority of states that genetic material should be available to all.

However with the steady growth of industries based on genetic resources that provide the building blocks for highly profitable pharmaceutical products, seed markets, other agricultural products and industrial processes, the recognition of the economic value of these resources became apparent.

Article 15 of the CBD affirms that states have sovereign rights over their genetic resources stemming from their sovereign rights over their natural resources. Thus the power and consequent authority to establish rules for access and use of all plant and animal genetic resources in Saudi Arabia is subject to national legislation.

The distribution of genetic resources does not follow political boundaries and two or more countries may share those genetic resources. That is why it is an advantage to take a regional approach by adopting common rules and regulations regarding access to genetic resources. Such a regional approach would help to avoid illegal competition between countries in the procurement of sale of genetic resources in a way that harm them all.

Proposed Action

Issue a national law to regulate and enforce implementation of the following:

1- Determine Access to Genetic Resources and means

2- Recognize Rights of Indigenous Communities over natural resources

3- Cooperative with Other States that share genetic resources

4- Promote Reciprocity with Other States

Monitoring Indicators

Extent of the willing of Saudi Arabia to regulate access to genetic resources.

Extent of recognizing the rights of indigenous and local communities over their traditional knowledge , innovations and practices.

Level of cooperation and reciprocity with other Sates to facilities access to genetic resources.

Responsible Institutions

The National Committee on biodiversity

The Ministry of Agriculture

The National Commission for Wildlife Conservation and Development

The National Committee for Biological Diversity

King Abdulaziz City for Science and Technology

Ministry of Commerce and Industry

Food and Medicine commission

Ministry of Defense and Aviation (Military Survey)

Ministry of Higher Education (Saudi Universities)

Strategic Goal 9

Introduce National Bio-safety Standards

Strategic Goal

To protect natural ecosystems and human health from the intended or accidental introduction / of Genetically Modified Organisms (GMOs).

National Bio-safety Standards

a) Natural Organisms produced by selective breeding.

For thousands of years, people have used various techniques to modify the genetic structure of plants and animals to achieve higher food production and better quality. The first form of traditional "low-tech' genetic manipulation is selective breeding, which makes it possible to

promote preferred traits such as colors in flowers or higher yields from milk cows and allowed man to produce hybrids of different species, such as when crossing a horse and a donkey to get a mule, and the production of the high yield hybrid varieties of corn.

Most countries have come to understand the implications, both positive and negative, of the introduction of "low tech" genetic manipulation of naturally occurring living organisms – and how to deal with them. In the severe cases of epidemics to plants, animals and humans, a large number of preventive measures have been tested and adopted – such as developing vaccines. As a result to those experiences, a large body of laws and regulations are now in force to control the movement of plants and animals and their products across national borders.

b) Genetically Modified Organisms (GMO's)

The sophisticated tools of modern biotechnology have created a "biotechnology revolution". Researchers can now take a single gene from a plant , animal or bacterial cell and insert it into another species cell to give that species a desired characteristic, such as resistance to a destructive pest or disease. The result is commonly referred to as a genetically modified organism (GMO), or as a genetically modified living organism (GMLO). Proponents of this powerful new approach argue that biotechnology has the potential to boost food security, reduce the need for clearing more land for farming, raise sustainable yields in marginal lands, and reduce the need for irrigation and agro-chemicals. However, others are concerned about the possible risks that GMOs and GMLO pose for biological diversity in ecosystems, species, and genetic resources whose interactions form the "web of life" on Earth. In fact the varieties and uses of transgenic crops, have grown much more rapidly than our ability to understand or safely regulate them. This has raised serious doubts and fear in many scientific and consumer circles worldwide.

The world's countries adopted the Cartagene Protocol on biosafety in January 2000 to ensure the safer transfer, handling and use of genetically (or living) modified organisms that may have adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health. Under the Protocol. Governments will decide

whether or not to accept imports to GMOs on the basis of risk assessments. These assessments are to be undertaken in a scientific manner according to recognized risk assessment techniques. However, because the Protocol is based on the precautionary approach, importers can decide not to accept GMO imports if there is a lack of scientific certainty due to insufficient information.

Proposed Action

1- Enact a New Legislation to regulate dealing with GMOs

2- Take Precautionary Measures Against all GMOs

3- Support Cartagena Protocols on bio-safety

4- Encourage Use of Native Wild Plants and Animals

5- Require Certificates of Origin

6- Utilize modern Screening Procedures to ensure that it is not genetically modified

Monitoring Indicators

1- Increase / decrease in the level of actual measures taken to safeguard humans from genetically modified organisms and their products.

2- Increase / decrease in the level of actual measures taken to safeguard the natural environment from genetically modified organisms and their products.

Responsible Institutions

King Abdulaziz City for Science and Technology (KACST) is the focal point for bio-safety and biotechnology issues in the Kingdom of Saudi Arabia.

Strategic Goal 10

Update and Enforce Environmental Legislation to conserve biodiversity in Saudi Arabia

Strategic Goal:

Update and enforce legislative measures concerned with conservation of biodiversity to ensure its conservation and sustainable use in the Kingdom of Saudi Arabia

Biodiversity Conservation Legislations and Supporting International Conventions:

The proper implementation of any National Biodiversity Strategy needs the issuance of a comprehensive and unified body of environment legislation to support all its components.

The first step towards an effective body of environmental legislation would be to review, expand, correct and amend the current laws and regulations that are in force in the Kingdom of Saudi Arabia today. It will also be necessary to overcome any administrative or legal obstacles that may be a hindrance to new environmental legislation.
After recurring of of the concepts and terms associated with biodiversity and sustainable development, Saudi Arabia has issued a number of laws, regulations and decrees that impact, directly or indirectly on the conservation of biodiversity and natural resources.

The following list includes legislations of importance to the conservation of wildlife:

- **1966. Land Development Act: gives the Ministry of Agriculture (MA) responsibility over the regulation of land development activities. The act puts a limit on the maximum acreage of land that may be utilized by individuals for agriculture.**
- **1975. Agricultural and Veterinary Quarantine Regulations: for controling the introduction of plant and animal species into Saudi Arabia and regulating the issuance of health certificates required for such introduction to avoid introduction of diseases and epidemics to the Kingdom.**
- **2004. Forests and Pastures Act: commit the MA to conserve pastures, and forests, and to regulate their use. According to this act it is prohibited to cut trees or shrubs to be used as fuelwood for private or commercial use without a previous permit. Grazing is restricted to allocated sites, and no building may be erected on agricultural land.**
- **2001. National Hunting Decree Law 457: specifies seasons in which hunting of particular species is permitted, species and areas with permanent hunting bans and provides protection for some rare and endangered speciew. Administered by Ministry of Interior on advice of NCWCD. .**

- 1979. Water Resources Conservation Act: governs the possession and use of water resources to human and animal needs and to agricultural and industrial purposes. Enforcement is the responsibility of the Ministry of Water.

- 1986. Royal Decree No. M/22: established the National Commission for Wildlife Conservation and Development (NCWCD). Under Article 3(4). The Royal Decree mandates the NCWCD with the responsibility for the establishment of a national system plan of protected areas for the conservation and management of wildlife.

- 1988. Living Marine Resource hunting, protection and utilization Act: prohibits all activities damaging to the marine environment and rules for marine fishing and diving. Administerd by the Ministry of Agriculture in coordination with the NCWCD

- 1995.The Protected areas for wildlife Decree No. 128: lays down the regulations governing a "Wildlife protected Areas System", that includes selection, establishment and management of wildlife. Administered by NCWCD.

- 2002. Trade in Endangered Species and their products Act ; regulates the trade in wildlife and wildlife products in the Kingdom of Saudi Arabia. NCWCD is responsible.

2002. General Decree for the Environment: States the principles and basis on which Environment protection efforts in Saudi Arabia are carried out. It also specifies the basis and standers on which the Environmental Impact Assessments are included in the feasibility studies for all new projects. The General Presidency for Meteorology and Environmental Protection is responsible in collaboration with other agencies concerned with particular environmental sectors.

Proposed Action

1- Establish Legal mechanism for Implementation of Biodiversity Strategy in the Kingdom and allocate sufficient budget for its implementation .

2- Update Legislation to Conserve Wild Flora and Fauna

3- Inact Legislation to Regulate Access and Use of Genetic Resources

4- Update Legislation to Control Use Local Domestic plants / Animals

5- Inact Legislations for protection against the Hazards of Genetic Engineering and genetically altered organisms.

Monitoring indicators

1- **Increase / decrease in the number and content of laws and legislation pertaining to biodiversity conservation.**
2- **Increase / decrease in the level of enforcement of laws and legislations pertaining to biodiversity.**
3- **Increase in the number of laws and regulations that provide economic incentives for conservation of biodiversity.**
4-

Responsible Institutions: All Ministries and concerned organizations involved in Conservation of Biodiversity are responsible for setting the necessary Legislations.

Strategic Goal 11

Scientific Research

Strategic Goal

To support scientific research and establish data base centers that provide decision makers with accurate facts on the status of biodiversity, ways of conserving it and its sustainable use..

Scientific Research

In Saudi Arabia there are a large number of scientific institutions involved in both academic and applied research in the broad field of biodiversity. These institutions concentrate on different aspects of biodiversity and conduct their respective research on those topics and species that concern them. Briefly they are:

Universities in Saudi Arabia

1- **King Abdulaziz University (Jeddah)**
2- **King Saud University (Riyadh)**
3- **King Faisal University (Dammam)**
4- **King Khaled University (Abha)**

5- King Fahad University of Petroleum and Minerals (Dhahran)

6- Imam Mohammed bin Saud Islamic University (Riyadh)

7- Islamic University (Medina)

8- Umm al-Qura Univeristy (Mecca)

9- Taiba University

10- Taif University

11- Qassim University

King Abdulaziz City for Science and Technology (KACST)

1- KACST has seven research institutes that conduct applied research, and the one most directly involved in biodiversity issues is the Natural Resources and environment Research Institute.

Military Survey (Ministry of Defense) Responsible for Preparation of maps for all of Saudi Arabia and conducting Research in Territorial waters .

General Presidency for Meteorological and Environment Protection; responsible for:

- Studies on the Quality of Air, Soil, and Natural Habitats, their productivity and environment protection at large.

- Studies on the Quality and Conservation of Water

- Preparation of reports on the weather and the climate

Ministry of Agriculture: The following research centers belong to it.

- National Agricultural and Research Center, Riyadh

- Rangeland and Animal Wealth Center – Al-Jouf

- Agricultural Research Center - Jizan

- Horticulture Research Center – Najran

- Date and Date-palm Research Center – Al-Hasa

National Commission for Wildlife Conservation and Development

The NCWCD is responsible for the following research centers:

1- National Wildlife Research Center (NWRC) which is primarily responsible for carrying out captive breeding and reintroduction programs of rare and endangered species, most importantly are:the Arabian Oryx , houbara bustard and red necked ostrich..

2- King Khaled wildlife Research Center (KKWRC) is responsible for the captive breeding of gazelles and their reintroduction into NCWCD protected areas.

3- Jubail Marine Wildlife Sanctuary Center is responsible for undertaking comprehensive survey of coastal and Arabian Gulf ecosystems.

4- Al-Sudairy Gazelle Center for breeding and ecological studies on Gazelle Reem.

Proposed Action

1- Adopt a Coordinated National Biodiversity Research Plan

2- Continue Conducting Field Surveys

3- Update Status of Species of Flora and Fauna

4- Orient University Studies Towards Biodiversity

5- Link Scientific Institutions to Computerized Data Base

6- Provide Research Grants

7- Make use of training programmes offered by organization, institutions and Research Centers regionally and internationally.

8- Develop National training programs in the field of Biodiversity in cooperation and coordination with scientific research centers, institutions and other bodies involved in environmental activities.

9- Develop qualified capabilities in scientific research in the field of Biodiversity.

Monitoring Indicators

1- Extent of implementation of a unified integrated national biodiversity research plan by all concerned parties.

2- Extent of orientating university studies towards national biodiversity issues

3- Number of specializing reference libraries and research facilities channeled in biodiversity

4- Increase in numbers of qualified researchers in the field of Biodiversity

Responsible Institutions

All universities, scientific institutions, government ministries and commissions and research centers are responsible for supporting research in biodiversity.

Strategic Goal 12

Enhance Awareness and Environmental Education

Strategic Goal

To intensify biodiversity education and public awareness campaigns to explain the importance of conservation of biodiversity in realization of Saudi Arabians welfare .

Environmental Education and Public Awareness

Education is usually restricted to students and to formal curricula, whereas awareness tends to be for people outside the formal educational system. Both formal education and public awareness are important tools in raising the level of knowledge and commitment to biodiversity.

Schools throughout Saudi Arabia teach many subjects that are related to biodiversity such as biology, botany, zoology, and environment. However they do not adequately cover the subject of conservation of biodiversity, nor do they cover the causes of its decline and the harmful effects of this decline on society.

Considering that there are eight governmental universities in Saudi Arabia, there is a need to develop undergraduate and graduate programs in all these institutes of higher learning to incorporate national biodiversity issues in such a way that they include the scientific, cultural economic and religious aspects of the subject.

The public media (TV/radio/newspapers) devotes time and space to environmental and biodiversity awareness. In previous these media depended on documentary films imported from were from outside Saudi Arabia, and hence, did not directly address the problems faced by the country. The public media is now cooperating with government sectors concerned with

biodiversity and made an advanced steo towards using locally produced films illustrating the experienced status to show problems linked to biodiversity that are faced by the people.

Because protected areas have some of the best examples of beauty of nature, they are of immense value for education in the earth and life sciences. Protected areas serve as living research fields and laboratories where students and others can observe the natural processes of geomorphology, hydrology, soil formation, and the complex interrelationships of animals, plants and microorganism. It is in protected areas that they can see the benefits of nature conservation and can actively participate in biodiversity conservation activities.

Environmental education is important for all students from primary school to university. It should also target extra-curricular groups such as scouts and wildlife clubs in which parents and educators can participate.

It is a fact that protected areas which are nearest to cities are usually more available for environmental education and awareness and hence can educate a large segment of the population. Whenever an area is close to a school it is more likely to be used for field studies, for the same reason a protected area that is close to a university is likely to be visited by faculty and students far more frequently that areas that are remote.

Global experiments have proved that visitor centers linked to protected areas should be located in towns or villages near these protected area where they become beneficial to local communities more than if they were in the protected areas themselves. Moreover ,the establishment of visitor centers in major cities attracts a large number of visitors and hence brings about more supporters for the protected area establishment and conservation efforts.

Special attention must be given to serving the educational and awareness needs of local people who live in and around protected areas and giving them all information related to protected areas and biodiversity. This is because many of the rural people, especially the older generations, rarly had a chance in formal education.

The Training Center for Conservation of Natural Resources

The Training Center was established in 1998 to fulfill the need for capacity building and formal training of staff in the diverse fields of natural resources conservation and protected area management. It is located in Riyadh at the headquarters of NCWCD. The interest and positive response from the Arab region to this facility has encouraged NCWCD to transform it into a regional training Center Offering a large number of specialized programs each year.

The Center's activities are concentrated into six main subject areas:

1- Protected Areas and National Parks

2- Biodiversity

3- Environmental Education and Nature Based environmental education.

4- Public Media and Communications

5- Environmental laws and legislations.

6- Ecotourism

Proposed Action

1- Develop the concepts of biodiversity existing in curricula of general education and universities as well as Training

2- Upgrade Curricular and Textbooks to Include biodiversity Issues

3- Develop Graduate Programs in Biodiversity at All Universities

4- Increase Number of Extracurricular Activities in the fields of Environment and Biodiversity outside schools and universities..

5- Encrease Public media concern to Increase broadcasting of Biodiversity Programs and increase time allotted for that..

6- Increase the Ecological Literacy of Rural Inhabitants to enhance their environmental awareness.

7- Establish NGOs for Conservation of Nature in the Kingdom

8- Establish and Equip Visitor's Centers for Environmental Awareness

9- Benefit from the training programs offered by the Training Center at NCWCD

10- Encourage Publication of Popular Books on Biodiversity

Monitoring Indicators

1- Increase/Decrease in the Number and quality of textbooks and Increase in school curricula incorporating studies of biodiversity using local examples of Saudi Arabian environment..

2- Increase / decrease of time periods devoted to biodiversity issues on TV, radio and newspapers.

3- Nnumber of NGOs concerned with Biodiversity.

4- Nnumber of organized field trips linked to Biodiversity.

5- Nnumber of Visitors Centers for Environmental Awareness.

Responsible Institutions

The Ministry of Education is responsible for environmental education whereas the Ministry of Culture and Information are primarily responsible for publicizing awareness programs in Saudi Arabia. NCWCD, the General Presidency for Metreology and Environment Protection, and Ministry of Agriculture are all concerned with preparation of Awareness material, and conducting Public Awareness Campaigns for Biodiversity in the Kingdom.

Strategic Goal 13

Achieve Sustainable Socio-Economic Development

Strategic Goal

To achieve sustainable socio-economic development through policies that aim at making changes in the structure and way of thinking within society to achieve enduring solutions to environmental problems.

Sustained Socio-Economic Development

As clearly indicated in the Convention on Biological diversity there is a growing consensus between the international conservation community and development institutions, , that conservation of biodiversity is intimately interconnected with sound economic development. Because economic growth is heavily dependent on the renewable natural resources, planners must realize that quantum leaps are required in dominant understanding of long term socio-

economic development,and that full integration between Development and Environment is an imperative to realize sustainability.
are The major factor around which all development activity and conservation ofbiodiversity and the use of its natural resources must be planned is the people of Saudi Arabia,

The population of Saudi Arabia is estimated at 20.8 million with a growth rate of about 3.4% per annum, one of the highest in the world. Population growth.The increase in population growth coupled with the migration from rural to urban areas has led to an increasein urban populations of the countr Due to pressure of a growing human population and the expantion in agricultural industrial and services sectors, there has been a marked degradation of biodiversity. This loss of biodiversity around the large cities and agricultural regions convinced the responsible authorities of the urgent need for a sustainable form of socio-economic development that would ensure conservation of the vital elements of biodiversity.

Serious environmental and nature policies are required that aim at structural changes within society in order to achieve enduring solutions to environmental problems. Such a policy should be aimed at maintaining the sustainable use of the fragile ecosystems as well as protecting and developing the wild plant species for their intrinsic value.

Proposed Action

1- Conduct Studies on Cost of Environmental Degradation

2- Conduct Studies on Benefits of Biodiversity Conservation

3- Enact Legislation that Incorporates Socio-Economic Component

4- Application of Sustainable Development principles and concepts and proposals in all development sectors in the Kingdom.

Monitoring Indicators

1- Number of projects, programs and plans that incorporate biodiversity conservation in socio-economic development.

2- Number of projects with Environmental Impact Assessment (EIA) of proposed projects on biodiversity.

Responsible Institutions

Responsbility to achieve the sustainable Socioeconomic development rest with all Ministries, particularly the Ministry of Planning and National Economy, which do the socio-economic development planning that impacts directly on the environment in collaboration with other governmental bodies.

Strategic Goal 14

Encourage Collaborative Participatory management

Strategic Goal

To realize partnership between stakeholders, from government and private sector, on sharing management consequences, rights and responsibilities for conservation and sustainable use of biodiversity.

Collaborative Management

The term collaborative management (also referred to as co-management, participatory management, joint management, shared management and multi-stakeholder management) is used to describe a situation in which some, or all, of the relevant stakeholders in a natural resource are involved in its management activities.

Collaborative management regimes operate well under most situations such as protected areas, and can be practically applied to virtually all types of natural resources such as forests, fisheries, , grazing lands, and wildlife, but is not effectively applicable in all cases Particularly In situations that require rapid decisions and actions, such as to stop rapid ecological deterioration of an area, it is better to act than to wait for a general consensus on what to do.

In striving to meet its responsibilities – which include the conservation of all wild plans and animals and their natural habitats – the NCWCD coordinates with other concerned governmental agencies particularly in the fields of woodlands, rangelands, commercial fisheries, waste-water outflows, and sites of ecotourism. Moreover the NCWCD has adopted the principle of collaborative participatory management in protectede areas which allows all concernd parties to participate actively in all activities relevant to conservation of biodiversity and natural resources,

Proposed Action

1- Encourage Partnership between all concerned parties and Stakeholders

2- Inform all Partner Stakeholders of Decisions Concerning Relevant Issues

3- Develop Specific Laws for Participatory Collaborative Management

4- Seek More Partners of concerned Stakeholders to realize Participatory Collaborative Management

Monitoring Indicators

1- Increase / decrease in the level of collaborative management among the different organizations and agencies of the government and stakeholders.

2- Extent of implementing the participatory collaborative management among government agencies and the private sector.

Responsible Institutions

Government Ministries, Agencies, and Commissions

Non-Governmental Organizations (NGOs)

Scientific Institutions

Private Sector

Strategic Goal 15

Promote Regional and International Cooperation in the Field of Biodiversity

Strategic Goal

To promote cooperation with regional and international organizations for the conservation and sustainable use of biodiversity.

Regional Agreements

- **Regional Agreement on the protection of the Marine Environment (ROPME) was signed in 1972. This agreement is concerned with the Arabian Gulf, and all coastal states of the Gulf are parties to it.**
- **Regional Agreement on the Protection of the Marine Environment of the Red Sea and Gulf of Aden (PERSGA) was singed in 1982.**
- **GCC Agreement on wildlife Protection: a draft agreement consisting of 43 articles was proposed by NCWCD which seeks to promote regional programs for wildlife conservation, erection of protected areas and control of wildlife trade in the States of The Gulf Cooperation Council.**
- **Arabian oryx agreement**
- **Houbara Agreement**

Regional Research Institutions

The following regional research institutions are established in the region and are involved in conservation of agricultural biodiversity.

ACSAD – Arab Center for the Studies of Arid Zones and Dry Lands

Established in 1971 in affiliation with the Arab League. Sixteen Countries from West Asia and North Africa are members, Headquarters: Damascus. Syria

AOAD- Arab Organization for Agricultural Development

Established in 1972 with its headquarters in Khartoum, Sudan, it has a membership of 21 Arab countries. Among its principal tasks is the development and efficient exploitation of natural and human resources in the agricultural sectors of the Arab region, and sustainable agriculture.

ICARDA – International Center for Agriculture Research in Dry Areas

Established in 1977 and based in Aleppo, Syria. Among its tasks is to improve the welfare of people in the dry areas of the world and to enhance food production and quality by increasing agricultural productivity and quality while conserving the natural resource base.

IPGRI – International Plant Genetic Resources Institute

IPGRI is based in Rome, but it has a regional office located in Aleppo, Syria. IPGRI collaborates with national programs in conducting research, assist in the activities of seed collection and documentation, their conservation and training activities which cover a wide range of species that include vegetables, tree crops, native shrubs and grasses.

Environment and Development Center in the Arab region and Europe (CEDARE)

Established in1992.in Cairo, Egypt. Works in coordination with governmental organizations, United Nations institutions, international bodies, private sector, public media, and the civil society in general., It combines Environmental policies,and decision makers and his interests include management of coastal and aquatic resources, as well as land resources, and handles issues of commerce, investment and environment.

International Agreements

Saudi Arabia is a signatory to a number of international agreements and conventions on biodiversity such as:

- **Convention on Biological Diversity. Saudi Arabia joined in 2001, It is the main agreement dealing with protection of Biodiversity and its Sustainable use.**
- **Convention for the Conservation of Migratory Species (Bonn Convention – 1979) was signed in 1990. NCWCD is developing an international agreement within the framework of this convention for the protection of the houbara bustard.**
- **Convention concerning the protection of the World's Cultural and Natural Heritage (World heritage Convention, UNESCO. 1972): was signed in 1978, the Convention provides the basis for international recognition for sites of such cultural or natural importance that their conservation is of international concern.**

- Convention on the International Trade in Endangered Species (CITES – 1973) was singed in 1996. After joining CITES, an act on Trade of Wildlife and its Products wasissued to regulate trade in wildlife and wildlife products in Saudi Arabia.

- Convention on Combating Desertification was singed in 1997.

- Convention on Climate Change

Proposed Action

1- Promote Regional and International Cooperation

2- Attend Regional and International Conferences

3- Comply with Singed Conventions and Agreements on Biodiversity

4- Participate in Drafting New Regional and International Conventions and Agreements.

Monitoring Indicators

1- Increase / decrease in the level of implementation of the articles of regional and international conventions, and agreements.

2- Increase / decrease in the level of bilateral and multilateral funding allotted for biodiversity conservation projects, such as a system plan of protected areas.

3- Increase / decrease in the number of Saudi Arabian officials, scientists, and environmentalists participating in regional and international meetings/conferences.

Responsible Institutions

, Ministry of Foreign Affairs, General Presidency of Meteorology and Environment Protection , Ministry of Agriculture, National Commission for Wildlife Conservation and Development, King Abdulaziz City for Science and Technology, , and all concerned Government Agencies.

Strategic Goal 16

Economic Investment of Wildlife Resources

Strategic Goal

To generate income from wildlife resources by effective operation of protected areas, propagating wild plants, captive breeding of wild animals, and promoting local wild honey production.

Harvesting Wild Plants

Of the 2250 species of plants in Saudi Arabia, it is estimated that:

1- 350 species are medicinal plants,

2- 95 species are edible plants

3- 34 species are aromatic plants

4- 140 species are ornamental plants

There are many other plants with potential medicinal, food, aromatic and ornamental uses that are known only to local people who still follow traditional customs and practices. It is of utmost importance that such knowledge of wild plants and their uses be recorded and not allowed to disappear with the passing away of older generations.

Gathering wild plants is practiced in Saudi Arabia. Of these edible greens such as *Rumex vesicarius, diplotaxix acris, Reichardia tingitana*, and edible roots such as *Scorzonera spp* and the fruits of *ziziphus spina-christi*, *Capparis cartilaginea*, and *Balanites aegyptiaca.* Others are an important source of revenue to many people such as *Salvadora persica*, *Acacia sp. Morinigra peregruna.* Aloe, *Commiphora spp*. *Dracaena ombet Cymbopogon spp*. *Artemesia spp*. etc. in addition to some fugal species as Truffles.

The harvesting of some of these plants by individuals or families for their private use does not endanger them with extinction, However, commercial professional harvesting endanger their survival. It is also important to note that harvesting, whether private or commercial, can disturb their propagation, often degrade herbaceous vegetation by off-road driving, and littering with solid waste. That is why harvesting of these wild plants require regulation, particularly in protected areas, such as restricting harvest to certain areas and during certain periods of time to allow to supervising and regulating the harvesting activities.

There are a number of causes that threaten the survival and usefulness of these plants. These could be summarized as follows :

- **The high rate of Commercial collection or harvest of these plants that may reach the depletion level and endanger its survival.**
- **Loss of habitat through expansion of agriculture, overgrazing tree cutting for fuelwood and building construction into the forests, rangelands and other marginal lands where these wild plants grow.**
- **The loss of traditional knowledge about the uses of these wild plants.**
- **Native species being replaced by escaped exotic species.**

Other important wild products in Saudi Arabia:-

Tthe edible desert fungi known as truffles "faqa" or "qama" that are sold in the markets of Saudi Arabia for high price present one of the most important wildlife products .. They are usually of three kinds.

1- **Zubaidi, that is snow white when freshly harvested**
2- **Khlassi, with brownish to reddish tinge on outside.**
3- **Jibbah, also brownish to reddish tinge on outside .**

Wild Honey Production:

This is the honey produced from bee hives that harvest wild flowers ."The production of "wild honey" is one of the most successful practices using natural resources in Saudi Arabia because:

1- **It is a measurable sustainable activity generating income**
2- **yields tangible and direct benefits to local communities**
3- **has a positive influence on conservation of terrestrial ecosystems**

Wild honey production is dependent on the flowering of native plans and trees. Historically a number of ancient himas have been established for honey production, and within them grazing was prohibited during the flowering season or excluded all together. It is interesting to note that a number of these himas continue to be well maintained and cared for because of the high economic value of wild honey which can fetch hundreds of riyals per kilogram n the

market. Wild honey production thus competes successfully with other natural resource uses such a pastoralism, and has effectively discouraged overgrazing of rangelands in areas where it is practiced. In addition, the production of wild honey serves as an environmental indicator of the healthy plant communities.

Because wild honey production can be virtually non-consumptive of natural resources it should be encouraged, as a human practice both in and outside protected areas. Whether they are Resource Use Reserves, natural Reserves or Special Nature Reserves. This is because it has no negative impacts, but on the contorary positive effects.

The most important environmental impact often associated with honey production is the felling of the dragon trees – the trunks of which are hollowed out for making hives. Another negative impact is importation of bee colonies from other continents – a practice that may destroy most of the local bee populations and causes a drop down in the quality of the local wild honey. A few simple regulations to prevent negative impacts are required to make wild honey production a model resource use that should be encouraged in all protected areas that are suitable for such activity.

Hunting Wild Animals:

Hunting is one of the oldest and most important traditional uses of wildlife in Saudi Arabia. Hunting is permitted in Islam on condition that:

- **hunting is not done merely for sport (talahhi)**
- **hunting is not excessive or wasteful**
- **hunting does not degenerate into inhumane killing**
- **hunters either eat or sell the meat they hunt for sustenance.**

In Saudi Arabia, as in the rest of the Arab region, the most desirable mammals for hunting are the Arabian oryx (Al-Wudaihi), the Sand gazelle, the mountain gazelle ,the Nubian ibex the Dhabb and the wild rabbits. In the absence of any hunting laws, they were among the first to become endangered and some became actually extinct in the wild. The Arabian oryx have

disappeared from all its natural habitats and the gazelles and ibex became rare, with a few oryx, gazelle and ibex being kept alive and bred in private collections.

The most bird species that are hunted and trained for hunting by people are the saker falcon and peregrine falcon, They are used for hunting Houbara bustard, rabbits and others. In addition, they trap falcons and the local partridges *Alectoris spp, francolins* and *Frncolinus spp*.m Quail *Coturnix coturnix*, and sandgrouses *Pterocles spp*. from among the 360 species of birds that live or migrate through Saudi Arabia. This is usually done in an unctrolled unregulated way thus endangering these species with extinction.

Depletion of game animals in Saudi Arabia is usually attributed to over-hunting besides habitat fragmentation or even total loss due to the noted increase in population number and in human developmental activities whether industrial, agricultural or touristic. as well as the increase in urban development and road-cutting in addition to some adverse natural factors such as prolonged drought seasons.

The remining numbers of the wild game in Saudi Arabia could be of direct economic benefit if they are utilized in regulated hunting. This is particularly true for those species of mammals and birds that are increased in number by means of captive breeding programs. They may be reintroduced and made available for licensed and organized hunting against payment of certain fees, as practiced in many countries.

Regulated hunting is only minimally consumptive. It usually removes male animals that are a surplus that can be spared and consequently there is no need to keep all their numbers. In fact substantial income can be generated through imposing rewarding fees on hunting permits and and for providing support services such as guides camps, food, equipment, etc. In this way organized hunting can be many times more profitable than livestock grazing and certainly less destructive of the ecosystem.

It is important to emphasize that a large portion of the profits from hunting is allotted to local people who bear the burden of preserving wildlife populations in their area. If local

inhabitants become aware of the actual benefit from conservation of "their" wildlife, they will undoubtedly cooperate in supporting i the conservation efforts.

Organized hunting can be a tool to enhance conservation of biodiversity by educating hunters on the importance of conserving the game for the continuity of pracising their sport, and getting them to understand the importance of keeping and protecting the natural breeding areas of game animals, in addition to the need to breed some of those species in captivity. These concepts are the pillars of an awareness program that should be associated with organized hunting in the future.

Proposed Action

1- Survey Wild Plants with Economic Value

2- Establish Special Protected Areas set and managed for hunting

3- Develop Propagation Techniques for wild plants of economic value, and encourage their cultivation in deteriorated Agriculture lands

4- Promote Production of Wild Honey

5- Develop Marketing methods for wildlife products

6- Continue Wildlife Captive Breeding Programs for investment purposes

7- Carry out feasibility studies to determine the economic value on of wild plants and animals (wildlife resources) of economic use.

8- Investigate potential uses of Less Known Wild Plants

9- License Hunting and Introduce a Code of Conduct and regulate hunting for paid for permits.

Monitoring Indicators

1- Increase / decrease in the density of wild plants in their natural habitats

2- Growth of knowledge about the location and uses of all wild plants with economic value.

3- Increase / decrease of ares in which wild plants are commercially cultivated as compared to those harvested in the wild.

4- Increase / decrease in the production of honey from wild plants.

5- Increase / decrease in the successful captive breeding programs for wild animals for regulated hunting purposes,

6- Increase / decrease in numbers of areas managed for regulting hunting.

7- Increase / decrease in the number of hunting licenses issued to hunters after being trained oriented and introduced to abide by a hunting code of conduct.

Responsible Institutions

Ministry of Interior: Control of hunting, issuance of hunting licenses and implementation of Hunting Laws, in collaboration with NCWCD.

National Commission for Wildlife Conservation and Development: In-situ and ex-situ conservation of wild plants and animals and captive breeding and reintroduction of animals in protected areas within their historic natural range.

Scientific Institutions / Research Centers: Investigating, locating and cataloguing wild plants and determination of their potential income generation.

Private Sector: Establishment of regulated hunting regions and farms for production of wild plants having direct economic values such as medicinal, aromatic and poisonous plants.

Strategic Goal 17

Develop Nature-Based Tourism

Strategic Goal

To develop sustainable nature based tourism in the natural and scenic areas of Saudi Arabia by implementing a set of policies and technologies that protect the natural beauty of these areas.

Background

Nature based tourism is a broad description of all tourist activities that depend on the consumptive and non-consumptive uses of natural resources such as mountains, valleys seashores, seas, etc. From this broad concept emerged what has become known as "ecotourism" in the early 1980's. It is defined by the Ecotourism Society as "responsible

travel to natural areas that conserves the environment and sustains the well-being of local people".

Internal Tourism

Because some natural areas especially the scenic sites in Saudi Arabia are very popular among Saudi citizens for picnics and camping, there is an urgent need to conserve and manage those sites to avoid the destruction of their natural assets. It is important for this biodiversity strategy to stress the importance of developing and managing local nature based tourism to respond to Saudi citizens wishing to enjoy the beauty of their country., conserving at the same time the assets of the natural environment and wildlife and generate additional income forpopulations of the local communities..

Ecotourism can make substantial contributions to regional development by attracting both local and foreign tourists to rural areas. It is considered one of the best ways of bringing economic benefits to those remote areas by providing local employment, activating local markets and stimulating the improvement of transportation and roads. However, it has its negative impacts on the natural environment. Of these, deterioration of the the wild vegetation cover, depletion of natural resources and pollution of water resources, in addition to its negative effects on on traditional culture such as the change in of lifestyles in a way that are incompatible with inherited local customs, traditions and beliefs and which must be kept at its minimal acceptable level.

External Tourism

The World tourism Organization predicted that in 2000 global travel spending would be US$ 4.2 trillion, and by 2010 thee will be over 1 billion tourist journeys per annum around the world.

Aside from the influx of pilgrims to the religious cities of Mecca and medina each year, foreign tourism to natural or cultural sites in Saudi Arabia was practically unknown except for the members of the foreign community residing in Saudi Arabia. However, this situation is now beginning to change. In the year 2000 about 6000 tourist visas were issued by the

government to foreigners wishing to visit natural and cultural sites. Now the Kingdom is open for all tourism lovers after establishment of the High Commission for Tourism to regulate and manage all tinternal and external touristic activities to generate the targeted income and preserve the natural,wildlife and cultural heritage of the Kingdom.

Factors in Selecting Nature-Based Tourism Sites

The potential value of sites for rural development through nature based tourism are related to the following factors which have a cultural and aesthetic significance to the people of Saudi Arabia:

1- **The presence of flagships species of plants such as the date palm, juniper, dragon trees, *ziziphus spp*. *Adenium obesum* and *Moringa peregrine*.**
2- **The presence of flagship species of animals such as Arabian oryx, gazelles, ibex, dolphins, houbara, ostrich, cranes and sea turtles and coral reefs.**
3- **The presence of water features such as springs, waterfalls, steams, ponds and sea.**
4- **The presence of a dense vegetation that provides shade, greenery and a colorful seasonal show of flowers.**
5- **The presence of dramatic natural scenery as exemplified by spectacular peaks, escarpments, cliffs and rock formations.**
6- **The presence of outstanding sand dunes.**

Development of Nature-Based Tourism Sector

The Decree of the Council of Ministers No. 9 dated 12/1/1421 A. H. approved the established of the High Commission for Tourism to undertake the following functions:

1- **Introduction and appraisal of tourism development projects on publicly owned lands in natural areas like beaches, forests, mountains, valleys and others.**
2- **Survey and demarcation of natural areas and determination of limits to heir development.**
3- **Survey and classification of historic and archaeological sites that lend themselves to tourist development.**

4- Investigate the status of architectural heritage and the potential of its restoration for tourism.

5- Study the infrastructure needs of tourism projects.

6- Prepare an atmosphere that is conducive to investment in eco-tourism by the private sector.

7- Pay particular attention to the positive and negative impacts of tourism on natural resources.

Proposed Action

1- Determine Willing of local Communities towards accepting touristic development.

2- Select Suitable Areas and Upgrade Infrastructure and set plans for management and conservation of its natural assets.

3- Prepare and implement compelling standards for Basic Facilities and Build Tourist Accommodations

4- Train and license Tour Guides and Outfitters

5- Prepare and Implement Visitors Policy

6- Employing Local Residents

7- Provide Credit Facilities and Encourage Local Trade and Investment in Sustainable ecotourism activities.

Monitoring Indicators

1- Increase / decrease in the number and impact of people visiting an area for tourism.

2- Increase / decrease in the willingness of tourists to pay for visiting the area.

3- Increase / decrease in the monetary benefits to local businesses from visitors.

4- Increase /decrease in number of local visitors, the regions they come from and the sites they visit.

5- Increase / decrease in the number of foreign visitors ,their nationalities and ,the sites that they visit.

Responsible Institutions

The High Commission for Tourism; to set in collaboration with the private sector the standards for developing national and international tourism in Saudi Arabia.

National Commission for Wildlife Conservation and Development (NCWCD): to develop visitor policies to regulate visits and visitors conduct for sites that are in protected areas.

Ministry of Agriculture (MA) will develop visitor policies for sites that are in national parks.

CHAPTER FIVE
MECHANISM FOR IMPLEMENTING AND MONITORING THE NATIONAL BIODIVERSITY STRATEGY

Institutions Managing Biodiversity

Mechanism for Implementing and Monitoring National Biodiversity Strategy

To achieve the strategic goals of the National Biodiversity Strategy, implementation needs to be based on regular consultation and active participation of all government agencies, non-governmental organizations, scientific institutions and local stakeholders.

Government Ministries and Commissions:
National Commission for Wildlife Conservation and Development (NCWCD)
General Presidency for Meteorology and Environment Protection (PMEP)
Ministry of Defense and Aviation / Military Survey
Ministry of Agriculture (MA)
Kingd Abdulaziz City for Science and Technology (KACST)
Ministry of Economic and Planning
The High Commission for Tourism
Ministry of Interior (Local Administration)
Ministry of Municipalities and Rural Affairs
Ministry of Industry and Electricity
Ministry of Health
Ministry of Culture and Information
Ministry of Petroleum and Minerals
Ministry of Education
Ministry of Finance
Ministry of Higher Education

Government Committees on the Environment:
Ministerial Committee on the Environment
Environmental Coordination Committee
National Committee for Biological Diversity
National Committee for Bio-safety

Non-Governmental Organizations:
Saudi Biological Society - Riyadh
Saudi Environmental Society (SES) - Jeddah
Jeddah Ornithology Group (JOG) - Jeddah
Saudi Diving and Water Sport Club (SDWSC) - Jubail
Society of Advocates and Volunteers for Environment (SAVE) – Dhahran
Saudi Wildlife Fund

Preparation of Detailed Action Plans: Preparation of National Biodiversity Strategic Plan.
To implement the National Biodiversity Strategy all ministries, governmental agencies and organizations in Saudi Arabia need to prepare and implement detailed Action Plans. The establishment of a Secretariat for Biological Diversity is required to coordinate the preparation and implementation of the detailed Action Plans.

Background
Saudi Arabia has ratified the Convention on Biological Diversity and fulfilled its obligation of preparing a National Biodiversity Strategy [Article 6(a)]. The next step is to integrate the conservation and sustainable use of biological diversity into all the relevant sectors of the government and national plans of the country [According to Article 6(b)].

National Biodiversity Strategy has been designed to be implemented through partnerships where the different parties work together as partners and not as competitors. The roles and responsibilities of all stakeholders, as well as their agreement on modes of collaboration, must be properly defined to avoid any future conflict.

In order to implement the National Biodiversity Strategy all concerned ministries, organizations and institutions in Saudi Arabia need to prepare detailed Action Plans. These plans will reflect the level of experience, human resources and budgets which those institutions are prepared to commit to fulfill their roles in the efforts to conserve and sustainably use biodiversity.

The preparation of detailed action plans is an essential part of the mechanism for implementing the Strategy. It will require the combined effort of the National Coordinator (representing the National Commission for Wildlife Conservation and Development) and Sectoral Coordinators (representing the National Committee for Biological Diversity).

The National Coordinator will undertake the functions of a Secretariat for Biological Diversity and will be assisted by technical experts, technical working groups and consultants to advise him and the Sectoral Coordinators on how to most effectively prepare and implement detailed action plans.

The Sectoral Coordinators will also be assisted by the staff and experts within each of their concerned ministries, organizations and institutions in preparation and implementation of the detailed action plans that are within the scope and budget of their agency.
The success of the national biodiversity strategy depends on securing funds that are allocated by the concerned ministries, institutions and organizations for preparation and implementation of the detailed action plans.

Work duties of the Component Elements of the Organizational Chart

National Commission for Wildlife Conservation and Development

* **Leads the effort for the conservation of biodiversity at the national level**
* **Serves as the focal point or biodiversity in Saudi Arabia**
* **Chairs the National Committee for Biological Diversity**
* **Serves as the government coordination center for implementation of the National**

Strategy

* **Appoints a General Coordinator to assist in the implementation of the Strategy**
* **Estimates the budget of implementing the Strategy**
* **Train and upgrade the qualifications of administrators, legislators and technical staff in the different Government. ministries and institutions, through the Training Center for the Conservation of Natural Resources.**

National Committee for Biological Diversity

* **Establishe data bases that contains all information pertaining to the biodiversity issues in Saudi Arabia.**
* **Promote and coordinate scientific cooperation between concerned parties in Saudi Arabia**
* **Select Sectoral Coordinators in each ministry, organization and institute to follow up on the preparation and implementation of the detailed action plans.**
* **Uprade the national strategy for the conservation of biodiversity, whenever needed.**

Secretariat for Biological Diversity (The National Coordinator for Biological Diversity)

* **Follow up the functions of the National Committee for Biological Diversity and endeavor to put its decisions into effect.**
* **Follows up on the implementation of the biodiversity strategy**
* **Helps Ministerial Coordinators and Government organizations to prepare Action Plans in details to implement the strategy and carry it through.**
* **Organizes training to build national institutional capacities in biodiversity**
* **Develops awareness programs that focus on the importance of biodiversity**

Technical Experts and Working Groups

* **Full time experts and consultants are required in the various disciplines to assist the National Coordinator and Sectoral Coordinators in the implementation of the National Biodiversity Strategy.**
* **Consultants will also be required in specialized disciplines to assist the National**
* **Technical Working Groups composed of experts in the field of conservation of biodiversity and the sustainable use of natural resources will conduct the needed technical**

studies and prepare and review reports.

Office Staff

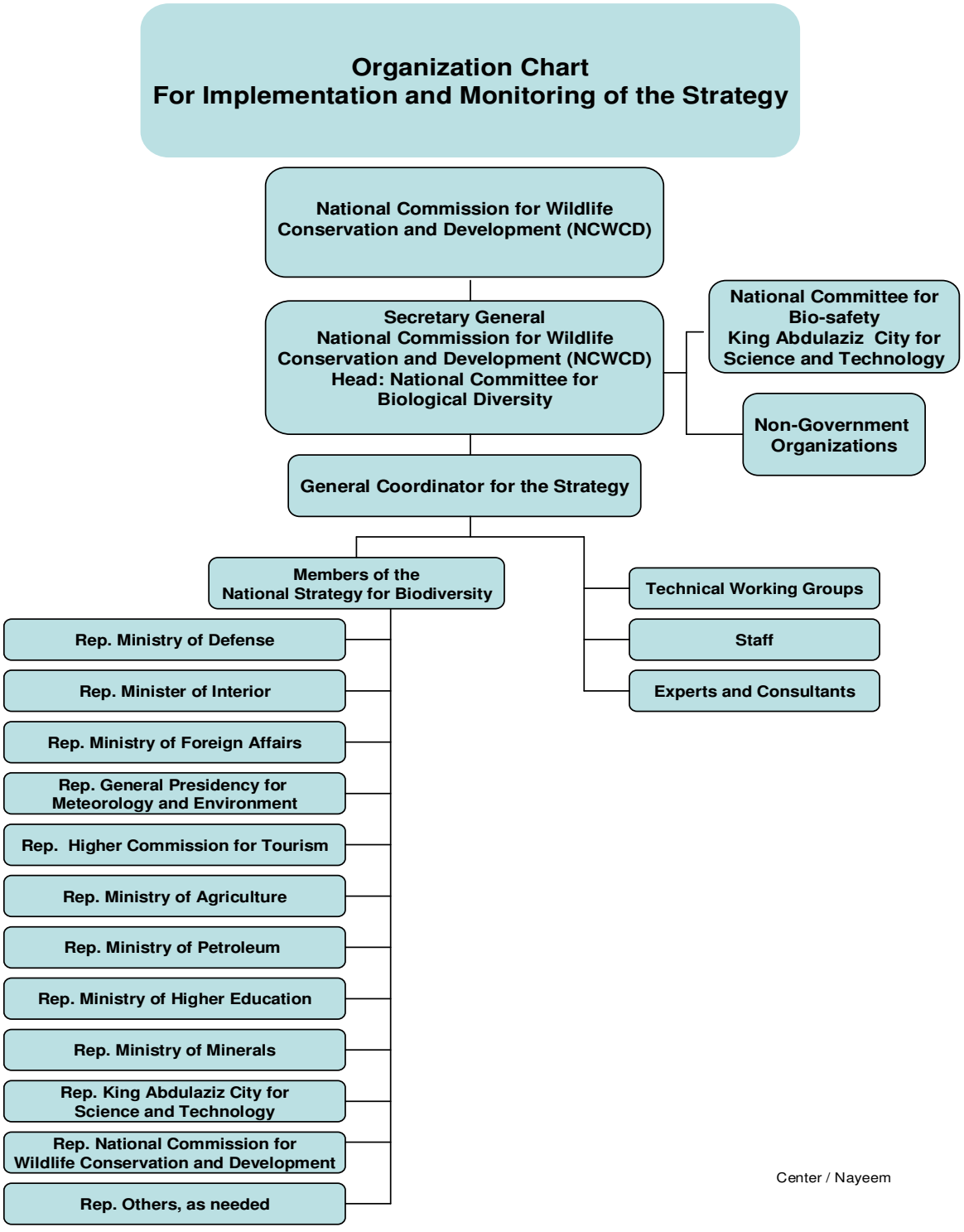
* **Assistant, Secretary and Driver**

National Committee for Biosafety

* **Coordinated by the King Abdulaziz City for Science and Technology**
* **Responsible for development of biosafety standards for Saudi Arabia**

Public Participation (Non-Governmental Organizations)

* **Include Public non-governmental groups and private individuals who are stakeholders in the National Strategy**
* **Participate in planning, implementing, monitoring and auditing for the National Strategy.**


Organization Chart
For Implementation and Monitoring of the Strategy
National Commission for Wildlife Conservation and Development (NCWCD)
Secretary General
National Commission for Wildlife Conservation and Development (NCWCD)
Head: National Committee for Biological Diversity
National Committee for Bio-safety
King Abdulaziz City for Science and Technology
Non-Government Organizations
General Coordinator for the Strategy
Members of the National Strategy for Biodiversity
Technical Working Groups
Staff
Experts and Consultants
Rep. Ministry of Defense
Rep. Minister of Interior
Rep. Ministry of Foreign Affairs
Rep. General Presidency for Meteorology and Environment
Rep. Higher Commission for Tourism
Rep. Ministry of Agriculture
Rep. Ministry of Petroleum
Rep. Ministry of Higher Education
Rep. Ministry of Minerals
Rep. King Abdulaziz City for Science and Technology
Rep. National Commission for Wildlife Conservation and Development
Rep. Others, as needed
Center / Nayeem