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ENVIRONMENT PROGRAMME

STATE OF THE ENVIRONMENT REPORT – 1980

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KUWAIT

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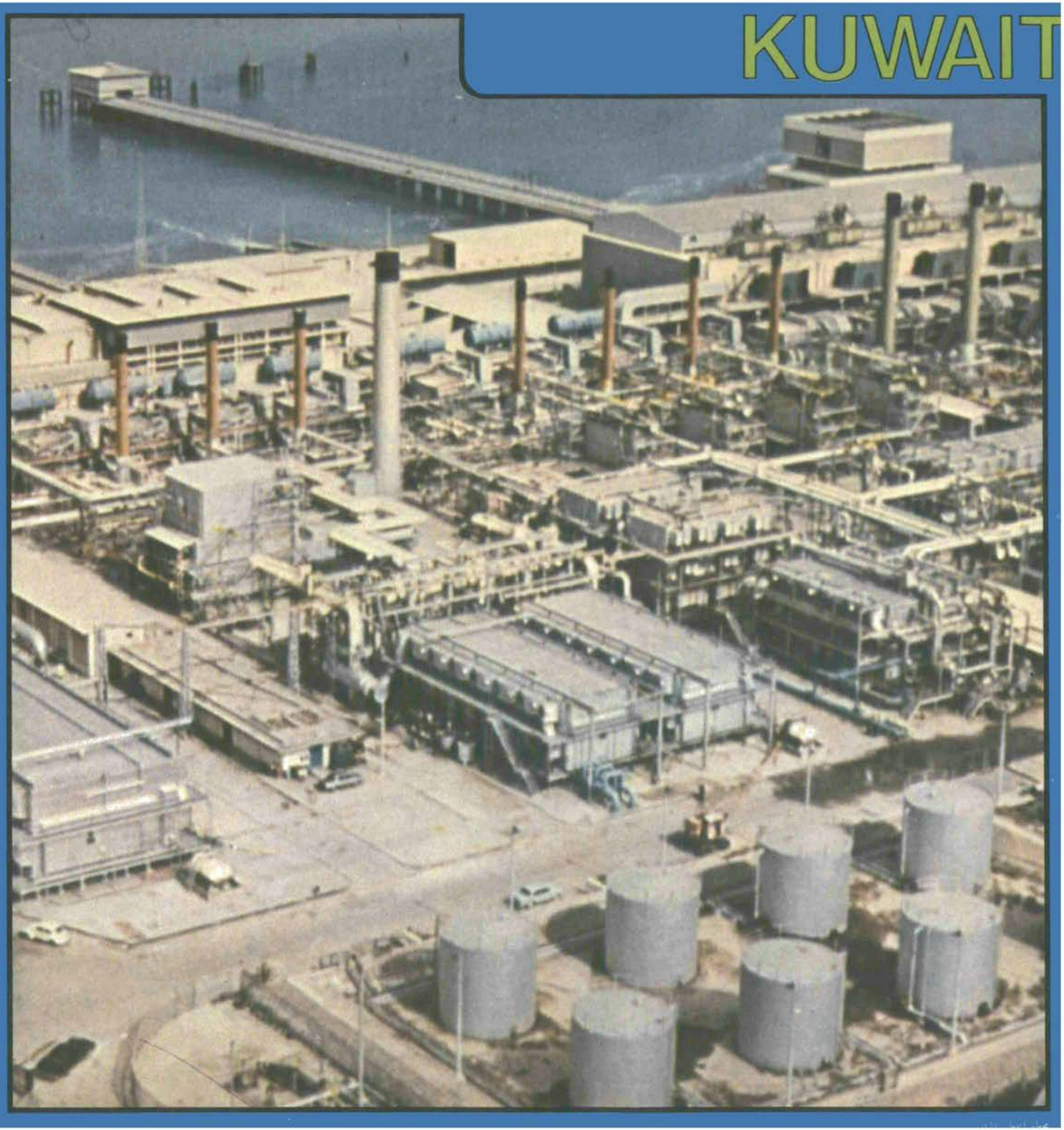
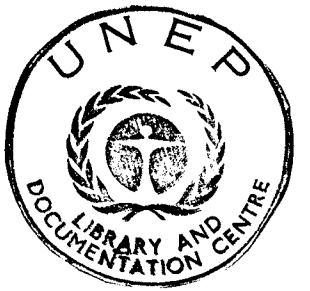
KUWAIT



STATE OF THE ENVIRONMENT REPORT - 1980
THE STATE OF KUWAIT



UNEP REGIONAL OFFICE FOR WESTERN ASIA
BEIRUT , LEBANON

COUNTRY: STATE OF KUWAIT

CONTENTS

1	COUNTRY: KUWAIT
GENERAL INFORMATION: Area, Physical features, Climate, Population (urban, Rural), National income (GNP), Major income basis, Capital, Universities and research centres (national, regional and international).	Area: 17,818 square kilometers. (1) Physical Features: The state of Kuwait is situated in the Arabian Peninsula to the north lies Iraq and to the south Saudi Arabia (1) . Kuwait is largely a desert, except for Al-Jahrah Oasis and a few fertile patches in the southeastern and coastal areas. The largest off-shore islands are the uninhabited islands of Bubiyan and Warbah. The islands of Faylakah, near the entrance of Kuwait Bay, has been populated since prehistoric times. The other islands, Umm an-Nemmel, Mis'chan, Auhha, Al-Kubbar, Qaruh and Umm al-Maradim, are small specks of unhospitable sand. The topography of Kuwait is mainly flat or gently undulating, broken only by occasional low hills and shallow depressions. The elevations range from sea level in the east to nearly 1,000 feet in the southern corner of the country. The Jal az-Zawr escarpment, one of the main topographic features, borders the northwestern shore of Kuwait Bay and rises to a maximum height of 475 feet above sea level.Else where in coastal areas large patches of salty marsh land have developed. Throughout the northern, western, and central sections of Kuwait there are basins called playas, which fill with water after winter rains, forming important watering areas for the camel herds of the Bedouins. (10) Climate; The Climate of Kuwait is a desert climate and characterized by long hot summer, and a short comparatively warm winter.

1	COUNTRY: KUWAIT
GENERAL INFORMATION:	The temperature normally ranges from a minimum of 5°C in winter to a maximum about 50°C in summer. Kuwait climate is charaterized by two main features, dry hot summers with frequent sand storms and cool winters with high relative humidity and occasional rain (usually not more than 125 mm/year). Rather more rain tends to fall on the coastal ridges than elsewhere, sometimes causing flooding along with coastal flats. The average monthly temperature in summer (June through September) is around 36° C with the highest average temperature being around 44°C. The average maximum sun radiation temperature reaches its peak during this season, and is about 74°C. Relative humidity is, on the average, between 26 and 30 per cent with a minimum about 12 per cent. The rate of evaporation of water is very high, reaching 24.6 mm/day in June when the sun radiation and the mean wind speed both reach their maximum. The strongest winds usually in spring and early summer (March through July), the prevailing direction being from the north-west to north. Light to fresh winds prevail for 50 per cent of the year; with high frequency in winter. Wind speeds of more than 18 m.p.h. only occur for about 10 per cent of the year, being more frequent in June and July. Dust or sandstorms or both, known in Kuwait as the "Tauz" may occur any time during the year. They are more frequent in the warm months from March to September. In these months they generally last for one day or more each week. During June they blow for about two days a week. (3) The average results of the two-year (1971-72) analysis are that there are 103 fine days per year and 33 rainy days with 168 mm of rainfall, and that mist is formed in 18 days, fog in 7, haze in 80, suspended dust or sand in 101, and dust and/or sandstorm in 23. (3) Population: - Total population: 994,8 (47% of the inhabitants were Kuwaitinationals, 1970).

1	COUNTRY: KUWAIT
GENERAL INFORMATION:	- Urban population: 88.6%. - Population of the Capital agglomeration: 27.8%. - Population under 15 years: 44.3%. - Population 65 years and over: 1.6%. - Rate of growth: 6% (for 1970-75). - Life expecting at Birth: (70 years for Kuwaitis only). - Illiteracy rate of the population aged 15 years and over: Male: 32%; Female: 52%. - Economically active population: 304,600. - Economically active population in percent of the total population: 30.6%. (4) GNP: - Per capita income: $ 11,460. (4) - National Income: 1977 income groups (monthly) in US $ I. 0-400 61 per cent II. 401-820 20 per cent III. 821 and above 19 per cent. (5) Major income basis: Oil is the main product of the country, accounting for more than 60 per cent of GNP. (5) Kuwait ranks second after Saudi Arabia in oil proven reserves. (10) Capital: Kuwait. Universities and Research Centers: - University of Kuwait; - Kuwait Institute for Scientific Research (KISR).

2	COUNTRY: KUWAIT

ENVIRONMENTAL POLICIES:

a) Problems: Air, Fresh water, Seas, Soil, Fauna, Flora, Forest Vegetation, Rangelands, Desertification, Natural disasters, Urban growth and environmental problems etc...

b) Policy Status:

i) an overall policy for environment.

ii) in relation to development planning;

iii) concerning major resource areas: Land use, natural range, agriculture, forestry, water, minerals, fisheiries, energy etc....;

iv) on area development: Human settlements, basins, watershed menagement;

on science policy for environmental management.

a. Problems:

Air:

The two main sources of atmospheric pollution, namely natural and man made, effect Kuwait environment in various degrees.

Inorganic and organic particulate matter are brought into the air over Kuwait from many sources including: sandstorms; dusts generated locally from base lands and unpaved roads by wind; salt particles (sea spray) from the highly saline water of the Arabian Gulf; upper winds from neighbouring countries; organic wastes; industrial activities; transportation facilities and; commercial and residential activities.

Sources of gaseous contaminants in the atmosphere over Kuwait are mainly industrialactivities, transportation facilities, sewage disposal operations, burning of excess natural gas and uses of petroleum products. This is evidenced by the substantialincrease in the number of days with visibilities less than 5 Km. This number rarely exceeded 10 days per year before 1956, but had risen to 108 days by 1967 and to an average of 230 days for the two years 1971/72. (3)

As the heavy industries are centred at Shuaiba and Shwaikh areas, many pollutants have been emitted which adversely affect the human and marine life in the area. (6)

The inhabitants of Shuaiba village were seriously affected by two incidents in 1966 by extremely high concentrations of sulphur dioxide in the air due to mal-operation of the sulphuric acid plant of K.C.F.C. during start up. (7)

2	COUNTRY: KUWAIT
ENVIRONMENTAL POLICIES a) Problems	Oil contaminated process condensate is pumped to a pit in the desert where oil is periodically skimmed off for reclaiming and the residual water is allowed to evaporate. This is, at best, a messy and untidy procedure and, at worst, is a source of air pollution from the release of H_2S and any other foul smelling compounds. (7) The geographical and climatic characteristics lead to frequent atmospheric temperatures inversions, with important consequences for the disposal of air pollutants. Sunny and clear skies, particularly in desert areas, favour the formation of fairly strong convection currents and vertical diffusion during daytime while they enhance the development of stable nocturnal atmospheres with frequent formation of surface temperature inversions. These conditions are observed in Kuwait where the sky is clear for almost 9 days out of 10 throughout the year. (3) It is seen that surface temperature inversions, on the average, occur in about 84% of the nights of the year. In 80% of the cases, the top of the inversion layer is not more than 300 meters above ground level and in 17% it is 600 m. (3) Fortunately, these temperature inversions do not persist during day time, occuring in only 2% of the days of the year. (3) It has been noticed that annual precipition is increasing, which is accounted for by the recent introduction of high concentrations of condensation nuclei into the atmosphere. These additional nuclei are mostly smoke, fume and gaseous contaminants from industrial activities and vehicle exhausts. The number of rainy days and the amount of rainfall during the year 1972 was almost double that for the year 1971. This resulted in doubling the number of fine clear days in 1972,

2	COUNTRY: KUWAIT
ENVIRONMENTAL POLICIES a) Problems	due to cleansing effect of rain and in cutting down the number of days with dust hase to about 2/3, the days with suspended dust or sand to about 3/5, and the days with dust and/or sand-storm to about 1/3 of those for 1971. The consequent increase in humidity with the continuous discharge of condensation unclei into the atmosphere, resulted in increasing the number of days with mist to thrice and the foggy days to twice as much as that of 1971. (3) Water: Kuwait is totally lacking in permanent surface water, and it does not have any river and has only limited supplies of under-ground water of variable quality mostly brackish. Its annual rainfall ranges between 25 and 175mm. It has therefore turned to desalinization of sea water as the basis for its water supply, and thus the quality of sea water has become a factor of vital importance to Kuwait. Seas: The principle source of marine pollution arising from the land is industrial effluents, especially at the Shuaiba Industrial Area, and partly from activities taking place out-side of Kuwait, in particular, maritime activity in the Gulf. There is also an ever-present threat of pollution from shipping within Kuwait waters; especially from the de-ballasting of tankers and the loading of oil and refined petroleum products. (8) Marine pollution is an outstanding environmental problem, changing coastal recreation areas and adversely affecting the fishing industry, which supplies the local market and supports 3 companies specializing in shrimp fishing for export. Liquid ammonia turned into the Arabian Gulf by the Kuwait Chemical Fertilizer Company reaches high concent-rations at least twice a year killing millions of fish. (9)

2	COUNTRY: KUWAIT
ENVIRONMENTAL POLICIES a) Problems	Soil: Kuwait's soil is qualified by having Sandy and Loamy sand characteristics, where the percentage of sand reaches sometimes 90%. The soil is lacking organic materials and basic nutrients such as nitrogen, phosphorous and potassium. The absorbative capacity is very low. Kuwait's soil ranges between sandy in general to gypsic, to local clay or the combination of the three. Some soils are characterized by being sedimentary in origin, and others by being recently formed. These natural characteristics of the soil together with the aspects of desertification; promoted the loosing of the vegetative cover of the country. Soils of Kuwait are also facing salinity problems due to 1) the usage of water, with high percentage of salinity, in the irrigation procedure where some of the lands, even before their cultivation, had salinity, and 2) since the land naturally low-lying, relatively to the sea surface, the underground sea water by capilary action reaches the surface of the soil and, after evaporation, leaves the solid salt on the surface of the soil. "The Gatch" These are layers of Silica and Carbonate of calcium with less amounts of oxide. These are spread in the majority of Kuwait's soil. It is a layer which forbids the percolation of extra water and rain water, so the water is evaporated from the soil surface leaving its disolved salt behind which is formed a white cover in many of Kuwait's region. Also because the soil contains a big quantity of carbonate of calcium, the PH level of the soil is increased, which in its turn, reduces the quantity of iron and manganese in the soil which weaknes the plants and makes their leaves yellow which is a sign of disease. (32)

2	COUNTRY: KUWAIT
ENVIRONMENTAL POLICIES a) Problems	Although no comprehensive soil survey has yet been carried out, a reconnaissance survey was undertaken in 1966, and some 17,000 hectares were studied in detail. In general, it can be said that good soils with a high crop production capacity, which are located in proximity to actual or potential sources of suitable water, are a scarce resources. They should, therefore, be identified and reserved for agricultural use. It is understood that some potentially productive soils have already been swallowed up by urban development. (8) But the pollution of soils by chemicals does not appear to be an actual or potential problem for Kuwait as comparatively small amounts of chemical pesticides and fertilizers are used. So in general the soil condition is basically poor and desert land is not conductive to many types of flora. (10) Flora and Fauna: The terrestrial flora and fauna of Kuwait is still not well-known, but at present there are no known unique or significantly endangered species which warrant special conservation measures. It has an endemic flora and fauna, which at present is almost totally neglected, and warrants further study, and a measure of protection for various purpose. Marine fauna and flora is also not well known, it does, however, form a not unimportant food resources for Kuwait, and requires conservation, management and protection of the marine environment. (8) The vegetation cover of Kuwait is diversified but it is sparse. The vegetation cover and natural range contain six principal types of desert vegetation, the follows: a. Zygophyllum Coccineum: Usually found in salty areas, also found in Boulian island and regions next to the sea shore and in some parts of Filka island; b. Banicum Purgidum: Found on sandy shore, south of Kuwait city and on the Kuwait's border with Saudi Arabia.

2	COUNTRY: KUWAIT
ENVIRONMENTAL POLICIES a) Problems.	c. Cyperus conglomeratus: obvious indicator of the existance of good soil. d. Phanperum Epapposum. e. Haboseylum Salicornicum. f. Anabasis articulata and anabasis setisera. (32) Range Lands: Desertification: The factors causing desertification in Kuwait are as follows: 1. Ranges and Uprooting of Desert Vegetation: Nomadism used to be one of Kuwait's characteristics. The tribes used to roam over the land in search of water and range. Their uprooting activities made some of the vegetation disappear as for example the Cyanomorium Coccinum which used to be cut to be utilized as a medicine for kidney. The Phanterium Epapposium, was used as a fuel material before the appearance of oil. Terferia Sp., a meal with high percentage of protein, disappeared due to the lack of rain and the circulation of cars in the desert region. 2. Ranging and Collecting Stones: The phenomenon of ranging continued to the limit that ranges were going to loose their importance in production. Another phenomenon used to take place; collecting stones from the soil surface to be used commercially for building and constructing matters, while stones work as natural wind breaker and erosion stabilizers, which had led to a quick uncover around sand dunes that intensified the process of desertification aided by hard climatic conditions.

2	COUNTRY: KUWAIT
ENVIRONMENTAL POLICIES. a) Problems	3. Uses of Water with High Salinity and Frequent Irrigation: Kuwait agricultural land is very limited. Water used for its irrigation contains high percentage of salinity. Also whenever farmers used to encounter some difficulties in the agricultural production, they used to irrigate more with this same saline water, thus the soil was salinized and the farmers were forced to abandon them and shift to other plots to practice the same process. 4. Oil and Industry: The discovery of oil in addition to its advantages has had its disadvantages: Many of the workers in the agricultural field sector left to work in the oil fields, industry, trade, and commerce for their higher financial revenues. This lead Kuwait to import much of its needs, estimated as follows: 81% of the consumption of fresh vegetables; 100% of the consumption of canned vegetables; 45% of the consumption of poultry; 100% of the consumption of red meat; 90% of the consumption of dairy products; 70% of the consumption of green fodder; 100% of the consumption of dry fodder; 98% of the consumption of fruits; 100% of the consumption of industrialized fish. (32) Pollutants of soil from oil, garbage, wastes, fertilizers and pesticides causes soil erosion and therfore expansion of desert due to sand movement. (11) Natural Disasters: Sand storms arising in the almost featureless desert area beyond 10 Km wide coastal strip around Kuwait Bay, occur through out the year once or twice weekly from March to September.

2	COUNTRY: KUWAIT
ENVIRONMENTAL POLICIES: a) Problems.	Urban Growth and Environmental Problems: Kuwait is essentially a city state. Most of the population resides in the coastal belt in the immediate vicinty of Kuwait city proper. The concentration of the population in a few urban centers, combined with the design of the cities and towns, has lead to a very high level of motor car ownership and use, which has profound environmental consequences, and to a large extent already constitute a single urban system, and are all located within 10 Kilometers of the coast. A singnificant social characteristic of Kuwait is the fact that over 50% of the population are foreigners, without citizenship rights, and at present, little chance of obtaining them. However, it is understood that this problem is presently under serious study by the Government. Non-Kuwaitis may not own land, consequently they depend upon rented accomodation which is available only in certain areas. This has lead to marked disparities in population densities in the Kuwait metrepolitan area. Another feature of the population is the very large per cent of children. The impact of demand for housing during the next 20 years as this group enters the home establishment market will make very significant demands on land resources, with all the associated environmental consequences. There will also be additional demand created by further immigration but its size is difficult to forecast. (8) Noise: Noise pollution from motor car traffic the result of almost universal, and totally unnecessary use of horns, is another unpleasant environmental feature which could, and should be controlled. (8)

2	COUNTRY: KUWAIT
ENVIRONMENTAL POLICIES. b) Policy Status: i) an overall policy for environment; ii) in relation to development planning; iii) concerning major resource areas:Land use, natural range, agriculture, fisheries, energy etc.... iv) on area development: Human settlements, rural development, river basins, watershed management; v) on science policy for environmental management.	b) Policy Status: i) The Government of Kuwait is actively taking the appropriate measures to avoid the deterioration of the environment resulting from rapid industrialization and urbanization. The Second Five Year Plan (1975/76 - 1976/80) had environmental dimension where each economic and social sectoral plan included a substantial environment component. For this purpose a draft law for the establishment of a Central Environmental Agency has been developed. Kuwait sees the need of establishment of international monitoring systems, establishment of international environmental standards - regional cooperation to prevent the spread of contaminents - establishment of a permanent institution to deal with the environment. (10) ii) Brief Statement on the Objective of the Development Plan Until 1946, the Kuwait economy was based mainly on transit trade, boat building and pearling. Oil was discovered in the late 1930's and export started in 1946. Oil production increased after 1951, and in 1972/73 the income from this sector had reached a level of KD 507 million. Due to recent increases in the price of oil, Government revenues are expected to increase steadily . In the 1950's the Government invested a major share of the income in the economic and social development. Following the establishment of the State Planning Broad in 1962, the first Five-Year Development Plan was prepared for the period 1967/68 - 1971/72. This Plan placed heavy emphasis on the development of physical infrastructure (housing, transportation, communication, water and power supply, etc) , as well as on expansion and improvement of education, health and social services. During the period of the plan, initial steps were also taken to encourage the development of manufacturing industry and agriculture.

2	COUNTRY: KUWAIT
ENVIRONMENTAL POLICIES: b) Policy Status: ii) in relation to development planning.	As a direct result of the development oriented policies of the Government, a modern and comprehensive socio-economic infrastructure has replaced the old subsistence economy. The Government has in fact been ploughing back natural resources, i.e. oil revenues into the economy, with the overall objectives of the following: a) A modern administrative system; b) a viable population base; c) a welfare state with a full-fledged system of social services, and supporting physical infrastructure. In sum, the first phase of development in Kuwait has concentrated on all the major prerequisites for an industrial and economic diversification take-off. At present, the Kuwait economy and society have characteristics both of a developed country and of a developing country. In terms of per capita income, Kuwait r. .ks among the rich countries in the world. In "substantive" terms, however, Kuwait displays several of the characteristics of a developing country such as an over-whelming dependence of the economy on a single industry (oil), a shortage of trained technical and managerial manpower, a relatively low productivity of labour, and almost complete dependence on imports for the supply of consumer and capital goods, etc. The rapid growth of the Kuwait economy and the quick expansion of social services in the past two decades has created a shortage of trained and experienced technical, managerial and professional manpower. To a considerable extent, this need for manpower is being met by the influx of large number of immigrants from neighbouring countries. - Social services: In general, the objectives of the new Five-Year Plan 1975/76 - 1979/80 are geared ultimately to the long term strategy of the country's social policy - the continuation of the welfare state; to ensure an increase in production accompanied by an increase in standard of living and income; to ensure an

2	COUNTRY: KUWAIT
ENVIRONMENTAL POLICIES. b) Policy Status: ii) in relation to development planning.	adequate level of social and economic welfare for the Kuwaiti citizen and at the same time, give adequate attention to the social and economic security of expatriates within the frame of the country's capacity for the absorption of immigrants.(1) The Government seeks to improve the standard of living of all inhabitants and believes that every Kuwaiti has the right to enjoy the benefits of wealth after a group history of previous hardship. No taxes are imposed on land distribution. Education, health and welfare services are free. (2) Human Resource Development: The development and training of skilled manpower constituted one of the main objectives of the First Five-Year Development Plan, and has received major emphasis in the Second Five-Year Development Plan too. (1)
iii) concerning major resource areas; Land-use, natural range, agriculture, forestry, water, minerals, fisheries, energy etc...	iii) Concerning water, Kuwait is situated in one of the great arid regions of the world, but the Government is providing funds to search for new natural water sources. This might realize the hope of old finds and finance agricultural industry on what is still desert land beyond the urban boundaries. (13) The Second Five - Year Plan envisages a substantial increase in Kuwait's capacity to produce food, and important experimental studies on improved agricultural techniques by the Department of Agriculture. However, the total area of land which is likely to be used for intensive crop production (both plant and animal) will remain small because of climatic constraints, and thus there should be little or no conflict with other land-use objectives. (8) At the heart of the agricultural project is the government's experimental farm. There, scientific methods are researched to produce fruit and vegetables. (13)

2	COUNTRY: KUWAIT
ENVIRONMENTAL POLICIES: b) Policy Status: iv) on area development: Human settlements, rural development, river basins, watershed management.	iv) On area development: Kuwait municipality wants to stop more construction in Kuwait city until 2000. The municipality, called for the city's population to be restricted to 140,000 - 170,000. The municipality policy aims at curbing immigration and developing secondary centres outside Kuwait city. (14) - The national Physical Plan and Master Plan for urban areas, based on the studies of Colin Bachana and Parteners contains proposals for land to be reserved for parks and nature reserves. It is understood that the municipality intends to implement most, if not all, of these proposals. Health Services Sector The main objectives of the Second Five-Year Development Plan were as follows:- 1) To decrease the mortality rate - especially infant mortality. 2) To decrease the rates of contagious diseases. 3) To make available necessary number of doctors to meet the responsibilities resulting from the improvement of medical services. 4) To make available a nursing staff in quality and quantity. 5) To make available the assisting medical staff which fits the actual needs to ensure the assisting services in hospitals and medical units. 6) To take care of the training courses for the staff working in the Health Services sector. 7) To make available the medical and hygienic services for the staff on all basic levels taking into consideration the population intensity and geographical distribution.

2	COUNTRY: KUWAIT
ENVIRONMENTAL POLICIES: b) Policy Status: iv) on area development	8) To make available the medical fitness services to enable the person to be an effective citizen. 9) To increase the medical establishments and its geographical distribution to fit the population intensity. (10)

3	COUNTRY: KUWAIT
IMPLEMENTATION STATUS a) Legislation b) Administrative structure c) Enforcement of Laws.	a) Legislation: - Pollution of territorial marine waters by ships is strictly controlled under the provisions of the Law regarding Prevention of Pollution of Navigable Water by Oil, which is enforced by Ministry of Communications. (8),(9) - Decree 1964, Prohibits oil discharge in territorial waters extending 50 miles from land and in the internal waters of Kuwait Bay. Fines and charges for clear-up of oil spills can be imposed on polluters. (15) - A proposed Kuwait environmental act: Kuwait has no standards or legislation concerning contamination. Proposed measures for national level action are outlined. Means for international collaboration are also suggested. (5) A law concerning the Conservation of Petroleum Resources, was passed in 1973, The Explanatory Memorandum to which proclaims the right of the State "to take whatever measures are necessary and proper to ensure conservation of its natural resources and their sound economic exploitation". - A law covering the dumping of refuse is being drafted. Rules that govern the safe use of pesticides including registration, storage, application, and treatment of poisoning are in effect. (12) - There appears to be no legislation giving permanent protection to parks and natural reserves, nor does there appear to be any of government with the capacity of skill to manage and protect such areas. (8)

3	COUNTRY: KUWAIT
IMPLEMENTATION STATUS b) Administrative Structure	b) Administrative structure: A department of Environmental Planning was established in June 1971 as one of the main Departments in the Planning Board. The Department had undertaken studies, analysis, and collection of statistical data covering the architectural, social, technological and recreational development with respect to the environmental protection for the State of Kuwait. The Council of Ministers in its meeting of 1st April, 1973, decided to establish an Inter-Ministerial Committee under the chairmanship of Ministry of Public Health to coordinate the activities related to the environment. This Committee met several time and concluded in recommending the establishment of an Environment Agency. As of 1978, the Governmental Institutions concerned with Environmental Protection, are as follows: A. The Ministry of Planning: The functions and duties of the Ministry of Planning include performance of the environmental planning processes, as follows: - To propose and follow up the general policies of environmental protection, and evaluation and coordination of the activities of the executive departments concerned with the implementation of these policies. - To study the proposed development projects, either suggested by Governmental Departments or by joint sector, to evaluate them from the economical, social and environmental view point, to follow up their implementation and to coordinate activities of the concerned Governmental Departments. - To follow up study the Master Plan and the development of its projects - so as to correspond with the development plans-through coordination with the concerned Departments. - To conduct researches and sudies necessary for the description and analysis of economical, social and environmental phenomena.

3	COUNTRY: KUWAIT
IMPLEMENTATION STATUS: b) Administrative Structure	B. The General Department of Technical Cooperation in the Ministry of Planning. a) Prepares for regional and international meetings and conferences concerned with environmental affairs, to be held in Kuwait, and coordinates with the concerned bodies. b) Functions as the Secretariat of the High Committee of Environmental Protection, and its sub-committees, together with relevant technical and coordination affairs. c) Prepares information regarding environment required by other countries, international organizations and specialized agencies. d) Prepares studies in various fields of environment, necessary for the Environmental Planning Process. e) Conducts multiple studies aimed basically at defining the necessary procedures for the stimulation of the technical cooperation between Kuwait and other countries on regional, Arab and international levels in the field of environmental protection. C. The Ministry of Public Health. Many departments within this Ministry cooperate in the field of environmental protection. The most important are: a) The Preventive Health Department b) The Occupational Health and Industrial Pollution Combating Department c) Department of Radiation Preventation. D. The Kuwait Municipality. The Departments related directly to Environmental Protection Affairs are: a) The General Department of Organization and Planning b) The General Department of Food and Shops Licensure c) The General Department of Cleaning of Roads d) The Fire Department.

3	COUNTRY: KUWAIT
IMPLEMENTATION STATUS: b) Administrative structure	E. The Shuaiba Area Authority For many years the Shuaiba Area Authority has played a positive and effective role to maintain the balance between the development of industry and the protection of the area's environment. The most closely related Department is that of Development and Planning. F. The Kuwait Institute for Sciencitific Research G. Oil and Industrial Installations. H. Ministry of Communications J. Ministry of Oil K. Ministry of Electricity and Water L. Ministry of Commerce and Industry M. Kuwait University N. The Environment Protection Society O. The High Committee for Environmental Protection Formed in April 1976. This Committee comes under the Council of Ministers and is headed by the Minister of Public Health. It aims at laying a distinctive policy to protect the environment and combating causes and sources of pollution. It also aims at unifying efforts made by other executive organs in order to avoid repetition. (19) The ministry of Electricity and Water (M.E.W.) with its power plants and water distillation plants at Shuaiba North and Shuaiba South sites, is the Authority most immediately concerned with both water and air pollution in the Shuaiba Area. (7)
c) Enforcement of laws	c) Enforcement of laws: No information available .

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION a) Human settlements and environmental health. b) Dry farming agriculture, irrigated agriculture, forestry, range management, combating desertification. c) Resource Status: i) Agriculture- soils, forests, range, water, crops, reserves, animal husbandary; ii) Fisheries-inland water, coastal zones, oceans, reserves; iii) Industry and shipping; iv) Labour force; d) Environment and Development: i) Environmental management ii) Environmental law; iii) ES & AT; iv) Industry and environment v) Oceans; vi) Energy. e) Socio-economic Problems. f) Supporting Measures: i) Earthwatch (IRS, INFOTERRA, IRPTC) ii) Environmental education and training, public information; iii) Research activities concerning natural resource management and environmental protection.	a) Human settlements and environmental health: Like other Arab Emirates, Kuwait has long been a paternalistic autocracy, but in recent years, particularly since the advent of oil income, englightened changes have taken place. Formerly, ownership of land was confined to the Emir and the ruling family, but when oil began to be produced in quantity, it became apparent that a scheme to distribute the new-found wealth was needed. A land reform programme was undertaken, and Kuwaiti citizens were permitted to purchase plots of land at a low figure, relating them for their own purposes or re-selling them to the government later at a higher price. At that time, the government had not begun to provide housing, and all dwellings were constructed as private ventures. The original mud structure disappeared rapidly, with few remaining to-day. There was a flurry of "villa" construction by private parties - large houses with an average of 10 rooms to accomodate the family styles of affluent citizen-owners . Ultimately, the government abandoned this method of land distribution and undertook its own housing programme. Today, many of the villas have been subdivided into apartment units to provide rental accomodations for both citizens and noncitizens. Some Housing development is provided by the private sector in Kuwait, usually in blocks of 200 units or fewer and available for rent or purchase. The Kuwaiti government entered the housing production field in the first half of seventies with a middle-income housing development consisting of 4,000 units. This effort was a near disaster because of a lack of coordination among the authorities responsible for various segments of the project. (16) Despite planned development of city of Kuwait, Shanty settlement fringe the urbanized zones. Over 1/4 of the population lived in shanty-town settlements in 1975. (2)

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION a) Human settlements and environmental health.	Part of the old town was built to accommodate part of the foreign communities after demolishing a number of the old houses. The old houses in other parts were then taken over by lower income groups of Kuwaiti and non-Kuwaiti communities. The occupancy rate increased in these old houses and caused the natural ills of slums. The Kuwaiti Government then constructed a large number of dwellings outside the old town and sold them on very favourable terms to the Kuwaitis with relatively low incomes. The first houses of this type were built in 1953. The number of the old traditional houses estimated in the long term strategy amounts to 4,000 units in the old town and 3,000 units in the surrounding residential areas, which were isolated villages outside the old town. (17) The geographical distribution of the population: Kuwait, as a whole, is a thinly populated country. The ratio of man to land (density of population) is approximately 52 people to every square kilometer, if we assume that the population is evenly distributed throughout the country. But this assumption does not exist, since most of the population is concentrated in a small area of the nation. The inhabited sections are about 160 square kilometers, or 1.25% of the country's total area. The density of the inhabited area is about 5,459 persons per square kilometer, unevenly distributed. According to the 1970 census, about 30% of the nation's population lived in the capital Governorate, 37% of this ratio live in Kuwait's old city, while the remainder are situated in the suburbs, neighbouhoods and villages of the capital governorate. The built-up area (The Greater Kuwait) which includes the old city, with its accompanying neighbourhoods and suburbs on the one hand and Hawalli and Salmiyah towns with their surrounding suburbs on the other hand, altogether have 436,245 people or about 59.5% of the country's population.

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION a) Human settlements and environmental health.	About six kilometres to the south west of Kuwait city, lies the second urban concentration, but it is relatively less populated than the built-up area. The core of this concentration includes the villages of Farwaniyah and Abrag-Khitan, with small satellite connected or semi connected settlements. this area has 158,617 people or about 21.5% of the State's population. The third area of human concentration is al-Ahmadi-Fahaheel, with a population of 51,041 or about 7% of the country's population. Finally, there are tiny settlements with widely ranging densities, i.e., al-Jahra (24001) and Salwa and Messela (1,573).(figures present the status of 1976) The population concentration in Kuwait city and its environs essentially manifests the uneven distribution of the population as a whole in the country. This uneveness obviously results from an imbalance in economic opportunities. Most of the country's employment opportuinities are concentrated in the Governments Departments, located primarily in Kuwait city. The fast rate of urbanisation in the country should, however, be attributed to a set of special circumstances, such as a fast developing economy as a result of the discovery of oil which has resulted in better opportunities for employment and hence a high immigration of labour force from Arab and foreign countries. It is worth nothing that about 91% of the country's population live near the Gulf coast. The towns, villages and settlement take a linear development shape, extending from Doha in the north to Shuaiba in the south. Even the inland villages and settlements are not located far from th coast at a ten kilometre maximum. This coastal growth attributes its development was resourceless, vegetation was sparse and the most potential life source was the sea, and as a result the location and site of previous Kuwait settlements inhanitants concentrated along the sea coast. (10)

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION a) Human settlements and environmental health.	Building materials. Early housing construction(pre-world war II) had depended on indigenous materials, i.e. sun dried mud pallets or lumps of coral rock taken from the shore. The mud used to construct the old town (partof the encircling wall is still preserved), a non-plastic silt found in shallow deposits at Shuwaïkh and Ras Salmijab is now beyond exploitation because the areas in question have given way to extensive urban development. With the disappearance of mud construction, the old art of making thermally efficient buildings deteriorated. The use of mud was associated with backwardness. A changing life style called for "modern" materials. A growing disposable income encouraged use of manufactured elements. The sand lime bricks and the sand cement bricks rapidly replaced mud pallets, and the wider use of air conditioning did not call for thermally protective wallings. Gravel for ballast in concrete work is likely pose a future problem. The few types of rock suitable for the work are nearly depleted. Authoritative estimates place the amounts required will have to be imported from the neighbouring countriés . A likely place is Iran. Spalling of Plaster from masonary is also a major problem. This is due partly to: a) Unequal strength of plaster and wall; b) Rapid cooling and dehydration of plaster in the intense summer heat, relative to wall; c) High sulphate content in sands. There are no clay having ceramic properties. There is no timber or straw and no sand pure enough for glass making. (5)

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION a) Human settlements and environmental health	Utilizing of Local Building Material The main sources of the raw materials for the local building industry are:- (1) The Ahmadi lime stones quarry. (2) The supply of sand, limestone and oolite sand at Ras Ashirij and Jezerat-Namil, used in the manufacture of bricks at the Sand-Lime Brick factory. (3) Other local supplies of sand and gravel. Local sand and gravel is also greatly used by the Kuwait Prefabricated units. These are supplied from the sand pits in Jahra and Farwaniya near the airport. This supply is also used by the Cement Products Factory which produces cement blocks, circular pipes and ready-mixed concrete. Gatch and clay may be very important in the future. These deposits are known to exist adjacent to the Basra Road north of the Zor Ridge and possibly extending south. (10) Kuwait Institute for Scientific Research (KISR) with its Building Materials Centre is a leading institution in the human settlements technology. (5) Water in Human Settlement: Kuwait has installed what is believed to be the world's largest desalination system capable of producing 270 m litres of fresh water/day. The daily production is distributed as follows: - Industrial use 27 million litres/day. (m-l/d) - Building and other non personal use 23 m-l/d. - Household consumption 177 m-l/d. Assuming that 10 per cent of the household consumption is used for non-personal use, the per capita consumption is roughly 160 l/c/d.

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION a) Human settlements and environmental health	Desalination is an energy intensive way of providing water. The multi-stage flush distillation system that is used in Kuwait requires 1 billion BTU/day for every 4.5 million litres of fresh water produced. The total daily average consumption of energy is in the order of 60 billion BTU. An abundant and reasonable priced source of energy is therefore a prerequisite. Fortunately, Kuwait is amply supplied with energy. The technology for using renewable sources of energy for such a large amount of distilled water does not exist. Present knowledge limits solar desalination plants to maximum daily out of 45,000 litres. (5) Water demand projection for the year 2000 are estimated as follows: Municipal: 68 U.S. gallons per capita per day Industrial: 540 U.S. gallons per capita per day Agricultural: 123 U.S. gallons per capita per day. (20) In the last few years, however, the government has moved to conserve its fresh water by: (a) greatly increasing the production of desalinized sea water and by; (b) constructing a parallel water distribution system that permits brackish groundwater to be used for many non-potable purposes. As a result of these measures, extractions of fresh groundwater in the northern well fields declined from 700 Mcm in 1970 to 264 in 1974 and the "useful life" of the reserve has been greatly extended. Even though the overdrafts has been notably reduced, the fresh-water reservoir continues to be mined. (19) New developments: In November 1977, the Ministry of Electricity and Water has developed a project of importing 500 million gallons of water to be piped daily to Kuwait from Iraq. The Ministry of Water and Electicity has installed 23 water filling stations where a fleet of privately owned tankers fill up for distribution to homes without connections.

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION. a) Human settlements and environmental health	Special underground or above ground water reservoirs are found in all residential areas. These reservoirs are extended with pipes and connected to the desalination plants and a distribution network has been established to distribute the water from the reservoirs to the different houses and buildings. (10) In spite of the large proportion (72 per cent) of the water delivered through house connections, it is believed that the actual percentage of people served is much less, being in the neighbourhood of only 40 per cent. This is because: a) More water per capita is consumed through house connections; b) In areas where house connection predominates the density of population is much lower. (5) Waste management in human settlement Liquid wastes: Unconfirmed reports suggest that 15% of the Central business distinct and an equal number of the high income residential areas are sewered. But in the absence of any treatment plant the raw effluent is discharged in the Gulf at the rate of 36 m.l./d. The rest of the areas depend on individual septic tanks, periodically emptied by trucks for disposal in the Gulf. Sewage and waste pollution of the sea from urban is a diminishing problem. The Sewerage Department of the Ministry of Public Works was constructing a system which will, in the near future, result in the connection of the greater part of the Kuwait Metropolitan Area to mains leading to a secondary treatment plant, from where the effluent will be supplied to agricultural areas for irrigation.

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION a) Human settlements and environmental health	In 1976 as much as 60% of waste and sewage was discharged to the sea, but it was expected that almost 100% would have gone to treatment by 1977. (8) Plans are underway to sewer the rest of the remaining residential areas and a treatment plant is under design to handle a daily affluent of 245 ml. A reasonable efficient collection system is in effect in Kuwait city proper. In the outlaying areas, the system of collection is less effective . Solid Waste : At present is disposed either in the Gulf or is dumped and burnt in open lots at the outskirts of the Town. No plans are in hand for longer term solutions. (8) Energy for Human Settlements: The main source of domestic power is electricity, used for lighting, cooking and cooling. As already mentioned, the intense summer heat has encouraged the use of air conditioning units. In the absence of proper insulation, a lot of the cooling load is dissipated. Of a total of 3600 kwh per capita domestic consumption (1976), as much as 2400 Kwh per capita per year is utilized for air conditioning (66% of installed capacity). A major concern, therefore, in regard to energy consumption in human settlement deals with the thermal response of residential units. (5), (8) It is worth nothing that Kuwait has an ambitious programme for harnessing solar energy for domestic use, including cooling of houses.

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION a) Human settlements and environmental health	Transportation in human settlements: Available figures seem to indicate that Kuwait is one of the more intensively motorized countries, at the same level as some industrialized countries. There are approximately 200,000 passenger vehicles and 75,000 trucks. (5) Their number is increasing at the rate of 45,000 a year. More roads are being built and more buildings. In 1960 there were about 30,000 cars. Before that there were very few. (13) Although Kuwait has an excellent network of roads, the number of vehicles causes congestion, and traffic problems in centre areas is becoming severe. (5) A major recreation of Kuwait's population these days would appear to be a mild form of motor mania, with practically owning one or more vehicles. (13) The existing roads andparking areas are insufficient to the ever-increasing number of motor cars (representing more than one for every four persons), the intense peak-hour concentrations of traffic, combined with the heavy congestion in certain parts of the city and at some major intersections, poses an actual and potentially worse threat to Kuwait's environment than almost any other problem. (8) (2) No reliable figures were available as to the number of buses in operation but there are far fewer than the normative requirements set at 1 bus per 1000 inhabitants. In the case of Kuwait this should mean a fleet of 1000 buses. An unconfirmed report from the municipality suggest the existance of 250 buses. The situation is eased by the existance of taxies and collective vans, and a school bus system free for Kuwaiti citizens.(5)

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION a) Human settlements and environmental health	Human Settlements and Environmental Health As a result of the dry nature of the climate, with its low relative and absolute humidity, the absence of surface water and drainage and the desiccation of potential breeding places for mosquitos, flies and other disease vectors, infectious diseases are not a serious problem in Kuwait. Problems of health and hygiene and combating of poverty have been tackled by the Government since the start of the petroleum era. Conditions in Kuwait, while comparatively unfriendly to man, are even more so to his traditional enemies, be they microbes, insects or other pests. There is one important exception however: Kuwait has been overridden by rats since its early history and on many occasions bubonic plague had ravaged the population. This is a result of the sea ties that connect Kuwait with disease infested equatorial zones. It was thought that the piped sewage system would have provided the rat population with excellent opportunities for penetration and proliferation. This depends on the efficiency and care with the use of this system in some localities. Kuwait has maintained environmental defences against infectious diseases. This is exemplified by the comparatively low prevalence of typhoid fever and related waterborne bacterial diseases, non-veneral syphillis and relapsing fever and clinically active intestinal amoebiasis, in contrast with the viral diseases. Measles especially is a scourge and results in a high fatality rate amongst children in certain groups, 0 - 5. Influenza is also a common infection and is sometimes very severe as evidenced in the pandemic of 1957. More recently, the smallpox epidemic of 1967 provided a sharp reminder that the ambient conditions of Kuwait today are a ready stimulus to virus propagation and easily spread with the aid of air and dustborne transmissions. (10)

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACIVITIES AND SITUATION a) Human settlements and environmental health	Housing needs: The population of Kuwait will be 2 million by 1990-2000. It is growing at an annual rate of about 6 - 7%, creating a need for about 12,000 units annually. To this must be added the replacement of the aging housing, and the replacement of units by urban renewal projects. Although, no acurate statistics are available, it is estimated that an additional 12,000 units would be required for replacement, making a total annual need of 24,000 units. The National Housing Authority plans to construct 33,353 units through 14 different projects from 1977 through 1982, representing an annual production of about 6700 units. (5) The present coastal population of Kuwait is approximately 1.000.000 is growing at a rate of 3 per cent natural increase plus an estimated 2 per cent in-migration, or approximately 50,000 additional population annually. Moreover, the development plan indicates an expected increase in regional urban migration, to 3 per cent or more, which would result in a higher annual population increase of approximately 65,000. This would indicate a need of an annual addition of habitation land and facilities of 13 Km2. (19) The shanty towns seem to have been established a long time ago in small sized settlements on locations which were originally the sites of wells used by the nomadic bedouin. These settlements in fact represent a natural transitional stage from the nomadic life to urbanization. The reflection of the socio-economic structure of the inhabitants on the urban structure of their shanty towns should be fully examined in order to reach a reasonable formula for any future rehabilitation. From our experience in similar cases we found that the socio-economic development of such communities should accompany the urban development of their settlements. The first stage of the ambitious schemes which the Government has recently launched to re-house the bedouins in a total number of 15,000 dwellings should be taken as an experimental stage.

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION a) Human settlements and environmental health	Re-housing both Kuwaitis and non-Kuwaitis in such settlement is a disputable concept from both social and economic sides beside other moral or political problems. (17) Factors affecting the housing problem The development of the housing problem has been affected by the following three main factors: 1) A continuous change in the different socio-economic structures of the Kuwaiti and non-Kuwaiti communities living in the country: Each community has its own characteristics; population structure, income groups, rate of growth, way of life, rights, obligations, habits and values as determinate factors affecting their housing requirements at present and in the future. The determination of the size of the non-Kuwaiti community in relation to the local community is a question of policy derived from that of the long term socio-economic development programme to be drawn for the country. The housing policy could not be separated from the overall national development policy. 2) The difference in status of each of the Kuwaiti and non-Kuwaiti community, as explained before: This fact has its natural reflection of the urban pattern and the location of the different type of housing groups. The location of housing for each community drags the question of the local services required for the different types of housing groups. On the other hand the difference in rights and obligations of the two communities will be also reflected on the system of financing, design, construction and management. The social relationships between the two communities will be also reflected on the physical relationship pattern in plan.

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION6 a) Human settlements and environmental health	3) The changing housing requirements which affect the use and arrangement of space inside the housing unit: The continuous change of the housing requirements is not easily met by similar change in the size of the housing unit. This fact may not be a problem for the higher income groups who can afford a larger initial housing accommodation although it represents a higher initial cost. The problem is so imposing in the case of the lower income groups who cannot afford a larger initial housing accommodation. The problem is how to accommodate a changing family structure within the static structure of the housing unit. This may seem not be an acute problem in the case of industrial communities with a higher range of housing supply than demand where the family can easily get the suitable size of accommodation. In the developing communities this fact represents a basic problem for housing the low income groups. The main economic factor affecting any housing programme is to minimize the initial coast of construction. The growth in the family size, therefore, would be met by a similar growth in the housing unit - in either the vertical or horizontal sense. This constitutes a major case of study in the housing problem. 4) The variety in housing standards in relation to the different income groups: The housing problem does not only involve the provision of the number of housing units needed but also the provision of the complimentary housing services. The economic housing standards in this case are subject to the planning of the housing project which involves the same concept of organic growth of community in plan without losing its effeciency. (17)
b) Dry farming agriculture irrigated agriculture , forestry,range management, combating desertification.	b) Dry farming agriculture: Interest in forestry can be seen in the development and implementation of an afforestation programme. It was so successful that today more than half a million trees have been planted. (2)

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION c) Resource Status: i) Agriculture - soils. forests, range, water crops, reserves, animal husbandary.	c) Resource Status: i) Agriculture: Agriculture plays a minor role in the economy of the country. The total cultivated area in 1973 was estimated at 626 hectares, or 0.001 ha. of arable land percapita. (1), (2) According to one survey conducted in 1970, at least 17,000 hectares were considered suitable for agriculture provided water is available. Kuwait does not have any rivers, but there are some under-ground water resources which are mostly brackish. In recent years, there has been a noticeable increase in agricultural activity in the country, both in public sector and in the private sector. Agricultural population in 1960 was 5,000 while in 1970 it was 12,000. The share of agricultural population to that of total population in 1960 was 2% while in 1970 it was 1% indicating a drop of 1%. (22) During the 1970-72 period, vegetable production averaged about 18,000 tons per year, representing about 15 per cent of local consumption. The agricultural exports during 1971-73 has amounted to 23.3 million, and the imports 182,3 million. (21) For a long time there has been some traditional agriculture at Jahra. However, the area used for this purpose has been reduced, as land has been taken for urban uses. (3) The severity of the climatic conditions, the lack of naturally fertile soil and the shortage of water for irrigation purpose impose serious constraints on agricultural development. In order to circumvent these constraints, various research programmes have been undertaken in the past aiming at the introduction of advanced cultivation techniques. While some of these methods have proved to be technically successful, the cost of production has been high. (1) Showpiece of the farm is the hydroponicum where about 150,000 tomato seedlings were planted with potato and corn samples. Such flower varieties as gladioli, freesias and

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION c) Resource Status: i) Agriculture	irises were also grown in the chemical solution. Yields were far greater than with crops grown conventionally. The farm also has an aeroponics centre. Aeroponics uses the same principle as hydroponics by feeding the roots with a chemical-water solution, but instead of planting the seedings in a medium of gravel, sand, vermiculite, cotton, or sponge, they are anchored throughout the sectional length of a tall vertical pipe inside which the roots are fed by the chemical solution. (13) The primary purpose of project KUW/70/504 being undertaken in co-operation with UNDP is to investigate the possibility of adopting more economic production systems for growing vegetables in Kuwait. The activities of the project include the introduction of methods for the protection of crops against the adverse effects of the climate e.g. plastic tunnels, windbreaks, cooling systems, etc; investigation of suitable sowing dates to extend the growing season; introduction of new irrigation practices with a view to economizing the limited water resources; economic studies and evaluation of the results; training of local personnel; extension of the results to farmers; and exchange of information on project results with other countries in the region. (1) Water There are three sources of water in Kuwait, underground fresh water, underground brackish water and distilled sea water. Underground fresh water fields are located in the north of Kuwait at Raudhatain and Umm Al-Aish and produce two million gallons per day. Surveys are being carried out to discover further fields. The reserves of the present fields are estimated to last twenty years at the present rate of extraction. Apart from the smaller local wells, which are scattered over many parts of Kuwait, there are two major sources of underground brackish water; one of them is already in use,

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION c) Resource Status: i) Agriculture.	producing 20 to 22 million gallons per day, the other should be producing 40 to 50 million gallons per day. The reserves of the latter field suffice for 100 million gallons per day for about twenty years. (3) Kuwait has turned to desalinization of sea water as the basis for its water supply, and thus the quality of sea-water has become a factor of vital importance of Kuwait. (8) It has installed what is believed to be the world's largest desalination system capable of producing 270 million litres of fresh water per day. Shuaiba south plant produces 135 million litres/day. Shuaiba north produces 77 million litres/day. Both plants are located 30 Km south of the heart of Kuwait city. The third plant is located at Shuwaikh, at the edge of the industrial centre and the major port. This system along with the few brackish water wells deliver 265 million litres of water per day, which means that it is working at almost full capacity. Forestry The directory of forestry works on afforestation projects which cover a surface estimated at about 11,000 hectares. Reserves Animal wildlife does not appear to have any significant potential as a renewable economic resource in Kuwait. Although there is a "hunting season", it appears that most hunting takes place outside of Kuwait, or is confined to rabbits and other pest species. There appear to be no controls over hunting. It is encouraging to note that Kuwait has recently decided to become a State member of the International Union for the Conservation of Natural Resources (I.U.C.N.).

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION c) Resource Status: i) Agriculture	It is understood that some nine areas were identified as areas to be reserved for scientific reference located in different vegetation zones. They were under the management of the Department of Agriculture and were fenced, but lack of adequate laws to protect them and inability to provide reliable protection staff, led to their virtual destruction. There has been (1976) a proposal to set aside as a reserve some 16 square miles as a scientific nature reserve. (8) The creation of Ahmadi and more recently, walled gardens along the coastal strip, had a dramatic effect on wildlife. There was suddenly more cover for birds and more plants for insects, which were able to reproduce in greater number. The migrant birds began to break their journey in Kuwait rather than overflying. (13) Some 16 million is to be spent on beautifying Kuwait. The programme will include developing parks and beaches. (14). Programmes for beautifying Kuwait are carried out which include development of parks and beaches. Soil The pollution of soils by chemicals does not appear to be an actual or potential problem for Kuwait. Comparatively small amount of chemical pesticides and fertilizers are used in Kuwait, nor are there adjacent areas from which such pollution could arise. (8) Livestock production and poultry has increased in recent years. The livestock sector experiences various problems such as health and nutritional deficiences among animals. (1) The size of livestock during 1971-75 was: - Camels 6,000 heads - Sheep 95,000 heads - Goats 74,000 heads.

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION c) Resource Status: i) Agriculture	Crops Kuwait's winter is generally very agreeable, but occasional frosts can create problems for plant crop production. (8) The main agricultural crops are tomatoes, parsely, raddish, melon, clover and dates. The grand total of vegetable production in 1975/76 had amounted to 45,240 tons. During 1972-76, 653,6 tons of dates was produced. The total area under cultivation reached to 9,242 dunums (or 1,000 ha) in 1975/76. (9)
ii) Fisheries - inland water, coastal zones, oceans, reserves.	ii) Fisheries: Living marine resources, especially those suitable for exploitation for food, require further study, and carefull management. Because of the small size of Kuwait's territorial sea. The marine fauna surface is also not well known though again it is unlikely to be significantly different from that of the Arabian Gulf generally. - Fish Resources At present, there are two types of fishing which are being carried on - the local traditional fishing supplying only the home market and the industrial shrimp fishing which is directed towards the export market. - Sub-regional Fisheries Training Centre Located in Kuwait for four years duration, commenced in 1975 and provided commprehensice training in subjects required by fishing vessels masters, engine operations. This Centre cooperated with the FAO's Regional Fishery Programme.

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION c) Resource Status: iii) Industry, Shipping and Mining.	iii) Industry, Shipping and Mining: There are two main industrial areas in Kuwait: - the Shuwaikh industrial area for light industry; and Shuaiba industrial area for heavy industry. Light Industrial Areas. 1. Shuwaikh Industrial Area: This is the largest centre for light industry in the country. It is situated to the south of Kuwait main harbour and to the south-west of Kuwait city. It occupies an area of 1000 hectares. It is bordered on the east and south by residential areas and on the west by a hospital area. Hundreds of various sized services and light manufacturing industries are housed in this area as well as the following plants: - Sand-lime brick manufacturing; - Asbestos cement products; - Cement products; - Asphalt mix plant; - Lead-acid battery plant; - A big foundary; - Metal and woodworks; - Food industries including a big flour mill and flour products, non-alcoholic beverages, milk and milk product plants and animal food products; - Printing industries; - Garages, car repairs and mechanical workshops; - Slaughter house; - Cattle, chicken and sheep breeding farms; - Water desalination and power plant; - Salt, Chlorine and caustic soda plant; - Sewage treatment plant.

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION c) Resource Status: iii) Industry, shipping and mining.	The following industries are being installed in the same area: - Pre-stressed concrete products; - Synthetic detergent and sulphuric acid plants; - A new special asphalt mix for paving purposes. Other light industrial areas includes: 2. Al Ray Industrial Area: This is an area of some 195 hectares located south of Shuwaikh and the 4th Ring Road. It is still under development and is only occupied at present with storage facilities connected with the motor trade. 3. Ahmadi Industrial Area: This area has been developed to meet the needs of the town of Ahmadi and the oil industry. The types of light industry in this area are mainly construction and building materials as well as a large number of firms and motor vehicle repair and servicing garages. 4. Fahaheel Industrial Area: This is the 4th largest light industrial area and lies west of Fahaheel and is partly developed. Car servicing and repairs garages occupy the majority of the area. 5. Areas of Industry in Kuwait City: A number of light industries are found scattered throughout the city adjacent to the belt which has replaced what used to be the city wall in the Old City of Kuwait. The main industries found in the city are motor trade workshops, the tin manufacturing and market, food and drink trade, building materials and printing industry. (10) Heavy Industrial Area. - Shuaiba-Ahmadi Industrial Complex: This area which has a quite defferent character is situated on and near the Arabian Gulf shore, starting at about 25 km to the south of Kuwait City and extending about 25km along the coast. It is the heavy industrial area and includes;

4	COUNTRY: KUWAIT
ENVIRONMENTA: ACTIVITIES AND SITUATION c) Resource Status: iii) Industry, shipping and mining.	1. Oil industry including exploration, production. gathering, loading and refinery operations; 2. Manufacturing of various oil products; 3. Petrochemical industries including the production of chemical fertilizers, sulphuric acid, urea and ammonia. (3) The following industries operate in Shuaiba Industrial Area: Kuwait National Petroleum Company, Shuaiba Refinery: This refinery is unique as it is the first "All-Hydrogen" refinery to be built in the world. The designers of this refinery incorporated up-to-date methods to control air and water pollution and the only real criticism now is that the multiplicity of low stacks would not be acceptable in Europe. The authorities would nowadays insist on adopting not more than three stacks of considerably greater height. Unfortunately, problems have arisen during the operation the refinery and, so far, it has not been possible to operate the ammonia stripper with any degree of sucess. Some of the ammonia is disposed of through the flare stacks where it is burned to oxides of nitrogen and the remainder, quoted as "about 2 tons/day" is bled into the effluent water system, and hence to the sea. (7) Kuwait Oil Company, Mena Al-Ahmadi Refinery: Lies approximately 3.5 kilometers to the north of Shuaiba Industrial Area. This refinery is the oldest in Kuwait, the No. 1 distillation unit having been commissioned late in 1949 . This unit is not now in regular service, but is kept in a state of readiness against unforeseen demands. (7)

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION. c) Resource Status: iii) Industry, shipping and mining.	Kuwait Chemical Fertilizer Company: This comprises 4 units: - Ammonia Plant 400 Tons/day - Urea Plant 550 Tons/day - Sulphiric Acid Plant 400 Tons/day - Ammonium Sulphate Plant 500 Tons/day. K.C.F.C. began production in 1967. Direct sea water cooling was adopted contrast with P.I.C. and K.N.P.C. which use distilled water, which is then cooled with sea water and passed over a cooling tower. Due to problems of corrosion, Sakaphen lined tubes were used in the coolers. These tubes are now reaching the end of their lives and when they fail ammonia leaks into the cooling medium, i.e. sea water, due to the nature of the leakage, and as there is no retention pond in the system, the polluted water goes straight into the sea. Appreciate quantities of urea and ammonium sulphate find their way into the drains. On the air pollution side, records indicate that the acid plant regularly exceeds reasonable levels of concentration of SO_2. (7) P.I.C.'s Fertilizer Plant: These plants are modern, having been commissioned in 1971. In general, the ammonia record in the effluent water is to a reasonable standard. The most obvious source of pollution is dust from the Prill Tower.

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION. c) Resource Status: iii) Industry, shipping and mining.	As the tower is designed to handle a third train, it is obvious that too much air is being used and in consequence, with the high air velocity, more dust than normal is being entrained. Another obvious pollutant was ammonia due to leakage from the high pressure plunder pumps, and the aqueous ammonia pumps. PIC are aware of the causes of these. On the H.P. pumps the piston rods are not properly plated and mechanical seals have not been installed on the aqueous ammonia pumps. The use of a ground level flare inside the PIC plant boundary seems to be a dangerous practice. (7) Cement Factory: From visual observations there appeared to be no dust emissions from the plant while working, but as cement dust has been reported on insulators in the power station switchyards, some dust must come from the factory. Most probably, this emanates from the stockyards in times of high winds, Its capacity will be increased from present 1 million tons/year to 1.4 million tons/year. (7) Ministry of Electricity and Water. Shuaiba North and South Power Stations: Owing to the largest amount of fuel gas burned, there is a large emission of sulphur dioxide from both these stations. A report dated September 1969 indicates this figure for Shuaiba North to be 33,676 tons/year or 33% of the total emissions in Kuwait. This figure is open to doubt, as Shuwaikh Power Station, of approximately the same size, emits only 5,090 tons/year. Nevertheless, both Shuaiba Power Stations together must contribute fairly high proportion of the total emission in the Shuaiba Area. (7)

4	COUNTRY : KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION. c) Resource Status: iii) Industry.	Aminoil, Mona Abdulla Refinery: Lies approximately 1 km. south of the Shuaiba Industrial Area. It is basically a very simple refinery producing naphtha and fuel oils for export. Its plant capacities are: 144,000 bl/day of crude; 125,000 bl/day vaccum feed preparation unit; 315 Tons/day sulphur recovery; Plus fuel gas desulphurization. In theory, the fuel gas used for firing all the refinery heaters has been desulphurized, so that SO_2 emissions to the atmosphere are so small as to be negligible. Unfortunately, the sulphur recovery plant has been shut down for a number of months owing to mechanical failure resulting from a strike of their operating staff. As a result, all the sulphur which would normally be recovered has had to be burned and disposed of as SO_2 to the atmosphere; i.e., daily emissions have been of the order of 630 tons of SO_2. (7) A policy of rapid industrialization has made further calls on the oil industry for fuel. The policy has been to develop industries which have a good domestic market and those which depend on petroleum as their source of raw material. Thus the Kuwait National Industries Company makes sand-lined bricks, asbestos pipes and sheets and cement bricks which meet the needs of the State. The Kuwait Flour Mills Company provides all the country's needs of flour, bread, biscuits, macaroni and spaghetti. The Government's aim to diversify industrial projects led to the creation of the Shuaiba Area Authority in 1964. This

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION c) Resource Status: iii) Industry, shipping	extensive complex of ten large enterprises, supplies industries with their requirements of electricity and distilled water and produces a variety of products for domestic needs and export. One of the major industries there, the United Fisheries of Kuwait, occupies an area of nearly 10,000 square meters with a harbour for its fleet of more than 150 vessels. The commercial harbour and oil pier are being extended to increase the handling capacity to 1.5 million tons annually. Ample and cheap supplies of oil and gas have made Shuaiba a viable project and the list of products today is impressive: Sulphuric acid; liquid ammonia; ammonium sulphate; urea fertilizer; drilling mud; cement; industrial and medical gases; sulphur; oxygen; nitrogen and argon. Boilers and heat-exchangers are made for heavy industries and the Kuwait National Petroleum Company supplies all the State's needs for petrol and other refined products. (13) Finding that the potential supply of natural gas is insufficient to meet the demands of water distillation, power generation and industrial requirements. The Minister of Electricity and Water has stated that atomic plants" may have justification... and first... will be needed in the early 1980's." (19) He also had called for cooperation between Saudi Arabia, Bahrain and Kuwait to establish a joint nuclear plant on the Coast of the Gulf. He had justified his suggestion saying that due to the high cost of the plant, cooperation would be most beneficial for all the three countries. (19) SHIPPING: Development in Ships: For the increase in ships sizes, sea islands have been made, connected to shore by submarine pipeline, such as Mina Al-Ahmadi.

4	COUNTRY: KUWAIT

ENVIRONMENTAL ACTIVITIES AND SITUATION.

c) Resource Status:

iii) Industry, shipping and mining.

A new seaport and an international airport maintain the State's links with the outside world. The airport, some seven miles south of the City, was opened in 1962 and its runways are capable of handling the largest of today's airlines, including the Anglo-French supersonic Concorde which carried out hot wheather trials for several days in 1974 over the City and Gulf. (13)

There are no railway, and no internal air flights. The 1,920 km. of roads include the dual carriage way from Kuwait City to the border with Iraq. The port is an important Middle Eastern port of call and has been modernized. Special oil terminals facilitate oil shipments.

MINING:

Oil and Gas: The main resource of Kuwait is oil and gas. It has one out of the world's 68 largest oil field the Burgan field. During 1971-73 the revenue from oil was $3,137.9 million. (21)
The production rate of oil in 1978 was 1.75 million barrels per day. (23)
The proven oil reserves in 1977 was estimated as 67.4 billion barrels. And that of gas reserves 31.7 trillion cubic feet. (24)
Gas is used for local consumption.

Minerals: Local minerals have been of significant use for construction purposes in Kuwait. The principal resources that have been utilized are certain types of sand, gravel, and gatch (a local name used to describe a variety of marine deposits) coarse-grained sand was discovered in 1957 and has been used extensively to supply the needs of construction works.

Gravel quarries are situated some 50 km. to the north of the City. Gatch is found in various areas and is used in certain construction works. There are two varieties of limestone that have particular significance, colitic and eocene. The stone is burnt to form quicklime, which is used in the sand-brick industry.

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION. c) Resource Status: iii) Industry, shipping and mining. iv) Labour Force	Clay is found in the neutral zone and Bybiyan island. It may prove suitable for the cement industry which was established recently in the Shuaiba Industrial Area. (3) Marable as a raw material is available at four sites in small deposits. (25) iv) Labour force As a result of the rapid economic and social development which Kuwait has experienced in the past few decades, there has been a steadily growing demand for qualified and skilled manpower. This need could only partly be met from among Kuwait nationals and the country has had to rely largely on foreign professionals, technicians and workers. In 1970, Kuwaiti constituted less than one-fourth of the active labour force. With the plans for industrial development and other development programmes which Kuwait has for the future, the demand for qualified and skilled manpower will continue to grow. (1) - Activity rate of the population aged 15 years and over: Male : 84.3% Female: 15.0% - Relative distribution of employment by economic sector: Primary : 2.5 Secondary: 23.1 Tertiary : 74.4 (4) Animal husbandry and fishing employed only 1.7% of the active population over the age of twelve according to the 1970 Census. (1)

4

COUNTRY: KUWAIT

ENVIRONMENTAL ACTIVITIES AND SITUATION

c) Resource Status

iv) Labour force

Share of Expatriates in Total Employment in Kuwait, 1970

Division of Economy	Per cent
Agriculture, forestry, hunting and fishing	80.2
Mining and quarrying	76.6
Manufacturing	81.0
Construction	93.5
Electricity, gas and water	70.6
Commerce	77.9
Transport, storage and communication	80.5
Services	64.6
Activities not adequately stated	70.6
Whole Economy	74.6

Source: (26)

d) Environment and Development:

i) Environmental Management

ii) Environmental Law;

iii) ES & AT ;

iv) Industry & Environment;

v) Oceans;

vi) Energy.

d) Environment and Development

i) Environmental Management:

As long as 1964, the Occupational Health Section of the Ministry of Health was established to assess occupational exposures, to study effective control measures in the working environment, and to establish a proper system for medical factory inspection to ensure safety and health regulations for the working population.

There is genuine and widespread interest in Kuwait Government circles in the protection and management of the environment. However, it would be fair to say that at present, there is no adequate legal or administrative frame-

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION. d) Environment and Development; i)Environmental management	work within which this can be done. While a number of individual departments and authorities have certain specific responsibilities, and while there has for some time been a Department of Environmental Planning within the Planning Board, these have not proved effective in grappling with the problems. The administrative capability for effective implementation, and not least, on the degree of cooperation given by other agencies where powers and responsibilities overlap or need joint action. (8) While the identification, protection against damage or loss, and management for contained productivity, of important economic resources cannot be said to be primarily an environmental problem, nevertheless it is an element of sound environmental management that these resources should be conserved and managed with long-interests in mind. Failure to do so, especially those economic resources which are essentially renewable, could well lead to truly environmental problems in the future. The conservation and management of terrestrial groundwater resources is also a matter which receives careful attention. In addition, increasing reuse of waste water, including suitable industrial effluents and treated sewerage effluent is being planned and practiced. (8) Good examples of preventative planning may be found in the Shuaiba Industrial Area Authority in Kuwait. They are using early site planning and industrial engineering in the blueprint stage to minimize the damages. The Authority enters into the total land planning for industries, ports and transport, water plants, sewers, cooling water systems, safety systems, landscape irrigation systems, plant employee housing, recreation beaches and onshore recreation; specify pollution limits, install pollution-warning devices linked to a control centre. (19)

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION d) Environment and Development i) Environmental management	The need to plan Kuwait's development has long been recognized. In a physical sense, this has been the responsibility of the minicipality and reference has already been made to the National Physical Plan and Master Plan for Urban Area, based on the studies of Colin Buchanan and Partners. (8) The Department of Industrial Pollution at the Kuwait Ministry of Health, in 1978 had announced that strict regulations had been adopted to ensure appropriate functioning of industrial plants "which should be located in accordance to a specific zoning which takes into consideration the nature of the industry and its effects on man. " Due consideration is being given to protect workers of various industries from being affected by work hazards. They were moved in particular, by the fact that industrial wastes were killing millions of fish in the Kuwait territorial waters of the Arabian Gulf. (3) The Government has already recognized the need to apply conservation measures to its most important economic resources - oil and natural gas. While these continue to be exported in great quantities, there has been a limitation of production in recent years, and a law concerning the Conservation of Petroleum Resources, was passed in 1973. "Petroleum is the main source of Kuwait's wealth and its conservation is considered to be necessary for the preservation of its economic structure and future. " (8) The continuation of introducing selective various crops which are suitable to the climate and habits of the country. Will lead to establishing an ideal forest. Sufficient food and improving the ecological conditions of the desert is the objective of concerned authorities, other plans for producing food through utilizing microbial fermentation to produce single-cell protein from petroleum by-products are planned.

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION d) Environment and Development i) ii) Environmental Law :	Last but not least objective of Kuwait, is looking for the natural environment of the desert by optimising the utilization of its native plants to maximize its use to work out further inhibitors of its growth. (32) ii) Environmental Law: In 1973, a Committee of the Municipality on which most, if not all, of the relevant agencies and departments were represented. proposed that an Environmental Protection Agency be established. A draft Law was prepared. But for various reasons, no action has been taken to pass this law. Among its terms of reference, which are broad, is the requirement that it should "propose necessary legislation for environmental protection and pollution prevention in a total sense, avoiding the recent lack of status of the environment. " (8)
iii) ES and AT: (Environmentally Sound and Appropriate Technology)	iii) ES and AT: Kuwait has an ambitious programme for harnessing solar energy for domestic use including cooling of houses. Solar thermal conversion, and agricultural applications, such as, desalinization, green house heating, and integrated complexes, the solar energy programme was commenced in 1976. (5) Recycled wastewater from treatment plants are used for silviculture.
iv) Industry and Environment:	iv) Industry and Environment: Industrial effluents discharge into sewage lines, and at present, are not subject to any pre-treatment requirements. However, it is hoped that appropriate regulations will be brought into force soon and that pre-treatment of effluents by industries will become the general practice. (8) At Shuaiba Industrial Area, a variety of air pollution problems exists. They have been studied in detail by a consultant firm, Cremer and Warner; by the Shuaiba Area Authority; and

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION d) Environment and Development. iv) Industry and environment	the Department of Environmental Health. Corrective measures have been recommended, though they are not yet fully implemented. (8) Air pollutant criteria for new plants are adopted, based on international emission standards for particulates. Also Ambient marine environment quality criteria for inshore waters around Shuaiba are adopted, where the final effluent, leaving the industrial site of Shuaiba, for discharge to the Gulf should have a quality not materially worse than that which is adopted. The total maximum seawater coolant effluent, discharged from all the industries in the Shuaiba Industrial Area, at present is of the order of 5.5×10^6 metric tons per day. (27) Air Pollution The Ministry of Electricity and Water reports serious problems in their switchyards, particularly in Shuaiba South Power Station due to corrosion of their copper conductor, circuit breakers, etc. caused by sulphur dioxide and hydrogen sulphide in the atmosphere. Another contributing cause is the deposition of fine urea dust. Claims that urea is innocuous are misleading and erroneous as is evidenced by the fact that urea plant designers incorporate stainless steel equipment wherever urea has to be handle in solids, molten or aqueous solution forms, unless temperatures and pressures permit the use of aluminium. In Shuaiba North switchyard the insulators are protected with coatings of sillicon grease which is replaced periodically. In Shuaiba South this method was not adopted and for reasons of economy the insulators are washed weekly with distilled water to remove dusts, etc. The Ministry of Electricity and Water face the problem that washing of the insulators may not be possible on an absolutely regular basis and that dilute solution of SO_2 ?

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION. d) Environment and Development: iv) Industry & Environment.	and corrosion products from urea and other dusts will then build up to such an extent that "Flash-over" occurs. This then means power supply from Shuaiba South will be interrupted. One such occurence has been reported. The Ministry of Electricity and Water, therefore faces the following possibilities: - a) Breakdown of power supplies due to water pollution; b) Breakdown of power supplies due to air pollution; c) Breakdown of supplies of distilled water due to water pollution. As Ministry of Electricity and Water supply power to the industrial users in the Shuaiba Authority's area, i.e. KNPC KCFC, PIC, the Cement Company and others, as well as to a considerable area of Kuwait, a breakdown under (a) and/or (b) would be disastrous from equipment safety aspects and from the loss of revenue from each of these plants which must rely on a constant supply of power. Likewise, any breakdown in the supply of distilled water to these industries, while it would not be instantaneous, if prolonged would certainly force the shut down of KNPC, and PIC plants. Also, the cutting off of one of the few sources of drinking water in the State of Kuwait would bring extreme hardship, especially if it occurred during summer months. No reports have been received from the industrial complexes in Shuaiba indicating that they have problems due to pollution of either sea water or air. However, urtnessing to KCFC, and PIC, has shown considerable evidence of badly damaged paint-work in particular locations, much of it associate with deposition of urea dust. As a precautionary measure, this plant will now only be started up when the wind is in a favourable quarter.

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION. d) Environment and Development iv) Industry and Environment	Furthermore, in Shuaiba village, H_2S and SO_2 give rise to offensive odours at ground level. (7) Sea Water Pollution at Shuaiba Area The power stations require large quantities of sea water for cooling purposes and relatively smaller quantities for their distillation plants. Ammonia in solution in the sea water is undesirable because of its corrosive action on copper alloys. The cupro-nickel tubes in the turbine condensers and the Admiralty brass tubes in the multiple effect evaporators of the sea water distillation plants are particularly vulnerable. (7) The Ministry of Electricity and Water had reported that in 1972 they have located 21 leaking tubes in the main condensers whereas in previous years non have been found. As it is stated in the report if Cremer and Warner (1973), at Shuaiba Power Stations ammonia is present in measurable quantities in their cooling water intakes. For the month of August, 1972, at Shuaiba South intake the level was greater than 2.0 ppm. for the greater part of the month rising to a maximum of 5.44 ppm. During September the levels were, in general lower but on one occasion rose to 7.1 ppm. For Shuaiba intake the highest ammonia content on record to-date was 55.76 ppm. on August 15th, 1972. Other high figures were reached on August 15th, 1972. Other high figures were reached on August 12th 1972, 10.20 ppm., and September 12th 1972, 3.8 ppm. Understand by the Ministry of Electricity and Water is most concerned about these premature failures in Shuaiba North Power Station as any further failures will necessitate retubing complete condensers at an early date." (7)

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION d) Environment and Development iv) Industry and Environment	There is the further problem of ammonia in solution in the sea water feed to the distillation plants in that during distillation some of the ammonia is carried over into the distilled water. Contamination by Oil While sea water polluted with oil does not present additional corrosion problems, it does badly affect the efficiency of the heat transfer surfaces of condensers and evaporators. This, in turn, has a disproportionate effect on the vaccum which can be maintained. This, in turn, will reduce the power output of the turbine/generator set. Any occurence of oil pollution does not produce a transient effect as the oil is usually deposited on the tube surfaces as an adherent film which is not simply removed by robbing out at shut down periods, but requires thorough washing out, possibly with solvents or detergents, to return the tubes to their original clean condition. In the sea water evaporators, in addition to the fouling effect, excessive quantities of oil cause frothing and " pewking" with consequent "carry-over" of concentrated brine solution into the recovered distilled water, again requiring considerable quantities of valuable water to be dumped. (7) Thermal Pollution The nature of cooling on the adjacent refinery and fertilizer plants does not require the close temperature approaches required by the power station condensing equipment, and cooling water temperature increases of 10°C to 15°C are quite acceptable. From the physical locations of the refinery and fertilizer plants effluent lines, recirculation of the water into

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION d) Environment and Development:, iv) Industry and Environment	the power station stations cooling water inlets occurs before dilution and natural cooling can have much effect. Consequently, the temperature of the cooling water to feed the power stations is higher than the main body of sea water (particularly in summer). This again contamination by sewage has a bad effect on the vaccum levels at the turbine outlets with consequent reduction in efficiency and power output. (7) Control of the discharge of raw sewage into the Gulf was done as a result of the study of water pollution by bacteria treated water from the sewage treatment plant is being used for afforestation purposes. A project for water treatment of the effluents of petrochemical industries is underway based on the findings about the quality of offshore water of the Shuaiba Industrial Area conducted by a consulting firm. Accordingly no more polluted effluents will discharged to the sea.
v) Oceans	v) Oceans: Kuwait is small, with only 16,800 square kilometers of mainland territory, and 1,000 square kilometers comprising of 10 off-shore islands. Its coastline is about 200 kilometers long (excluding Kuwait Bay and the off-shore islands). Thus its total marine resources are limited. Pollution of marine waters arising outside of Kuwait's national jurisdiction remains probably the greatest problem. Although Kuwait is a party to the International Convention for the Prevention of Pollution of the Sea by Oil. It is understood that there are other States bordering the Gulf which have not yet adhered to any of these Conventions. (8) Kuwait has for some time been a leading advocate of regional cooperation in the Gulf area to protect marine resources and prevent pollution. Further steps are currently being taken to try to achieve such cooperation. Meanwhile, the threat remains very real, and visible evidence of oil pollution of the sea and foreshores is not uncommon. (8)

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION d) Environment and Development vi) Energy	vi) Energy: Oil and Natural Gas ; Kuwait possesses about 14% of the world's known oil reserves. Oil and its by-products provides the greatest part (93.5%) of Kuwait's current Government revenue, while the natural gas provides the basic fuel for Kuwait's developing strength. (8) Natural gas is found dissolved in the extracted crude oil and its availability therefore completely tied to the production of oil . (3) Known resources are estimated to be sufficient to last for at least thirty years at the anticipated rate of extraction. (3) In order to conseve its oil in the ground, Kuwait has been limiting production, the daily average production figures for the Kuwait Oil Company for the first month of 1974 were 2.3 million barrels per day compared with 2.8 in 1973. The average daily oil production in 1978 was 1.76 m.bl/day. (23) Electricity; Installed capacity of industrial and public electric generating plants in Kuwait in 1976 presented the following situation : - Industrial 120.000 k watts. - Public 1.446.000 k watts. Total 1.566.000 k watts, all of which are of thermal type. (28) The consumption of electricity is rising up 18% yearly. In 1979, the daily production of electricity was 2620 mega-watt-hours Solar Energy; Solar energy programme of Kuwait was commenced in 1976. Its main areas of emphasis are: Domestic use, agricultural use and thermal conversion. In cooperation with an European Company 9 solar thermal station of 100 KW each is under development. (5)

4	COUNTRY : KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION d) Environment and Development: vi) Energy	Nuclear Energy: Kuwait has plans for utilizing atomic enrgy up to the year 2000 which envisage the installation early in the second half of the nineteen-eighties of a station of about 600 MW, which would be followed around 1990 by a plant of the same size. The construction of two more stations of 1200 MW each would subsequently be considered, thus allowing for a total installed capacity of 3600 MW by the turn of the century. A co-operation agreement has been signed with the United Kingdom. The acquisition of a 50 MW research reactor if presently under consideration. A nuclear energy commission is to be set up. (29)
e) Socio-economic Problems	e) Socio-economic Problems: Kuwait has serious social-environmental problems stated to dislocation and readjustments following the acquisition of sudden wealth through petroleum developments. Changes of the social structure have involved disintegration of the large family system and disturbance of relation between generation egotism and irresponsibility charaterize some elements observed with spending while the oil money flows. The presence of foreign workers and technicians and the educational and social needs of the Bedouins, native to the area but not enjoying all the rights of the Kuwait, also are factors in the complex. Dependence on oil production for economy and way of life large nevertheless limited oil reserves. (2) Sudden wealth and consequent rapid development have resulted in profound disturbance of the social structure of the community. The former large family structure has vanished, resulting in Juvenile delinquincy, sexual crimes and alcoholism. The deterioration of the housing problem in Kuwait is a natural result of the rapid socio-economic changes which the country has witnessed during the last 20 years. The sudden increase of national income from oil revenue attached

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION e) Socio-economic problems	a continuous flow of imigrants from Arab and foreign countries. Consequently the Country became more exposed to the cultures of other nations. The rapid increase of population within the limited area of the old town caused an urban explosion outside the old walls of the town. The open space around the old town was then planned in several neighbour units of the western design for the Kuwaitis to live in. Each neighbourhood included the daily services of the community beside a number of plots ranging between 750 m^2 and 1000 m^2. A very large number of lavish villas were built on these plots in a gala of architectual styles expressing the sudden changes in the culture and values of the population together with the poor design and hasty construction. (8) Limitations on income earning capacity or non-Kuwaitis and on their rights to play a full role in Kuwait society may have consequenses for technical, managerial and administrative capacity, long term political and economic stability and, of course, the evolution and expression of community values and concerns, including environmental concerns. (8)
f) Supporting Measures: i) Earthwatch (INFOTERRA, Gems, IRPTC);	f) Supporting Measures: i) Kuwait still has not designated its INFOTERRA National Focal Point. The National correspondent of IRPTC has not been nominated yet.
ii) Environmental Education and Training: Public Information;	ii) At the elementary level, there is a concern to create in the kuwaiti citizen an awareness of the principles of hygiene and their good effects on the quality of life. Field visits are also encouraged to provide the students with first hand accurate information on their natural environment and to create in them the concern of it. At the intermediate level the same principles of environmental education existing at the elementary level are taught but in a more
iii) Research Activities concerning Natural Resource Management and Environmental Protection.	

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION. f) Supporting Measures: ii) Environmental education	detailed and developed manner. A new principle is also introduced and that is the structure of the social environment in Kuwait. At the secondary level, environmental education is formally introduced through biology. Thus the principles and problems of ecology are taught in biology courses. Petrochemicals in chemistry and information on the local physical environment and its problems are emphasized in the geology courses. Sociology at the secondary level highlight the Kuwaiti social structures and cultural characteristics. The training programmes for teachers are in coordination with the school programmes, but with no or little emphases on developing- the teacher a critical awareness of environmental problems to enable him to provoke certain attitudes in the student. Ecology is taught at the university. As of 1976 more emphasis will be put to develop programmes emphasizing problems associated within the local environment. Upon the recommendation of its Environment Department, the Planning Board has requested that the Ministry of Education should integrate in the school programmes more information on the local environment in order to create in the students the awareness of their inter-relation with their socio-cultural and economic environment. The university of Kuwait is also in the process of founding a medical school with a new concept including the environmental health aspect in the training of doctors. This training will bring a solution to the lack of trained professionals, whose fields of practice has considerable impact on the environment. (30)

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION. f) Supporting Measures: ii) Environmental Education.	- Health education and weekly programmes are being conducted by the Health Education Section Daily Talks on specific health topics are broadcasted on Radio and TV. - Two seminars about environmental problems and health were held in 1975 - 1976 by Kuwait University with the participation of interested organizations. - A seminar on T.B. Control was organized by the international Union against T.B. in cooperation with the Regional WHO Office and Ministry of Public Health in 1976. - A conference was held in 1976 organized by the Kuwait Medical Association dealing with major health topics including a) traffic accidents; b) control of cancer. - Various lectures by visiting professors are given to the interested personnel by the Kuwait Medical Association, Kuwait Institute for Scientific Research, Ministry of Public Health, University of Kuwait and the Environmental Protection Society. - Formal classes for an integrated 40 hours is the topic of environmental health and pollution is given to the primary, intermediate and high school students. Two thousand Kuwaiti students in July 1978 participated in a large-scale cleanliness campaign at the coastal strip of Kuwait. A spokesman for the Ministry of Education , said the campaign aimed at training the youth to protect their environment against pollution. In 1979, the Kuwaiti Ministry of Education have had organized an "Agricultural Competition" for elementary and intermediate schools. The students were required to plant and take care of a 30 sq.meters piece of land. Valuable awards was distributed.

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION. **f) supporting measures:** **iii) Research activities concerning natural resource, management and environmental protection.**	iii) Research activities are carried out by the following 1. The Kuwait Institute for Scientific Research (KISR): The Institute was established in 1967 to undertake research in the fields of petroleum, arid-zone, agriculture, marine biology and fisheries. It has, since 1973, been attached directly to the Council of Ministers, and its objectives are "to promote scientific and applied research, particularly where industry, energy, agriculture and other major resources of the national economy are concerned." (8). The Kuwait Institute for Scientific Research comprises the following Departments: A. Engineering Department. - Solar energy programme of this department has been commenced in 1976. Its main areas of emphasis are: Solar cooling and heating of buildings; Solar thermal station; Agricultural applications such as, meeting the food (vegetables), water (desalinization), and power requirements of isolated communities. Additionally the programme is looking into: - Flat plate collectors; - Heat storage employing water, rock and heat of-fusion salts; - Use of Kuwait: Capital in the development of solar cells. This work will be done by laboratories in the industrialized countries; - Testing of Solar-MEG, on behalf of the Gas Development Corporation (Chicago) with the eventual goal of manufacturing such units under a Kuwaiti licence; - Absorption chillers with a view to manufacturing them with Kuwaiti capital under a licence for export to European and Far Eastern Markets; - Solar water pumps for irrigation with the view to attaining manufacturing rights for production with Kuwaiti capital and export to various countries in Africa and Asia.

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION. f) Supporting Measures: iii) Research activities	The programme has a staff of 27 (7 with ph.D. and 20 MS) . (5) - Building Materials Centre: has only two full time research workers, both from England. The Centre has been engaged in: (a) study of energy saving in buildings; and (b) study of building materials. (5) - Laser and Electronic Sciences Programme. B. Environmental and Earth Sciences Department. - Marine pollution, Air and water pollution. One of the activities include the remote sensing of marine pollution. - Resource assessment mapping. C. Agriculture and Fisheries Department. - Aquatic life, Food technology, Fisheries Research activities is being carried out to develop systems for planting some vegetables in saline soil. Studies for using methane as a source of energy are carried out. The production of protein from petrol derivatives is under study. - Arid Zone Agriculture division Research is being carried out on the use of treated sewage and sweet water for irrigation and the possibility of using desalinized sea water to raise crops. It is concentrating on using the green cover of the desert for supporting livestock and introducing useful vegetation for local needs. (13) 2. University of Kuwait. Various faculties of the K.U. are actively engaged in research activities concerning natural resource management and Environmental Protection.

4	COUNTRY: KUWAIT
ENVIRONMENTAL ACTIVITIES AND SITUATION. f) Supporting Measures: iii) Research Activities	Faculty of Agriculture is engaged in activities for combating desertification. Laboratory and field training are given to technicians working in the field of insects and rodent control. Activities of the faculty cf Science include, research on marine pollution, epideminology of diseases, entomology etc. (30). Kuwait University possesses the most modern equipment and its library is large and universal in its references. (13) 3- Ministry of Public Works - Department of Agriculture; - Centre for protected vegetable production (El-Ameria) . 4- Ministry of Planning - Directory of Environmental planning 5- Ministry of Public Health. Kuwait is the host country for the Arab Institute for Economic and Social Planning which is receiving assistance under the UNDP Regional Programme. This regional project has evolved from a national project which assisted in the establishment and activities of the institute during its initial years of existence. The Government of Kuwait has a keen interest in promoting the establishment of further regional institutions, especially with the countries of the Gulf areas, and in utilizing UNDP assistance for such purposes. In future some of the current national projects in Kuwait may lend themselves to serving wider regional needs. (1)

5	COUNTRY: KUWAIT
UN. BILATERAL PROJECTS (Global, regional and country level) - UNEP fund	- The Kuwait Regional Conference of Plenipotentiaries on the Protection and Development of the Marine Environment and the Coastal Areas was convened by the Executive Director of the United Nations Environment Programme in pursuance of decision 58 (IV) of the Governing Council of UNEP. (15 to 23 April 1978). The Executive Director called attention to the important task that lay before the Conference in adopting a Final Act which would include an Action Plan for the Protection and Development of the Marine Environment and the Coastal Areas Gulf. The Action Plan aims to achieve the following: Assessment of the state of the environment including socio-economic development activities related to environmental quality and of the needs of the Region in order to assist governments to cope properly with environmental problems, particularly those concerning the marine environment. Development of guidelines for the management of those activities which have an impact on environmental quality or on the protection and use of renewable marine resources on a suitable basis. Development of legal instruments providing the legal basis for cooperative efforts to protect and develop the Region on a sustainable basis. (31) Now the Action Plan is being implemented in the Gulf region. - UNEP has assisted to a regional Kuwaiti symposium on the "micro biological conversion systems for the production of food and waste management". - Who and ILO: studies are being made of health, social and psychological problems, including increase in and nervous diseases in relation to industrialization, air and sea pollution A 2 year general study of the environment has been jointly sponsored by the Kuwaiti Government and ILO. As a result of an agreement with ILO/WHO, a permanent environmental Committee was set up to assess environmental problems The occupational Health and Environmental Pollution section deals with problem of the working environment. (10)

5	COUNTRY: KUWAIT
UN BILATERAL PROJECTS (Global, regional and country level) - UNEP Fund	- The UNESCO/UNEP's project of environmental education has been welcome at the official and the university levels.

6	COUNTRY: KUWAIT
REGIONAL OFFICE SUPPORT TO GOVERNMENTS AND TO UN AGENCIES.	Dr. Donal Mc.Michael visited Kuwait (as UNEP consultant) upon the request of the Kuwaiti Government and had written a report on Environmental Planning and Management in Kuwait in 1976. - Nadia Saad visited Kuwait for assessment of Environmental Aspects, in 1975 . - Mr. David Tarazi visited Kuwait from 15 February - 20 February 1977, and reported on pollution in general and water pollution in particular. (11) - From 18 - 21 February 1979, the Executive Director of UNEP visited the State of Kuwait. Two meetings were held at the Ministry of Planning with the Technical Committee on the Environmental and were attended by representatives of the Ministries of Health, Foreign Affairs, Commerce and Industry. Communications and Planning and of Kuwait Municipality. The items discussed were environment and development, cost-benefit approach to environment and development, Earthwatch and INFOTERRA, desertification, the UNEP Fund and the Kuwait Action Plan for the marine environment of the Gulf, including the finalization of the Interim Secretariat agreement .

7	COUNTRY: KUWAIT
AGENCY PROGRAMMES OF ENVIRONMENTAL RELEVANCE	The country's absorptive capacity for external technical cooperation, goes far beyond the relatively limited number of activities that can be supported from the IPF in US dollars and from the additional funds provided by the Government for the purpose of cost-sharing in certain projects. A large number of technical assistance activities in Kuwait are being financed, therefore, under funds-in-trust arrangements with various Agencies of the UN system. These funds-in-trust projects play a significant role in the general context of technical cooperation in Kuwait and, in some instances, are closely related to UNDP financed projects. UNDP assistance in the programme period is concentrated on a relatively small number of projects. The primary emphasis is placed on (i) manpower training and (ii) advisory assistance for the diversification of the economy. UNDP is also requested to assist in strengthening the public administration machinery and in the establishment of appropriate measures for the protection of the environment. A good amount of funds were set aside for financing consultancy services on an ad-hoc basis. It is expected that the need for such services in specialized fields will arise in connection with a variety of development programmes and projects. Agricultural rpoject KUW/70/504 Phase F. The Government is studying a number of proposals for development projects in the agricultural and livestock sector, in fields such as improvement of livestock health and nutrition, poultry production and milk processing. While these projects are likely to be financed from other sources than UNDP if investment decisions are made, the Government foresees the need for assistance by short-term consultants during the various stages of project preparation and implementation. Further more, it is expected that hte Kuwaiti personnel of these and other projects in the agricultural sector will require specialized training abroad.

7	COUNTRY: KUWAIT
AGENCY PROGRAMMES OF ENVIRONMENTAL RELEVANCE	A follow-up project (Phase II) to KUW/70/504 (described above) is envisaged in order to undertake further tests and trials with these methods developed during the first phase. Several of the methods tested in the course of the first phase indicate a promising potential. The second phase will also assist in introducing the new methods among commercial farmers through extension and demonstrations. The project will be financed under a funds-in-trust arrangement. Industrial Development and Consulting Bureau- (Kuw/73/507) Phase I. The primary objectives of this project which started in the latter half of 1973 are to help the Government elaborate its industrial development strategy with special emphasis on the diversification to the economy and to assist in accelerating the identification, appraisal and implementation of new industrial projects. Industrial development and diversification constitutes one of the key objectives of the Second Five Year Development Plan. The Industrial Development and Consulting Bureau will be expected to play an increasingly important role in the industrialization process. In order to enable the Bureau to assume such a role, the Government has foreseen the need for a second phase of UNDP assistance in the period 1977/78. While emphasis will continue to be placed on the principal objectives of the first phase, it is expected that the services of the Bureau will increase in scope as well as in sophistication. (1) Environment: With the increasing industrialization and urbanization in Kuwait in recent years, the need for better environmental planning and pollution control has been strongly felt. The Government has shown a keen interest in taking appropriate steps to avoid the deterioration of the environment.

7	COUNTRY: KUWAIT
AGENCY RPOGRAMMES OF ENVIRON - MENTAL RELEVANCE.	Between 1971 and 1973, the Government in cooperation with ILO undertook a project for the improvement of "Pollution Control in the Working Environment" and a number of studies concerning water , air and noise pollution were prepared in the course of the project . The project also resulted in three Kuwaiti scientists completing specialized study hours in industrialized countries in the field of environmental pollution . The project was executed by ILO in association with WHO under a funds-in-trust arrangement. An advisor in air and water pollution control also served on a short-term assignment in 1974 to advise the Shuaiba Industrial Area Authority on identifying the problems of pollution and recommend further technical assistance. (1) Kuwait has been chosen a regional centre for agricultural research in the Gulf countries. The 3-Year project sponsored by FAO, aims at the development of appropriate systems for the production of vegetables, ensuring self-sufficiency for the region. Solar energy will be one major item to be exploited. (1)

8	COUNTRY: KUWAIT
AVAILABLE BACKGROUND INFORMATION ON ENVIRONMENTAL SOURCES. a) Surveys, reports, reserves and their availability. b) Personnel and expertise.	a) Reports on studies carried out regarding the resisting levels on different pests are being desseminated to the interested organizations. The information is sent regularly to WHO. - Various reports about air pollution, water pollution, climatic stress and noise in the local environment of Kuwait have been distributed among the interested organizations. - Several articles about various health problems have been published in the Kuwait Medical Jounal. - The Council of Arab Economic Unity held its thirteen session in Kuwait early March. Among the items discussed were: Desertification, industry, population and energy. - Shuaiba Area Authority, on behalf of the Ministry of Electricity and Water and the Area's main industries, made an agreement with Messers Cremer and Warner to carry out a study of pollution in the Area and produce adequate solutions for it together with rules to be observed by the industries so as to protect the environment from all sorts of pollution. The said Consultants submitted their preliminary report in May 1975, where they stated that pollution had reached a serious limit at the Area and therefore they required that the industries take up protective measures to eliminate emission of pollutants. Consequently, on 11.6.1975, Shuaiba Area Authority submitted to the Minister of Finance the following three reports: 1. General report on the Pollution in the Area. 2. A suggestion that the measures recommended by the consultants be adopted and enforced on the occupants of the Area.

8	COUNTRY: KUWAIT
AVAILABLE BACKGROUND INFORMATION ON ENVIRONMENTAL SOURCES. a) Surveys, reports.	3. The high limit that the pollution has so far reached and its adverse effects on the possibilities of the expansion of existing industries or the accomodation for new ones.
b) Personnel and expertise	b) Names of Personnel and Expertise: Ministry of Planning P.O.Box 15 (Technical co-operation Department). - Miss Naima Al Shayji - Dr. Fikry Khalaf, Advisor Technical Co-operation Department. - Dr. M.Y. Shana'a, UNIDO Expert. Kuwait Institute for Scientific Research (KISR) - Dr.Mohamed Ali-Omar Director of Research. - Dr. Malek Associate Director of Research. - Dr. Khalaf, Advisor Ministry of Planning. - Dr. Malek, Chief Materials and Engineering Sciences Division. - Mr. Allyson, Chief Building Materials Unit. - Mr. Afif Debs Director, Division of Engineering

8	COUNTRY: KUWAIT
AVAILABLE BACKGROUND INFORMATION ON ENVIRONMENTAL SOURCES. b)Personnel and expertise	- Dr. Fadi Al-Kazli Associate Director of Research. Chief,Environmental and Earth Sciences Division. - Dr. Mohammed Idozon Leader of Survey Projects. Municipality - Mr. Abdel Rahman Al-Duaij, Chief Planning Department. Ministry of Electricity and Water (Water and Gas Department). - Mr. Mubarak Al-Mutawa Chief of Operation and Maintenance Section. National Housing Authority (Programme and Research Section) - Mr. Omar Al-Kanai - Mr. Ali Al-Fouzan - Miss Maryam Amadi, Head of the Human Settlement Division in the Planning Board. National Industrial Company - Mr. Mossed Al-Marzouk - Mr.Naim Abu-Warda. UNDP Office - Mr. Khalil Othman Resident Representative.

8	COUNTRY: KUWAIT
AVAILABLE BACKGROUND INFORMATION ON ENVIRONMENTAL SOURCES. b) Personnel and expertise	Ministry of Public Health - Dr. Mustafa Dasuki, Chief Occupational Health Section. Kuwait University - Dr. Kasem Bahbahani Assistant Dean of the School of Science. - Mr. Anwar Al-Nouri Secretary General of Kuwait University. Environment Protection Society - Mr. Anwar Al-Nouri Secretary General. Shuaiba Area Authority - Mr. Sulayman Al-Hamed Director, Shuaiba Area Authority Ahmadi, Kuwait.

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