

ATTACHMENT 4: ENVIRONMENTAL BASELINE STUDY

An extensive desktop review exercise has been undertaken to establish the current environmental quality of the proposed site. There is not much specific data available for the Al-Jubail area. This attachment addresses the environmental and social conditions for Saudi Arabia as a whole with some specific issues for the Al-Jubail area.

This baseline study is based on data provided by the Saudi government. The main sources are: www.rcjy.gov.sa, www.ncwcd.gov.sa, www.sgs.org.sa and www.saudinfo.com. Furthermore a report by the royal commission has been used: RC meteorological and hydrological design information (May 2002).

4.1 Socio-economic environment

4.1.1 Demography

Population residing in Jubail Industrial City has reached 94,100 of which 55.4% are males, since the majority of the workforce is on single status. Saudis represent 73.3% of the total population. It is worth noticing that a large number of workers and employees who live outside the City enter the City during daytime. Accordingly, daytime population reaches 139,170 of which 45,070 workers and employees work in the city but reside outside it.

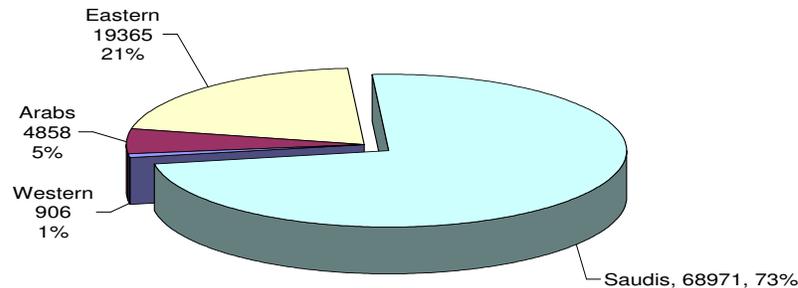


Figure 1: Population distribution at Jubail in Thousands

Table 1: Age groups as percentage of total population

Age group	Percentage of total population
< 15 years	36.8%
15 – 64 years-	62.5%
> 65 years	0.8%

4.2 Economic activity

4.2.1 Economic activity for Jubail and Yanbu

The share of the two major industrial cities Jubail and Yanbu of the GDP is 8% and by excluding the Oil Industry the share is 12%.

The share of the Kingdom's Industrial output is 60% and by excluding the Oil Industry is 80%.

The percentage of Jubail and Yanbu Industrial workforce is 19% of the total Industrial workforce of the Kingdom.

4.2.2 Economic activity in Saudi Arabia

The number of employees per sector is a good indication of the total economic activity. The table below displays the number of civilian employees per economic activity in Saudi Arabia for the year 2000.

Table 2: Economic activity in Saudi Arabia (year 2000)

Economic Activity	Employees (000s)	Share (%)
Agriculture and Hunting	341	6
Fishing	8	1
Petroleum and Minerals	102	2
Manufacturing	441	8
Electricity, Gas and Water	76	1
Construction	516	9
Wholesale and Retail Trade	901	16
Restaurants and Hotels	165	3
Transportation and Communication	242	4
Banking and Insurance	43	1
Real Estate and Business Services	140	2
General Administration	1,116	19
Education	713	12
Health and Social Services	218	4
Personnel and Community Services	133	2
Domestic and Other	551	10
International Organization	5	0
Not Stated	3	0
GRAND TOTAL	5,713	100.0

4.2.3 Employment characteristics

The Labor Law is protective of employees in general and overrides conflicting contractual provisions agreed under another jurisdiction, unless they are beneficial to the employee.

The Ministry of Labor issues a model form of labor contract in Arabic which is widely used, but other forms of contract are enforceable, provided they comply with the Labor Law.

End-of-contract gratuities are equivalent to 15 Days the salary for every year of the first five years of service and 30 days for every year thereafter.

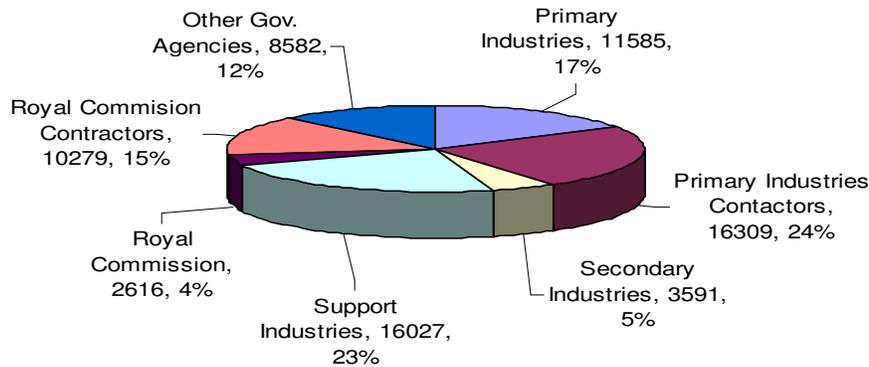


Figure 2: Jubail employment

Explanation of categories in industries:

- Primary industries include ethane and methane petrochemical and fertilizer manufacturers
- Secondary industries are industries such as plastics and synthetic materials producers
- Support and light industrial industries are companies such as food servers, car rental providers, packaging plants and shipping agents.

4.2.4 **Sensitive structures**

Jubail is the largest of eight planned industrial cities designed to take advantage of Saudi Arabia's vast oil resources. The Jubail area has been developed as an industrial city in the early 1980s. Before that time, the land where Jubail now stands was an uninhabited desert coastline. No significant heritage, historical or archeological sites are present in the proposed project area.

4.2.5 **Infrastructure**

4.2.5.1 **General**

The Royal Commission for Jubail and Yanbu (RCJY), is responsible for providing, or helping to provide, the necessary infrastructure for Jubail and Yanbu Industrial Cities, on a highly reliable standard. Basically, utilities such as Electric Power, Potable Water, Seawater for Cooling, Sanitary and Industrial Wastes in the two industrial cities fall under the responsibility of Marafiq Co.

Some of the infrastructures are provided by other entities. For example; Electricity at Jubail is provided by the Saudi Electric Company Saudi Electric Company (SEC), Desalinated Water is partially provided by the Sea Water Conversion Corporation (SWCC), Natural Gas is provided by Saudi Aramco while Telecommunication services are provided by the Saudi Telecommunications Co. (STC).

4.2.5.2 **Transportation and roads**

Jubail has a very modern road network built on international standards and integrates with national road Networks. Air travel is the preferred method of travel within the Kingdom because of the distances separating the main cities. Saudi Arabian Airlines (SAUDIA) is the national

carrier. All major airlines in the world offer services in and out of the Kingdom.

The major 3 International airports are: Riyadh's King Khalid International airport, Jeddah's King Abdulaziz International airport and Dammam's King Fahd International airport.

The Kingdom owns the largest marine network in the Middle East consisting of nine ports i.e. seven commercial ports and two industrial ports. RCJY accommodates the two King Fahd Industrial Ports at Jubail and Yanbu.

4.2.5.3 Potable water

Saline Water Conversion Corporation pumps 136,000 cubic meters of desalinated water per day to cover most of the City's consumption. The RC desalination plants provide supplementary quantities to meet the daily requirement levels. The actual consumption level at the time of writing this report was 899,161 cubic meters per day pumped through a 782-km network feeding both the residential and the industrial areas.

4.2.5.4 Sewers / Waste water treatment

Domestic and industrial wastes are collected and treated at RC owned and operated centralized facilities. The total capacity of the wastewater treatment facilities is 72,000 cubic meters per day. 44,896 cubic meters of wastewater is processed daily; 44,432 cubic meters of treated water is reclaimed daily.

Treated water is used for irrigation; excess treated water being stored for future needs.

Sewage treatment plants contribute greatly to reservation of potable water, ecological programs, improvement of public health and the widespread of greenery.

4.2.5.5 Electricity

Saudi Electric Company (SEC) supplies the Jubail Industrial City with electricity for all its needs through a 1716-km network. The consumption is in the range of 831 and 1613 megawatts supplied to 16,500 consumers representing industries, households, commercial installations and public facilities. Capacity has been contracted for the project.

4.2.5.6 Communications

Saudi Arabia has witnessed rapid advancements in the field of telecommunications. By 2005, There are two telephone providers, one providing fixed and mobile telephones and the other is licensed for Mobile Telephones only, the Saudi Telecom Company (STC) operates 3.96 million fixed lines and 7.5 million mobile lines, while Mobily is providing 2 Million Mobile Telephones. These are providing telephone direct access to 152 countries. Although mobile phone penetration is at less than 10 percent of the population, rapid expansion and upgrading of the network is under way, as well as the entrance of the third licensed Telephone Operator. International telephone calls can be made to almost anywhere in the world. Internet services are freely available and the main cities have several Internet Service Providers (ISPs) and Internet café's. VSAT as well as High speed DSL Internet are also available.

4.2.5.7 Waste disposal sites

The Royal Commission has implemented strict policies for the management of industrial waste (hazardous or non-hazardous wastes) generated by industrial facilities, plants and companies in Jubail Industrial City. These policies aim at minimizing impacts on the environment and provide safe and permanent disposal solution.

Waste is being observed carefully from generation to safe disposal. Regular inspection by Royal Commission on industrial facilities and monitoring of waste storage handling, transportation and disposal methods is carried out to ensure that generators are following proper management policies.

A private specialized company operates a waste treatment and disposal facility with operations comprising of incineration, pretreatment, stabilization, evaporation and land filling.

4.3 Physical environment

4.3.1 Terrain and topography

Saudi Arabia is approximately 1,969,000 square kilometers occupying 2/3 of the Arabian Peninsula and is bounded by the Red Sea in the west and the Arabian Gulf in the east.

Western Saudi Arabia is dominated by the mountain chain running the entire length of the country parallel to the Red Sea, known as the scarp of the Hejaz and Asir mountains and raises to between 1300 - 3000 meters above the Tihama coastal plain to its west. From this fertile crest it falls towards the west 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.

The Southern Region (Asir) is the relatively fertile area of coastal mountains in the extreme southwest (near Yemen). It has always been relatively densely populated. With the implementation of government irrigation schemes, the agricultural potential of the region is being increasingly exploited.

4.3.2 Land use and land cover

4.3.2.1 Industrial land use

The Royal Commission has successfully developed Jubail into a world class industrial city with an area of 1,016 sq km, of which 5,500 Hectares is in industrial use.

The success of Jubail 1 has led to the need for expansion in Jubail in order to satisfy the future investment demand. This new development is called Jubail 2 and will double the industrial area of Jubail Industrial City. The Royal Commission has implemented this development to support the Kingdoms national development strategy. This will be accomplished through a phased development which will add an additional site area of 5,508 Hectares.

4.3.2.2 Commercial, institutional and residential land uses

The residential community is located in the north of the industrial zone. It is comprised of 8 districts of which Al-Fanateer and Al-Deffi have been developed primarily by the Royal Commission and partly by the private developers.

The primary (retail / commercial) center is located in Al-Fanateer with expansion work under progress to suit the growing Jubail community.

4.3.2.3 Military land use

The city of Al Jubail played a crucial role during Operations Desert Shield and Desert Storm. Almost all Marine Corps personnel and many Army units deployed through this port city. The Navy positioned several fleet hospitals in the area, and the Air Force had units on the ground to support airlift missions and medical evacuation missions. In general it can be stated that there are various American and British army bases in use in Saudi Arabia and more specific in the Jubail area.

4.3.2.4 Forests and Grazing Land

Forests spread south west of the Kingdom in an extensive area. The government has undertaken many procedures for their protection and conservation, in addition to the building of 20 nurseries in different areas to produce the necessary seedlings for the development and expansion of forests. It has planted tree barriers in the form of defensive lines to stop creeping

sands, and has used trees for similar purposes alongside the main roads outside the cities in the eastern region.

Natural grazing land accounts for approximately 75% of the land in the Kingdom of Saudi Arabia.

4.3.2.5 Nature reserves and aesthetic environments

The Kingdom of Saudi Arabia enjoys a diversity of good natural scenery ranging from mountains covered by a variety of natural vegetation and trees and wide plateaus with attractive plants in spring, to beautiful green oases in the middle of the desert, distinguished by their wild fauna, and the rich coastal regions by the Red Sea and the Arabian Gulf.

The government of the Kingdom of Saudi Arabia has realized the importance of the protection of these natural resources, which are for the enjoyment of present and future generations. It has thus been concerned with the establishment of parks, such as the National Park of Asir on the large mountainous and hilly landscape of Asir around the city of Abha. There are also studies and designs in preparation for the establishment of modern parks in Riyadh, al-Hasa, al-Baha and in other places. For details on the national parks see under environmental protection areas.

4.3.3 Climate and meteorology

The climatology of the area around Jubail is one of environmental extremes. Summers are characterized by intense heat and persistent, strong winds. In winter near freezing temperatures and occasional heavy rain showers, thunderstorms, and extended sandstorms can be expected.

Although four seasons are observed at Jubail, the summer and winter seasons are dominant. The length of the summer season is greater than in more temperate zones and can be considered to last from May until September. Rain is almost totally non-existent during this period and daytime temperatures in excess of 50 °C are possible. Evaporation on land is greater during the summer, but is believed to be higher over the open Gulf in fall, winter and spring. Relative humidity is generally low in summer but often high enough in fall and winter to cause persistent fogs.

Beginning in late May and June, an extensive low-pressure area develops over the Asian continent due to excess summer heating of this large landmass. The counter-clockwise wind circulation, which is characteristic of a low-pressure area, persists for the entire summer. The eastern coast of Saudi Arabia lies on the northwest edge of this circulation resulting in northerly winds over the Jubail region. During June and July wind speeds are frequently strong enough to cause sandstorm conditions known locally as "Shammals" (from the Arabic word north). These strong winds may last for 2 or 3 days at a time with mean wind speeds of 15 m/s or higher and gusts over 18 m/s. By mid-July the pressure gradient between Asia and Saudi Arabia begins to diminish and the northwest winds weaken. September is the calmest month.

The fall months of October and November are transitional months during which temperatures lower and relative humidity begin to rise. By November the first extra tropical cyclones begin to influence the area and may bring heavy but usually short duration rainfall. The rainfall season extends from November to April. The mean annual precipitation at Jubail is 86 mm. Most of the annual rainfall often occurs over relatively short periods in only a few storms.

The winter months of December through February are characterized by relatively mild weather interrupted by occasional stormy periods consisting of strong and variable winds; thunderstorms, sometimes heavy rainfall and blowing dust. Winter winds are not persistent as those of the summer, but the strongest gusts of the year usually occur in association with the passage of frontal systems traversing the area from west to east. January is usually the coldest month and freezing temperatures, although rare, are possible.

During the spring months of March and April, strong thunderstorms may occur as surface heating increases and winter storms are still possible.

4.3.4 **Water quality and use**

4.3.4.1 General

Discharge of cooling seawater, ballast water and certain types of industrial waste water are regulated to preserve the marine environment. Presently, the Royal Commission routinely monitors water quality in the Gulf adjacent to the city, seawater cooling system, groundwater and wastewater from industrial facilities.

4.3.4.2 Gulf water

Thirteen water quality monitoring stations have been established by the Royal Commission to give comprehensive picture of water quality. These stations allow the measurement of water quality changes near the coast and offshore. Routine monitoring gives an early indication of long-term trends, allowing action to be taken to prevent damages if there is a need.

At each of the water quality monitoring stations, an electronic probe is used to determine several water quality parameters, including temperature, salinity, dissolved oxygen, and pH. Samples from several depths are also collected for more comprehensive analysis.

At the Royal Commission Environmental Laboratory, samples are analyzed for physical and chemical parameters including heavy metals and organic compounds. Results are then entered into a computerized database and periodic reports are generated.

4.3.4.3 Seawater Cooling System

The Royal Commission performs routine monitoring of the once-through, non-contact seawater cooling system to enable continued compilation of baseline data for possible future determination of short term impacts on water quality.

4.3.4.4 Groundwater

The Royal Commission conducts a comprehensive groundwater monitoring program to prevent degradation of natural groundwater quality, as the city grows.

Groundwater in the vicinity of industrial processes, waste management facilities, and storage tanks is closely monitored for early detection of contaminants.

4.3.4.5 Industrial Wastewater

Industrial wastewater is discharged to the central wastewater treatment facilities where is treated using the latest technology and used for irrigation. Wastewater quality is monitored for compliance with discharge standards.

The influent and effluent of the central wastewater treatment facilities are also monitored to ensure that only waste which can effectively be treated are received and treated. In addition, the treated wastewater used for irrigation is monitored to ensure it complies with the irrigation water quality standards.

4.3.4.6 Oil Spill Protection

In order to facilitate early detection of oil and chemical spills, and to protect recreational beaches and vital operations such as the cooling water canal and the intake to the desalination plant, the Royal Commission has established an oil spill monitoring program. The Royal Commission has also developed an emergency response plan for oil and chemical spills.

4.3.5 Geology

4.3.5.1 Overview of geology

The rocks of Saudi Arabia range in age from the Precambrian to the present day, forming part of a larger unit that includes the Arabian Peninsula and is known as the Arabian Plate. Some Precambrian rocks in this region date back to the Archean (nearly 3 million years ago) but most are Neoproterozoic (1000-540 Ma). They originated as volcanic islands or as chains of volcanoes along spreading centers and subduction zones in a Neoproterozoic ocean and against ancient continental margins, and were folded and uplifted toward the end of the Precambrian as a large belt of mountains. The mountains existed between about 680-540 Ma and were part of one of the largest mountain belts ever known to have existed on Earth. By the end of the Precambrian, the mountains had been eroded and only their roots are preserved, exposed in western Saudi Arabia in the Arabian shield.

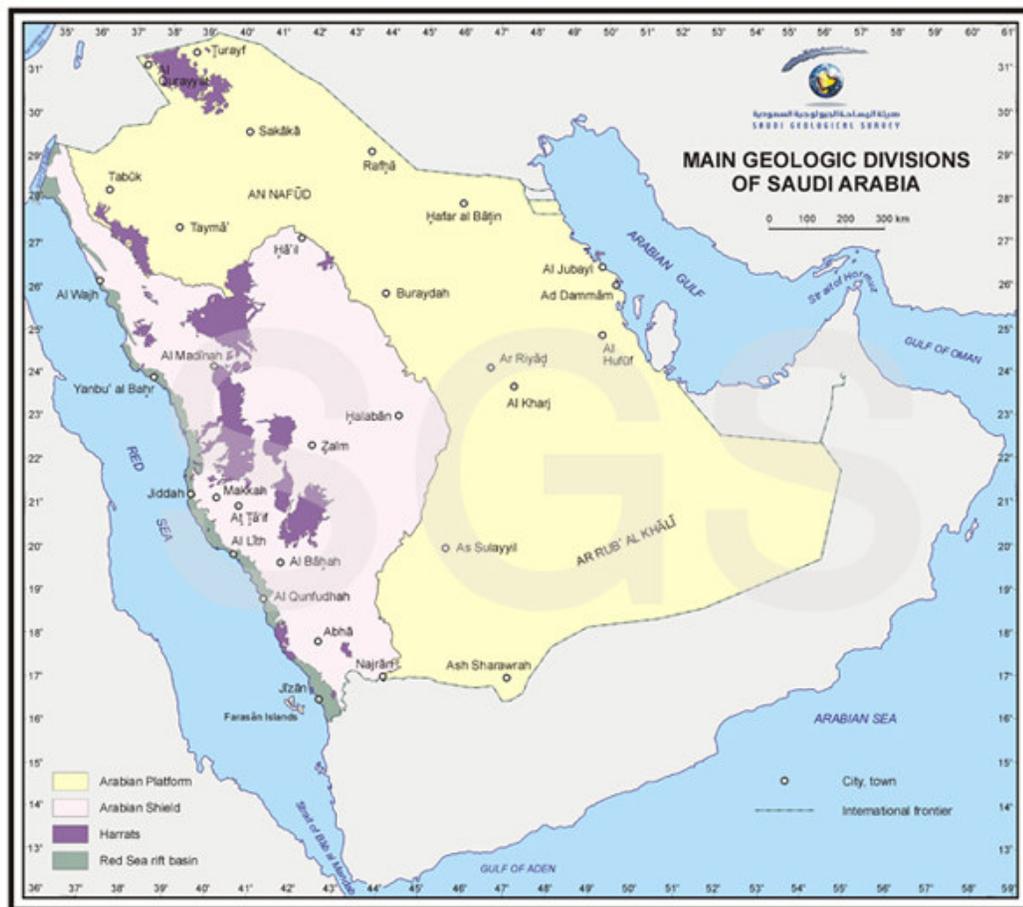


Figure 3: Main Geological Divisions of Saudi Arabia

The younger rocks in Saudi Arabia belong to the Paleozoic (540-250 Ma), Mesozoic (250-65 Ma), and Cenozoic (65 Ma to Recent) (collectively referred to as Phanerozoic cover), and crop out as relatively flat lying beds of sedimentary rocks such as sandstone, siltstone, limestone, and evaporites (salt deposits), and volcanic rocks. The rocks were deposited unconformably on the underlying Precambrian basement, in riverbeds, in glacial valleys, and in shallow seas, or were extruded from sub aerial volcanoes. The rocks north and east of the Arabian shield are referred

to as the Arabian Platform; those on the shield are mainly harrat (fields of Cenozoic flood basalt); and those west of the shield are Cenozoic rocks that occupy the Red Sea basin. The youngest deposits in the region include coral limestone and unconsolidated sand, silt, gravel, and sabkhah, which accumulated in the sand seas of Ar Rub al Khali and An Nafud, filled dried-up lake beds and wadis, and fringed the coastlines.

The Precambrian contain most of Saudi Arabia's known metal deposits of gold, silver, copper, zinc, iron, and magnesium. The Phanerozoic cover contains the oil resources and deposits of bauxite (the source of aluminum), phosphate, clay, limestone, silica sand, and lightweight aggregate that are of increasing importance to the industrial development of the Kingdom.

4.3.5.2 Geohazards

The threat of natural hazards has increased worldwide and is directly correlated with a growing population that is increasingly concentrated in urban centers, an expanding investment in economic and social infrastructure, and an accumulation of vulnerable critical industrial and civil installations. Saudi Arabia is no exception to these trends. Saudi society's awareness of these problems demands measures to reduce the risk of loss of life, property damage, and economic and social disruption. Natural hazards are either short-lived or long-term, have local, regional or national impact, and occur either as isolated events or in various combinations. The more frequent geologically related hazards affecting the Kingdom are floods, rock falls and ground collapse; volcanic eruptions and damaging earthquakes are potential hazards but occur relatively infrequently.

In order to study the geological issues the Saudi Geological Survey (SGS) was established as an independent entity attached to the Ministry of Petroleum and Mineral Resources following a Council of Ministers Decision in 1999. The SGS programs in Geohazards focus not only on mapping events such as landslides, flooding, earthquakes, and volcanism in the past, but also on making predictions about the recurrences and likely effects of such phenomena in the future.

4.3.6 Hydrology and drainage pattern

The Saudi Geological Survey carries out integrated studies on the quantity and quality of underground water in the Kingdom, to provide sustainable solutions to problems of conservation, water use, and quality.

Flooding is one of the main elements of the hydrological cycle. During heavy storms, some of the rainwater infiltrates through the ground to recharge groundwater aquifers, some evaporates, and the remainder runs off the ground as surface water. Flooding occurs when the volume of rainwater is greater than the maximum infiltration capacity of the soil. Several wadis discharge their floodwater, usually in the form of flash floods, into the coastal area between Jeddah and Jizan. These floods commonly cause damage to property, roads, bridges and irrigation schemes, and may result in loss of life. Accumulation of floodwater can later be a source of disease. Engineering solutions are necessary to mitigate these hazards and control the floods. The coastal area of the red sea is the most vulnerable area for these floods. Studies concentrate to that area. There are no studies currently ongoing in the Jubail area.

4.4 **Biological environment**

4.4.1 Environmental protection areas

Considering the size of Saudi Arabia and its biophysical diversity, creating a comprehensive system of protected areas is a formidable task, especially as the system must be appropriate to the social, economic, and cultural characteristics of the Kingdom. The inspired determination of the national commission for wildlife conservations and development to conserve and develop the renewable resources of the Kingdom for the sake of all its citizens, has received international

acclaim. At present the Commission manages 17 protected areas, which have been ratified by its Board of Directors. Below 14 of these protected areas are described in the table below. None of these reserves is located in the vicinity of the Jubail industrial city.

Table 3: Protected Areas

Name of Protected Areas	Date Established	Size of Area (km ²)
Harrat al Harrah	1987	13,775
Al - Khunfah	1987	20,450
Mahazat as - Sayd	1988	2,141
Ibex Reserve	1988	2,369
Al - Tubayq	1989	12,200
Farasan Islands	1989	696
Raydah	1989	9
Umm al - Qamari	1978	1,600
`Uruq Bani Ma`arid	1994	11,980
Majami`al - Hadb	1993	3,400
At - Taysiyah	1995	4,260
Al - Jandalayah	1995	1,160
Nafud al - `Urayq	1995	1,960
Saja Um Al-Rimth	1995	7,190

4.4.2 **Terrestrial Flora**

The stereotype of the Kingdom as a dry, barren desert devoid of almost all flora and fauna is far from correct. Of course, both plants and animals have had to adapt to the rigors of the climate but, for those who look, there is a wealth of wildlife to be discovered, even in the desert regions - and there are parts of the Kingdom, notably the Southern Region, which enjoy ample rainfall and support a wide variety of crops as well as plants and animals.

In recent years, the Kingdom's flora has attracted increasing interest, resulting in the publication of several books on the subject. Wild Flowers of Central Arabia by Betty A. Lipscombe Vincett lists more than 80 wild flowers growing in a region often thought to be entirely barren. Desert regions also support acacias and desert shrubs, salt bushes and tussock grass, as well as cacti. The Southern Region (Asir) is the relatively fertile area of coastal mountains in the extreme southwest (near Yemen). Mountain peaks rise to 3,000 meters and there is ample rainfall to support natural vegetation and cultivation. Asir, with some juniper trees, wild olive trees and even some larger trees is the only part of the Kingdom of Saudi Arabia to support forest. More fertile regions boast date palms and, in the shade of these desert trees, apricot, lime and quince trees thrive, together with grape vines and vegetables. With the Kingdom's determined effort to irrigate and cultivate the desert, there are vast areas of the Kingdom devoted to the production of cereal crops (barley, millet and wheat).

4.4.3 **Terrestrial Fauna**

Seventy six of 98 mammals species recorded from the Arabian peninsula occur in Saudi Arabia. The Arabian Oryx became extinct in the wild in the 1970's. Captive bred and re-introduction species include the Arabian Oryx and two gazelle species (reem and idmi). 444 bird species have been recorded in Saudi Arabia, of which 10 are endemic and 185 breed in the Kingdom. The country is ecologically significant for flying visitors from Asia, Europe and Africa. Tidal flats of the Arabian Gulf are among the most important over wintering areas. They are home to 1-2 million waders of 125 species.

There are 45 species of terrestrial snakes, 7 native amphibians and 67 species of lizards know from Saudi Arabia. The small scaled dhubb is under pressure from hunting because of its flesh.

4.4.4 **Marine ecosystems**

Saudi Arabia has 2500 kilometers of coastlines along the Red Sea and the Arabian Gulf. The Red Sea is one of the deepest regional seas (reaching 2500 meters) while the Arabian Gulf is shallow and almost land-locked sea. Both, described as "rainforests of the sea and an underwater paradise", play a strategic and fundamental role in providing the Kingdom with fresh water from desalination plants as well as fishes. The coastal environment is of a high recreational value.

Coral reefs are famous for their beauty and 250 species of Red Sea coral have been recorded. They are less extensive in the Arabian Gulf and occur around offshore islands and in other patches. Coral reefs provide shelter and food for marine life, particularly fishes. Over 1280 species of fish have been recorded in the Red Sea and 542 species in the Arabian Gulf.

Sea grass beds and algal flats are among the most productive of the global ecosystems. Eleven species of all the seven known genera of sea grass occur in Red Sea. There are three species in the Arabian Gulf. Sea grass has a fundamental role in primary production and main tendence of fisheries as feeding and breeding grounds. Beds of sea grass are also important for coastal stabilization and as an essential habitat for the endangered dugong and 5 species of marine turtles.

4.4.5 **Endangered and threatened species**

In the year 1986 The National Commission for Wildlife Conservation and Development (NCWCD) was established by a Royal Decree. Among other things, the Decree requires the Commission to "Develop and implement plans to preserve wildlife in its natural ecology and to propose the establishment of proper protected areas and reserves for wildlife in the Kingdom , and to manage such areas..." . In accordance with this mandate, the Commission strives to protect, conserve, and develop the wildlife resources in terms of the laws of Saudi Arabia, and the welfare of its people.

The NCWCD has so far created 17 wildlife natural reserves. These constitute approximately 4% of the total area of the country. These reserves are the habitat for various endangered species.



In the 'Uruq Bani Ma'arid Protected Area 100 reem gazelle, 31 Arabian oryx and 25 idmi gazelle from the were re-introduced in 1995.

In the Mahazat as-Sayd reserve, where houbara have been re-introduced, the animals were observed to be exhibiting natural behavior and have begun to breed. Two nests and a female chick were recorded.

Sixty births were recorded among the Arabian oryx herds in Mahazat as-Sayd, bringing the population to

263 animals by the end of 1995. The Reserve contains scattered herds of reem gazelle, estimated at 772 animals, and nine red-necked ostriches which have been released into the Reserve on an experimental basis.

The Ibx reserve, another protected area with diverse flora and fauna, holds 200 idmi gazelle and more than 250 Nubian ibex.

Preparations were continued in the Majami' al-Hadb protected area to make it ready to receive 75 idmi gazelles as a nucleus for re-



introduction, and plans were made at the sites in At-Taysiyah and Al-Jandaliyah for the release of houbara bustards.



Farasan Gazelle, Farasan Reserve (Jazan Region)

Further improvements in both species and habitat conservation were made to the Farasan Islands Protected Area in the course of 1995. Eighty five pairs of osprey were recorded breeding in the protected area. These birds represent one quarter of the entire known osprey population in the Red Sea region. Farasan gazelle have thrived and now number approximately 1,100 animals. The new mangrove restoration project in areas where mangroves have deteriorated is one of the most important conservation efforts in the Saudi Arabia.

Despite all efforts by the NCWCD there are 4 species recorded as critically endangered in the Kingdom of Saudi Arabia according the 2004 IUCN red list of threatened species. A total of 10 species is considered endangered and 30 species are classified as vulnerable. Details of the species are listed below.

The following species are considered critically endangered:

1. Eretmochelys imbricata (Hawksbill Turtle)
2. Geronticus eremita (Hermit Ibis, Northern bald Ibis, Waldrapp)
3. Numenius tenuirostris (Long-billed Curlew, Slender-billed Curlew)
4. Vanellus gregarius (Sociable Lapwing)

The following species are considered endangered:

1. Acrocephalus griseldis (Basra reed-warbler)
2. Capra nubiana (Nubian Ibex)
3. Cheilinus undulatus (Giant Wrasse, Humhead Wrasse, Humhead, Maori Wrasse, Napoleon Wrasse, Truck wrasse)
4. Chelonia mydas (Green Turtle)
5. Dracaena ombet
6. Dracaena serrulata
7. Falco cherrug (Saker Falcon)
8. Meriones arimalius (Arabian Jird)
9. Oryx leucoryx (Arabian Oryx, White Oryx)
10. Oxyura leucocephala (White-headed Duck)

According to the red list of endangered species the following are assessed as vulnerable:

1. Acinonyx jubatus (Cheetah, Hunting Leopard)
2. Aquila clanga (Greater spotted Eagle,)
3. Aquila heliaca (Imperial Eagle)
4. Asellia patrizii (Patrizi's trident leaf-nosed Bat)
5. Carcharias taurus (Grey nurse Shark, Sand tiger Shark)
6. Carcharodon carcharias (Great white Shark)
7. Chlamydotis undulata (Houbara Bustard)
8. Dendrocopos dora (Arabian Woodpecker)
9. Dugong dugon (Dugong, Sea Cow)
10. Eptesicus nasutus (Sind Bat)
11. Euphorbia ammak
12. Falco naumanni (Lesser Kestrel)
13. Gazella gazella (Idmi)
14. Haliaeetus leucoryphus (Band-Tailed Fish-Eagle, Pallas's Fish or Sea Eagle)
15. Hemipristis elongatus (Fossil Shark, Snaggletooth Shark)

16. *Marmaronetta angustirostris* (Marbled Duck, Marbled Teal)
17. *Myotis emarginatus* (Geoffroy's bat)
18. *Nebrius ferrugineus* (Tawny Nurse Shark)
19. *Otis tarda* (Great Bustard)
20. *Panthera leo* (African Lion)
21. *Paragomphus sinaiticus*
22. *Phalacrocorax nigrogularis* (Socotra Cormorant)
23. *Pseudochromis pesi* (Pale Dottyback)
24. *Rhina ancylostoma* (Bowmouth Guitarfish, Mud skate)
25. *Rhincodon typus* (Whale shark)
26. *Stegostoma fasciatum* (Leopard Shark, Zebra Shark)
27. *Sylvia buryi* (Yemen Parisoma)
28. *Torgos tracheliotus* (Lappet-Faced Vulture)
29. *Turdus menachensis* (Yemen Thrush)
30. *Vulpes cana* (Afghan Fox, Blanford's Fox, Corsac, Dog Fox, Hoary Fox, Steppe Fox)