Environmental Profile of

ARAB REPUBLIC OF EGYPT

prepared by the

Arid Lands Information Center
Office of Arid Lands Studies
University of Arizona
Tucson, Arizona 85721

for

U.S. Man and the Biosphere
Department of State
Washington, D.C.
(National Park Service Contract
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DRAFT
ENVIRONMENTAL REPORT

ON

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THE UNITED STATES NATIONAL COMMITTEE FOR MAN AND THE BIOSPHERE
Department of State, IO/UCS
WASHINGTON, D. C. 20520

An Introductory Note on Draft Environmental Profiles:

The attached draft environmental report has been prepared under a contract between the U.S. Agency for International Development (AID), Office of Forestry, Environment, and Natural Resources (ST/FNR) and the U.S. Man and the Biosphere (MAB) Program. It is a preliminary review of information available in the United States on the status of the environment and the natural resources of the identified country and is one of a series of similar studies now underway on countries which receive U.S. bilateral assistance.

This report is the first step in a process to develop better information for the AID Mission, for host country officials, and others on the environmental situation in specific countries and begins to identify the most critical areas of concern. A more comprehensive study may be undertaken in each country by Regional Bureaus and/or AID Missions. These would involve local scientists in a more detailed examination of the actual situations as well as a better definition of issues, problems and priorities. Such "Phase II" studies would provide substance for the Agency's Country Development Strategy Statements as well as justifications for program initiatives in the areas of environment and natural resources.

Comments on the attached draft report would be welcomed by USMAB and ST/FNR and should be addressed to either:

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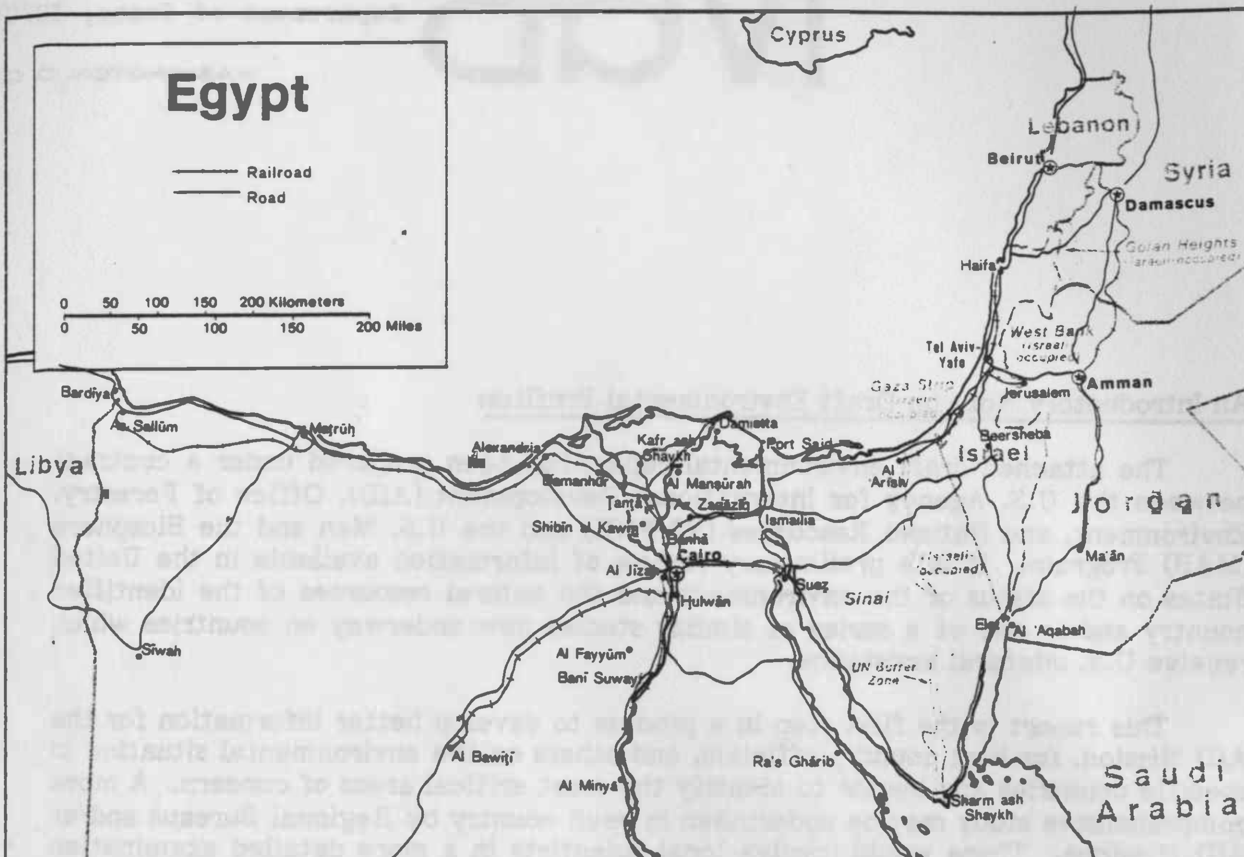
Egypt
Railroad
Road
0 50 100 150 200 Kilometers
0 50 100 150 200 Miles
Cyprus
Lebanon
Beirut
Syria
Damascus
Golan Heights
Haifa
West Bank
Tel Aviv-Yafo
Gaza Strip
Jerusalem
Amman
Isael
Jordan
Beersheba
Ma'ān
Al 'Aqabah
Libya
Bardiyah
As Sallūm
Matrūh
Alexandria
Damanhūr
Kafr ash Shaykh
Damietta
Port Said
Al Mansūrah
Az Zaqāzīq
Tanta
Shibīn al Kawm
Banhā
Ismailia
Al 'Arīsh
Cairo
Al Jīzah
Suez
Sinai
Hulwān
Sīwah
Al Fayyūm
Banī Suwayf
UN Buffer Zone
Al Bawīţī
Ra's Ghārib
Al Minyā
Sharm ash Shaykh
Saudi Arabia
Asyūt
Al Ghurdaqah
Būr Safājah
Sawhāj
Qinā
Al Qusayr
Mūt
Al Khārijah
Bārīs
Aswān
Administrative line
Sudan
Dunqunāb

SUMMARY

The environmental problems of the Arab Republic of Egypt relate to its peculiar situation of intensive irrigation agriculture and great population densities in a very arid land, 96% of which is as yet uninhabitable. The population of 38 million lives on the remaining 3-4% comprised predominantly of the Nile valley and delta. Attempts to raise significantly the productivity of Egypt's natural resources (especially soil resources) have led to problems of resource degradation and hazards to the health of large numbers of the population.

Unlike many Middle Eastern countries, Egypt's pastoral activity is minimal because the Mediterranean coastlands, once the granary of the Roman Empire, have lost most of their natural productivity through overexploitation in the last millenium. Attempts to rehabilitate the area in this century have not met with great success, and recent plans stress economic activities besides those which are natural resource-based.

The better-known desert reclamation schemes of the delta fringe and oases of the New Valley will benefit from the experience gained in the last few decades on the functioning of water, soil and biotic systems in the situation of highly manipulated perennial irrigation schemes, although better control of the inputs and outputs of these systems seems to be necessary.

The major environmental problems faced by Egypt at present are:

1. Soil damage and loss - resulting from irrigation-induced salinization, to different degrees, of at least 28% of Egypt's irrigated soils. Pressures on soils in the better-watered coastlands prevent them recovering their ancient fertility. Windblown sands and urban sprawl remove arable soil from use entirely.

2. Water pollution - resulting from salinized drainage water from irrigated areas, agricultural pesticides, sewage disposal, industrial effluent, and overpumping of aquifers (allowing in contaminating, saline, marine water), all of which affect surface and groundwater bodies differently.

3. Health hazards - resulting from endemic water borne diseases spreading through the newly - converted (perennial) irrigation system, most seriously schistosomiasis and malaria.

4. Pests and weeds - resulting from the introduction of perennial irrigation, although some are endemic. The aquatic water hyacinth has recently become rife in waterways.

Measures to control these problems are evaluated briefly in the text.

M. Justin Wilkinson
Compiler

DRAFT ENVIRONMENTAL REPORT ON EGYPT

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1.0 PREFACE

This report represents a desk study compiled from many and varied sources. The major task was to integrate and synthesize the vast amount of material available on Egypt's environment and natural resources.

2.0 INTRODUCTION

2.1 PURPOSE AND SCOPE

The report has three related aims: (i) to inventory the major natural resources of the Arab Republic of Egypt[1]; (ii) to evaluate the impacts on the environment of man's manipulation of natural resources; and (iii) to provide bibliographies on (i) and (ii) above, as well as some references to generally related topics.

It was necessary to limit, where possible, the concerns in this report to directly natural resource-related problems. Space and time prevented diverging too widely from this guideline. It proved possible, for example, to avoid such topics as agriculture per se and land tenure changes in Egypt. Therefore discussion in (ii) was restricted to environmental problems related to water, soils, flora and fauna. Environmental impacts of urbanization and industry were included, however, whereas those stemming from mining were not, these being considered relatively insignificant in contrast to the others.

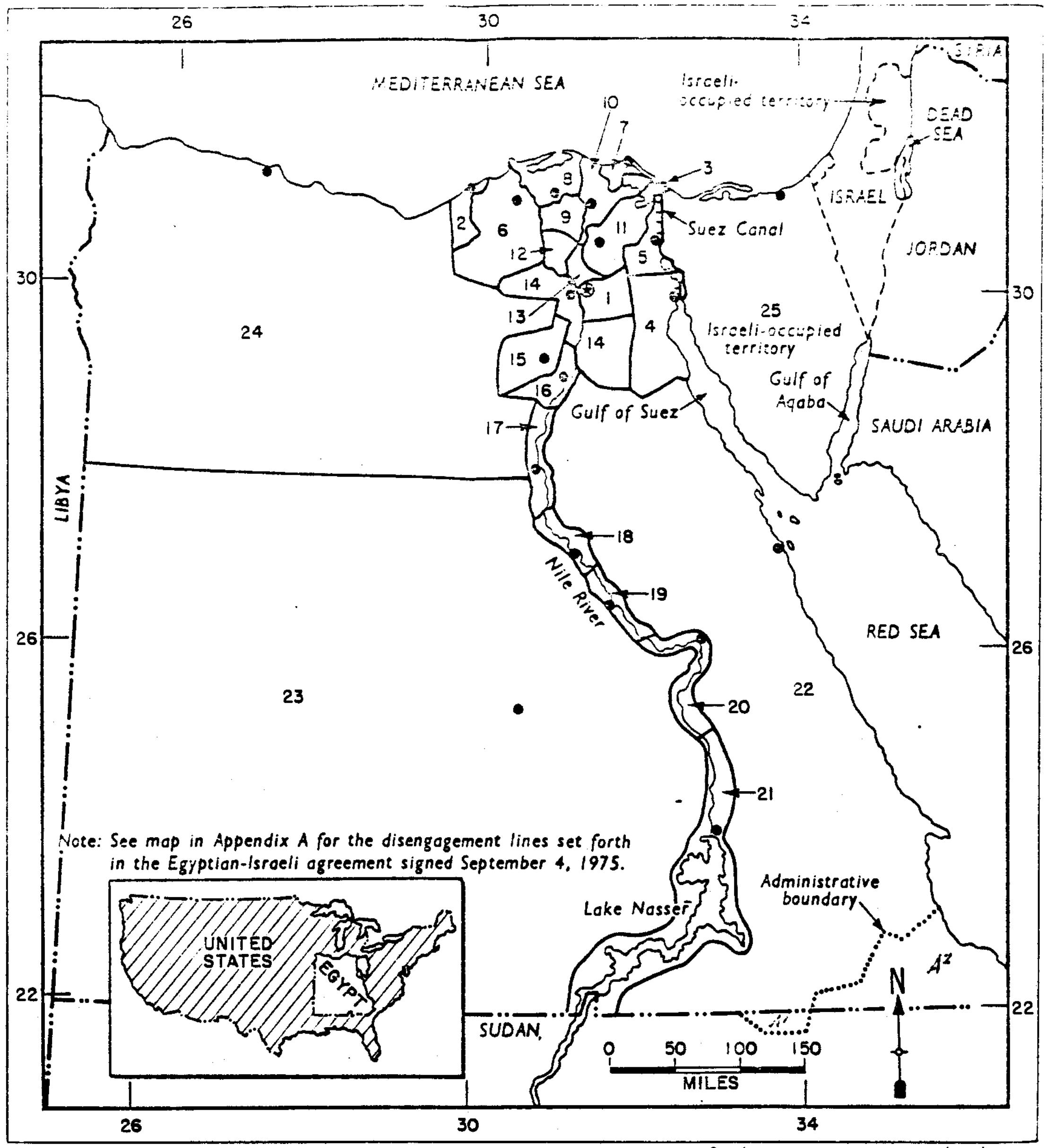
It was considered invidious, generally, to discuss environmental dangers which will or may flow from economic development schemes which have not been initiated yet.

2.2 GEOGRAPHY AND CLIMATE

2.2.1 Boundaries and Administrative Divisions

Egypt occupies the arid northeast corner of Africa. It incorporates almost one million km^2, roughly equivalent to the area of Colorado, Utah, Arizona and New Mexico combined. It is bounded on the north by the Mediterranean Sea, and on the east by the Red Sea. Libya lies on Egypt's western border, the

[1] Referred to as Egypt hereafter.



Dots (●) indicate governorate capital.

Boundary representation not necessarily authoritative.

Governorates	Governorate Capital	Governorates	Governorate Capital
City Governorates		*Upper Egypt*	
1. Cairo (Al Qahirah)	Same	14. Giza (Al Jizah)	Same
2. Alexandria (Al Iskandariyah)	Same	15. Al Fayyum	Same
3. Port Said (Bur Said)	Same	16. Bani Suwayf	Same
4. Suez (As Suways)	Same	17. Al Minya	Same
Lower Egypt		18. Asyut	Same
5. Ismailia (Al Ismailiyah)	Same	19. Suhag (Sawhaj)	Same
6. Al Buhayrah	Damanhur	20. Qena (Qina)	Same
7. Damietta (Dumyat)	Same	21. Aswan	Same
8. Kafr ash Shaykh	Same	*Frontier Governorates*	
9. Al Gharbiyah	Tanta	22. Red Sea (Al Bahr al Ahmar)	Hurghada (Al Gh
10. Ad Daqahliyah	Mansura (Al Mansurah)	23. New Valley (Al Wadi al Jadid)	Kharga (Al Khar
11. Ash Sharqiyah	Zagazig (Az Zaqaziq)	24. Marsa Matruh	Matruh
12. Al Minufiyah	Shibin el Kom (Shibin al Kawm)	25. Sinai (Sina)	Al Arish
13. Al Qalyubiyah	Benha (Banha)		

Note—Names in parentheses are the formal names, which are used on many maps and in some of the literature.

Fig. 2.1
Source: Nyrop, 1976.

Republic of Sudan on the southern border (1025 km from the sea), and Israel across a shifting, negotiated border in the Sinai peninsula, at present approximately along 33°30'E. (Nyrop, 1976).

The Sinai peninsula was occupied by Israeli forces in the June 1967 war. After the October 1973 war the Suez Canal was regained by Egypt with a strip of land on its east side. The Gaza Strip is a narrow area stretching 40 km east from the Sinai border along the Mediterranean coast. Its Arab population was administered by Egypt after the 1949 Egypt-Israeli armistice, but since June 1967 it has been occupied by Israel.

The formal Sudanese-Egyptian boundary is modified by an administrative boundary for the purpose of allowing nomads the use of traditional water holes in two areas (A^1 and A^2, Fig. 2.1).

Egypt comprises twenty-five administrative areas called variously governorates, provinces, or districts, which include four city governorates (Cairo, Alexandria, Port Said, and Suez), nine governorates in Lower Egypt (Nile delta region), eight in Upper Egypt (along the Nile south from Cairo to Aswan), and four so-called frontier governorates for the Sinai and desert area east and west of the Nile valley (Fig. 2.1). The formation of a 26th governorate, Nubaria, immediately southwest of Alexandria, had been announced but not fully organized in mid-1975.

2.2.2 Natural Regions (Fig. 2.2)

Only about 3.5% of Egypt's one million km^2 area is occupied, the rest being barren unpopulated desert, part of the arid zone which stretches from the Atlantic to Rajasthan.

(a) Nile Valley and Delta

The Nile valley and delta is the northern 1800 km of Africa's largest drainage system which originates in Lake Victoria in East Africa as the White Nile (Fig. 2.3). This branch provides only 10% of Egypt's flood season water when the other branches are full, but 80% of the low-water flow (January to June). Major branches such as the Blue Nile and Atbara provide 68% and 22% respectively of summer flood waters, which derive from the Ethiopian plateau. These therefore provide the floodwater which causes the Nile to overflow its banks, irrigating and depositing silt in Egyptian fields for millennia.

The valley is bounded by low escarpments and ranges from 18 km to 25 km wide. At Cairo distributaries of the Nile spread out

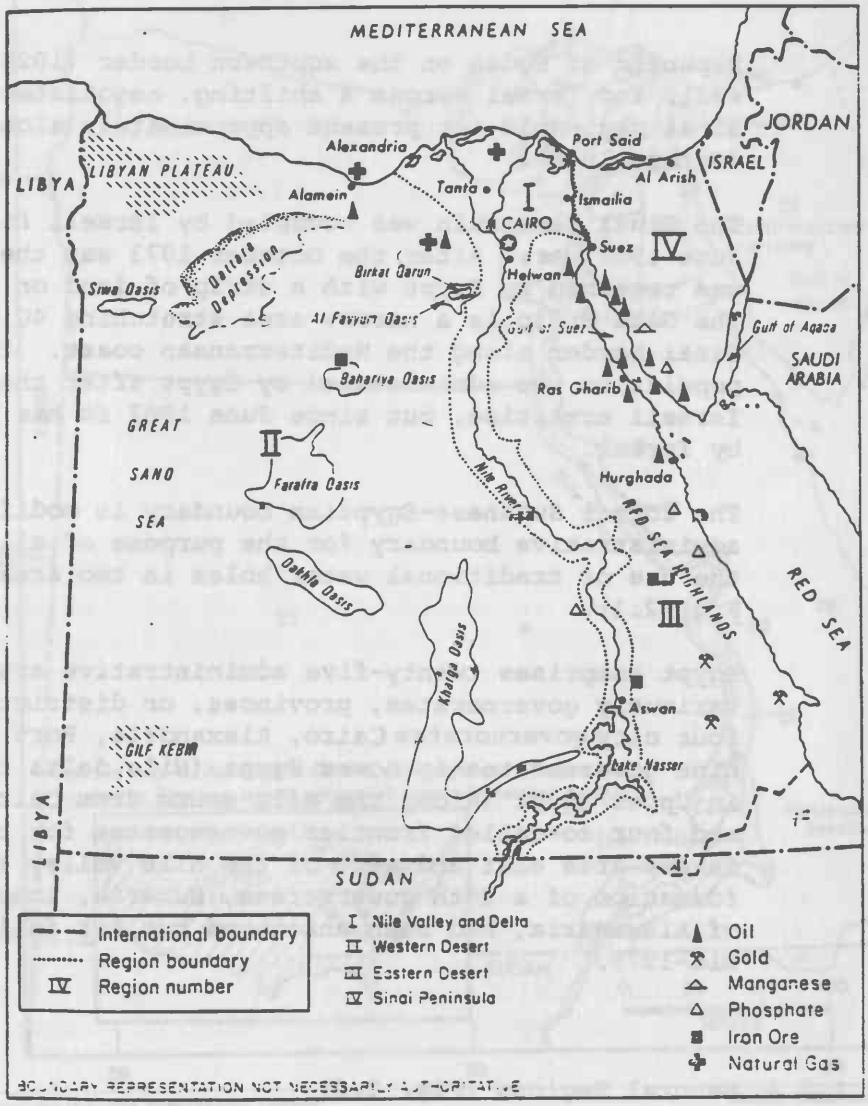


Figure 2.2 Egypt, Natural Regions.

over an enormous delta 270 km across at the sea and 180 km in length. In the first century A.D. 7 distributaries existed, but now only the Damietta and Rosetta branches lead the Nile's water to the sea.

Several coastal lakes exist. From west to east Lake Maryut (Mareotis) lies behind Alexandria, Lakes Idku, Burullus and Manzala occupy the delta fringe, and Lake Bardawil spans half of Sinai's Mediterranean coastline.

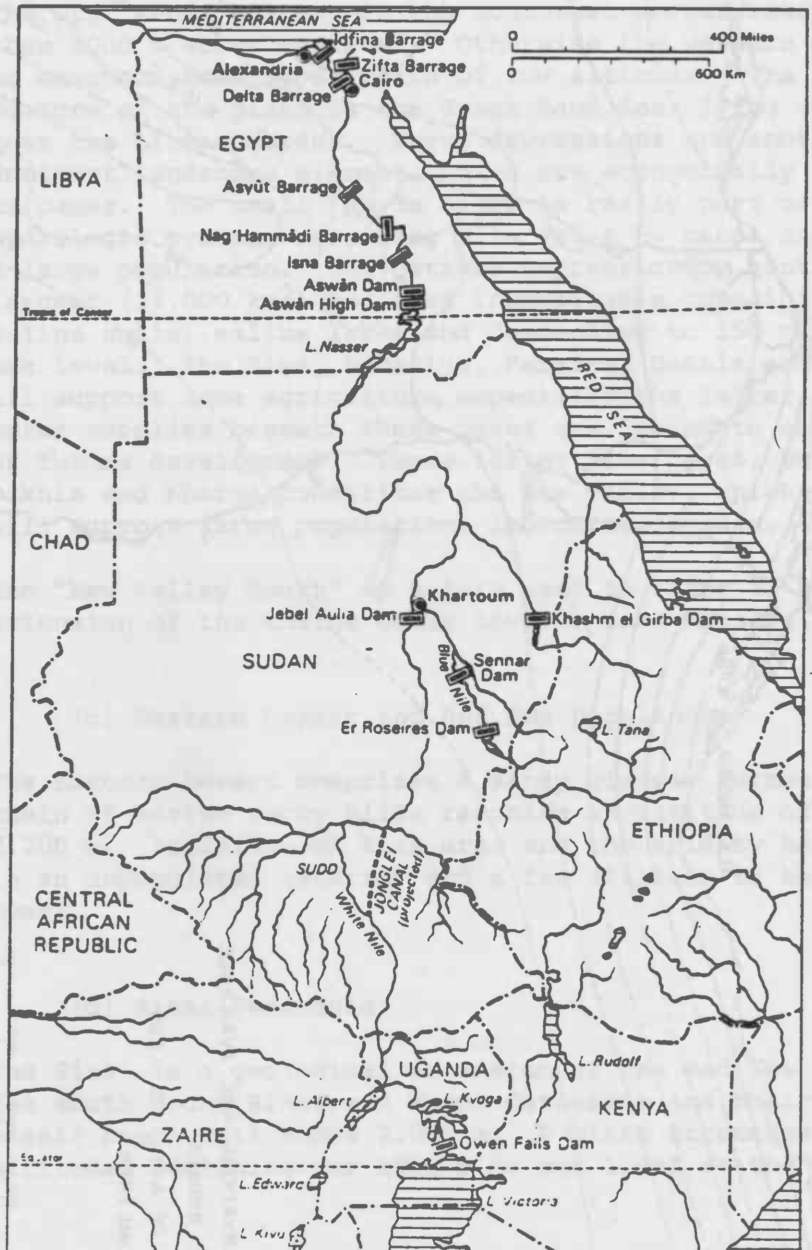


Fig. 2.3 The Nile Drainage System

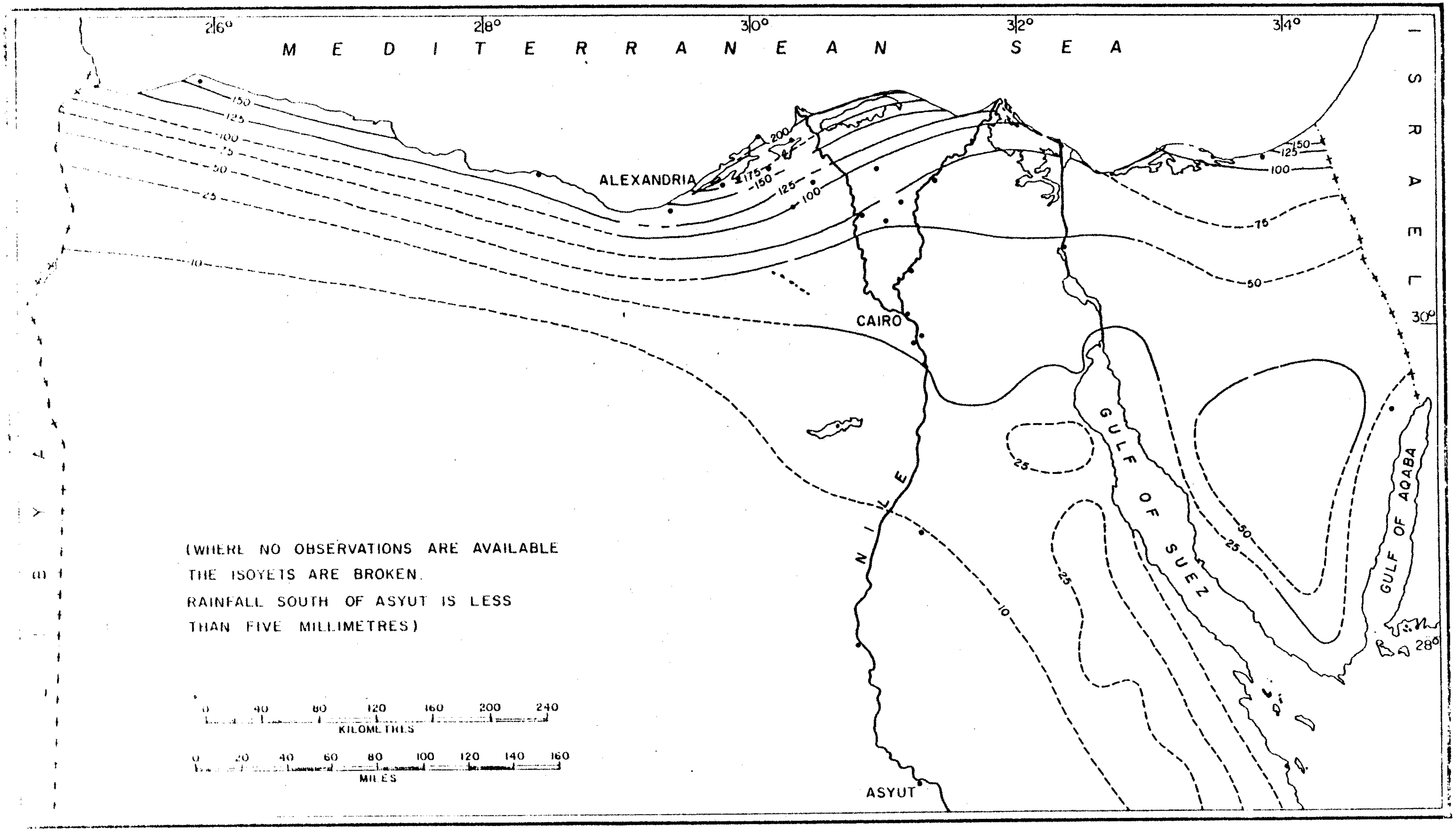


Fig. 2.4 Annual Rainfall in Egypt
Source: UN Conference Desertification. 1977, A/Conf 74/25.

(b) The Western Desert

The Western Desert constitutes about 75% of Egypt's land area. The Gilf Kebir plateau in the southwest corner reaches more than 1000 m above sealevel. Otherwise the western desert is an enormous monotonous plain of low altitude. The largest feature of the plain is the Great Sand Sea, lying generally near the Libyan border. Seven depressions are another less dominant landscape element, which are economically important as oases. The small Fayyum oasis is really part of the Nile hydrologic system, receiving Nile water by canal and supporting a large population. The Qattara Depression by contrast is the largest (23,000 km^2) and most inhospitable, containing highly saline soils, saline lakes and descending to 150 metres below sea level. The Siwa, Bahariya, Farafra, Dakhla and Kharga oases all support some agriculture, especially the latter two. Groundwater supplies beneath these oases are looked to as the basis of future development. These latter five oases, but particularly Dakhla and Kharga, consititue the New Valley, which it is hoped will support large populations in coming decades.

The "New Valley South" is a term used to refer to the southern extension of the Kharga oasis towards Lake Nasser (Fig. 2.2).

(c) Eastern Desert and Red Sea Highlands

The Eastern Desert comprises a sandy plateau surmounted by a chain of barren rocky hills reaching an altitude of about 2,200 m. Isolation of this area and the aridity have resulted in an unpopulated interior and a few villages on the Red Sea coast.

(d) Sinai Peninsula

The Sinai is a geological extension of the Red Sea Hills. In the south Mount Sinai and Mount Catherine and their red-colored massif reach well above 2,000 m. A plain stretches north with altitudes declining for 1000 m to sea level at the Mediterranean.

2.2.3 Climate (Europa Publications, 1978)

The coastline of the western delta, in the Alexandria region, receives up to 200 mm of rainfall annually because it lies across the path of prevailing westerlywinds. To the west and east coastal rainfall declines to 150 mm. Rainfall drops dramatically inland, so that by the latitude of Cairo, 200 km from the Mediterranean, rainfall is 25 mm yearly (Fig. 2.4). Low, sporadic precipitation characterizes the rest of the country, making it one of the most arid in the world.

Summer temperature maxima reach highs of 38° - $43^{\circ}C$ in Cairo, and at times even $49^{\circ}C$. 32° is the maximum at the coast which consequently draws tourists and the wealthy to Alexandria in the summer. Winters are generally warm, with occasional rain showers. Cold fronts bring colder weather from time to time and even rare, light snows.

In spring a hot southerly wind (the Khamsin) blows from the Sahara, bringing sand storms and $20^{\circ}C$ temperature increases with winds sometimes up to 150 km/hr. In spring and early summer an early morning fog sometimes develops over the delta.

2.3 POPULATION

Egypt is the second largest Islamic country in the Middle East (38.228 million in 1976: Birks et al., 1978), being almost as large as Turkey. 90% of the population follows the Sunni branch of Islam, as do the majority of Islamic countries. Besides Egyptian, other

Table 2.1 Egypt, Density of Population by Governorate, 1966 Census and 1975 Estimates

Governorate	Area (in square miles)	Population (in thousands)		Density (per square mile)	
		1966	1975	1966	1975
City Governorates:					
Cairo	83	4.220	5,859	50,842	70.590
Alexandria	112	1.801	2,303	16.081	20,563
Port Said	320	283	347	884	1,084
Suez	119	264	378	2.219	3,176
Total	634	6,568	8,887		
Lower Egypt Governorates:*					
Ismailia	153	345	451	2.254	2,948
Buhayrah	1,773	1,979	2.487	1.116	1,403
Kafr al Shaykh	1,348	1,119	1,364	830	1,012
Gharbiyah (Tanta)	770	1,900	2,277	2.474	2,957
Daqahliyah (Mansura)	1,337	2,285	2,722	1,705	2,036
Sharqiya (Zagazig)	1,815	2.102	2.606	1,158	1,436
Minufiya (Shibin el Kom)	585	1,458	1,607	2,492	2,747
Qalyubia (Benha)	365	1,214	1,565	3,327	4,288
Damietta	231	432	518	1,868	2.242
Total	8,377	12,834	15,597		
Upper Egypt Governorates:					
Giza	416	1,640	2,265	3,967	5,445
Al Fayyum	692	941	1,088	1,360	1,572
Bani Suwayf	507	928	1,030	1,830	2,032
Minya	878	1,706	1,931	1,943	2,199
Asyut	600	1,418	1,562	2,364	2,603
Suhag	595	1,696	1,845	2,851	3,101
Qena	699	1,471	1,657	2,104	2,371
Aswan	341	521	729	1.527	2,138
Total	4,728	10,321	12,107		
Frontier Governorates					
Combined	372,973	352	409	1	1
TOTAL	386,712	30,075	37,000		

*Capitals in parentheses where different from the name of the governorate.

Source: Nyrop, 1976.

small ethnic groups are Copts, Bedouins, and Nubians. Arabic, English and French are spoken (Europa Publications, 1978).

More than one third of the delta's population centers on the four city governorates of Cairo, Alexandria, Port Said and Suez (nearly 9 million in 1975 - Table 2.1). The other nine delta governorates have almost 16 million people, with population densities ranging from 1,000 to 4,300 people per sq. mile, compared with the very high densities of 20,000 and 70,600 people per square mile in Alexandria and Cairo respectively (Table 2.1). Densities are very low beyond the Nile valley and delta which comprises 3% of Egypt's land area but supports 96% of the population.

Population pressure on especially land and water resources is Egypt's principal economic problem. It vitiates health standards in urban environments.

One authority estimates Egypt's 1897 population at 9.715 million (Birks et al., 1978). Average annual growth rates have increased from 1.51% in 1907 to a high of 2.46% in 1960, and have declined since to 2.31% which translates to the additon of about 800,000 people per year to the population.

The birthrate has dropped from 44.3/1000 recorded in 1927 to 35.1 in 1971. Death rates have declined drastically from 27.1/1000 in the 1927-36 period to 13.2/1000 in 1971 (Nyrop, 1976). 42% of the population was under 15 years of age and 50% under 20 in 1966. The diet of the average Egyptian is poor and contains little animal protein.

Table 2.2 Landownership in 1952 and 1965
(Figures are in thousands)

Size group (Feddans)	Before land reform (1952)				After land reform (1965)			
	Owners	Area	Per cent of total Owners	Per cent of total Area	Owners	Area	Per cent of total Owners	Per cent of total Area
Less than 1	2,018	788	72·0	13·0	3,033	3,693	94·5	57·1
1–4	624	1,344	22·2	22·5				
5–9	79	526	2·8	8·8	78	614	2·4	9·5
10–19	47	638	1·8	10·7	61	527	1·9	8·2
20–29	13	309	0·5	5·0	29	815	0·9	12·6
30–49	9	344	0·3	5·7				
50–99	6	429	0·2	7·2	6	392	0·2	6·1
100–199	3	437	0·1	7·3	4	421	0·1	6·5
200 and over	2	1,177	0·1	19·8	0	0	0	0
TOTAL	2,802	5,982	100	100	3,211	6,462	100	100

Source: Beaumont et al. 1976.

40% of the population is active in agriculture, which contributes 60% of the total export earnings. Land reforms instituted after the Revolution in 1952 which brought Col. Nasser to power have altered significantly the pattern of land ownership. Before 1952 72% of landowners were in the group of smallest land holders (less than 1 feddan[1/]). By 1965 this figure has risen to 94.5%, more than quadrupling the total area in this class (Table 2.2). Nevertheless, half the agricultural land (49.3%) remained in the hands of only 5.4% of the agricultural population. It has been noted that the problem is less one of land distribution than overall scarcity. For this reason many schemes have been initiated to increase absolutely Egypt's arable acreage by reclaiming land from the desert (see 3.3.3 below).

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[1] 1 feddan = 1.038 acres = 0.42 hectares

3.0 REVIEW OF NATURAL RESOURCES

3.1 MINERALS (U.S. Dept. of the Interior, 1976; Nyrop, 1976; Europa Publications, 1979; Kirwan, 1977) (Table 3.1)

Egypt's mineral industry is underdeveloped compared with its known reserves of many minerals. The industry contributes 10% of the GDP ($700 million in 1974). Egypt's major minerals are iron ore, petroleum and natural gas, and phosphates (Fig. 3.1). Many others are produced in small quantity, such as granite, limestone, gypsum, ilmenite, gold, aluminum, manganese, salt, and sand.

Table 3.1: Role in the world mineral supply
(Thousand metric tons, unless otherwise specified)

Map symbol	Major commodities	1974 production	Estimated share of production exported (%)	Share of world output (%)	Reserves	Share of total world resources (%)
Fe	Iron ore........................	*1,300	20	(1)	400,000	(1)
N G	Natural gas (billion cu ft).......	15	None	(1)	4,000	(1)
Pet	Petroleum, crude (million 42-gal bbl)............................	54	*5	(1)	3,900	(1)
P	Phosphate rock....................	550	30	(1)	200,000	1.0

*Estimated. (1) Less than 1%.

Source: U.S. Dept. of Interior, Bureau of Mines, 1976.

3.1.1 Iron Ore

The majority of iron ore mined derives from Aswan and the Bahariya oasis 360 km southwest of Cairo. 1,300,000 metric tons were mined in 1974, and transported by rail from both localities to smelters at Helwan near Cairo. Production by 1980 is projected to be 3,100,000 metric tons.

3.1.2 Phosphates and Related Development

Most of Egypt's minerals have been consumed at home. Only 30% of phosphate production is exported, but recent finds of very large reserves (1 milliard metric tons) at Abu Tartur in the Kharga area have enabled Egypt to plan on mining 9-10 million tons per annum (550,000 tons in 1974) and exporting 8 million tons of this by 1985.

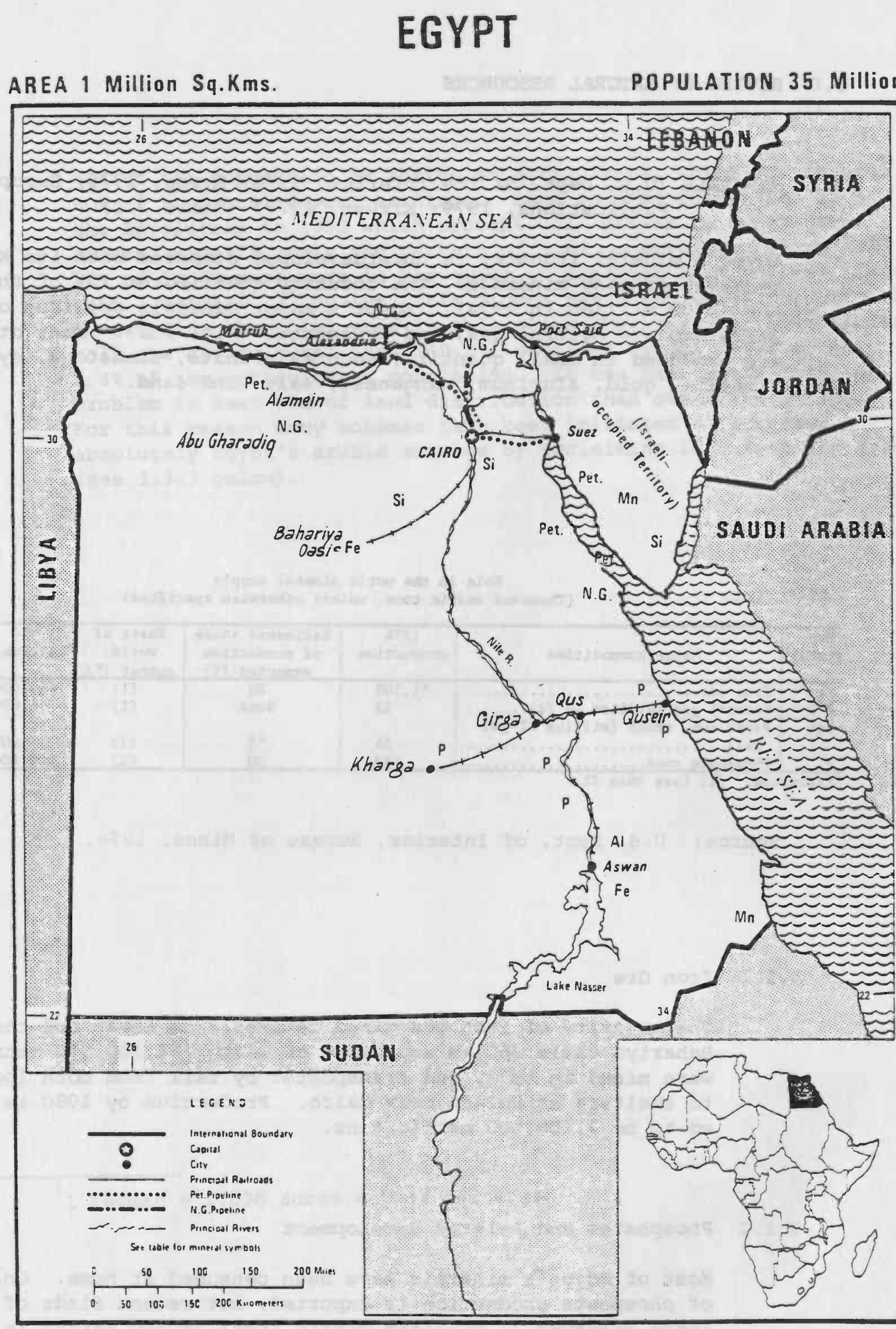

Fig. 3.1 Minerals of Egypt
Adapted from U.S. Dept. of the Interior, Bureau of Mines. 1976.

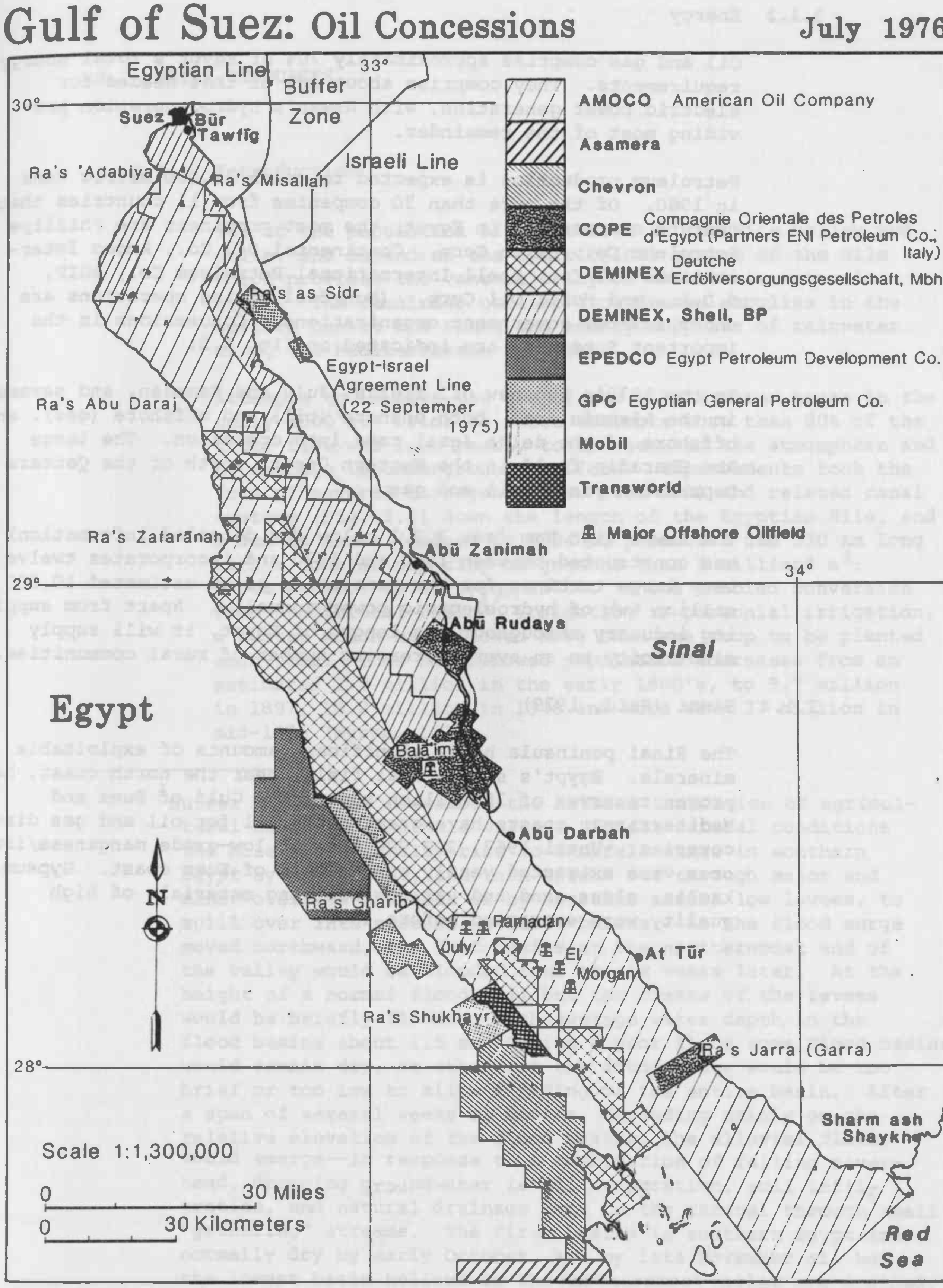

Fig. 3.2 Gulf of Suez: Oil Concessions
Source: U.S. Dept. of the Interior, Bureau of Mines. 1976.

3.1.3 Energy

Oil and gas comprise approximately 70% of Egypt's total energy requirements. They comprise about 30% of that needed for electric power generation, with Aswan's hydrogeneration providing most of the remainder.

Petroleum production is expected to reach 20,000 metric tons in 1980. Of the more than 30 companies from 11 countries that operate concessions in Egypt, the most prominent are Phillips Petroleum Co., Exxon Corp., Continental Oil Co., Amoco International Oil Co., Shell International Petroleum Co., AGIP, S.D.A., and Mobil Oil Corp. (Non-fuel mining operations are under several government organizations. Concessions in the important Suez area are indicated on Fig. 3.2.

In the 1970's two new oil fields, July and Ramadan, and several in the Alamein area both onshore (oil) and offshore (gas), and offshore of the delta (gas) came into operation. The large Abu Gharadiq field in the Western Desert south of the Qattara Depression yields oil and gas.

The Aswan High Dam (see 3.2.1 below for detailed information) was constructed between 1960 and 1970 and incorporates twelve very large turbines for the generation of an estimated 10,000 million kwh of hydroelectric power annually. Apart from supplying industry throughout the length of Egypt, it will supply electricity to an ever increasing number of rural communities.

3.1.4 Sinai (Said, 1979)

The Sinai peninsula holds significant amounts of exploitable minerals. Egypt's single coal field, near the north coast, has proven reserves of 35 million tons. The Gulf of Suez and Mediterranean coasts have great potential for oil and gas discoveries. Until 1967, 200,000 tons of low-grade manganese/iron ores were extracted yearly on the Gulf of Suez coast. Gypsum, kaolin, glass sand and various building materials of high quality were extracted before 1967.

3.2 WATER RESOURCES

3.2.1 Introduction

96% of the population of Egypt live in the Nile valley and delta, and depend on the hydrological system of the Nile which provides the vast majority of accessible water in Egypt. The remainder utilize groundwater supplies in the western Desert and Sinai and scanty supplies of rainwater along the Mediterranean littoral.

Attempts to improve the use of the Nile's water began in the early 1800's. Prior to these attempts more than 80% of the total flow was lost yearly to the sea, to the atmosphere and by seepage to underground aquifers. Improvements took the form of several barrages (Figs. 2.2, 3.3) and related canal systems (Fig. 3.3) down the length of the Egyptian Nile, and a dam at Aswan (raised in 1934 to produce a dam 330 km long with a doubled capacity of greater than 5 milliard m^3: Hafez et al., 1978; Nyrop, 1976). These enabled conversion from traditional basin[1] irrigation to perennial irrigation, a system which has allowed more than one crop to be planted each year. This has allowed population increases from an estimated 2.5 million in the early 1800's, to 9.7 million in 1897, 18.8 million in 1946 and more than 37 million in mid-1975 (Nyrop, 1976).

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[1] Butzer (1976) has described the natural inundation of agricultural basins in the Nile valley: "Under natural conditions the Nile would ideally rise to bankfall stage in southern Egypt by mid-August, and then spread out through major and minor overflow channels or by breaches across low levees, to spill over into successive flood basins. As the flood surge moved northward, the last basins at the northernmost end of the valley would be flooded four to six weeks later. At the height of a normal flood, all but the crests of the levees would be briefly flooded, with average water depth in the flood basins about 1.5 m. During a poor flood some flood basins would remain dry, or otherwise the flood stage would be too brief or too low to allow flooding of the entire basin. After a span of several weeks or months, depending mainly on the relative elevation of the flood basins, the alluvial flats would emerge--in response to a combination of falling riverhead, dropping groundwater level, evaporation, soil infiltration, and natural drainage back to the channel through small "gathering" streams. The first basins in southern Egypt are normally dry by early October, and by late November all but the lowest basin hollows in the northernmost valley are drained, with persistent marsh in isolated, valley-margin backswamps or in the cutoff, oxbow lakes of abandoned meanders."

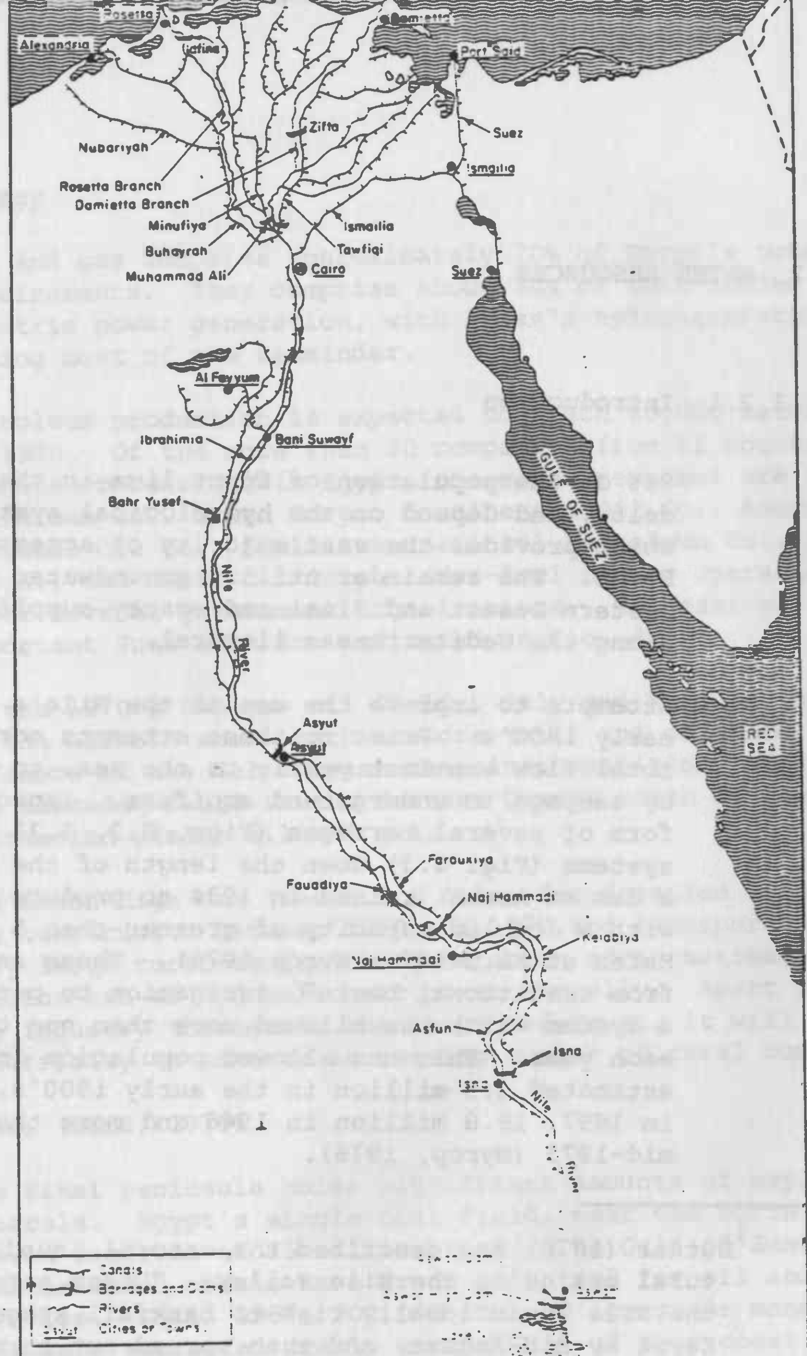

Fig. 3.3: Man-made features of the Egyptian Nile
Source: Nyrop. 1976.

3.2.2 Nile Hydrological System

3.2.2.1 General Features

50% of the Nile's water is lost before it reaches Egypt's border. 84 milliard m^3 of water is available in Lake Nasser/Nubia[2] of which 55 milliard m^3 is apportioned to Egypt. To this may be added 12.2 milliard of Nile water which is re-used, and 0.5 milliard of groundwater pumped from wells. This gives a total of 68.2 milliard available to Egypt, against its present (1977) need of 51.41 milliar (Badran et al. 1979). The remainder is lost primarily by seepage, evaporation and runoff to the sea.

[2]The Aswan High Dam impounds a lake which straddles the Egyptian/Sudanese bor der, (called Lake Nasser in Egypt and Lake Nubia in the Sudan).

Efforts of many kinds are directed at reducing these losses, and increasing the efficiency of the systems so that potentially arable areas may be brought under irrigation. In fact, it has been stated, despite this quantity of extra water available at Aswan, that "Egypt may soon face a water shortage [in the absence of] very careful water management" (Kinawy, 1978) since population continues to increase at 2.5% p.a.

The Jonglei scheme (Fig. 2.2) aims to short-circuit Nile water through the Sudd region of stagnant swamps in Sudan where very large losses occur. 4 milliard m^3 of water could be supplied to Lake Nasser annually in the first phase of the scheme. Subsequent phases would attempt to eliminate losses in the Sudd zone. (Egypt, 1978a. Abs. 16).

The Nile's seasonal discharge regime is presented in Table 3.2.

TABLE 3.2 The Aswan High Dam Discharges During 1972

(*milliard m^3*)

		BF 27.200	
Jan.	3.350	July	6.950
Feb.	4.000	Aug.	6.200
March	4.200	Sep.	4.300
April	4.000	Oct.	3.850
May	5.200	Nov.	3.650
June	5.450	Dec.	3.000
BFW 27.200 milliards		Total 55.150 milliards	

Source: Kinawy. 1978.

3.2.2.2 Lakes Nasser and Nubia (Hafez et al. 1978)

The Aswan High Dam was built 6.5 km south of the historic Aswan Dam, first built in 1902 and raised twice in 1912 and 1934, the second doubling capacity to more than 5 milliard m^3. The High Dam was begun in 1960 and completed in mid-1970. A canal leads water to twelve generating units capable of an energy output of 2.1 million kWh.

The water body is the second largest man-made lake in the world, second only to Lake Bratisk in the USSR. Its dimensions are given in Table 3.3.

Table 3.3: Dimensions of Lake Nasser and the Total Reservoir

	Lake Nasser only	Total Reservoir
Length	292 km	540 km
Surface area at elev. 160 m.	2,585 km^2	3,057 km^2
" " at elev. 180 m.	5,248 km^2	6,216 km^2
Volume at elev. 160 m.	55.6 km^3	65.9 km^3
" " " 180 m.	132.5 km^3	156.9 km^3
Shoreline length at 160 m.	5,380 km.	6,027 km.
" " at 180 m.	7,844 km.	9,250 km.
Mean width at elev. 160 m.	8.9 km.	7.1 km.
" " at elev. 180 m.	18.0 km.	12.5 km.
" depth at elev. 180 m.	25.2 m.	25.2 m.
Maximum depth at elev. 180 m.	130.0 m.	130.0 m.

Source: Hafez et al. 1978.

The most important results expected from the Aswan High Dam were (Benedick, 1978):

a. to provide a dependable supply of irrigation water for the agriculture of Egypt, even in years of drought;[3] in particular storage of the annual flood would permit perennial irrigation to be introduced and long term storage, the so-called "century storage" of the water of several higher-than-average floods for use during a possible series of dry years;

b. the saving of large amounts of water which previously were lost to the sea for the reclamation of 1.3 million feddans of new land for cultivation;

c. the protection of life, property and crops against ravages of uncontrolled and annual floods;[4]

d. the supply of large quantities of cheap hydro-electric power with the hope that this would stimulate industrialisation sufficient to reduce Egypt's dependence on overseas cotton earnings.

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[3] Crops worth an estimated $600 million were saved in 1972 when the lowest flood in a century would have caused the loss of over one third of the harvest (Waterbury, 1974).

[4] Fluctuations have been moderated from extremes of 200 - 14,000 $m^3 sec^{-1}$ to 930 - 2,600 $m^3 sec^{-1}$.

3.2.2.3 The Canal System

From beginnings in 1902, 30,000 km of canals have been constructed in Egypt (Kinawy, 1979) whereby 80% of the arable land has been converted to perennial irrigation and can be cultivated in summer.

In Egypt's canal system (Fig 3.3) the Bahr Yusnf dates from ancient times, and is perhaps the oldest major canal in the entire valley. Much of the length of the inland waterways occupies smaller alternate courses of the ancient Nile (Butzer, 1976). The canals provide not only irrigation water but transportation routes as well. The Ismailiya and Nubariya canals are integrated into land reclamation schemes, bringing water to areas which were not flooded by the Nile.

The ecological problems connected with perennial irrigation are presented below (4.1).

3.2.2.4 Groundwater and Drainage Water

(a) Groundwater

The total extraction from wells is about 2.9 milliard m^3, of which 65% is used for non - agricultural purposes (Seddik et al., 1979). Extraction by governorate is listed in Table 3.4. 130 productive pumping installations.

Table 3.4 Groundwater Extraction in Egypt

Governorate	Annual extraction
Cairo	238,404,000
Guiza	66,836,154
Qalubia	277,143,625
Sharkia	142,429,426
Dakhalia	137,661,005
Gharbiya	26,976,687
Menufiya	59,735,882
Tahrir Province	612,757,856
Beheira	11,033,216
Beni Suef	12,259,200
Minya	258,322,520
Assiut	101,733,040
Sohag	602,250,650
Qena	352,118,000
Aswan	996,450

Total in Lower Egypt about 1.6 milliard m^3
Total in Upper Egypt about 1.3 milliard m^3

Source: Seddik et al. 1979.

in the southern delta feed the downstream ends of irrigation canals to supplement lower summer supplies (Kinawy, 1978).

(b) Drainage Water (Badran et al., 1979)

2.3 milliard m^3 of drainage water were re-used in the delta for irrigation in 1976. A similar quantity flowed to Qarun Lake in the Fayyum and was also re-used for irrigation, giving a total of 4.6 milliard m^3 re-used in the Nile's hydrologic system, a significant contribution to overall water use efficiency (3.2.2.6 below). Government sources quote a figure of 12.2 milliard m^3/yr. as potentially re-usable (Egypt, 1978b).

3.2.2.5 Industrial and Agricultural Use

3.0 milliard m^3/yr (1972 records, Kinawy, 1978) of Nile water are withdrawn for industrial and domestic use, which is only 6% of the Nile water budget. This is expected to grow 4.5 milliards by the year 2000 A.D. Another 1.5 milliards/yr. ultimately will be consumed by ten new industrial towns planned for construction around the city of Cairo (Kinawy, 1978).

3.2.2.6 Water Use Efficiency

Egypt has become somewhat more efficient in its use of a static "water capital" of 55.5 milliard m^3/yr. In 1966 efficiency was computed to be 66%, 6 years later this had risen to 75% (Table 3.5), compared with as little as 25% in some countries (Holy, 1978).

Table 3.5 Balance of Water Budget in Egypt Based on 1972 Records (milliard m^3)

Total discharges of the Aswan High Dam		55.150
Industrial and domestic abstractions	− 3.000	
Upper Egypt (UE) irrigation requirements (Table 1)	−15.720	
Reuse of drainage water in UE	+ 4.570	
Losses in UE	− 4.420	18.570
Water passing Cairo (measured)		36.580
Delta irrigation requirements (Table 1)	−25.700	
Spillage into the Mediterranean (measured)	− 3.500	
Losses in the Delta	− 7.380	−36.580
Overall efficiency of irrigation water	41.420	= 75%
	55.150	

Source: Kinawy. 1978.

However, the major cause for this rise has been the conversion to cultivation of more water-demanding crops such as rice and sugar, which together consumed 5 milliard m^3/yr. more water (Kinawy, 1978).

The obverse of water budget efficiency can be seen in the breakdown of yearly water losses (Table 3.6).

Table 3.6 Nile Water Loss Analysis

	(*milliard* m^3)	% quota
Industrial and domestic use	3.000	5.5
Excess discharges to secure navigation, and to cover the hydro-power requirements, which finally spill into the sea	3.500	6.5
Losses due to conveyance, seepage and extravagance in water utilization	9.800	17.5
	18.300	33.0%
Recovered through the reuse of drainage water	− 4.880	− 8.0
Net losses	13.880	25.0%

Source: Kinawy. 1978.

Some Measures to Increase Efficiency

(a) Losses from Lake Nasser

Excluded from the tabulations above (Tables 3.5 & 3.6) is the 10 milliard m^3/yr. left to compensate for evaporation and seepage from Lake Nasser. As one of the largest losses in the Nile hydrologic system, it is obviously "vital to encourage researches aiming at supressing the huge evaporation losses" (Kinawy, 1978), a problem easier to control perhaps than the great seepage losses from the dam (1 milliard m^3/yr. reaches the aquifer; Wafa, 1977). These latter recharge groundwater supplies, and in this sense the loss is not complete. Little is known about the functioning of Egypt's aquifer systems, however.

(b) Losses from the distribution system

30,000 kms of canals exist in Egypt with differing problems of seepage. Worthington (1978) states that infiltration claims 40-45% of water supplied at the canal head.

0.8 milliard m^3/yr. is lost, for example, from the Ismailiya canal due to the fact that a section is unlined, water seeping through the sandy bottom (clay-lined canals are significantly more efficient, and fine materials deposited on the floor of Lake Nasser are thought to reduce seepage). Losses are greater from canals that are situated high above the surrounding plain. The abovementioned Ismailiya canal is situated as much as 4.5m above the plain (Kinawy, 1978).

Evaporation from canals can be reduced drastically by converting to piped water distribution (Worthington 1978). This is very costly, however, and not seriously considered on a large scale.

(c) Improvement of irrigation practices

Improvements relate primarily to controlling extravagant irrigation practices. The present system is termed free-of-charge flush irrigation, whereby water is discharged into canals long enough to have an area innundated. Losses are twofold. Firstly, more water than is necessary for a healthy crop is usually used in this flood system, and secondly a certain amount reaches drains at the end of canals resulting in losses estimated at about 2.0 milliard m^3/yr. Unnecessary over-irrigation and re-irrigation is common as is the use of water during daylight hours only, allowing nocturnal supplies to reach the drains (Worthington, 1978).

In all, such losses amount to some 9.8 milliard m^3/yr. (Table 3.6), or nearly 18% of Egypt's disposable supply. Sprinkler and drip irrigation systems, and charging farmers for the water they use, are methods mentioned to control water use. Major coincident advantages are those of controlling waterlogging and salinization problems.

(d) Cropping pattern

A principal aim in increasing efficiency should be to raise the crop index, especially in newly reclaimed lands. This index has risen from 1.0 crop /feddan/year at the turn of the century to 1.67 in the 1970's. It could be raised further by cultivating crops with lower water requirements, i.e. by giving over rice and sugar cultivation, for example, for maize, wheat, cotton, legumes, etc. (final two columns, Table 3.7), "whatever the value of such crops may be" (Kinawy, 1978).

Table 3.7 Water Requirements under Flush Irrigation

	Lower Egypt (the Delta)			Middle Upper Egypt			Uppermost Egypt			Total cropped area in Egypt × 1000 fed.	Total water requirement for Egypt, mill. m^3
	Cropped area × 1000 fed.	Water requirements per fed. m^3	Total requirements mill. m^3	Cropped area × 1000 fed.	Water requirements per fed. m^3	Total water requirements, mill. m^3	Cropped area × 1000 fed.	Water requirements per fed. m^4	Total water requirements, mill. m^3		
Winter crops:											
Wheat	725	1600	1160	217	1700	370	297	2100	624	1239	2154
Beans	135	1350	183	153	1470	225	77	1600	123	365	531
Barley	73	1400	102	6.7	1500	10	11.3	1700	19.5	91	31.5
Fenugreek	1.8	1050	2	11.7	1170	14	15.5	1290	20	29	36
Lentils							67	1210	81	67	81
Flax	32.5	1070	35	0.5	1190	0.6				33	35.6
Onions	2.5	2250	5.5	6.5	2500	16	22	2700	59.5	31	81
Lupine	6	1000	6	2.5	1120	3	1.5	1230	2	10	11
Chick-peas	3.5	1020	3.5	.3	1130	0.4	6.2	1240	7.5	10	11.4
Egyptian clover (Bersim)	1166	3100	3600	274	3650	1000	125	4000	500	1565	5100
Temporary (Bersim)	903	1910	1730	226	2120	480	125	2330	292	1254	2502
Garlic	2.2	1600	3.5	6.6	1780	117	.2	1950	0.5	9	121
Vegetables	45	2220	100	129.5	2470	320	4.5	2720	12	179	432
Others	11.5	1900	22	1.5	2110	3	16	2320	37	29	62
Summer crops:											
Cotton	1000	3400	3400	334	3900	1300	218	4700	1030	1552	5730
Rice	1140	8800	10,100	6	9920	59				1146	10159
Corn				92	2800	258	392	3080	1210	284	1468
Maize	1140	2700	3100	322	3000	966	69	3300	228	1531	4294
Sugar cane	12	14,760	117	25	16,400	410	165	17,800	2940	202	3527
Earth nuts	18	3160	57	11	3510	39	5	3860	19	34	115
Sesame	6	2000	12	6	2220	13.5	30	2440	73	42	98.5
Vegetables	98	3780	377.5	129	4200	544	335	4620	1550	562	2471.5
Others	60	3420	205	18	3800	68.5	42	4180	175	120	448.5
Orchards	188	6850	1290	44.2	7600	322	20.8	8370	174	253	1786
Total	6769		25671	2023		6539	2045		9177	10837	41387

Water requirements shown in this table are according to extensive experiments carried out by the Ministry of Irrigation in pilot areas.
Total cropped area is 10,837 million feddans as actually surveyed in 1972.

Source: Kinawy, 1978.

(e) Re-use of drainage water

An estimated 4.5 milliard m^3/yr. of water are re-used for irrigation in Egypt. Re-use furnishes a relatively large proportion (8%) of the total disposable supply and will probably increase with time.

Serious industrial pollution and salinity in the delta have dissuaded large-scale water re-use, which is thus mainly practised in Upper Egypt.

(f) Management practices

Optimizing water use at the field scale involves improving the ability to supply no more than critical amounts of water at a critical period or periods of plant growth. Such decisions are made according to crop-type and soil characteristics such as retention capacity and natural water supply. Proper tillage, mulching, weed control, and erection of wind breaks all reduce soil moisture loss.

At the project scale two management problems are critical: firstly, "avoiding peaks in field water requirements as well as idle periods when the [irrigation] network is undercharged" (Worthington, 1978); and secondly, obtaining effective agronomic use of water (i.e. by controlling water supply and hence depth of wetting, and by controlling the period(s) of water supply to comparatively short critical times of need). Crop type and the amount of land under particular crop types need to be built into the management system. "Sophisticated schedules of water delivery" are the ultimate aim (Worthington, 1978).

Worthington, (1978) encapsulates the experience of 91 operating irrigation projects from many countries in which improved organization and management practices promote overall efficiency: avoid irrigation projects of less than 1000 ha; divide large irrigation projects into lateral units of between 2000 and 6000 ha, depending on topography; let each lateral unit contain a number of rational units, the size of which should vary between 70 and 300 ha, depending on topography; operate main, lateral and sublateral canals on a schedule of continuous flow; within a rotational unit, organize the rotation of water supply to farm inlets or group inlets independently of the distribution in adjacent units; on large irrigation projects of more than 10,000 ha decentralize the project management so that each lateral unit has its own staff. (Worthington, 1978: 16-17)

These measures are believed to cost little to implement while contributing substantially to water use efficiency.

(g) Spillage into the Mediterranean

Canals are closed during the Nile's low January flow, with only enough discharge from Lake Nasser to maintain navigable depths in the major canals, to supply power generation needs and domestic requirements. 3.5 milliard m^3/yr. flows into the Mediterranean as a result. It has been suggested that this substantial quantity be stored either in the coastal lakes or in the Natrun depression for irrigation use (Kinawy, 1978).

3.2.3 Western Desert Oases and the Western Coastal Zone

3.2.3.1 Western Desert Oases

Two aquifers, a shallow and a deep, supply water to the two major oases of the Western Desert (Kharga and Dakhla - Fig. 2.1) by means of wells (Table 3.8). 31,000 feddans

Table 3.8 Kharga and Dakhla Oases Well Yields

Deep Wells

Name of well	Date completed	Depth in meters	Yields (m^3/day)
Khargá oasis			
Mahariq	1947	487.7	600
Borg	1940	503.3	425
Qasr	1939	507.2	1741
Faruqiya	1939	470.3	2615
Bustan	1950	457.5	1720
Ginah 2	1952	342.5	3400
Ginah 1	1942	483.4	-
Gomhuria	1955	542.5	5500
Dakhla oasis			
Budkhulu	1941	240.1	8705
Qasr 2	1947	353.8	6400
Qasr 1	1943	221.1	4910
Gedida	1940	259.2	7482
Qalamun	1940	249.2	1670
Faruqiya	1940	233.0	8683
Ismant	1951	335.5	8200

Shallow Wells

	1941		1953	
District	No. of wells	Discharge m^3/day	No. of wells	Discharge m^3/day
Kharga oasis	354	123200	412	105800
Dakhla oasis			805	253500

Note: Data from taxation records.

Source: Seddik et al. 1979.

were irrigated in 1976, compared with 15,800 feddans in 1955 (Seddik et al., 1979).

However, recent geophysical exploration reveals that these two oases are underlain by aquifers capable of supplying 750 million m^3 of groundwater yearly, sufficient to irrigate 150,000 feddan. Totals for all 6 of the Western Desert oases show 2.5 milliard m^3, sufficient for the irrigation of half a million feddans (Table 3.9).

Table 3.9 Groundwater Supplies Western Desert Oases

Area	Available Groundwater million m^3	Possible irrigated area 1000's Feddans
Siwa Oases	125	25
Bahariya Oases	250	50
Farafra Oases	700	140
Dakhla Oases	500	100
Kharga Oases	250	50
South Kharga Dep.	675	135
Total	2500	500

Source: Seddik et al. 1979.

Piezometric gradient in southwest Egypt (Fig. 3.3) indicates groundwater flow from the south and southwest (Fig. 3.4).

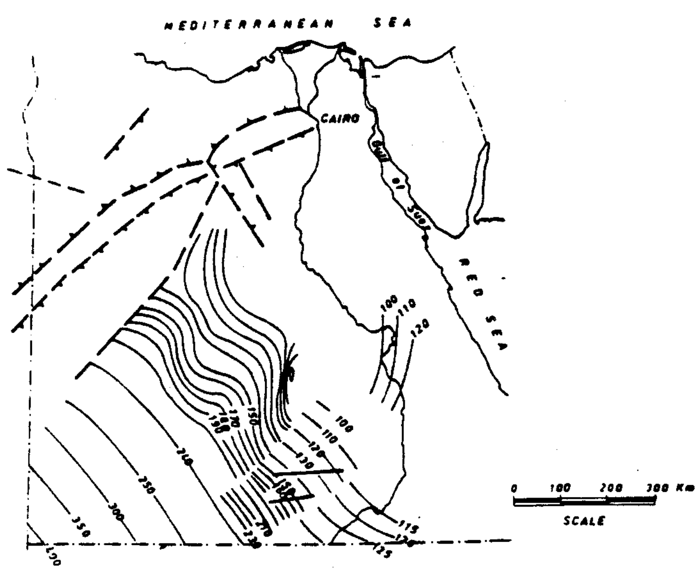

Fig. 3.3: Piezometric Surface in Southwest Egypt
Source: Shata. 1979a.

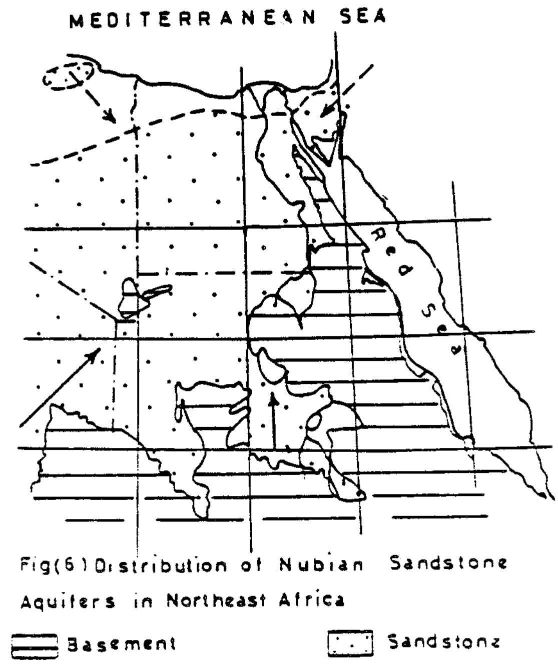

Fig. 3.4: Directions of groundwater movement in Egypt's major aquifer (Nubian Sandstone). Source: Shata, 1979a.

3.2.3.2 Western Coastal Zone (Seddik et al., 1979)

Rainfall along the coast, insufficient for most kinds of agriculture (150 mm/yr.), is concentrated by 218 wadis drainages sufficiently to supplement irrigation by precipitation in an area of 135,000 feddan. A groundwater supply from Neogene and quaternary aquifers (United Nations, 1973) of 25 million m^3/yr is sufficient to irrigate 5,000 feddan of olive, almond and fig trees.

3.2.4 Sinai Peninsula (Said, 1979; Shata, 1979b).

The major drainage feature is Wadi el Arish which drains two thirds of the peninsula and drains into the Mediterranean at El Arish. 200,000 m^3/yr could be drawn from this groundwater supply.

Large wadis on the Suez and Aqaba Gulf coasts carry sufficient runoff for planners to consider developing settlements (Shata, 1979) (Fig. 3.5).

Nile water irrigated a small number of feddan near Ismailiya

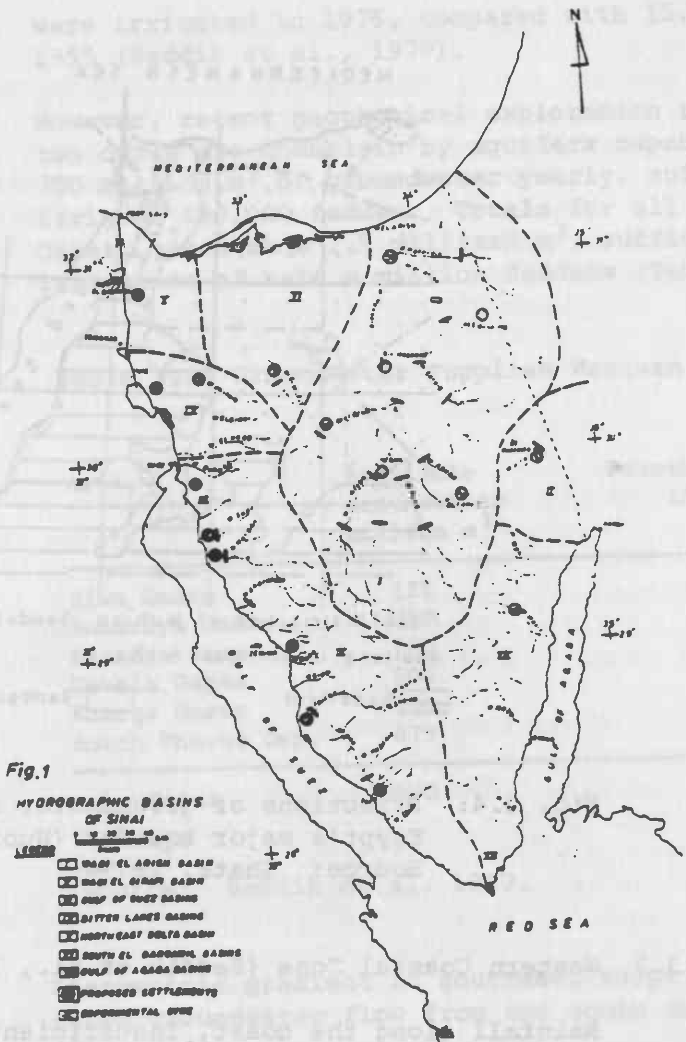

Fig. 3.5: Hydrographic basins and proposed settlements in Sinai. Source: Shata. 1979b.

before 1967. A scheme envisaged 25 years ago, considered viable, planned the irrigation of 250,000 feddans.

Three major aquifers, almost entirely uninvestigated, underli the Sinai: Nubian Sandstone, Eocene and Cretaceous rocks, and Quaternary calcarenites (Shata, 1979b.

3.3 SOIL RESOURCES

3.3.1 General Description

Of eighteen soil associations identified in the FAO/UNESCO classification (1970), six account for 85% of the surface area of Egypt (Fig. 3.6).

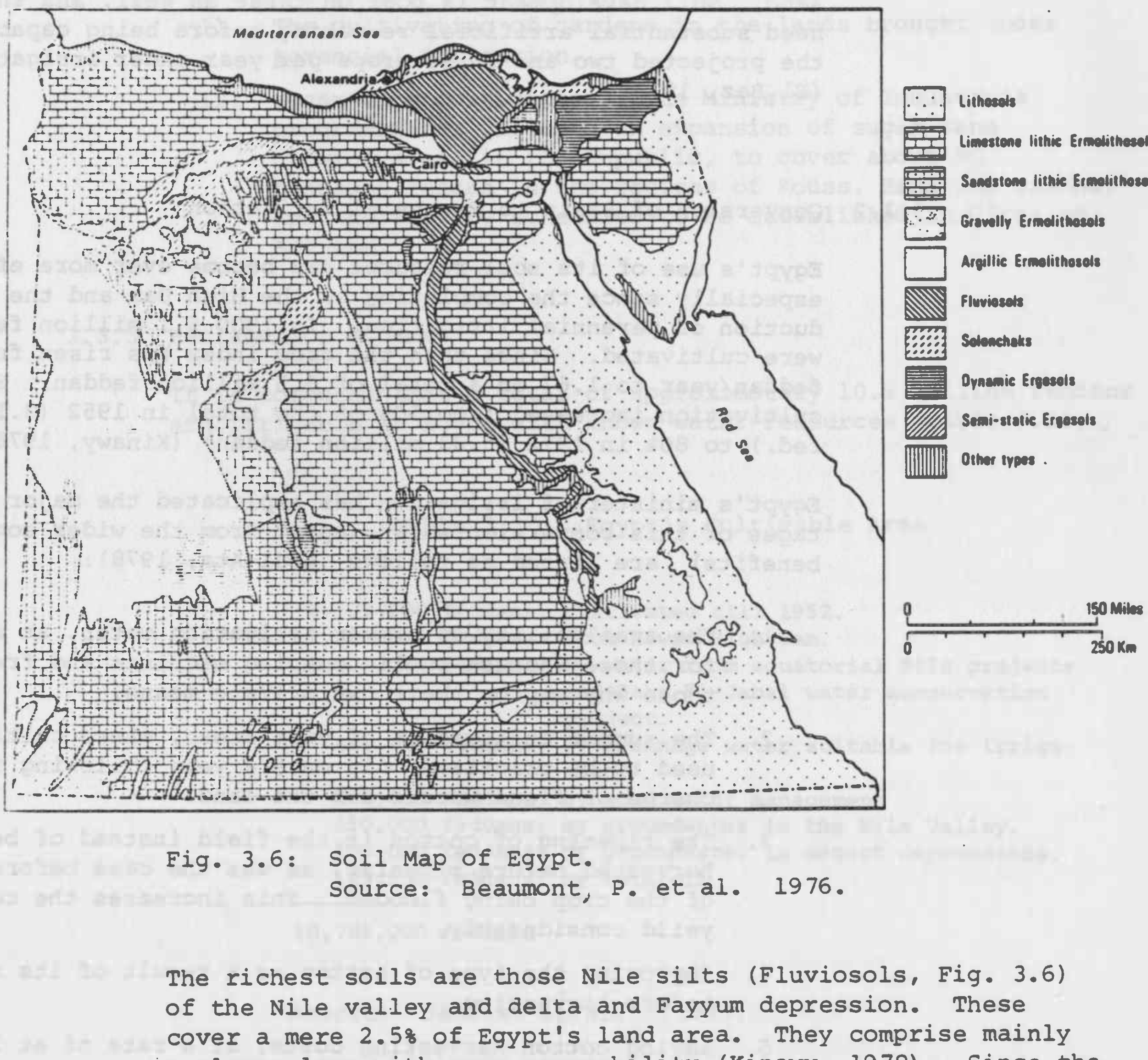

Fig. 3.6: Soil Map of Egypt.
Source: Beaumont, P. et al. 1976.

The richest soils are those Nile silts (Fluviosols, Fig. 3.6) of the Nile valley and delta and Fayyum depression. These cover a mere 2.5% of Egypt's land area. They comprise mainly a clayey loam with poor permeability (Kinawy, 1978). Since the introduction of peremmial irrigation, slow water migration in these soils has caused problems of gleying and salinization.

Soils along the Mediterranean littoral hold the best potential for development outside those of the Nile fluviosols. However, these littoral soils and degraded are display C - horizons only, with ubiquitous strong calcic accumulation in the zonal soils;

azonal soils generally reflect such parent materials as dune sand and marine and alluvial sediments (Hammad et al., 1972). Saline clays fringe the coast of the delta (Shata, 1979a).

Rudimentary soil development of the Lithosols and Ermolithosols characterise much of the rest of the country, and are commonly known as "desert pavement." Soils developed on fixed and shifting dunes, the dynamic Ergosols and semi-static Ergosols respectively, are similarly useless agriculturally. The depressions of the western Desert contain patches of fluvial and lacustrime silts and clays with varying admixtures of sand. Soil development is poor on these as well, and they will need substantial artificial re-making before being capable of the projected two and three crops per year under irrigation (El Baz, 1979).

3.3.2 Conversion of Basin to Perennial Irrigation

Egypt's use of its soil resource has become ever more efficient especially since the completion of the High Dam and the introduction of perennial irrigation. In 1900 5.1 million feddan were cultivated. Since then the crop index has risen from 1.0 feddan/year to 1.67 on a total of 6.5 million feddan. Summer cultivation increased from 50% of the total in 1952 (3.12 million fed.) to 80% in 1972 (5.33 million feddan) (Kinawy, 1978).

Egypt's minister of irrigation has explicated the major advantages of this conversion which (apart from the wider social benefits) are listed as follows (Abul-Ata, 1978):

1. The availability of summer irrigation water, at a low cost for those who use public pumping machines and free for those who employ their own private means.
2. The summer cultivation of vast areas, where cultivation used to be practised only once a year following the discharge of flood waters off the land.
3. The ripening of cotton in the field instead of being early harvested before ripening, as was the case before for fear of the crop being flooded. This increases the cotton yeild considerably.
4. Improving the type of cotton as a result of its ripening before harvesting.
5. Saving cotton harvesting costs, at a rate of at least one pound per feddan, since there is no longer urgent demand for harvesting labour before the crop was flooded.
6. Considerable increase of the millet crop, as a result of being supplied with full water requirements. In the past, the plants remained unirrigated for long periods, sometimes as much as 50 days.

7. The possibility of early cultivation of clover for cattle feed, thus increasing livestock production.

8. The early cultivation of winter crops without waiting for the draining of flood water.

9. The possibility of harvesting two crops of clover instead of one, before the cultivation of cotton.

10. The possibility of cultivating certain areas three times a year, for example clover followed by summer maize followed by Nili summer millet.

11. The cultivating of gardens in the lands brought under perennial irrigation.

12. Sugar-cane cultivation. The Ministry of Industry's programme has included an expansion of sugar-cane growing areas in the Republic, to cover about 90 thousand feddan in the regions of Kouss, Esna and Dishna, and the factory scheduled to be established in Girga or Balyana.

3.3.3 Reclamation Schemes

It is computed that a total of approximately 10.8 million feddans are irrigable in Egypt with known water resources (Table 3.10)

Table 3.10: Egypt's Cultivable Area

6,500,000 feddans:	cultivated till 1952.
1,300,000 feddans:	from Aswan High Dam.
1,000,000 feddans:	by water from equatorial Nile projects and Bahr El-Jabal water conservation project.
400,000 feddans:	by drainage water suitable for irrigation.
800,000 feddans:	by good water management
150,000 feddans:	by groundwater in the Nile Valley.
500,000 feddans:	by groundwater in desert depressions.
135,000 feddans:	by rainfall
10,785,000 Feddans	

Source: Seddik, et al. 1979.

This constitutes a more than 50% potential increase on the pre-revolution area of 6.5 million feddans, although only approximately 1 million feddans have been reclaimed from the desert thus far (El Gabaly, 1978) in several parts of the Nile valley and delta. The twelve reclamation schemes in progress (scheduled for completion by 1980) are all in the Nile valley and delta, the seven larger ones in the north and five smaller in the valley itself (Nos. 1-12, Fig. 3.7; Beaumont et al., 1976).

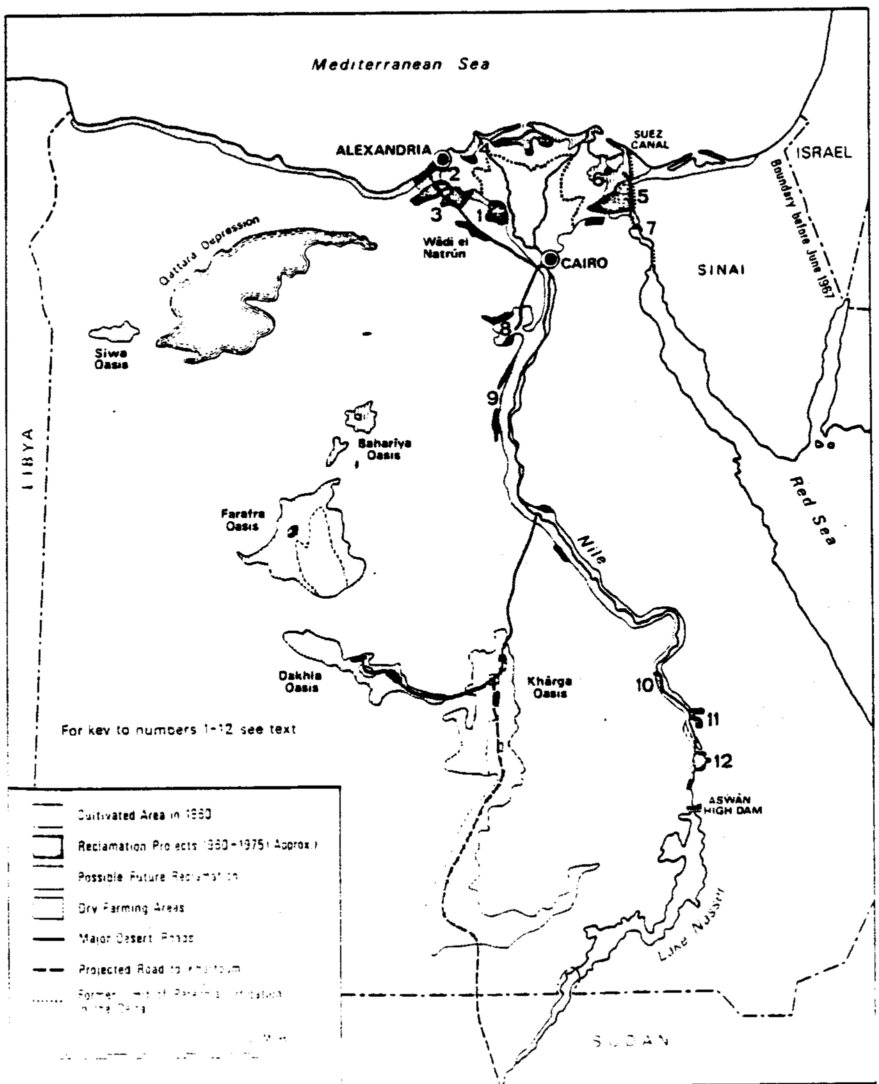

Fig. 3.7 The 12 Reclamation Areas are Listed and Discussed in the Text
Source: Beaumont et al. 1976

Salient details of these schemes are listed below:

1. *Tahrir ('Liberation') Province*, one of the earliest large scale settlement schemes in Egypt was begun in 1957. Over 150,000 feddans had already been reclaimed by 1972 and 25,000 people had established in seven villages. A further 50,000 feddans remain to be taken up. Water is obtained from the Nile by canal, but in the southern sector it is also supplemented by local groundwater. A number of problems have arisen in the management of the calcareous soils of this region, which are gradually being overcome.

2. *The Maryut region*. This scheme, eventually covering come 115,000 feddans, includes the draining and reclamation of lake Maryut and adjacent land near Alexandria. A feature of this project is the use of processed sewage water to supplement water from the Nile. The reclamation of 68,000 feddans was completed in 1972.

3. *The Nubariya desert scheme*, southwest of Alexandria, is being undertaken using Nile waters on some 217,000 feddans: 75,000 feddans had been reclaimed by 1970.

4. *The Northern delta*, south of Lakes Idku and Burullus. A vast region of lakes, swamps and lagoons known locally as *Barari* has been drained and the saline soils reclaimed at great cost, bringing about 120,000 feddans into cultivation.

5. *The desert southwest of Isma'iliya*. This region of perhaps 300,000 feddans could eventurally support dozens of new villages; the projected scheme had not begun in 1972.

6. *The region south of Lake Manzala* should yield 135,000 feddans for agriculture when drained and irrigated.

7. *The western Sinai scheme*. Irrigation water was to be conducted to this region by pipeline underneath the Suez Canal. Over 2,000 feddans out of a projected 20,000 feddans had been reclaimed in 1967, but not yet settled.

8. The Faiyum depression - 9,500 feddans

9. El Minya region - 58,500 feddans

10. Kena province - 17,000 feddans

11. Radesia and Wadi Abbady - 13,000 feddans

12. Kom Ombo - 44,000 feddans

The Kom Ombo scheme was primarily for the resettlement of Nubians from Upper Egypt dispossessed of their lands by Lake Nasser; some 115,000 feddans will eventually be reclaimed. (Beaumont et al., 1976)

Other reclamation schemes in the New Valley of the Western Desert (Fig. 3.7) are in the planning stages.

3.3.4 Damage to the Soil Resource

An important perspective on the soil resource of Egypt is the damage which occurs due to waterlogging and salinization. El Gabaly (1978) notes that 30% of Egypt's cultivable acreage is affected to some degree by these phenomena, which are common to irrigation projects throughout the world. For instance, 50% of Iraq's irrigated land is affected, as is 23% of the whole of Pakistan, 80% of the Punjab (Pakistan), 50% of the Euphrates valley in Syria and more than 15% in Iran (El Gabaly, 1978). The severity of the problem in some areas can be judged from the situation at Kom Ombo in the Upper Nile where the ratio of land irrigated to that lost downslope through insufficient drainage "is believed to be 1:1" (Worthington, 1978). Nyrop (1976) notes that only 40-50% of the 1 million reclaimed feddans seemed to be cultivated by the end of 1975.

Until very recently reclamation and conversion projects have not incorporated fully-fledged drainage systems, mainly because of lack of funds, engineers, building materials and transport networks It was also believed that the lower level of the non-flooding Nile would induce sufficient drainage, and also that the policy of "low-lift" irrigation would discourage farmers from over-irrigating in the first place (Abul-Ata, 1978).

It is generally agreed that Egypt's northern coast lands were highly productive from at least classical times through to the 11th century A.D. (Kassas, 1979; Tolba, 1979). Since then they suffered desertification as a result of intensive land use and the fragile, almost rainless environment (Ayyad, 1979). Roman ruins lie great distances from presently inhabited centers attesting to the once productive "granary" of the Roman world.

The present minimal productivity is maintained by continuing pressure to feed existing population.

Attempts to rehabilitate these potentially rich soils are dealt with below (4.2). The Samdene workshop (Kassas 1979) looked forwar to the coastal zone becoming a major axis of growth in the next 20 years, based partly on recovering Mediterranean coastal soils.

Migrating dunes bury productive soils (and buildings, roads and railways) in the western oases and along the western margin of the Nile valley and delta (El Baz, 1979; Tolba, 1979). The exact extent of dune encroachment is not known, although Landsat image analysis has provided preliminary information. Controlling sand movement is examined below (see 4.2.2).

The permanent loss of agricultural land to other land uses, particularly urban sprawl, is an important consideration in the evaluation of Egypt's soil resources. It is reported that more than 600,000 feddans were lost during the decade of Egypt's first two five-year plans (Salah Galal, 1977). Quoting UNEP's 1977 State of the World Environment Report, Al Ahram's Galal (1977) concludes that Egypt's percapita cultivated area is declining, as population increases at 2-5% yearly, as land is lost to other uses, and since the reclamation effort "in practice......has almost come to a standstill."

3.3.5 Examples of Problems in Raising Soil Use Efficiency

3.3.5.1 Cattle, Clover and Canals

The single most-grown crop in Egypt is Egyptian clover (berseem) (Table 3.11) of which the bulk is used to feed 4.2 million (Nyrop, 1976) cattle and buffaloes (Beaumont et al., 1976). These animals provide milk, meat and animal power particularly for lifting irrigation water from canals.

Table 3.11 Chief Crops and Orchards, 1970

	Area in '000s of feddans	Per cent of total area under crops
Clover (or *berseem*)	2,734	25·5
Cotton	1,627	15·2
Maize	1,509	14·0
Wheat	1,304	12·2
Rice	1,140	10·6
Vegetables	706	6·6
Millet	501	4·6
Beans	330	3·0
Sugar cane	186	1·7
Barley	83	0·8
Other crops	380	3·5
Oranges	113	1·1
Other fruit	119	1·1
TOTAL:	10,732	100·0

Source: Egypt, Central Agency for Mobilization and Statistics. 1971.

This latter apsect often arises in discussion of Egyptian rural economics. The need to improve animal quality as a provider of protein, and the possibility of introducing mechanized pumping of water, leads to speculation on phasing out draft animals (often used purely in irrigation and thereby reducing the significant areas of land needed to feed them.

Canals were specifically designed, in fact, to lie 30-50 cm below field level so that farmers would need to lift the water (thereby, reducing extravagant water use), and so that field drainage would be encouraged (Abul-Ata, 1978).

E.B. Worthington (1978) asks whether this is not a negative position to hold since it encourages farmers to retain their draft animals. He suggests that a gravity system (above-field canals, presumably well insulated against leakage) of water supply, with a small charge for optimum water use, would be the best way to reduce the cattle and buffalo draft animal population and so free acreage for other crops.[1]

3.3.5.2 Land Reclamation at Kharga

A commonly quoted figure for the amount of reclaimable land in the southern part of Kharga oasis in the Western Desert (South New Valley) is 1,300,000 feddan (Badran et al., 1979) which would constitute an increase of 22% in cultivable land.

El Baz (1979) notes, however, that this area will have to be "confirmed" first, presumably by more detailed soil mapping and classification. He also notes that problems of undulating topography, underground water availability, the need for extensive and efficient drainage systems, and high costs of operation "are likely to reduce this figure to by a factor of ten, to about 130,000 feddans" (El Baz, 1979).

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[1] Nyrop (1976) argues for an increase in fodder acreage, towards a greater number of protein-producing livestock, which Egypt lacks. Foreign exchange spent importing meat would be saved. In 1974, however, the Government invested heavility in chicken farms to augment protein supplies.

3.4 FLORA

3.4.1 Introduction

The natural vegetation cover of Egypt is sparse because of the desert climate. There are no natural forests. The most widespread indigenous tree is the datepalm, although exotics such as eucalyptus, cypress and elm have done well since being introduced. Reclamation and burning of swamp lands has reduced even the papyrus-dominated swamp vegetation in the Delta (Nyrop, 1976).

Natural vegetation ranges from scrub-land in patches along the coast (with 150-200 mm rainfall) to completely unvegetated stony desert and sand dunes. Major plant associations of the desert are listed below.

3.4.2 Plant Associations and Distribution in the Desert (Hassib, 1951)

The following are the major associations (selected by McGinnies, 1970, pp. 408-9):

1) The *Panicum turgidum* association is the most important because of wide distribution; it is found on sandy plains and broad shallow valleys; mixed grasses, herbs, and shrubs occur with it.

2) The *Zilla spinosa* association has wide distribution on deep sandy soils.

3) The *Pithuranthos tortuosus* association covers large areas of sand in the Libyan Desert, often with *Zilla spinosa*.

4) The *Zygophyllum coccineum* association is common on rocky desert plateaus and shallow depressions on the margins of deep valleys; *Reaumuria hirtilla* is often associated with it.

5) The *Haloxylon salicornicum* association is common and widely distributed on the sandy floors of shallow wadis and on small sandy dunes.

6) The *Capparis spinosa* association is found on rocks and high cliffs of deep wadis.

7) The *Odontospermum pygmaeum* association is abundant on loose stony areas or banks of wadis.

8) The *Cornulaca manacantha* / *Convolvulus lanatus* association is found on sandy soil with the drifting sand collecting around the plants.

9) The *Reaumuria hirtilla* association is widely distributed in depressions on exposed plateaus; this species forms pure associations and is also common on rocky ground in deep wadis associated with *Zygophyllum coccineum*.

10) The *Salsola foetida* association is abundant in the sandy ground of broad shallow wadis.

11) The *Cleome droserifolia* association is found in broad shallow wadis.

12) The *Artistida coerulescens / Danthonia forskalii* association accumulates sand, forming small dunes in drifting sand areas.

Hassib (1951) computed that of 755 species identified in the Egyptian desert, 46% are annuals, 7.2% small trees and shrubs, 0.1% succulents, and the rest are low-growing perennial plants.

The **SAMDENE** project is involved in the task of establishing more productive rangelands along the Mediterranean littoral, Egypt's only potential rangeland, which Rattray (1968) has characterized as a *Hyparrhenia hirta - Oryzopis miliacea - Cynodon dactylon* grass association. At present it has very little grass due to intensive grazing by camels and sheep, and it "has been reduced to an unpalatable shrub steppe" (Rattray, 1968). Olives and almonds are grown in many localities since government efforts in the early 20th century concentrated on this area. Rattray (1968) quotes a carrying capacity of only 1 sheep/hectare/year on well-managed sandy soils.

3.5 FAUNA (Benedick, 1978; Nyrop, 1976; U.N. List of National Parks and Equivalent Reserves, 1973)

Indigenous wild life is very limited in Egypt. In the delta some wild boars, jungle cats, caracal lynx, and mongoose can still be found. A variety of rodents is common in the valley.

In the desert beyond the Nile ibex inhabit rocky slopes of the Sinai and Eastern Desert. To the south especially, various gazelles, ibex, Barbary stag, leopard, cheetah, striped hyaena, jackals, and wild asses are thought to occur still. A recent report mentions the highly unusual sighting of a family of six cheetah north of the Qattara Depression (Ghabbour, 1978). A variety of snakes, some poisonous (viper, cobra), still occur.

More than 300 species of bird, resident and migratory, are concentrated in the Nile valley and delta.

Egypt's fish resource is the only economically exploitable group other than domestic animals. The catch was primarily offshore and amounted to 100,000 tons yearly in the early 1960's. The sardine catch of 18,000 tons yearly (1962) has disappeared, probably as a result of nutrient supply reduction to the Mediterranean after construction of the High Dam. Figures on the total catch were not available in 1975.

It appears that the potential for 3,000-5,000 tons of surface fish is available along the coast. The size of bottom fish supplies is not yet known.

Fishing in the Nile is said to be excellent, and the Nile perch catch from Lake Nasser has increased rapidly from 750 tons in 1966, to about 11,000 tons in 1975, to nearly 19,000 tons in 1979. Over-fishing has not occurred and development of this resource depends on increasing the number of fishermen around the Lake. On the other hand, capital investments in the marine fishing industry are needed in order to exploit Mediterranean and Atlantic waters.

7.5 million domestic animals provide protein and act as draft animals.

4.0 ENVIRONMENTAL CONSIDERATIONS

This section reviews the major environmental impacts of the manipulation of Egypt's natural resources.

4.1 ENVIRONMENT AND IRRIGATION PROJECTS

The kinds of benefits which have flowed from construction of the High Dam and perennial irrigation system have been recounted (3.3.2 and 3.3.3 above). Many dire predictions about the harmful impacts of the scheme have not materialised. Nevertheless many related changes in environment have occurred and the major ones are presented in this section.

HYDROLOGIC CONCERNS

4.1.1 Effects of Cumulative High- and Low-Flow Years

A major purpose of the High Dam is to regulate the annual Nile flood. A series of floods would tax the lake's capacity, finally forcing large amounts of water to be released with consequent damage downstream. To obviate this danger an overflow channel is being excavated to divert accumulated water into the Toshka depression west of the lake (Benedick, 1978).

A series of low rainfall years, on the other hand, immediately reduces the head of water needed for power generation. Overreliance on Aswan's cheap hydroelectricity may threaten the viability of electrically-powered industry in particular.

4.1.2 Nile Water Quality

One of the most important effects of the High Dam has resulted from the impoundment of water-borne silt in Lake Nasser. 60 million m^3/yr of silt are deposited, amounting to a staggering 30 km^3 after about 500 yrs.; however, engineers indicate that this is a fraction of the lake's total capacity of 1569 km^3 (Hafez and Shenouda, 1978). Fears that the silt delta at the head of the lake in Sudan would cause the Nile to spill out into the desert have proved unfounded. Flood currents appear to be keeping a central channel open through the delta deposit (Benedick, 1978).

Silt starvation of river water below dams induces erosion of the river bed (and banks) and thereby the undercutting of installations situated on the banks, the removal of arable land, and lowering of the water surface, a serious problem where water has to be lifted for irrigation. It appears from a recent study (Abul-Ata, 1979) that original projections of river erosion have been confined to fairly short stretches mainly below the dam and barrages.

Average river bed level dropped 4-5 m below each barrage, with substantial stabilization expected by 1985. A 1977 estimate suggests that average final degradation between Aswan and Assiut will be 1 m and between Assiut and Cairo 2 m. This poses no risk to structures on the banks if discharges of water from the High Dam remain within reasonable limits (Abul-Ata, 1979). Conversely, drainage from the surrounding agricultural lands will not be as vigorous as originally expected (see 4.1.7 below).

Effects of silt starvation have been felt in rural Egypt and along the Mediterranean Coast. 60-180 million tons/year (Sharaf, 1977) were deposited by the Nile in pre-Aswan times. The nutrient value lost to the valley and delta soils (non-silica/aluminum component (Table 4.1) is made up by applying 13,000 tons of calcium nitrate fertilizer per year. Much sediment used to reach the Mediterranean yearly. It appears that, without this supply, winter storms now produce net erosion on the coast although no agricultural land has yet been lost (Benedick, 1978).

The severe industrial and domestic pollution in the Nile from Cairo to Alexandria is discussed below (4.4), as is pollution from agricultural chemicals.

Table 4.1 Chemical Analysis of the Clay Fractions of Nile Sediments for the Flood of 1954.

Constituents	%
SiO_2	44.94
Al_2O_3	14.81
Fe_2O_3	13.99
CaO	3.98
MgO	1.60
K_2O	1.77
Na_2O	1.38
C org.	1.14
N org.	0.09
Carbonates	0.99

Source: Worthington. 1978:21.

4.1.3 Effects on Groundwater

It has been noted that the Nile's new hydrologic regime will affect the manner in which aquifers are recharged (Egypt, 1978c). Year-round irrigation, seepage from canals and drains, and water levels which have risen tens of meters in a few years all affect recharge. Major concerns are to prevent salinization of groundwater bodies and to prevent overexploitation.

Salinization seems more likely in the case of the Nile valley aquifer than the deep Nubian Sandstone aquifer. Little information is available, but it appears that salinized drainage water has not seriously affected the undersurface water body. Effects have been noticed, however, in the delta where pumping fresh water to the surface has allowed marine salt water to rise nearer the surface and penetrate inland (Fig. 4.1). It has been suggested that Nile water be diverted into the lakes of the delta coast (instead of being lost to the sea) in order at least to prevent further salt water incursion into the deltaic gravels.

Water in the Nubian Sandstone has been dated by C^{14} and helium-argon methods at 30,000 - 1,850,00 years old (Shata, 1979a).

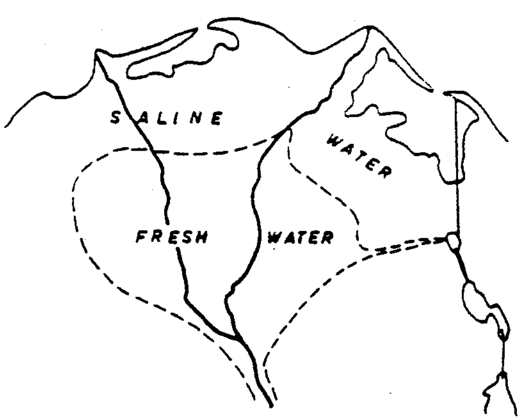

Fig. 4.1: Nile delta fresh water body

Source: Shata. 1979a.

Table 4.2 Monthly Salt Content of Noubaria Canal Water (ppm)

Sites	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Year 1975												
U/S D3					210	250						
U/S Dl					260	280						
At Nasr	700	560	430	360	390	425	470	490	520	510	500	350
At M-F*		760	250	280	310	290	320	450	370	400	350	460
At Thawra	980	820	370	400	400	460	510	580	580	560	540	530
At Mariut	590	990	500	420	580	430	530	555		530		670
At N.Lock**								770				
Year 1976												
At Nasr	460	450	450	530	560	590	510	510	630		580	780
At M-F*	490	460	420	390	465	530	365	360	530		480	520
At Thawra	580	500	450		670	675	735	580	670		630	700
At Mariut	910	540	570	560	850	810	690	770	830	760	770	800
At N.Lock**		510			1025		790					
Year 1977												
U/S Dl				640						352		
At Nasr			580	690	580	672			944	896	640	450
At M-F*		270	450	420	510	420			480	640	380	510
At Thawra		630	680	540	630	690			640	960	736	
At Mariut		690		710	770	750			1070	1280	755	
Year 1978												
At Nasr		512	544		640	736						
At M-F*	704	320	448	544	365	450	570					
At Thawra					770	820						
At Mariut		544			992	832						
At N.Lock**												

* M-F : Mechanized Farm
** N.Lock: Navigation Lock

Source: Hassan et al., 1979.

It appears that it probably derives from periods of wetter climate in the past. If groundwater supplies are to be maintained, pumping must not exceed recharge. Badran et al. (1979) nevertheless discuss land reclamation by the exploitation of this vast water body, extracting 3.0 milliard m^3/yr (annual recharge is 185 million m^3/yr), thereby reducing the water level by 100 meters in the course of 200 years.

4.1.4 Soil Damage and Irrigation

One of the most critical impacts of the new perennial irrigation has been the waterlogging and salinization (to different degrees) of fully 28% of Egypt's productive land. All reclaimed lands feel these effects (El Gabaly, 1978). Some lands have been abandoned and average yields are depressed by 30% in the effected areas (El Gabaly, 1978).

Irrigation has caused groundwater levels to rise very quickly to the surface. Experience from the Western Desert project (Noubariya) has shown that waterlogging occurred within 2-5 years as water levels rose from 50 m to 1-1.5 m below the surface (Worthington, 1978).

Soil salinization is a related phenomenon. It is most commonly associated with rising groundwater levels, either because the water is saline, or because fresh groundwater dissolves soil salts (Worthington, 1978). Soil salts also accumulate from saline soil water and saline irrigation water. Near-surface water is constantly subject to evaporation and consequent salt enrichment. Thus, fresh irrigation water is significantly more saline by the time it drains from farmland.

Such effects have been carefully monitored along the 100 km Noubaria Canal which was constructed to reclaim large areas on the west delta fringe (Nubariya Scheme, Table 3.10, Fig. 3.7) Drains leading drainage water back into the Noubaria Canal are contaminating the canal with water of salinities around 4500 ppm (Hassan et al, 1979). Furthermore, salinity in areas downstream (sites U/S D3 through N. lock, Table 4.2) rises as saline effluent is added. Table 4.2 shows also that salinity in the canal is increasing from year to year, almost doubling between 1975 and 1978 (May/June figures at Nasr (ppm):390 and 425 in 1975, *versus* 640 and 736 in 1975; 40 km downstream at Mariut: 580 and 430 in 1975 *versus* 992 and 832 in 1978).

Irrigation with slightly salinized water can cause salt build-up with time. Sophisticated models exist (Kovda, 1978) to predict whether or not soils will be damaged. With very good drainage and sufficient water, the salt balance in the soil can be maintained at non-toxic levels even using water too saline for less well drained soils.

The effects of saline groundwater have been monitored in many areas. In the Noubaria area, irrigation of lands 30 m above sea level has caused saline groundwater to drain back into irrigation canals at 3-6 m above sea level.

Attempts are now under way in Egypt to recover lost and damaged soils by further modifying the hydrologic environment. The largest capital expenditure will be devoted to construction of tile drainage below field level in order to lower high water levels, or to prevent them rising to the surface. US $500 million has been earmarked in the decade 1975-1985 for this vast programme (El Gabaly, 1978). In fact, the Minister of Irrigation suggests that Egypt's priority has shifted from the basin conversion problem to the recovery of damaged lands by the tiling of fields (Abul-Ata, 1978).

Kovda (1978) stresses the fragility and integrated nature of the soil-water system, and indeed Egypt has extensive plans not only to improve drainage but also to improve soil quality by subsoiling with gypsum, the use of fertilizers, new methods of irrigation and water distribution, the application of optimum amounts of irrigation water, and the consolidation of crops (El Gabaly, 1978).

Russian experience has shown that lining canals is a major component in lowering water levels, and in reclaiming naturally saline soils for agriculture (Kovda, 1978). There seems to be little emphasis on this aspect in Egyptian plans. It is apparent too that local surveys of soil type, topography and hydrology need to be conducted since so many variables are involved, and improvement schemes are likely to produce best results if constructed for each specific area.

Tolba (1979) reports that incursions of blown desert sand appear to be encroaching actively on the Nile's western fringe soils since the High Dam was built. Annual mixing of such sands with flood silts from the Nile used to maintain productivity of the fringe soils.

SOCIAL IMPACTS

4.1.5 Population Movements

A number of Nubians were resettled (50,000-Hafez and Shenouda, 1978; 60,000-Benedick, 1978; 100,000-Johnson and Johnson, 1977) from the flooded parts of the Nile valley, many to the Kom Ombo plain downstream.

Now fishing communities (5,000 individuals-Benedick, 1978) have occupied points on the 1400 km perimeter of the lake. Conversely, fishing communities at the coast have been adversely affected by the drop in fishing which has resulted, at least partly, from the lower Nile sediment discharge into the Mediterranean.

The town of Aswan has increased from 30,000 to 170,000 as a result of new tourist, fish processing and fertilizer industries, and related growth of commerce and banking (Benedick, 1978).

Social impacts associated with these range from the benefits in training and employment to the thousands who worked on the High Dam and associated irrigation system, the lifestyle changes involved in producing 2 or 3 instead of one crop per year (serving to encourage people to stay on the land), to the equivocal effects on the resettled Nubians (Hafez and Shenouda, 1978; Johnson and Johnson, 1977).

4.1.6 Water Supply and Industry

While providing a constant water supply for industry, the existence of the lake has not led to the development of heavy industry in southern Egypt. Reasons include distance from raw materials and other major centers, and the uncertainty of power supply. This may seem surprising, but outflows the dam are primarily geared to the needs of irrigation, so that more water is released in spring and summer than can be used by Aswan's turbine generators, and less than necessary during the higher demands of fall and winter.

This is highlighted by the fact that, despite general underutilization of the power-generation plant, thermal power stations are being built in Egypt.

The rural brickmaking industry has suffered from the absence of flood silt deposits since the Dam was built. Silt was dredged from canals and used widely to make mud bricks. Prices have risen sharply as brick production decreased. The government advocates the use of sand for brickmaking (Benedick, 1978) since there is no lack of this resource.

4.1.7 Aswan High Dam and the Fishing Industry

Siltation in Lake Nasser has reduced greatly the supply of phytoplankton in the Mediterranean off the delta coast. Schools of sardine are less in evidence. From processing a catch of 18,000 tows in 1962, the sardine fisheries have disappeared (Benedick, 1978). Benedick (1978) cautions, however, that declines in the fish yield also may have resulted partly from over-fishing and offshore pollution.

4.1.8 Health Considerations

There is little doubt that a sufficient supply of good water has beneficial effects on the general health of populations; the incidence of certain sanitation-related diseases is known to have declined in many arid areas (Worthington, 1978).

Nevertheless many diseases are directly waterborne or transmitted by hygrophilous organisms. These diseases are controlled to a large degree during seasonally dry periods. Perennial irrigation and permanent water supplies to villages very frequently provide year-round habitats for diseases and their vectors. It is argued that the mere existence of an irrigation system need not increase the incidence of water-related disease if basic sanitary principles are observed, especially in (a) hydrological engineering design and (b) upkeep of the water supply system to reduce bodies of open water and the vegetation associated with it. Worthington (1978) thus concludes:

> Everything points to one cardinal concept. The public health problems that arise from an irrigation project are not solely medical problems. Their medical aspects are often not the most important, they do not govern the epidemiology of the disease or the control strategy. They are a matter of environment, associated with the far-reaching changes made by man in the environment. This underlines the necessity of integrating the health component to the project as a whole: technically, financially and administratively.

Schistosomiasis is a major endemic disease in Egypt (Hafez and Shenouda, 1978). Its incidence has increased in places since the introduction of perennial irrigation, before which the snail vector was killed off during the dry season, and mollusc habitats partially cleared by the flood. Although it has always existed in Egypt, the disease has been noted migrating south from the delta (Benedick, 1978).

Attack on the snails appears to hold the best possibilities of breaking the life cycle of the parasitic schistosomiasis fluke. Cleaning out canals periodically and using molluscicides has been highly successful in a test area in the Fayyum where incidence of the disease dropped from 46% to 9% between 1969 and 1974. Transmission of the disease was practically halted. Unfortunately re-infection of individuals by contact of contaminated water is very easy (World Bank 1977; Benedick 1978). Chemotherapy is effective, especially in the early stages of the disease.

36% of the population suffers from the disease Egypt, 1978d) but the proportion is much higher among rural people who regard it as an occupational hazard (Johnson and Johnson, 1977). The disease costs Egypt US $560 million yearly (Farooq, 1967).

Malaria is still common in the delta and the year-round availability of water aids its spread southward. The dangerous *Anopheles gambiae* mosquito advances from the Sudan and has had to be checked by creating a *gambiae*-free zone immediately south Lake Nasser to prevent its further encroachment (Worthington, 1978). It is a highly effective vector, and threatens Egypt with a serious malaria hazard should it bridge the buffer zone (Farid, 1979).

BIOTIC CHANGES

4.1.9 Impacts on Fauna and Flora (Ali, 1978; Benedick, 1978; Ghabbour, 1978; Egypt, 1978d: Imam, 1978)

Several changes have been reported resulting from the introduction of perennial irrigation to the Nile.

The crocodile population (*Crocodilus niloticus*) has increased in Lake Nasser area, as have herds of gazelle (*Gazelle leptocera* and *G. dorcas*). Ibex (*Capra nubica*) and barbary sheep (*Ammotragus lervia*) have reappeared.

The Nile grass rat (*Arvichanthis niloticus*) has begun to invade villages, whereas *Rattus* spp. no longer invade higher ground as they used to when their burrows were submerged during the flood.

Economic insect pests (the grape moth *Polychrosis botrana*, the corn stalk borer *Chilo agamemnon*, and the cotton leafworm *Spodoplera littoralis*) are on the increase, apparently migrating progressively southwards up the Nile valley. Two bird pest species, the desert sand grouse *Pterocles* and *Passer hispaniolensis* have also increased.

Many plants have disappeared since the annual flood ceased, e.g. *Caldesia reniformis, Alisma plantago-aquatica, Riccia* spp., and *Glinus litoides*. The latter has appeared on the shores of Lake Nasser, however. Fourteen original species of rice- weed have disappeared from rice fields to be replaced by ten new species, some particularly harmful. These changes have accompanied the change to the Summer "Seifi" rice-type in the Fayyum.

Aquatic weeds are no longer flushed away by floods, especially floating weeds. The notorious water hyacinth appeared in large numbers immediately after the damming of the Nile in 1965. A control program started then was ultimately unsuccessful, but another was begun in 1975, by which time more than 80% of the waterways in Egypt were infested. Lake Nasser is still free of the weed.

Strong weed growth in delta canals has occurred with the new perennial water supply. Mechanical cutting, herbicides and introduction of carp fish are being used to control the weeds.

IRRIGATION AND FOREIGN AID

4.1.10 Criteria for Funding Irrigation Schemes

Worthington (1978) notes that existing technical knowledge concerning irrigation is glaringly underused. Whereas problems facing integrated planning are rooted in governmental structures and procedures, international action is also responsible. Apart from assuring a wide, rapid flow of available information to government and private project planners, international action can simply and directly improve planning by insisting on careful consideration of a few <u>environmentally</u>-oriented criteria, apart from the usually well-investigated economic costs and benefits, time periods and project feasibility (Worthington, 1978).

Worthington (1978) therefore suggests the following questions should be asked concerning environmental impacts of irrigation schemes:

(1) Has adequate provision been made for drainage and leaching so as permanently to maintain the quality of soil and water in the root zone?

(2) Has the full range of alternative measures for achieving efficiency in water use been appraised?

(3) Has the project study examined the probable effects upon aquatic and adjoining terrestrial ecosystems of changing the hydrological and soil regime in the area?

(4) Has the study canvassed and assigned costs to the social, health and economic measures which would be required to assure that anticipated benefits from crop growth and social stability are realized?

(5) Has the well-being of the population been taken into account?

4.2 SOIL PRODUCTIVITY OUTSIDE THE NILE VALLEY AND DELTA

4.2.1 Reclamation of Agricultural and Range Land

The narrow (50 km) coastal strip which comprises Egypt's slightly better-watered (100-150 rainfall) semi-desert area is classed as "severely desertified" (U.N. Conference on Desertification, 1977:A/Conf. 74/31). In Graeco-Roman times this area was agriculturally highly productive (Kassas, 1979; Tolba, 1979).

Various attempts have been made this century to improve the low productivity of the coastal zone. *Sultani* figs (*Ficus carica*) were successfully introduced on the coastal dunes from 1918 onwards. Shortly after *chimlali* olives (*Olea europa*) from Tunis were also cultivated successfully. Experiments in barley and other field crops were carried out but these have not been widely grown, suggesting to one authority that development in the coast world should be based rather on horticulture (De Cosson, 1935).

The coastal areas were also expected to support 100,000 Bedouins in settlement schemes involving 17,000 feddans. It was hoped that irrigated pastures could be developed and rangeland so much improved that it could be "grazed as an efficient highly productive livestock unit by 1959" (Pearse, 1955). Despite this potential, however, irrigation from many windmills caused soil salinization and finally, by 1959, the whole scheme collapsed (Kassas, 1979).

The research station and experimental area associated with the scheme produced valuable data on animal breeding, vegetation (Tables 4.3 and 4.4) and soil, geology and land units. A subsequent larger-scale livestock improvement and range management project was instigated in 1963 with international aid. It too failed to achieve the greatly increased productivity which had been earlier so confidently predicted for the area (Kassas, 1979).

Despite these setbacks it has been stated recently that the "coastal belt will, within the next 20 years, regain its ancient status as one of the axes of development and habitation in Egypt " (Kassas, 1979). This vision appears to rely less on range improvement and irrigated agriculture and more on mineral extraction (gypsum deposits, on- and off-shore oil and gas), the associated port facilities at Mersa Matruh and transportation lines along the coast, hydro-electric power from the "Qattara Lake" scheme to the south, and tourism.

Perry notes that the technology exists, generally speaking, for successfully rehabilitating and managing fragile, arid range-lands; by contrast, the economic, social and political aspects

of the process are far less tractable (Perry, 1979). The SAMDENE (Systems Analysis of Mediterranean Desert Ecosystems of Northern Egypt, 1974-1978)and REMDENE (Regional Environmental Management of Mediterranean Desert Ecosystems of Northen Egypt, 1979-1981) Projects will provide land use capability maps and other data which show optimium range-carrying capacities and irrigation régimes (Nile irrigation water has already been channeled 60 km west of Alexandria) (Kassas, 1979).
It appears, therefore, that the superior technical data of the 1930's will be available for future range improvement and agricultural reclamation schemes.

Table 4.3 The Most Promising Forage Plants Introduced into the Western Desert of Egypt.

Agropyron elongatum	Medicago arboria
" trichophorum	Onobrychis sativa
Atriplex numularia	Oryzopsis milacae
" canescens	" cörulescens
" semibiccata	" holoiforms
" visicarium	Panicum antidotale
Bromus catharticus	" coloratum
Cichorium intypus	" maximum
Cynodon dactylon	Phalaris tuberosus
Ehrerta calcine	Prosopis juliflora
" longifolia	Sanguisorba minor
Festuca elatior	Sorghum halipense
Hedysarum coronarium	Stipa pulohra
Hordeum bulbosum	Chloris gayanor

Source: U.N. Conference on Desertification, 1977, A/Conf. 74/25.

Table 4.4 The Important Perennial Native Fodder Plants in the Coastal Region of the Western Desert of Egypt

Scientific name	Family	Season of grazing
Agropyron elongatum	Gramineae	w + sp.
" junceum	"	w + sp.
Cynodon dactylon	"	sm.
Dactylis glomereta	"	w + sp.
Stipa lagasae	"	w + sp.
Ebenus ermitagei	Leguminosae	sp.
Hyperrhenia hirta	Gramineae	w + sm.
Lotus polyphyllus	Leguminosae	w + sp.
" creticus	"	w + sp.
Medicago sativa	"	all the year
Ononis veginalis	"	w + sp.
Echiochilon fruticosum	Boraginaceae	sp.
Echium sericeum	"	sm.
" sectosum	"	sm.
Atriplex halimus	Chenpodiaceae	sp + sm.
Convolvulus lineatus	Convolvulaceae	w + sp.
Helianthemum sp.	Cistaceae	sp. + sm.
Moricandia nitens	Cruciferae	w
Pithyranthus tortuosus	Umbelliferae	w + sp.
Plantago albicans	Plantageinaceae	w + sp.
Stipa parviflora	Gramineae	w + sp.
Polygonum equisetiforme	Polygonaceae	w sp + sm.
Poterium verrucosum	Rosaceae	w + sp.
Salvia lanigera	Labiatae	w + sp.
Oryzopsis miliaceae	Gramineae	w + sp.

Source: U.N. Conf. on Desertification, 1977, A/Conf. 74/25.

Critical to the success of any range improvement plan will be the response of livestock owners, as recognised in FAO reports on range management (FAO, 1974, 1975). However, this aspect appears to be peripheral to the admittedly technical SAMDENE and REMDENE Projects.

Egypt is signatory, with Tunisia and Libya, to the "Protocol on co-operation among North African countries in the fight against desertification" (U. N. Conf. on Desertification, 1977, A/Conf. 74/3/Add. 1:23). The Protocol proposes the establishment of a Transnational Green Belt, embracing Morocco, Algeria, Tunisia, Libya and Egypt. The Green Belt is described by the U. N. Conference on Desertification as:

> An interconnected belt across the five countries at the fringes of the areas where rainfall ranges from 150 to 250 mm per year. The green belt should not be conceived as a wall of trees grown perpendicular to the wind direction in order to reduce its velocity. It is a zone comprising a variety of devices for the prevention of further degradation of the ecosystem and the creation of an improved habitat. Soil stabilization, moisture conservation, afforestation, range improvement, appropriate plant and animal husbandry and dryland farming are among these devices. These need to be integrated within the green belt. The width of the green belt will depend upon local climatic and topographic conditions. It may vary between a few to tens of kilometers. The exact location in each country will be determined after further study. Existing and on-going national schemes will be taken into consideration. Within the proposed green belt there may exist farms, shelterbelts, woodlands, ranges and other forms of land use. Each type should be treated separately and there may be variations in structure and composition from one location to another. (U.N. Conf. on Desertification, 1977, A/Conf. 74/3/Add. 1:art. 78)

The primary aim of the transnational project is to co-ordinate the constituent national initiatives, and to set up intergovernmental machinery to aid this. The stress appears to be mainly on monitoring effects of desertification, sharing multidisciplinary data, and on intergovernmental co-operation. It may be noted again that the thorny problem of range improvement *vis a vis* present range users is underplayed.

Table 4.5 Species Recommended for Dune Stabilization

Grasses

a. Amophylla arenaria (marram grass)
b. Lupinus arborea (Lupin)
c. Saccharum spp. (S. munja, S. aegyptiacum)

The marram grasses are drought-resistant species, followed by lupins. Lupin is recommended even when mixed with other species, as its roots fix atmospheric nitrogen which leads to the enrichment of the sand and improves the growth of other species.

Shrubs

a. Prosopis spp.: some introduced members of this genus can be used for fodder as well as for sand fixation. This may cover the fixation costs within a few years.
b. Artemisia spp.
c. Haloxylon spp.: members of this genus and other succulent chenopods are drought and salt-tolerant and can be used in saline areas.
d. Ricinus communis: moderately drought-resistant, produces oil (oash crop).

Trees

a. Acacia cyanophylla
b. Acacia senegal
c. Acacia longifolia
d. Eleaganus angustifolia
e. Eucalyptus gemphocefala
f. E. camaldulensis
g. Tamarix spp.
h. Zizyphus spina-christi

Xerophytic pines such as Pinus pinea can also be used in areas where precipitation exceeds 300 mm rainfall per year.

Source: U.N. Conference on Desertification, 1977, A/Conf. 74/25

4.2.2 Stabilization of Wind-Blown Materials

Dust storms and shifting dunes pose a variety of problems in Egypt. The latter, in particular remove productive soils from use or disrupt their use, as is the case of small fast-moving dune bodies. Dune encroachment occurs along the coast and on oasis margins in the Western Desert. Most seriously it occurs at points along the western windward margins of the Nile Valley and delta where satellite photography has documented dunes migrating at a speed of up to eight miles per year (Anon, 1977).

A great dune chain, the Ghard Abu Muhariq, moves south across the Western Desert directly towards the large oasis of Kharga. Here the sand cascades over the northern scarp onto the oasis floor, forming small dunes which engulf villages, installations and soils. El-Baz (1979) quotes the example of Ginah village, which was abandoned in 1970 when dunes overran it. Moving sand also threatens the oasis' single land connection with the Nile valley at Assiut. Other oases are affected to a lesser degree.

A recent work has examined the problem of stabilizing dunes in the Kharga area, mentioning such techniques as fencing, surface stabilizing sprays, and biological stabilization (Hagedorn, et al., 1977).

Windbreaks and shelterbelts are extensive in Egypt and are the best in the Middle East (Oedekoven, 1970). They serve mainly to reduce sand movement and the amount of dust in the air. The threat of the creeping desert sand nevertheless remains, and indeed appears to have increased on the Nile margins as a result of the cessation of the annual flood (Tolba, 1979).

The most successful shelterbelt trees have proved to be limited in number: *Casuarina* spp., *Eucalyptus* spp., *Dalbergia sissoo*, Poplar spp., *Ecalyptus* spp., *Tamarix articulata, Albizzia lebbek, Prosopis juliflora, Khaya senegalensis, Acacia* spp., and *Brachychiton populneum* (Oedekoven, 1970).

Grasses, shrubs and trees suited to very sandy soils for primary dune stabilization projects are listed in Table 4.5. Stabilization can be expected within 3-4 years of planting (U.N. Conference on Desertification, 1977, A/Conf. 74/25).

Trees not only stabilize surface materials, but also provide a much-needed source of fuel. In fact, Oedekoven (1970) reports that the greatest obstacle preventing trees reaching maturity is the fact that they are stripped of bark and branches for fuel.

4.3 ENVIRONMENTAL CHANGES AND FAUNA

4.3.1 Historical Background

There seems no doubt that increasing populations in the Nile Valley and delta have taken their toll of whatever indigenous wildlife existed there. However, it is not certain what the exact "natural" composition would be. Butzer (1976) has argued that the Nile was probably very similar in ecology to other rivers which flow away from the well-watered central African Rift Valley. One may envisage a fauna therefore not unlike that of present-day Omo River which leads through arid areas into Lake Rudolf.

Butzer (1976) shows that elephant, rhinoceros, giraffe and gerenuk gazelle are recorded pictorially until 2,900 B.C. By 2,400 B.C. these disappeared from the Nile north of Aswan and from the Red Sea Hills. They became restricted ever more to the southern fringes of the Sahara. Camels become extinct, and Barbary sheep, lion and leopard became very scarce in Egypt.

Elephant, giraffe and rhinoceros may have been eliminated by man and his herds in the Nile Valley. Later, between 2400 and 1991 B.C., addax, ibex and oryx became scarce, leaving only dorcas gazelle and bubaline hartebeest in the desert. Butzer (1976) concludes that there was a climatic influence at least partly involved in these decimations--the Egyptian deserts were becoming distinctly drier.

4.3.2 Wildlife Protection

Although wildlife has been meagre in Egypt for four millennia, several species have felt more recent pressure on their habitats, to the point of being designated endangered species (Table 4.6) by the International Union for the Conservation of Nature and Natural Resources (IUCN).

It should be noted that crocodile populations are expanding along the shores of Lake Nasser.

Table 4.6

Endangered Species

Varanus griseus	Desert monitor
Acinonyx jubata	Cheetah
Oryx dammah	Scimitar-horned oryx
Addax nasomaculatus	Addax
Alcelaphus buselaphus tora	Tora hartebeest
Gazella gazella arabica	Arabian gazelle
Gazella leptoceros	Slender-horned gazelle
Crocodylus niloticus	Nile crocodile

Sources: IUCN, 1976; U.S. Dept. of the Interior, Fish and Wildlife Service, 1979.

No areas in Egypt at present qualify as "national parks" under these internationally agreed criteria (Johnson and Johnson, 1977):

a. permanent legal protection by the highest competent authority,

b. effective protection,

c. size (at least 1000 ha)

d. prohibition of exploitation (Ghabbour, 1979)

The old royal hunting grounds at Wadi Rishrash 80 km south of Cairo appear not to be maintained as a protected area, although they once were (Johnson and Johnson, 1977).

Nevertheless, legal protection of bird life is enunciated in three Acts (Appendix 1), two of which are directed specifically at the protection of birds useful to agriculture. Hunting by any means of any bird type (except poultry) is prohibited. Even the cultivation of birdlime trees (the glutinous gum of which is used to snare roosting birds) is prohibited except by license.

Article 117 of Act 53 of 1966 extends protection to wild fauna, and administration of the Act falls under the Ministry of Agriculture.

Several schemes (e.g. Ghabbour, 1978; Kassas, 1979) have been suggested recently for suitable sites, acreages and modes of administration for a national park system. Ghabbour (1978) has examined the problem thoroughly in relation to the development of Egypt's coastal areas. He suggests the establishment of two parks, one near El Alamein and one near Mersa Matruh. These are envisaged not only as tourist attractions and research and educational areas, but very much as havens for the threatened species mentioned above (Table 4.6). Further, Ghabbour argues against the notion that the desert is empty and worthless faunally and vegetationally. He argues for a program of stocking such reserves with non-threatened species such as wild sheep, wild goats, addax and oryx.

There have also been calls for the establishment of protected areas as intervals along the Nile, which acts as a critical resting area for migratory bird species (U.S. Fish and Wildlife Service, 1977).

4.4 POLLUTION

4.4.1 Water Pollution

Water is polluted from several sources. Salinity and agricultural chemicals are the pollutants of rural areas, with raw sewage and industrial effluent predominant from the cities. Re-use of water is curtailed by pollution. It has been noted (3.2.2.6 (e) above) that re-used water is a significant proportion of the country's water budget. More seriously is the damaging effect on health of unsanitary water supplies and poor sanitation (see 4.4.2 below).

The Nile is severely polluted from the apex of the delta at Cairo northwards (Costello, 1978) where the majority of Egypt's cities lie. Lake Mareotis, the end point of several canals, is severely eutrophied from influxes of agriculturally-derived phosphates (Saad, 1973), industrial wastes and raw sewage from the city of Alexandria on the north shore. This has resulted in an 85% drop in the fish catch (Saad, 1973).

Legislation on water quality appears to be based on monitoring pollutant levels in effluent (see Appendix III: Water) rather than being based on the quality of water in the Nile.

As yet Egypt has no unified environmental policy (U.S.A.I.D., 1979). Although such a development seems important to improve water quality it appears that even the legislation which does exist is ignored (U.S. Dept. of Energy, 1978).

4.4.2 Health and Pollution (Nyrop, 1976)

In general terms the health of Egypt's population has improved since the early 1950's. Life expectancy has increased from 42 to 53 years, and the number of people per doctors has fallen from 4,300 to 2,000.

Nevertheless health hazards related to pollution remain severe. Schistosomiasis and malaria have been mentioned in relation to irrigation schemes. Diseases related to poor sanitation are rife. Only about 25% of Cairo and Alexandria had sewage systems in the mid-70's. Half of Cairo's raw sewage is carried to the sea in open sewers. Of Egypt's approximately 120 towns, more than 100 entirely lacked sewer systems. Overcrowding exacerbates the problems. Egypt has one of the highest population densities in the world (2,400 people per square mile). Urban densities rise to 70,000 p.p.sq. mile in Cairo, and this will increase as Cairo's population doubles in the next 20 years.

Poor sanitation results in enteric diseases and dysenteries which alone are probably the major cause of death. Diarrhea apparently accounts for more than half of the deaths of rural infants. Typhoid, paratyphoid and hepatitis are endemic.

Unsanitary conditions have caused more than half the population to be afflicted by hookworm parasites. Roundworm parasites are common in the delta, and in the northern delta near saline water intestinal flukes are very common. Amoebiasis occurs widely throughout the country.

Diptheria is known, and respiratory ailments (pneumonia, bronchitis and tuberculosis) are common. Respiratory irritation is related directly to atmospheric dust and low humidity, which also cause chronic eye infections among children and a high rate of blindness. It is reported that as many as 80% of the rural population suffers impaired vision. Leishmaniasis is endemic in parts of the delta. Other significant diseases are louse- and flea-borne typhus, leprosy (insufficient facilities exist to treat the numbers), and rabies.

Various laws exist to regulate water pollution (Appendix III).

4.4.3 Agricultural Chemicals

Egypt uses pesticides heavily, especially in protecting the cotton crop, Egypt's single layer of export earner (Table 1, Appendix II). It has been noted that a general trend exists to over-use chemicals (USAID, 1979). Misapplication of a chemical recently caused many livestock and some human deaths (Anon, 1977). It has been noted that Lake Mareotis is polluted by high concentrations of agriculturally derived phosphates.

Agricultural chemicals are required by law to be tested before use. It has been noted that testing facilities seem to be insufficient to the task (Anon, 1977). It has also been observed that pesticide control legislation is practically ignored (U.S. Dept. of Energy, 1978).

4.4.4 Air Pollution

All the larger cities experience air pollution problems. Cairo's has been described as "extreme" (USAID, 1979). Insufficient paving and combustion products combine to produce high particulate and chemical concentrations in the urban atmosphere. It has been noted that, although legislation to control air pollution was introduced in 1971, it is not enforced (Anon, 1977).

4.4.5 Marine Pollution

Circulation in the Mediterranean water body is slower and less thorough than in the oceans. In addition nutrient and oxygen supply is lowest in the eastern Mediterranean where terrestrial runoff is low compared to the northern shores. Therefore, although pollution is lower off Egypt's shores than France's, for example, the marine ecology is more fragile (Le Lourd, 1977). It has been noted (4.1.7 above) that the sardine industry off the delta was disrupted, probably as a result of a stoppage in nutrient supply from the Nile. For these reasons concern is expressed in many quarters about the steady build-up of pollution, and the increasing inability of marine systems to absorb it without severe or permanent damage. Major contributions are dredge spoils from the Suez Canal and ports, offshore drilling, oil tanker traffic, and urban-industrial sewage (Osterberg and Keckes, 1977).

Coastal zones are most threatened and it appears that raw sewage poses the most immediate threat to the health of those who come in contact with seawater. Chemical pollutants affect health far less (Brisou, 1977).

It appears that little is known of the longer term effects of pollution on marine biology either near the shore or out to sea.

Egypt is one of 9 signatories of the 15 Mediterranean States which has signed (1977) 3 agreements approved at a UNEP conference in Barcelona 1976:

"Convention for the Protection of the Mediterranean Sea Against Pollution"

"Protocol for the Prevention of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft"

"Protocol concerning Cooperation in Combating Pollution of the Mediterranean Sea by Oil and Other Harmful Substances in Cases of Emergency"

5.0 MAJOR ENVIRONMENTAL PROBLEMS AND NATURAL RESOURCES

5.1 WATER POLLUTION

Polluted surface water is a most direct threat to health and general re-usability in the delta. Salinization and agricultural chemicals are less serious rural equivalents. Improved sewage disposal systems for Egypt's cities are central to improving urban health. Enforcement of existing water quality regulations, preferably under an integrated environmental policy, is also necessary. Control of the use of agricultural chemicals needs to be attempted, perhaps by educational programs. Drainage water quality is a significant contributor to salinity in irrigation water.

Pollution of groundwater is most serious in the delta where pumping has allowed saline seawater to encroach inland and contaminate the shallow delta aquifer. The effect of localized salinization of groundwater on the wider groundwater bodies, both shallow and deep (Nubian Sandstone), needs investigation. Similarly, groundwater bodies beneath the Western Desert oases need to be better understood before they are exploited, and before possible agriculture and its salinizing influence begin to have impacts. Transnational concerns for maintaining the regional aquifer will encourage a broad overview.

5.2 SOIL QUALITY

Major environmental problems to be corrected are waterlogging and salinization of otherwise productive soils, both of which affect almost 30% of Egypt's agricultural land and severely reduce productivity. A major national effort is in progress to drain hundreds of thousands of feddans of waterlogged land. It appears that this effort may not be sufficient without programs to prevent seepage from the distribution canals and overuse of irrigation water. It is unclear whether the drainage program of tiling the fields includes lining of canals and the prevention of over-irrigation. Funds allocated to the drainage program seem inadequate for these attendant, but critical, aspects of de-waterlogging soils.

Flushing salinized soils of accumulated salts can be accomplished if basic surveys of water quality, soil characteristics and crop needs have been performed, since locally unique combinations of factors appear to be involved. Highly regulated systems of water delivery are needed to prevent re-salinization and re-waterlogging.

It is not clear whether the water and soil surveys are complete or whether sufficient trained personnel are available to complete the ambitious schemes to rehabilitate either damaged agricultural soils or areas being newly reclaimed. The latter effort is insignificant at present, however.

Rangeland improvement, traditionally a difficult problem, appears to occupy an inferior position in plans for the development of the Mediterranean coast.

The outright removal of productive land from use by urban encroachment is a serious and apparently unchecked assault on Egypt's restricted but critical soil resource.

5.3 HEALTH

Most people are affected by one or more of the water-related diseases which are rife in Egypt. Overpopulation in parts and related insanitary conditons of water supplies and effluents result in enteric diseases and dysenteries which are probably the major causes of death. Schistosomiasis affects 30-50% of the population.

Improved water supply and sewage systems in addition to better irrigation practices would do much to control these diseases. The interrelatedness of health control measures with other human activities makes health problems often intractable. Successes in controlling schistosomiasis have been spectacular, but few.

5.4 PESTS

Pests destroy much of the country's various crops and have increased since the introduction of perennial irrigation. Although generally under control at present, the spread of pests needs to be carefully monitored in order to detect and prevent epidemic outbreaks.

5.5 WILDLIFE

The establishment of protected areas seems highly desirable, firstly to provide sanctuaries for Egypt's several endangered species, and secondly as recreation/tourism attractions. Several sites have been advocated.

5.6 AN INTEGRATED ENVIRONMENTAL POLICY

It is obvious that many of the salient environmental problems faced by Egypt are often interrelated. Therefore it seems imperative that environmental quality be as vigorously planned for as are Egypt's soil and water resources. This calls for an environmental policy to integrate existing environmental law.

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APPENDIX I

Population Statistics

CONTENTS

Table 1 Egypt, Demographic Indicators, Selected Years, 1897-1975

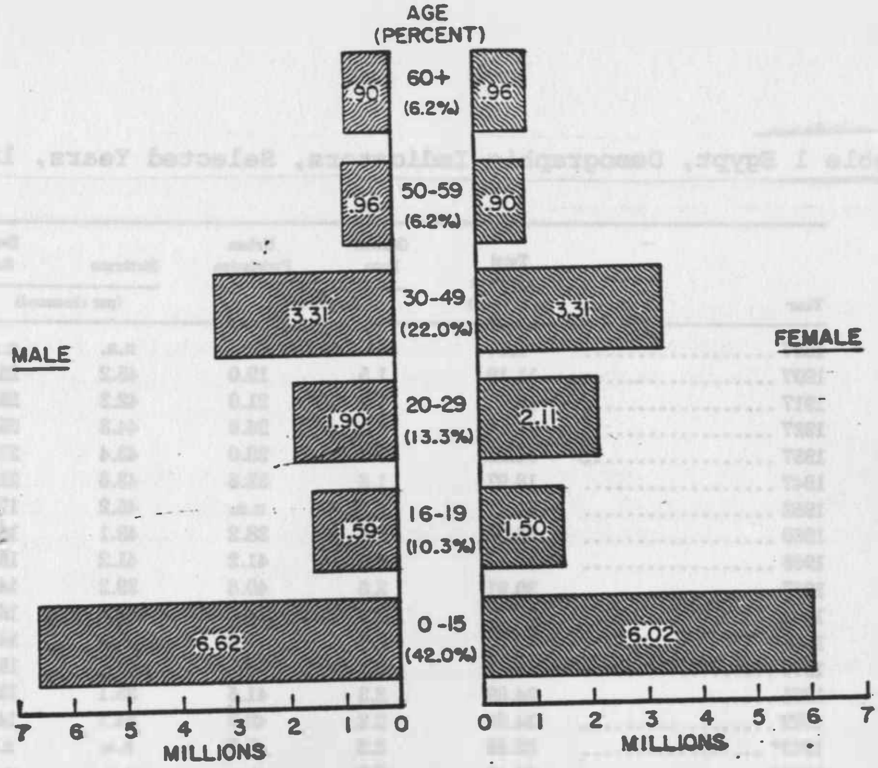
Year	Total Population (in millions)	Growth Rate (in percent)	Urban Population (in percent)	Birthrate (per thousand)	Death Rate (per thousand)
1897	9.67	n.a.	n.a.	n.a.	n.a.
1907	11.19	1.5	19.0	45.2	26.5
1917	12.72	1.2	21.0	42.3	25.8
1927	14.18	1.1	26.0	44.3	25.4
1937	15.92	1.2	28.0	43.4	27.1
1947	18.97	1.8	32.6	43.6	21.3
1952	21.47	2.5	n.a.	45.2	17.8
1960	25.83	2.4	38.2	43.1	16.9
1966	30.08	2.5	41.2	41.2	15.9
1967	30.91	2.6	40.8	39.2	14.2
1968	31.69	2.5	41.2	38.2	16.1
1969	32.50	2.5	41.6	37.0	14.5
1970	33.33	2.5	42.1	35.1	15.1
1971	34.08	2.3	41.5	35.1	13.2
1972	34.84	2.2	42.9	34.1	14.4
1973*	35.62	2.2	43.2	n.a.	n.a.
1974*	36.40	2.2	n.a.	n.a.	n.a.
1975*	37.00	2.6	n.a.	n.a.	n.a.

Source: Nyrop. 1976.

Table 2 Population and Rates of Growth of the Arab Republic of Egypt In Census Years

Census Year	Population (Thousands)	Average Annual Intercensal growth rate (%)
1897	9,715	-
1907	11,287	1.51
1917	12,751	1.23
1927	14,218	1.09
1937	15,933	1.15
1947	19,022	1.79
1960	26,085	2.46
1966	30,076*	2.40
1976	38,228	2.31

Source: Birks et al. 1978.



Note—1966 total population was 30.08 million.

Figure 1 Egypt, Population by Age and Sex, 1966

Source: Nyrop. 1976.

Table 3 Egypt, Sectoral Distribution of the Work Force, Fiscal Years 1968-1973 (in thousands)

Sector	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Commodity Sectors:						
Agriculture	3,892.4	3,964.9	4,048.3	4,056.9	4,094.7	4,179
Industry	867.3	890.7	916.1	1,052.8	1,094.3	1,169
Electricity	18.5	20.3	22.8	30.4	33.9	41
Construction	259.8	338.0	387.9	365.8	359.7	358
Total	5,038.0	5,213.9	5,375.1	5,505.9	5,582.6	5,739
Distribution Sectors:						
Transport and communication	330.4	335.7	347.2	374.5	388.5	409
Trade and finance	785.8	794.3	801.7	815.6	828.9	860
Total	1,116.2	1,130.0	1,148.9	1,190.1	1,217.4	1,269
Service Sectors:						
Housing	134.2	135.8	136.3	137.0	137.4	138
Public utilities	32.2	32.4	33.7	35.5	37.1	41
Other services	1,506.9	1,539.1	1,580.7	1,656.9	1,710.0	1,789
Total	1,673.4	1,707.3	1,750.7	1,829.4	1,884.5	1,968
TOTAL	7,827.6	8,051.2	8,274.7	8,525.4	8,684.5	8,976

Source: Nyrop. 1976.

Table 4 Egypt, Economically Active Population by Occupational Group and Sex, 1966

Occupational Group	Males	Females	Total	Percent of Population
Professional, technical, and related workers	279,288	87,706	366,994	4.4
Administrative, executive, managerial, and clerical workers	505,927	48,663	554,590	6.6
Sales workers	449,462	30,034	479,496	5.8
Farmers, fishermen, hunters, loggers, and related workers	3,676,501	125,776	3,802,277	45.6
Transport and communication workers	245,556	1,505	247,061	3.0
Craftsmen, production process workers, and laborers; miners, quarrymen, and related workers	1,330,857	42,189	1,373,046	16.5
Service, sport, and recreation workers	500,481	78,472	578,953	6.9
Workers not classifiable	723,768	207,548	931,316	11.2
TOTAL	7,711,840	[illegible]	[illegible]	[illegible]

Source: Nyrop. 1976.

APPENDIX II

Economic Characteristics

CONTENTS

Table 1 Egypt, Production of Main Crops, Selected Years, 1952-73 (in thousands of metric tons)

Crop	1952	1967	1971	1972	1973
Cotton (unginned)	1,296	1,208	1,418	1,422	1,368
Rice (paddy)	517	2,279	2,534	2,507	2,274
Wheat	1,081	1,291	1,729	1,616	1,837
Corn	1,506	2,163	2,342	2,417	2,507
Millet (sorghum)	522	881	854	881	853
Sugarcane	3,258	5,257	7,498	7,701	7,276
Onions	243	587	571	487	n.a.
Other vegetables	1,810	4,429	5,171	6,353	n.a.
Fruits	244	1,188	1,665	1,744	n.a.

Source: Nyrop. 1976.

Table 2: Imports and Exports

PRINCIPAL COMMODITIES

Imports	£E Million			
	1973	1974	1975	1976
Cereals and Milling Products	65.2	288.9	286.6	111.0
Animal and Vegetable Oils	16.8	47.3	135.2	37.4
General Grocery	4.8	8.6	16.0	21.2
Tobacco	11.2	11.5	20.7	26.3
Textiles and Textile Articles	16.9	22.0	29.7	55.4
Paper and Paper Products	11.8	32.9	61.8	60.7
Pottery and Glassware	3.6	5.0	14.9	20.2
Clocks, Watches, Scientific Apparatus	4.1	5.3	12.1	21.1
Mineral Products (excl. Crude Petroleum)	7.2	29.8	43.9	63.1
Chemical Products	33.6	122.2	197.5	125.9
Wood, Hides and Rubber	24.9	57.4	96.4	89.1
Machinery and Electrical Apparatus	51.7	78.6	169.8	280.5
Transport Equipment	35.9	83.4	139.8	178.0
Crude Petroleum	3.6	1.2	71.8	21.0
Iron and Steel	65.3	56.6	118.1	113.5

Exports	1974		1975		1976	
	'000 tons	£E million	'000 tons	£E million	'000 tons	£E million
Cotton, raw	232	279.1	185	201.0	165	154.8
Cotton yarn	37	65.1	32	63.0	37	57.8
Cotton piece goods	14	20.1	9	16.1	14	17.4
Rice	136	39.7	104	24.2	211	31.0
Potatoes	100	5.9	48	3.2	158	17.2
Onions	104	7.6	70	7.0	66	8.0
Edible fruits	169	12.0	228	20.4	185	24.3
Manganese and phosphates	120	1.8	105	1.1	119	2.2
Crude Petroleum	940	23.9	925	23.1	3,922	109.8
Benzene, kerosene and mazout	33	0.2	241	5.7	440	10.0
Cement	181	2.4	86	1.2	25	0.8

Source: Europa Publications. 1978.

Table 3 Egypt, Direction of Foreign Trade, Selected Years, 1968-73 (in millions of Egyptian pounds)

Area	1968 Export	1968 Import	1970 Export	1970 Import	1972 Export	1972 Import	1973 Export	1973 Import
Communist Countries								
Soviet Union	76	46	122	42	126	52	146	26
Czechoslovakia	14	10	16	14	21	13	26	12
People's Republic of China	7	9	8	7	11	11	8	10
Other	40	55	54	51	58	46	62	58
Total Communist Countries	137	120	200	114	216	122	242	106
Western Europe								
West Germany[a]	11	19	9	27	11	26	14	28
Italy	9	14	11	23	11	14	20	17
Other	34	77	34	81	43	92	74	91
Total Western Europe	54	110	54	131	65	132	108	136
Arab League Countries	27	12	27	21	27	34	31	24
Asia (noncommunist)								
Japan	10	5	11	5	15	5	23	6
India	20	11	18	27	19	13	13	10
Other	10	6	11	8	7	4	7	3
Total Asia (noncommunist)	40	22	40	40	41	22	43	19
Western Hemisphere								
United States	6	16	3	21	5	34	7	45
Other	0	2	1	3	3	3	9	1
Total Western Hemisphere	6	18	4	24	8	37	16	46
Africa and Oceania	6	8	6	12	2	44	4	30
TOTAL	270	290	331	342	359	391	444	361
Convertible currency areas	83	129	76	164	93	217	152	216
Bilateral agreement areas	187	161	255	178	266	174	292	145

Source: Nyrop. 1976.

APPENDIX III

Natural Resource and Environment Related Legislation [1]

CONTENTS

1. Water
2. Fauna
3. Flora
4. Radioactive Effluents and Pesticides

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[1] Sources: Food and Agriculture Organization (FAO). undated: preliminary material prepared for eventual inclusion in works on Water Laws in Moslem Countries

Johnson H. and J. Johnson. 1977. Environmental policies in developing countries. Beitraege zur Umweltgestalung, Heft A 27, Berlin: Erich Schmidt Verlag.

U.S. Environmental Protection Agency. 1976. Environmental Reports Summaries. Vol 1 - Africa, Asia, Australia, Sept. 1972-June 1976. Washington D.C.: National Technical Information Service No. PB-259 891

1. Water

- Order of 13 October 1924: Cairo Governorate, prescribing measures intended to prevent the pollution of water intended for drinking purposes.

- Order of 3 April 1936: Moudir of Keneh, concerning the closure of wells and the removal of pumps.

- Law No. 35 of 1946: concerning the discharge of wastewater from public toilets and industrial establishments into public sewers, as amended by Law No. 645 of 1954.

- Law No. 196 of 30 April 1953: concerning the discharge of waters from public, commercial, and industrial establishments into watercourses, as amended by Law No. 35 of 1954.

- Order No. 56 of 11 January 1962: protection of harbor and territorial waters against oil spills.

- Law No. 93 of 1962: disposal of liquid wastes

- Order No. 14 of 15 February 1963: concerning water quality.

- Decree No. 2703 of 1966: establishing the Higher Commission on Waters.

- Decree No. 649 of 1967: embodying regulations for the implementation of Law No. 93 of 1962 on the disposal of liquid wastes.

- Law No. 74 of 1971: irrigation and drainage.

- The Oil Pollution Regulations (undated)

- Circular No. 1 of the General Department for Urban Environmental Health (undated)

2. Fauna

- Act No. 13 of 1922: regarding the protection of birds.

- Act No. 134 of 1946: restricting importation of ornamental birds.

- Act No. 53 (Article 117) of 1966: concerning the protection of birds and wild fauna.

- Law No. 144 of 1969 (Section 12): regarding fisheries, especially preventing use of explosives.

3. Flora

- Act No. 61 of 1956: protection of flora against exotic pests and diseases.

4. Radioactive Effluents and Pesticides

- Law No. 59 of 1960: the control of the use of ionizing radiation and protection against its hazards
- Decree No. 170 of 1960: promulgating Law No. 59
- Law No. 509 of 1954: (Agricultural Pesticide Law) on pesticide control (amended by Decree No. 15 of 1957).
- Republican Act No. 16 of 1962: concerning pesticide control.
- Republican Act No. 50 of 1967: concerning pesticide control.

5. Air

- Executive order of 1971 on prevention of air pollution (Ministry of Health)

APPENDIX IV

Governmental Structure

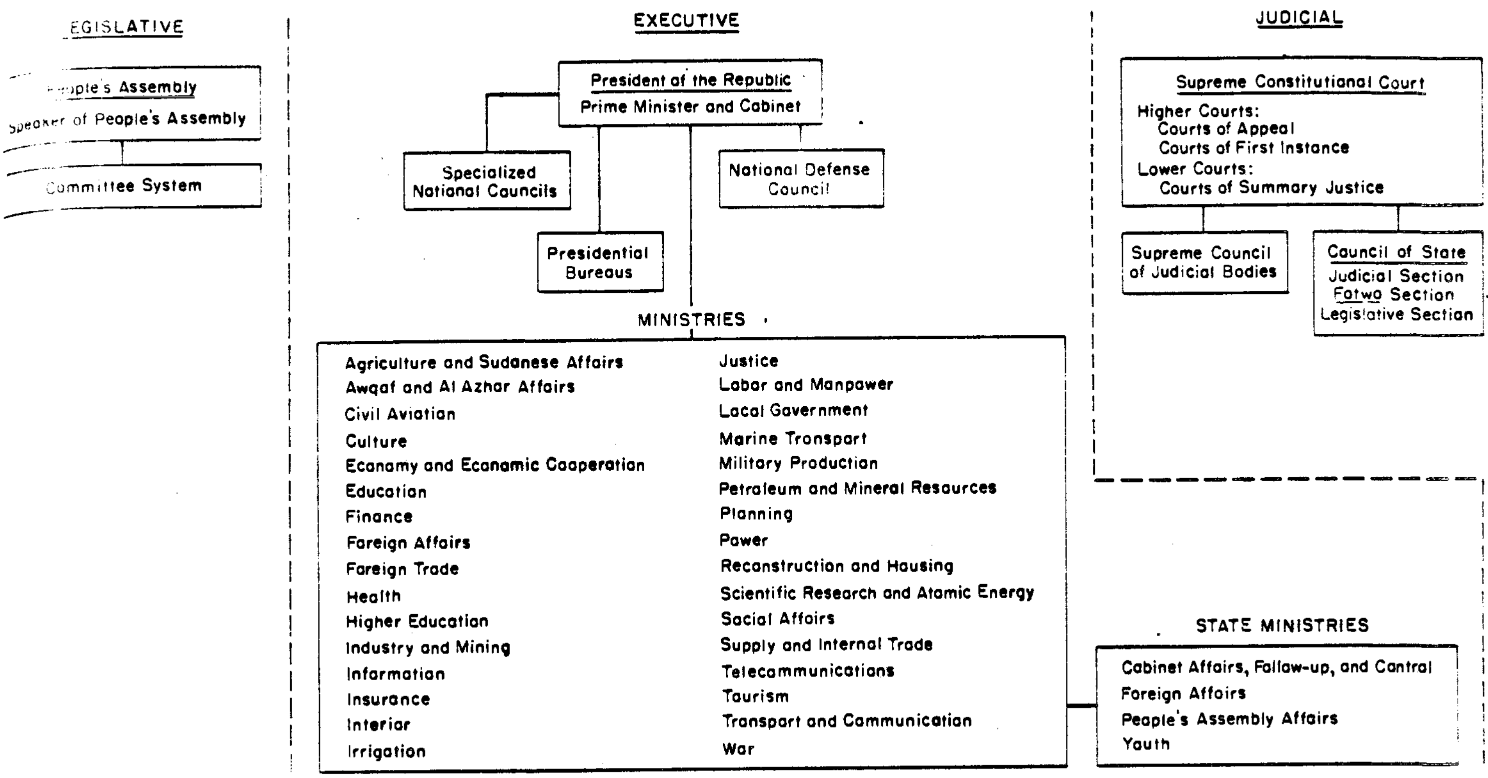

Fig. 1. Egypt, Government Structure, April 1975
Source: Nyrop. 1976.

APPENDIX V

List of Organizations[1/]

CONTENTS

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[1] Sources:

Bergquist, W.E. et al. 1978. Worldwide directory of national earth-science agencies. U.S. Geological Survey, Circular 771. iv + 77 pp.

-----. 1979. The world of learning 1978-79, vol. 1, 29th edition. London: Europa Publications Ltd. 1050 pp.

Food and Agriculture Organization of the United Nations, Current Agricultural Research Information System (CARIS). 1978. Agricultural research in developing countries, vol. 1: research institution. Rome: FAO. xv + 633 pp.

Paylore, P.P. 1977. Arid lands research institutions: a world directory. Tucson, Arizona: University of Arizona Press. xv + 317 pp.

Trzyna, T.C. and E.V. Coan, eds. 1976. World directory of environmental organizations, 2nd edition. Claremont, California: Public Affairs Clearinghouse. xxx + 258 pp. (published for the Sierra Club's International Program).

1. Government Organizations

Name: MINISTRY OF AGRICULTURE AND LAND RECLAMATION
Dokki, Cairo

Affiliates: Animal Production Research Institute
Dokki, Cairo

Desert Institute
El-Mataria, Cairo
Subjects: desert development, water and soil resources, plant and animal production, solar and wind energy.
Publication: Desert Institute Bulletin
Includes: Plant Pathology Research Institute

Egyptian Authority for the Utilization and Development of Reclaimed Lands (EAUDRL) formerly Land Reclamation Authority

Herbarium, Agricultural Research Centre
Dokki, Cairo

Plant Protection Research Institute
Madi Elseid Street
Dokki, Giza

Soils and Water Research Institute
Cairo University Street
Giza

Name: MINISTRY OF HOUSING AND RECONSTRUCTION

Name: MINISTRY OF IRRIGATION

Affiliate: Hydraulics and Sediment Research Institute
Delta Barrage
Publication: Technical Report (annual)

Name: MINISTRY OF MARITIME TRANSPORT

Affiliate: National Committee for the Combatting of Marine Pollution

Name: MINISTRY OF PETROLEUM AND MINERAL WEALTH

Affiliate: Geological Survey and Mining Authority
Abbasiya P.O.
Cairo
Subjects: regional geologic mapping, mineral prospecting, evaluation of mineral deposits, preparation of techno-economic reports, mine and quarry designs and granting mineral exploration and exploitation rights. 280 research workers.

Name: MINISTRY OF PUBLIC HEALTH

Affiliate: Public Health Laboratories
19 Sharia Sheikh Rehan,
Cairo

2. Agricultural Organizations

Name: AGRICULTURAL ECONOMICS RESEARCH INSTITUTE
Dokki, Cairo

Name: AGRICULTURAL RESEARCH CENTER
Desert Institute
Mataria, Cairo

Affiliate: Plant Pathology Research Institute
Giza

Name: BAHTIM AGRICULTURAL RESEARCH STATION
Bahtim
Kaliobeya Governorate

Name: COTTON RESEARCH INSTITUTE
Experimental Agricultural Research Center
Giza

Name: EGYPTIAN AGRICULTURAL ORGANIZATION
P.O. Box 63
Exhibition Grounds
Gezira, Cairo

Name: EGYPTIAN HORTICULTURAL SOCIETY
P.O. Box 46
Cairo

Publication: Horticultural Magazine

Name: FIELD CROPS RESEARCH INSTITUTE
Agricultural Research Center
Giza

Name: GEMMEZA AGRICULTURAL RESEARCH STATION

Name: MATANA AGRICULTURAL RESEARCH STATION
Matana
Isna District
Qena Governorate

Name: NUBARIA RESEARCH STATION
Al-Nasser
North Tahrir
Tahrir Province

Name: SAKHA AGRICULTURAL RESEARCH STATION
Sakha Kafr El-Sheikh Governorate

Name: SHANDAWEEL AGRICULTURAL RESEARCH STATION
Geziret
Suhag Governorate

Name: SIDS AGRICULTURAL RESEARCH STATION
Sids
Beni Suef

3. Universities

Name: AIN SHAMS UNIVERSITY
Kasr-el-Zaafran
Abbassia
Cairo

Affiliates: Department of Zoology
Subjects: ecology, taxonomy, physiology of desert animals, parasitology of desert reptiles, birds, and mammals
Publications: Ain Shams Science Bulletin

Faculty of Agriculture

Faculty of Medicine

Name: UNIVERSITY OF ALEXANDRIA
22 Al-Gueish Avenue
Shatby, Alexandria

Affiliates: Department of Botany, Ecology Unit
Moharram Bey
Alexandria
Subject: ecology of Mediterranean coastal desert west of Alexandria
Publications: Bulletin of the Faculty of Science

Faculty of Medicine

Faculty of Agriculture

Institute of Medical Research

Higher Institute of Public Health
Publication: Bulletin

Name: AL-AZHAR UNIVERSITY
Cairo

Affiliates: Faculty of Agriculture

Faculty of Medicine

Name: AMERICAN UNIVERSITY IN CAIRO
113 Sharia Kasr Al-Aini
Cairo

Name: UNIVERSITY OF ASSUIT
Assuit

Affiliates: Faculty of Agriculture

Faculty of Medicine

Faculty of Science

Faculty of Veterinary Medicine

Name: UNIVERSITY OF CAIRO
Orman
Giza
Cairo

Affiliates: Department of Botany
Subjects: taxonomy, survey of desert vegetation, environmental studies, ecology of coastal and saline deserts, microflora of desert soils.
Publications: Herbarium publications

Department of Natural Resources, Institute of African Research and Studies
33 Misaha Street
Dokki, Giza
Subjects: ecology of desert plants and soil fauna, physics and chemistry of desert soils, establishment of national desert parks and nature preserves.
Publications: African Studies Review

Soil and Water Research Institute

Name: HELWAN UNIVERSITY
7 Moderiet El-Tahrir Street
Garden City
Cairo

Affiliates: Agriculture Branch
Moshtohor

Name: MANSOURA UNIVERSITY
Mansoura

Affiliates: Faculty of Agriculture

Faculty of Science

Name: MINIA UNIVERSITY
Minia

Affiliates: Faculty of Agriculture

Faculty of Medicine

Name: TANTA UNIVERSITY
Tanta

Affiliates: Faculty of Agriculture

Faculty of Agriculture (at Kafr el Sheikh)

Faculty of Medicine

Faculty of Science

Name: ZAGAZIG UNIVERSITY
Zagazig

Affiliates: Faculty of Agriculture

Faculty of Veterinary Medicine

4. Libraries, Archives and Statistical Organizations

Name: AL-AZHAR UNIVERSITY LIBRARY
Cairo

Name: ALEXANDRIA MUNICIPAL LIBRARY
18 Sharia Menasce
Moharrem Bey,
Alexandria

Name: ALEXANDRIA UNIVERSITY LIBRARY
22 Al-Gueish Ave.
Shatby, Alexandria

Name: AMERICAN CENTER LIBRARY
4 Ahmed Ragheb St.,
Garden City, Cairo

Name: AMERICAN UNIVERSITY IN CAIRO LIBRARY
113 Sharia Kasr
El-Aini, Cairo

Name: ARAB LEAGUE LIBRARY
Midan Al-Tahrir, Cairo

Name: ASSIUT UNIVERSITY LIBRARY
Assiut

Name: BRITISH COUNCIL LIBRARY
192 Sh. El-Nil, Agouza,
Cairo

Name: CAIRO UNIVERSITY LIBRARY
Orman, Giza

Name: CENTRE OF DOCUMENTATION AND STUDIES ON ANCIENT EGYPT
4 Sharia Ramses,
Cairo

Name: DAMANHOUR MUNICIPAL LIBRARY
Damanhour

Name: EGYPTIAN ASSOCIATION FOR ARCHIVES AND LIBRARIANSHIP
24 El-Matbaa Al-Ahlia
Boulag
Cairo

Name: EGYPTIAN LIBRARY
Abdin Palace,
Cairo

Name: EGYPTIAN NATIONAL LIBRARY
Midan Ahmed Maher
Bab El-Khalq
Cairo

Name: HELWAN OBSERVATORY LIBRARY
Helwan

Name: INSTITUTE OF NATIONAL PLANNING
Salah Salem St.
Nasr City, Cairo

Name: LIBRARY OF THE BANK OF EGYPT
151 Sharia Muhammad Farid,
Cairo

Name: LIBRARY OF THE GREEK ORTHODOX PATRIARCHATE OF ALEXANDRIA
P.O.B. 2006
Alexandria

Name: LIBRARY OF THE INSTITUT d'EGYPTE
13 Sharia Sheikh Rihane
Cairo

Name: LIBRARY OF THE MINISTRY OF AGRICULTURE
Giza-Orman

Name: LIBRARY OF THE MINISTRY OF COMMERCE AND INDUSTRY
Sharia Ismail Abaza Pasha,
Cairo

Name: LIBRARY OF THE MINISTRY OF EDUCATION
16 Sharia El-Falaki,
Cairo

Name: LIBRARY OF THE MINISTRY OF HEALTH
Sharia Sultan Hussein,
Cairo

Name: LIBRARY OF THE MINISTRY OF JUSTICE
Midan Lazoghli, Cairo

Name: LIBRARY OF THE MINISTRY OF WAQFS
Qoubbih al-Ghoury, Cairo

Name: LIBRARY OF THE MONASTERY OF ST. CATHERINE
Mount Sinai

Name: LIBRARY OF THE SOCIETE ENTOMOLOGIQUE d'EGYPTE
14 Sharia Ramses
P.O.B. 430, Cairo

Name: MANSOURA MUNICIPAL LIBRARY

Name: NATIONAL ARCHIVES
Al-Qalcah, Cairo

Name: NATIONAL ASSEMBLY LIBRARY
Palace of the National Assembly,
Cairo

Name: NATIONAL INFORMATION AND DOCUMENTATION CENTRE
Al-Tahrir St.
Dokki, Cairo

Name: SHARKIA PROVINCIAL COUNCIL LIBRARY
Zagazig

Name: TANTA MUNICIPAL LIBRARY

5. <u>Other Organizations</u>

Name: ACADEMY OF SCIENTIFIC RESEARCH AND TECHNOLOGY
101 Kasr El Aini Street
Cairo

Affiliates: Institute of Oceanography and Fisheries

Institute of Astronomy and Geophysics:
Egyptian Observatories
Helwan, Cairo

Council of Environmental Research

Red Sea Institute of Oceanography and Fisheries
Al-Ghardaqa

Petroleum Research Institute
Medinat Nasser, Cairo

Name: AERIAL SURVEY OF EGYPT
308 El-Haram Street
Giza

Name: ALEXANDRIA INSTITUTE OF OCEANOGRAPHY AND FISHERIES
Kayed Bey
Alexandria

Name: AMERICAN RESEARCH CENTER IN EGYPT, INC.
2 Midan Kasr el Doubara
Cairo

Name: ATOMIC ENERGY ESTABLISHMENT
Dokki
Cairo

Name: BIOMEDICAL RESEARCH CENTER FOR INFECTIOUS DISEASE
Cairo

Name: COASTAL CONSERVATION COMMISSION

Name: EGYPTIAN GEOGRAPHICAL SOCIETY
Sharia Kasr El-Aini (Jardin du Ministere du Irrigation)
P.O. Garden City
Cairo

Name: EGYPTIAN REMOTE SENSING CENTRE (ERSC)
Cairo

Name: EGYPTIAN SOCIETY OF MEDICINE AND TROPICAL HYGIENE
2 Sharia Fouad I
Alexandria

Name: ENTOMOLOGICAL SOCIETY OF EGYPT
14 Sharia Ramses
P.O. Box 430
Cairo

Publications: Bulletin of the Entomological Society of Egypt

Name: GENERAL AUTHORITY FOR REHABILITATION AND AGRICULTURAL PROJECTS

Name: GENERAL PETROLEUM COMPANY
Dr. Mustafa Abu Zahra Street
Nasr City, Cairo

Name: HYDROLOGICAL RESEARCH STATION
Kanater-al-Khaiyria Barrages
Cairo

Name: INSTITUTE OF ARAB RESEARCH AND STUDIES
1 Tolombat St.
Garden City, Cairo

Name: INSTITUT D'EGYPTE
13 Sharia Sheikh Rihane
Cairo

Subjects: literary, artistic and scientific questions relating to Egypt and neighboring countires.

Name: INSTITUTE OF FRESHWATER FISHERY BIOLOGY
10 Hassan Sabry St. (Fish Garden)
P.O. Zamalik
Cairo

Name: MINING AND WATER RESEARCH EXECUTIVE ORGANIZATION
Dokki, Cairo

Name: NATIONAL COMMITTEE FOR MAN AND THE BIOSPHERE PROGRAM (MAB)
c/o National Committee for Unesco
17 Ismail Abul-Futuh St.,
Dokki, Cairo

Subject: for Unesco's MAB Program

Name: NATIONAL COMMITTEE FOR SCOPE
c/o Academy of Scientific Research and Technology
101 Kasr el-Aini St.,
Cairo

Subject: for the Scientific Committee on Problems of the Environment (SCOPE) of the International Council of Scientific Unions (ICSU)

Name: NATIONAL RESEARCH CENTRE
Al-Tahrir St.
Dokki, Cairo

Subject: research in pure and applied sciences. Staff of 1199 scientists and 133 technicians.

Includes: Applied Organic Chemistry Dept. (Pesticide, Biochemical and Microbiology Labs.)

Biology and Agriculture Dept. (Pests and Plant Protection Lab.)

Medicine and Pharmacy Dept. (Public Health Lab.)

Petroleum and Minerals Dept. (Petrol. Technol., Petrochem. and Earth Sciences Labs.)

Affiliates: Medical Research Executive Organization

Includes: Bilharziasis Research Institute, Giza

The Medical Research Institue, Alexandria

Nutrition Research Institute

Ophthalmological Research Institute

Memorial Institute for Ophthalmic Research, Giza

Ophthalmological Society of Egypt

Research Institute and Hospital for Tropical Diseases
10 Sharia Kasr el-Aini, Cairo

Name: SURVEY DEPARTMENT
20 Baghdad Street
Giza, Cairo

6. International Organizations

Name: THE AMERICAN CENTER
4 Ahmed Ragheb St.
Garden City, Cairo

Subject: library of 10,000 vols, 240 periodicals, 15,000 microfiche

Name: ARAB LEAGUE EDUCATIONAL, CULTURAL, AND SCIENTIFIC ORGANIZATION (ALESCO)
109 Tahrir St.
Dokki
Cairo

Subjects: promote intellectual unity of the Arab countries

Name: ASSOCIATION OF ARAB UNIVERSITIES
Scientific Computation Centre
Tharwat Street
Orman P.O.
Cairo

Publications: Bulletin, Directory of Arab Universities, Directory of Teaching Staff of Arab Universities, Proceedings of Seminars

Name: BOARD FOR THE UTILIZATION OF THE RIVER JORDAN AND ITS TRIBUTARIES
Cairo

Subjects: regulates water activities in the River Jordan basin; activities have been interrupted since Israeli occupation

Name: BRITISH COUNCIL
192 Sh. El-Nil
Agouza, Cairo

Subjects: 32,900 vols., 111 periodicals

Name: FAO REGIONAL OFFICE FOR THE NEAR EAST
Box 2223
General Cooperative Society for Agarian Reform Building
Dokki, Cairo

Affiliates: FAO Commission on Horticultural Production in the Near East and North Africa

Subjects: promotion of international collaboration in the study of technical problems and the establishment of a balanced program of horticultural research at an interregional level.

Name: INSTITUT D'EGYPTE
13 Sharia Sheikh Rehan, Cairo

Subjects: literary, artistic and scientific questions relating to Egypt and neighboring countries.

Name: INTERNATIONAL METEOROLOGICAL INSTITUTE
Cairo

Type: Regional, World Meteorological Organization

Subjects: meteorological research and training for Middle Eastern and African personnel engaged in meteorological work

Name: MIDDLE EASTERN REGIONAL RADIOISOTOPE CENTRE FOR THE ARAB COUNTRIES
SL. Malaeb El Gamaa
Dokki, Cairo

Subjects: train specialists in the applications of radio-isotopes, particularly in the medical, agricultural, and industrial fields; conduct research in hydrology, tropical and subtropical diseases, fertilizers, and entomology; promote the use of radioisotopes in Arab countries.

Name: NEAR EAST FORESTRY COMMISSION
c/o FAO Regional Office for the Near East
P.O. Box 2223
Cario

Subjects: forest policy preview and coordination of its implementation on a regional level; information exchange and advice on suitable practices and action on technical problems; make appropriate recommendations to the twenty-one member countries.

Name: NEAR EAST PLANT PROTECTION COMMISSION
c/o FAO Regional Office for the Near East
P.O. Box 2223
Cairo

Subjects: matters relating to the protection of plant resources in the region; fifteen member countries.

Name: UNESCO REGIONAL OFFICE FOR SCIENCE AND TECHNOLOGY
IN THE ARAB STATES
8 Abdel Rahman Fahmy St,
Garden City, Cairo

Name: U.N. INFORMATION CENTRE
Sh. Osiris
Tagher Bldg.
Garden City, Cairo

APPENDIX VI

Recent USAID Projects[1/]

[1]Source: USAID's prefunding project design documents, 1974-, from computer information system "TEXT," a component of computer information system "INQUIRE."

*
* TITLE: AGRICULTURAL DEVELOPMENT SYSTEMS
****

PROBLEM:

ALTHOUGH A BASIC SET OF TECHNOLOGICAL INSTITUTIONS EXISTS TO SERVE EGYPT'S AGRICULTURAL SECTOR, THE OVERALL PLANNING AND COORDINATING STRUCTURES ARE WEAK. THE LARGE NUMBER OF AUTONOMOUS OR SEMI-AUTONOMOUS SUB-UNITS WITH WEAK LINES OF COMMUNICATION RESULTS IN SCATTERED AND COMPETING CLAIMS TO RESOURCES, AND IN AN INADEQUATE TRANSFER OF TECHNOLOGY, INFORMATION, AND SERVICES TO THE FARMER.

PROJECT: 2630041 SUB-PROJECT: 00 *
*
INITIAL FY: 77 FINAL FY: 83 *
****

*
* TITLE: AGRICULTURAL MECHANIZATION
****

PROBLEM: AGRICULTURAL PRODUCTION IN EGYPT HAS STAGNATED DURING THE LAST FEW YEARS, CAUSING THE OVERALL RATE OF THE COUNTRY'S GROWTH TO SLOW DOWN. TO INCREASE AGRICULTURAL PRODUCTION, THE GOVERNMENT OF EGYPT (GOE) HAS PURSUED A VARIETY OF TECHNOLOGICAL POSSIBILITIES. IN THE IMPORTANT AREA OF FARM MECHANIZATION, HOWEVER, GOE PROGRAMS HAVE, TO DATE, LACKED ADEQUATE AND COMPREHENSIVE ANALYSIS AND PLANNING AND SO HAVE BEEN LIMITED IN SCOPE AND EFFECTIVENESS.

PROJECT: 2630031 SUB-RROJECT: 00 *
*
INITIAL FY: 79 FINAL FY: 85 *
****

*
* TITLE: ALEXANDRIA PORT EQUIPMENT
****

PROBLEM:

THE BASIC CONSTRUCTION AND CONFIGURATION OF THE ALEXANDRIA PORT ARE ABOUT 150 YEARS OLD. SILT IS FILLING THE MAIN CHANNELS, AND ONLY 11 OF 27 GENERAL CARGO BERTHS CAN ACCOMODATE DEEP-SEA SHIPS ABOVE 130 METERS LONG.PALLETIZATION OF CARGO IS NOT USED, AND CARGO TRANSPORT EQUIPMENT IS OUT OF DATE AND IN NEED OF MAINTENANCE. IN ADDITION TO SLOWING THE IMPORT AND EXPORT OF GOODS, THE PORT'S CONGESTION AND INEFFICIENCY COST THE GOE SOME $26 MILLION PER YEAR IN DEMURRAGE PAYMENTS AND SHIPPING CONGESTION SURCHARGES.

PROJECT: 2630014 SUB-PROJECT: 00 *
*
INITIAL FY: 76 FINAL FY: 80 *
****

*
* TITLE: ALEXANDRIA WASTEWATER SYS EXPANSION I
****

PROBLEM: THE COMPONENTS OF ALEXANDRIA'S EXISTING WASTEWATER COLLECTION AND DISPOSAL SYSTEM ARE INADEQUATE FOR A CITY OF ITS SIZE AND GROWTH RATE. THE COLLECTION SYSTEM IS OFTEN OVERLOADED DURING TIMES OF WET WEATHER; MANY SEWAGE PUMPING STATIONS ARE OBSOLETE IN DESIGN AND INEFFICIENT,AND MUCH OF THE DISPOSAL SYSTEM IS IN A STATE OF DISREPAIR. AS A RESULT MUCH UNTREATED SEWAGE IS DIRECTLY DISCHARED INTO AREA WATERWAYS THROUGH OVERFLOWS AND LITTLE BREAKS,OR,SIMPLY,OUT OF EXPEDIENCY.

PROJECT: 2630100 SUB-PROJECT: 00 *
*
INITIAL FY: 79 FINAL FY: 85 *
****

*
* TITLE: APPLIED SCIENCE AND TECHNOLOGY RESEARCH
****

PROBLEM:

EGYPT'S CONSIDERABLE SCIENTIFIC & TECH RESOURCES ARE DIRECTED TOWARD BASIC RATHER THAN APPLIED RESEARCH. RESEARCH PERSONNEL OFTEN LACK EXPERIENCE & TRNG IN EXECUTIVE SKILLS REQUIRED TO FORMULATE POLICY AND TO PLAN,SELECT,STAFF & MONITOR RESEARCH-ESP IN THE MGMT OF LARGE-SCALE INTER-DISCIPLINARY PROJS. MUCH OF THE AVAILABLE EQUIP IS RUN DOWN OR OUTMODED & UP-TO-DATE SCI & TECH INFO IS UNAVAILABLE. AS A RESULT,SCIENTIFIC RESEARCH HAS HAD LITTLE EFFECT UPON INCREASING THE IMPACT OF SCI,TECH & INNOVATION IN INDUSTRY OR NATL DEVEL PROGS.

PROJECT: 2630016 SUB-PROJECT: 01 *
*
INITIAL FY: 77 FINAL FY: 80 *
****

*
* TITLE: APPLIED SCIENCE AND TECHNOLOGY RESEARCH
****

PROBLEM:

A QUICKLY ACCESSIBLE & NATION-WIDE INFORMATION SYSTEM PROVIDING THE LATEST SCIENTIFIC & TECH INFO IS NOT YET AVAILABLE TO EGYPTIAN RESEARCHERS. RESEARCH INSTITUTIONS LACK FACILITIES,ADEQUATE RESOURCE MATERIALS & TRAINED PERSONNEL TO OPERATE A COMPUTER-ORIENTED STORAGE & RETRIEVAL SYSTEM. WITHOUT SUCH A SYSTEM,THE EGYPTIAN SCIENTIFIC COMMUNITY CANNOT KEEP ABREAST OF THE LATEST SCIENTIFIC/TECHNOLOGICAL INNOVATIONS-AND THEIR POSSIBLE APPLICATION IN SOLVING NATIONAL DEVELOPMENT PROBLEMS IS INHIBITED.

PROJECT: 2630016 SUB-PROJECT: 02 *
*
INITIAL FY: 77 FINAL FY: 80 *
****

* TITLE: AQUACULTURE DEVELOPMENT
****

PROBLEM: POPULATION GROWTH IN CONJUNCTION WITH INCREASES IN PER CAPITA INCOME HAS GENERATED AN INCREASING DEMAND FOR PROTEIN FOODS IN EGYPT. ALTHOUGH FISH IS TRADITIONALLY AN IMPORTANT HIGH PROTEIN FOOD SOURCE IN EGYPT,CONSUMPTION IS LIMITED BY SUPPLY SHORTAGES. PRESENT DEMANDS (MUCH LESS FUTURE DEMANDS) CANNOT BE MET BY NATURAL FISHERIES AND EXISTING FISH FARMS. AS A RESULT,THE DEMAND FOR FISH IS BEING MET BY IMPORTS--PLACING AN ADDITIONAL STRAIN OF THE NATION'S BALANCE OF PAYMENTS.

PROJECT: 2630064 SUB-PROJECT: 00 *
*
INITIAL FY: 78 FINAL FY: 83 *
****

* TITLE: CAIRO/ALEXANDRIA WATER SEWAGE
****

PROBLEM: THE RAPID POPULATION & INDUSTRIAL GROWTH OF ALEXANDRIA,EGYPT HAS RESULTED IN A SERIOUS WASTEWATER COLLECTION & DISPOSAL PROBLEM.THE PRESENT SEWAGE PUMPING & TREATMENT FACILITIES ARE INADEQUATE OR OBSOLETE AND THE COLLECTION SYSTEM(SEWER LINES,DRAINS)IS IN A STATE OF DISREPAIR AND /OR BADLY IN NEED OF CLEANING.THE EGYPTIAN AGENCY RESPONSIBLE FOR RECTIFYING THIS PROBLEM,THE GENERAL ORG FOR SEWERAGE & SANITARY DRAINAGE,LACKS THE FUNDING & TECH EXPERTISE TO BE ABLE TO UNDERTAKE A SEWER SYS REHAB PROG OF THE NECESSARY MAGNITUDE IN ALXNDRIA

PROJECT: 2630038 SUB-PROJECT: 00 *
*
INITIAL FY: 77 FINAL FY: 82 *
****

* TITLE: EGYPT: NATIONAL ENERGY CONTROL CENTER
****

PROBLEM:

THE UNIFIED POWER SYSTEM (UPS), EGYPT'S ELECTRICAL NETWORK, CONSISTS OF 2445 MEGAWATTS OF HYDRO POWER FROM TWO GENERATATION STATIONS, 1502 MEGAWATTS OF THERMAL POWER FROM 13 GENERATION STATIONS, PLUS 833 KM OF 220 KILOVOLT LINES, 768 KM OF DOUBLE 500 KILOVOLT LINES, AND 24 MAJOR SUBSTATIONS. VARIATIONS IN POWER AVAILABLE FROM THE HYDRO SITES, THE DISTANCE BETWEEN STATIONS AND LOAD CENTERS, AND THE 10% ANNUAL SYSTEM GROWTH RATE HAVE RENDERED THE PRESENT MANUAL VOICE-CONTROLLED POWER DISPATCH SYSTEM OBSOLETE.

PROJECT: 2630023 SUB-PROJECT: 00 *
*
INITIAL FY: 76 FINAL FY: 82 *
****

* TITLE: EGYPT: GRAIN SILOS LOAN
****

PROBLEM: EGYPT LACKS EFFICIENT SYSTEM TO RECEIVE, STORE AND DISTRIBUTE IMPORTED WHEAT, CORN AND FLOUR. EGYPT NEEDS GRAIN HANDLING EQUIPMENT AND SILOS TO REDUCE GRAIN WASTE ANS SPEED UP GRAIN MARKETING.

PROJECT: 2630028 SUB-PROJECT: 00 *

INITIAL FY: 75 FINAL FY: 79 *
****

* TITLE: EGYPT: URBAN HEALTH DELIVERY SYSTEM
****

PROBLEM: POOR ENVIRONMENTAL SANITATION, INADEQUATE WATER AND SEWAGE FACILITIES, AND CULTURAL PRACTICES CONTRIBUTE TO A LOW LEVEL OF HEALTH IN EGYPT, WHERE THE INFANT MORTALITY RATE EXCEEDS 150 PER 1000 AND INCIDENCE OF GASTROENTERITIS AND BRONCHIAL DISORDERS EXCEEDS MINIMALLY ACCEPTABLE LEVELS. WHILE THE GOVT HAS DEVELOPED A HEALTH CARE SYSTEM, THE SYSTEM HAS NOT FUNCTIONED TO ITS FULL POTENTIAL BECAUSE OF FRAGMENTATION OF SERVICES, POORLY MAINTAINED FACILITIES, AND LOW PUBLIC ACCEPTANCE OF PERIPHERAL HEALTH CARE UNITS.

PROJECT: 2630065 SUB-PROJECT: 00 *

INITIAL FY: 78 FINAL FY: 83 *
****

* TITLE: FAMILY PLANNING
****

PROBLEM: EGYPT, WITH 96% OF ITS POPULATION CROWDED ONTO 4% OF THE LAND, HAS A POPULATION DENSITY TWICE THAT OF THE NETHERLANDS AND AN ANNUAL POPULATION GROWTH RATE OF 2.5%. IN 1966 THE GOE ESTABLISHED A SYSTEM PROVIDING FAMILY PLANNING INFORMATION AND SERVICES, AND AS OF 1977 BETWEEN 15 AND 20 PERCENT OF EGYPT'S MARRIED COUPLES OF REPRODUCTIVE AGE WERE USING MODERN CONTRACEPTIVE METHODS. THIS PARTICIPATION RATE, HOWEVER, WILL HAVE TO AT LEAST DOUBLE AND BE MAINTAINED.

PROJECT: 2630029 SUB-PROJECT: 01 *

INITIAL FY: 77 FINAL FY: 81 *

* TITLE: FEASIBILITY STUDIES
****

PROBLEM: THE GOVERNMENT OF EGYPT HAS VERY LITTLE DOMESTIC CAPABILITY FOR PRODUCING ACCEPTABLE FEASIBILITY STUDIES AND THEREFORE LACKS A PORTFOLIO OF ACCEPTABLE DEVELOPMENT PROJECTS READY FOR FINANCINN; I.E., PROJECTS WHICH HAVE BEEN THOROUGHLY STUDIED AND HAVE PROVEN TO BE TECHNICALLY AND ECONOMICALLY FEASIBLE. MOREOVER, EGYPT FACES A BALANCE OF PAYMENTS CRISIS WHICH PRECLUDES THE USE OF FOREIGN EXCHANGE FOR REQUIRED TECH ASST. CONSEQUENTLY, GOE IS UNABLE TO UTILIZE FINANCIAL ASSIST BEING OFFERED BY ARAB OIL COUNTRIES AND OTHER FOREIGN DONORS.

PROJECT: 2630003 SUB-PROJECT: 00 *
*
INITIAL FY: 75 FINAL FY: 79 *

* TITLE: FOOD GRAIN/VEG OIL STOR. AND DISTR. FAC.
****

PROBLEM: IMPORTS OF TALLOWS, OILS AND FATS (TOF) PROVIDE A SUBSTANTIAL PORTION OF EGYPT'S SUPPLY FOR THE MANUFACTURE OF VEGETABLE OILS, SHORTENING AND SOAP. BECAUSE STORAGE AND DISTRIBUTION SYSTEMS FOR GRAINS AND TOF ARE INEFFICIENT, LARGE LOSSES RESULT FROM WASTEAGE, SPOILAGE AND PEST INFESTATION.

PROJECT: 2630037 SUB-PROJECT: 00 *
*
INITIAL FY: 77 FINAL FY: 81 *
****

*
* TITLE: GROUNDWATER INVESTIGATIONS - WEST DESERT
****

PROBLEM: WITH POPULATION DENSITY OF OVER 2000 PER SQ MI IN HABITABLE AREAS, ~~UNITED~~ ARAB REPUBLIC (UAR) NEEDS TO EXPAND AVAILABLE ARABLE LAND TO FEED AND EMPLOY ITS GROWING POPULATION. WITHOUT WATER FOR IRRIGATION OR INDUSTRY, THIS IS NOT POSSIBLE. ALTHOUGH GROUNDWATER IS KNOWN TO EXIST IN WESTERN DESERT OASES, BASIC DATA DO NOT EXIST FOR ADEQUATE APPRAISAL OF GROUNDWATER POTENTIAL. ACTUAL LOCATION OF WATER, ITS QUALITY, ITS QUANTITY ARE UNKNOWN, MAKING RATIONAL DEVELOPMENT PLANNING IMPOSSIBLE.

PROJECT: 2630253 SUB-PROJECT: 00 *
*
INITIAL FY: FINAL FY: *

*
* TITLE: PVC PIPE DRAINAGE
****

PROBLEM: CONSTRUCTION OF THE ASWAN DAM ENABLED THE YEARLONG & THOROUGH IRRIGATION OF FARMLANDS IN UPPER EGYPT. HOWEVER,THE ABSENCE OF ADEQUATE DRAINAGE FACILITIES TO COMPLEMENT THE INCREASED USE OF IRRIGATION WATER HAS RESULTED IN GROUND WATERLOGGING & INCREASED SOIL SALINITY AND CONSEQUENT DIMINISHED LAND FERTILITY. EGYPT LACKS SUFFICIENT FINANCIAL RESOURCES,TECHNICAL EXPERTISE,EQUIPMENT & MATERIALS(ESPECIALLY PIPING) TO UNDERTAKE CONSTRUCTION OF AN EXTENSIVE DRAINAGE SYSTEM TO REDUCE WATERLOGGING.

PROJECT: 2630019 SUB-PROJECT: 00 *
*
INITIAL FY: 76 FINAL FY: 81 *
****

*
* TITLE: PORT SAID SALINE PRODUCTION PLANT
****

PROBLEM:

SALT IS A BASIC CHEMICAL IN ALMOST ALL INDUSTRIES-ITS HISTORICAL RATE OF CONSUMPTION IN ALL COUNTRIES PARALLELS THE RATE OF INCREASE OF THE GNP. EGYPT'S EL NASR SALINES CO IS RESPONSIBLE FOR PROVIDING BOTH EDIBLE & INDUSTRIAL SALT FOR DOMESTIC USE AND IS THE SOLE EXPORTER OF SALT IN EGYPT. EL NASR'S PORT SAID PLANT WAS PARTIALLY DESTROYED IN THE 1967 & 1973 WARS WITH THE RESULT THAT SALT EXPORTS DECREASED TO ONLY 2%, SHARPLY DECREASING FOREIGN EXCHANGE EARNINGS FROM THIS SOURCE.

PROJECT: 2630072 SUB-PROJECT: 00 *
*
INITIAL FY: 77 FINAL FY: 80 *
****

*
* TITLE: POULTRY IMPROVEMENT
****

PROBLEM: EXPANSION OF POULTRY PRODUCTION IN EGYPT IS LIMITED BY: 1) A SHORTAGE OF POULTRY FEEDS; 2) A CHRONIC SHORTAGE OF VACCINES & MEDICINES; 3) A SHORTAGE OF FOREIGN EXCHANGE FOR IMPORTING FEEDS, FEED INGREDIENTS & OTHER CRITICAL ITEMS; 4) A SHORTAGE OF DAY OLD CHICKS FOR BROILER PRODUCTION; 5) THE UNKNOWN SIZE OF THE TOTAL MARKET.

PROJECT: 2630060 SUB-PROJECT: 00 *
*
INITIAL FY: 77 FINAL FY: 81 *
****

*
* TITLE: PRIVATE INVESTMENT ENCOURAGEMENT FUND
****

PROBLEM: WITH NATIONALIZATION IN THE EARLY 1960;S, EGYPT'S PUBLIC INDUSTRIAL/FINANCIAL SECTOR BECAME THE MAJOR SOURCE OF MOBILIZING AND ALLOCATING DOMESTIC RESOURCES FOR ECONOMIC DEVELOPMENT. MORE RECENTLY, THE GOVERNMENT OF EGYPT (GOE) HAS ADOPTED A MORE LIBERAL ECONOMIC POLICY AIMED AT STIMULATING THE PRIVATE INDUSTRIAL/FINANCIAL SECTOR. GOE HAS NOW REQUESTED AID ASSISTANCE IN PROVIDING MEDIUM TO LONG-TERM CREDIT TO FINANCE FOREIGN-EXCHANGE COSTS OF LARGER-SIZED PRIVATE SECTOR ENTERPRISES IN ORDER TO IMPROVE PRIVATE SECTOR PRODUCTIVITY.

PROJECT: 2630097 SUB-PROJECT: 00 *
*
INITIAL FY: 79 FINAL FY: 84 *
****

*
* TITLE: RICE RESEARCH
****

PROBLEM: EGYPT'S PRESENT STAGNATED & SUB-OPTIMAL RICE PRODUCTIVITY CAN BE TRACED TO INEFFICIENT FARM MGMT,CROP LOSSES,INADEQUATE FARM MACHINERY,OBSOLETE RICE MILLS & MILLING TECHNOLOGY,AND THE LACK OF HIGH PRODUCING RICE VARIETIES SUITABLE FOR EGYPTIAN SOILS. A WELL ORGANIZED & TRAINED FORCE OF RICE PRODUCTION AND PROCESSING RESEARCHERS & EXTENSION TRAINERS DOES NOT EXIST IN EGYPT. THEREFORE, THERE IS NO MEANS FOR DEVELOPING THE NEEDED TECHNOLOGY AND DISSEMINATING THIS TECHNOLOGY TO FARMERS; THE ABOVE CONSTRAINTS ARE PERPETUATED.

PROJECT: 2630027 SUB-PROJECT: 00 *
*
INITIAL FY: 77 FINAL FY: 83 *
****

*
* TITLE: SHOUBRAH EL KHEIMA THERMAL POWER PLANT
****

PROBLEM: EGYPT'S EXISTING ELECTRICAL GENERATING CAPACITY IS ONLY SUFFICIENT TO MEET THE COUNTRY'S NEEDS THROUGH 1983. THUS,THE INCREASED DEMANDS FOR ELECTRICITY IMPOSED BY DEVELOPING INDUSTRIAL,AGRICULTURAL,AND PRIVATE CONSUMER MARKETS DURING THE 1980'S CANNOT BE MET AND THE SOCIO-ECONOMIC GROWTH POTENTIAL OF THE COUNTRY NOT REALIZED.

PROJECT: 2630110 SUB-PROJECT: 00 *
*
INITIAL FY: FINAL FY: *

* TITLE: SUEZ CEMENT PLANT
****

PROBLEM:

EGYPT CURRENTLY HAS ONLY 4 GOVERNMENT-OWNED COMPANIES TO SUPPLY CEMENT. SHORTAGES OF CEMENT HAVE BECOME CHRONIC AND ADEQUATE FOREIGN EXCHANGE IS NOT AVAILABLE TO PURCHASE IMPORTS.
WITHOUT RELATIVELY LOW-COST AND EASILY AVAILABLE SOURCES OF CEMENT THE IMPLEMENTATION OF VITAL NATIONAL DEVELOPMENT PROGRAMS SUCH AS CONSTRUCTION OF ROADS AND PORTS AND CONSTRUCTION RELATED TO AGRICULTURAL AND INDUSTRIAL INVESTMENTS HAS BEEN SLOWED.

PROJECT: 2630012 SUB-PROJECT: 00

INITIAL FY: 76   FINAL FY: 81

* TITLE: TECHNICAL AND FEASIBILITY STUDIES II
****

PROBLEM:

EGYPTIAN MINISTRIES GENERALLY LACK FULL UNDERSTANDING OF THE TRUE NATURE OF A FEASIBILITY STUDY AND HAVE ONLY LIMITED CAPABILITY TO MEET THE QUALITATIVE STANDARDS ROUTINELY EXPECTED BY INTERNATIONAL LENDING ORGANIZATIONS. EGYPTIAN FEASIBILITY STUDIES OFTEN HAVE ADEQUATE TECHNICAL CONTENT BUT LACK ESSENTIAL COST ESTIMATION AND ECONOMIC EVALUATION ELEMENTS; LACK OF THESE ELEMENTS HINDERS THE IDENTIFICATION, EVALUATION, AND EXECUTION OF PRIORITY RECONSTRUCTION AND DEVELOPMENT PROJECTS.

PROJECT: 2630025 SUB-PROJECT: 00

INITIAL FY: 77   FINAL FY: 80

* TITLE: WATER USE AND MANAGEMENT
****

PROBLEM: AVERAGE AGRICULTURE PRODUCTION IN EGYPT, ALTHOUGH GOOD, IS 50% OR MORE BELOW YIELDS OBTAINED IN EGYPTIAN EXPERIMENT STATIONS. THE PRESENT WATER MANAGEMENT SYSTEM USES TOO MUCH WATER, AND OVERALL WATER EFFICEINCY IS LOW FOR GOOD CROP PRODUCTION.

PROJECT: 2630017 SUB-PROJECT: 00

INITIAL FY: 76   FINAL FY: 82

APPENDIX VII

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B: biogeography and climatology.
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