Country Report

Arab Republic of Egypt

Background

10 riparian countries share the Nile River, these countries are Burundi, Democratic Republic of Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda. Some of these countries are among the world's ten poorest countries. Today, poverty, instability, rapid population growth, and environmental degradation characterize the basin. Control of Nile waters has long been a source of dispute and potential conflict in the region. Yet, the Nile also holds great potential to foster regional social and economic development through power generation, food production, transportation, trade, environmental conservation, and other related development activities. To realize this potential, the riparian have come to recognize that they must take concrete steps to address these challenges and that cooperative development holds the greatest prospect of bringing mutual benefits to the region.

The Nile riparian have taken a historic step towards cooperation in the establishment of the Nile Basin Initiative (NBI). Formally launched in February 1999, the Initiative is a transitional institutional mechanism, which provides an agreed basin-wide framework to fight poverty and promote economic development. The NBI is guided by a shared vision "to achieve sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile Basin Water resources." The NBI is comprised of the Council of Ministers of Water Affairs of the Nile Basin States (Nile-COM), a Technical Advisory Committee (Nile-TAC), and a Secretariat (Nile-SEC) located in Entebbe, Uganda. The World Bank, United Nations Development Programme (UNDP), and Canadian International Development Agency (CIDA) support the formation of the NBI and on-going riparian dialogue.

The NBI has articulated a shared vision, established a transitional institutional mechanism, and formulated general guidelines to facilitate cooperative development in the Nile Basin. To translate the shared vision into action, the NBI has also initiated a Strategic Action Program, which includes two complementary components: (1) a basin-wide Shared Vision Program (SVP) and (2) Subsidiary Action Programs (SAP). The SVP will include a series of projects, such as capacity building, studies, and participatory activities to be implemented basin-wide to create an enabling environment for cooperative development. In parallel, appropriate groupings of countries (two or

more) will initiate SAPs to define and implement investment projects that confer mutual benefits at the sub-basin level.

The SVP encompasses five broad theme areas, referred to as 'pillars':

- Cooperative Framework (on-going UNDP sponsored D3 Project)
- Confidence Building and Stakeholder Involvement [Pillar C]
- Socio-economic, Environmental and Sectoral Analyses [Pillar D]
- Water Resources Planning and Management [Pillar E]
- Applied Training [Pillar F]

Pillar D addresses five components: (i) Efficient water use for agricultural production; (ii) Socio-economic/poverty diagnostic study; (iii) Assessment of opportunities for power trade and pooling; (iv) Environmental analysis and management and (v) Opportunities for integrated infrastructure development.

This report identifies the specific studies and preparatory work within the Environmental Analysis and Management component of Pillar D. It provides background information, and results of consultation process at the national level. The report is based on information from previous reports and publications, and consultation meetings with the main stakeholders.

Introduction

The Nile is one of Africa's greatest natural resource. It is the world's largest river, flowing from its sources in eastern and central Africa through a vast portion of the African continent and draining into the Mediterranean Sea in the north. It is a resource that is of great pride and inestimable value to the people of its vast basin

There is clear recognition within the Nile Basin Initiative that the development of Nile waters must be environmentally sustainable in the long-term. This is reinforced by the fact that the Nile is widely perceived as an environmental issue of global concern. Identifying the environment and development synergies, and thus the sustainable development opportunities, will be a major task for the initiative.

The Environmental Analysis and Management component of Pillar D overall objectives are;

- To develop a strategic framework for environmentally sustainable development of the Nile River Basin,
- To improve the understanding of the relationship of water resources development and the environment in the Basin; and
- To provide a forum to discuss development paths for the Nile with a wide range of stakeholders.

Environmental management studies and actions in the Nile Basin have thus far been largely undertaken on a national basis, and not with a trans-boundary vision. The present component will help to translate existing national environmental commitments and interest into regional and basin-wide analytical frameworks and eventually basin-wide actions.

In the following sub-sections the general characteristics of the Nile basin, and its associated lakes, and wetlands will be introduced.

The Nile basin

The Nile basin, comprising the valley in the south and the delta in the north, forms a riparian oasis (40,000 km^2) that is densely inhabited farmlands of Egypt. The river has been Egypt's lifeline for millenniums, fertilizing the narrow strip of land along its bank with a deposit of silt after each annual flood – no controlled by the High Aswan Dam. Egyptians have associated the Nile River with life, fertility and development. It has always been their source of prosperity, and was the main factor in building their great civilization.

The catchment of the Nile River is almost entirely located outside Egypt. Since about 98% of Egypt's water supply originate form the Nile, this creates the rare situation that a vital waterway is permanently dependent on the management of its upper catchment by ten upstream countries, who also have responsibility in its water quality conservation. The Nile system is formed by two main elements: the river itself and the Nile alluvial aquifer.

The Nile River

The Nile River is the principal source of freshwater and the principal water carrier. It flows from the Sudan-Egyptian border (Wadi Halfa, Lat 22^{o}N) to the Mediterranean with a gentle slope of 1m every 12 km.

The part of the Nile valley south of Aswan presents several features of special interest. (1) The river channel at Aswan is partly obstructed by a group of granite islands. Some of these islands have relicts of what was once widespread riverine forest. (2) The High Aswan Dam and its reservoir with ramifications and inland-ward extensions into the delatic parts of desert wadis created ectone habitat with dry-land desert on one side and water body on the other side. This man-made lake is an ecological feature of special significance.

Past Cairo the river fans into the Damietta branch (east) and the Rosetta Branch (west): the two diverging arms of the Delta. In the past distributaies were numerous reaching eastward to the coast of Sinai and westward to the west of Alexandria. The Delta is associated with the northern lakes (Maryut, Idku, Burullus, Manzala and Bardawil). These brackish water bodies receive the agriculture drainage of the whole country and discharge its excess to the sea. These are wetlands of special international significance and are important fisheries for Egypt.

The Fayoum is one of the depressions of the western desert that has access to the Nile river via a branch of the Nile (Bahr Youssef). It is an oasis of special character. Its drainage flows to lake Qarun which is a wetland site of special ecological and historical significance. Recently, excess of drainage was directed to a series of depressions to the south of Fayoum (wadi El-Rayan), where two man-made brackish lakes were formed.

By international agreement with Sudan (1956), Egypt's share of the Nile flow is 55.5 Bm^3/y. Actual releases from the High Aswan Dam (HAD), which was completed in 1967, have remained close to this figure, but with some variations due to climatically imposed fluctuations of the live storage of the Dam. Releases were:

Year	Discharge (Bm3/y)
87 - 88	52.9
88 - 89	53.3
89 - 90	54.0
90 - 91	53.8
92 - 93	55.3
93 – 94	55.5
94 - 95	55.5
95 - 96	55.5
96 - 97	55.5
97 – 98	55.5
98 – 99	55.5

Such variations are a cause of great concern for Egypt's water management. The long lasting drought (1978 to 1986) in the Sahel region called attention on the risks involved. A Water Security Project (UNDP, World Bank) was established to better deal with these risks in future water management policies.

The construction of the HAD in 1967 brought enormous changes in the Nile system because it allowed yearlong irrigation. Meanwhile, a number of detrimental side effects have been felt, such as increasingly difficult soil salination control, water logging, river bed and bank erosion, changes in water level in canals, a halt in silt supply to irrigated fields, and water quality degradation in coastal lakes and drains.

The Nile Alluvial Aquifer

The Nile aquifer is not a "resource" proper, as it produces no additional water by itself. It is only a huge freshwater reservoir with an estimated storage of 300 Bm^3, exchanging water with the surface streams. The aquifer underlies the entire Nile Valley as well as the present Delta and its fringes. It contains water of very good quality in the Nile Valley and the Southern and Central part of the Delta, where the freshwater zone is up to 300 m deep. It becomes saline in the northern delta, mixing with drainage salts and seawater. With respect to its use and vulnerability to surface pollution, it shows two distinct zones:

- The axial flood plains of the valley and delta, which support the traditional irrigated lands. These plains are under-laid by a thick layer of clay-silts, which provide some protection of the deeper reservoir against surface pollution. The depth of the water table is in the order of 10 meter.

- The elevated outer plains, which are now under rapid development for intensive modern groundwater-based irrigation projects, especially west (Tahrir Scheme), and east of the delta. Lacking the silt cover of the flood plain, the aquifers in these regions are highly vulnerable to surface pollution. The fact that industrial complexes without proper disposal of effluent, such as Ramadan City, are located in their vicinity is highly alarming.

The Nile aquifer is currently used as follows (1992 figures from RIGW expressed in Bm^3/y):

	Total	**Drinking water**	**Irrigation**
Nile Delta	1.80	1.00	0.80
Cairo	0.50	0.50	-
Valley	1.30	0.60	0.70
Total	**3.60**	**2.10**	**1.5**

The Total abstraction reached 4.60 Bm^3/y in 2000.

Exploitation is administratively controlled for drinking water supplies, but is not controlled for irrigation. The latter takes place essentially in the tail ends of the canals (namely in the north of the delta, where this is contributing to the saline intrusion), and in the fringes of the valley and delta. Figure 1 shows the land forms and groundwater utilization map of Egypt.

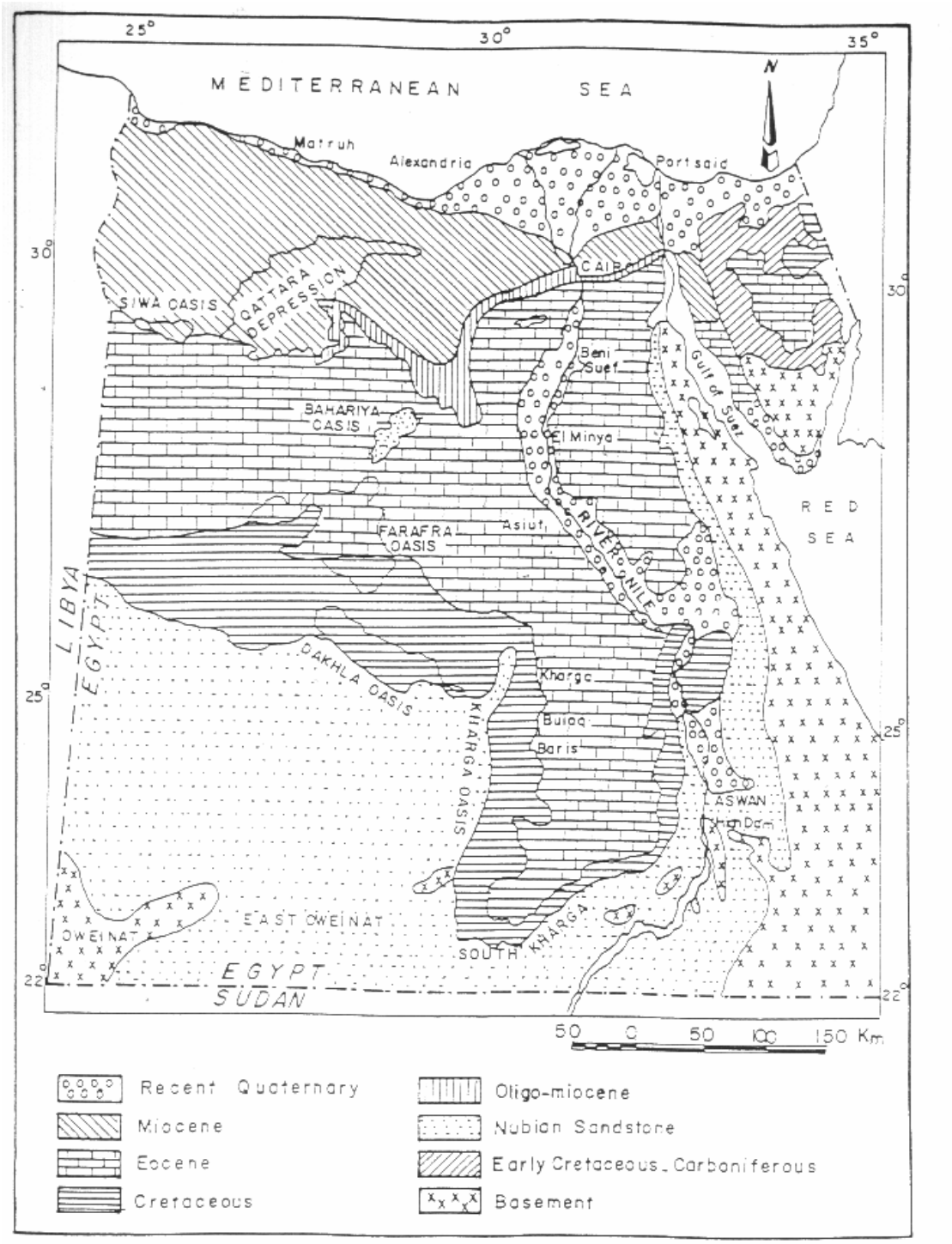

Figure 1: Land forms and groundwater utilization map of Egypt

Climate

The climate of the Nile basin is divided into two climatic zones:

(1) The Hyper-arid zone between Lat 22^{o}N and 30^{o}N with a mild winter and hot summer. The rain in this zone is less than 30 mm/yr and is occasional and unpredictable. Accidents of cyclonic rain may occur (October-November 1994) forming torrential flows that may cause damage. The temperature variation in this zone is between 4^{o} C and 38 ^{o} C. The sunshine duration is about 3900 hours.

(2) The arid zone which extends along the Mediterranean coast. This section is divided into two zones: the coastal zone with rainfall from 100 to 150mm/yr and the inland zone with an annual rainfall from 20 to 100mm/yr. Mild winter and hot summer characterize both zones. The temperature is between 7 ^{o} C and 30 ^{o} C. these rare rainstorms represent about 1.5 Bm^3/y over the Delta. The sunshine duration is more than 3400 hours per year.

In the desert tropical storms stir up sand and dust as Khasmasin wind blowing most frequently during March-May. Khamasin usually brings sharp rise in temperature, significant drop in humidity and heavy dust with poor visibility.

Population

Egypt comprises a principal oasis associated with Nile Valley and Delta. The inhabited area, that includes the irrigated farmlands, is about 4% of the total area of Egypt. Currently Egypt's population is about 62.5 millions and is projected to reach about 80 millions in 2017.
The population growth rate declined from 2.8% for the period 1976-1986, to 2.1%for the period 1986-1996,and is projected to reach 1.3% in 2017.

Population growth influenced various facets of human activities that influence the natural environment. By increasing the scale of human activities population growth amplifies these impacts potentially to the point that they could exceed the carrying capacity of the natural systems.

Egypt is divided into 26 governorates, 21 in the Nile valley, the delta and adjoining territories. About 97% of the population of Egypt live on only 4%of the total area of the country. Hence the population density is more than 1400 capita per square km. Population censuses conducted since 1966 up to the most recent one conducted in 1996 have monitored urban versus rural population density. The proportion is about 57% rural to 43% urban.

Currently, pressure on the Nile water is already severe, the river supplies water to a population of 62.5 million people, which means a per capita share of approximately 920 m^3/yr. The main consequence of the rapid population growth is an increasing stress on irrigation water supply. This calls for a more difficult and costly irrigation management to save and reuse water, while limiting soil salination. The current national master plan forces per capita water share less than 350 m^3/y by the year 2025. Recent population forecasts (World Bank) present a more positive view (see

Table 1) than the national master plan. Nevertheless, Egypt will become one of the world scarcest countries (see Table 2 for comparison of present situation with other countries).

Table (1) Development of population and total water supply in Egypt from 1960 - 2020.

Year	Population (million)	HAD release (Bm^3/y)	Annual per capita quota (m^3/y)
1960	26.0	55.5	2,135
1970	33.0	55.5	1,682
1980	42.0	56.6	1350
1990	57.0	53.8	943
2000	65.0	55.5	853
2010	82.0	57.5	700
2020	100.0	57.5	575

Table (2) Comparison of per capita quota in Egypt and selected countries.

Region / country	Renewable water resource [Bm^3/y]	Per capita quota [m^3/y]
World	40,673	7,690
Africa	4,184	6,460
Algeria	19	750
Egypt	57	1,000
Morocco	30	1,190
Sudan	30	2,955
North & Central America	6,945	16,260
South America	10,377	34,960
Asia	10,485	3,370
Europe	2,321	4,660

Nile Water Resources Use

Figure 2 is a schematic overview of the distribution of the main flows within the Nile system, several sub-systems are identified:

- Nile Valley upstream Cairo. This includes four major irrigation command areas. All drainage water as well as municipal and industrial effluents are discharged locally into the Nile. These areas comprise:

    - Aswan Governorate, upstream Aswan Dam;
    - Qena Governorate, upstream Nag Hammadi dam;
    - Assiut and Sohag Governorates, upstream Assiut dam;
    - Beni Suef and Minia Governorates.

The total population equals 15 million people. The irrigated area is 1.85M feddan. A minor subsystem (Red Sea Governorate) taps a limited piped water supply from the Nile at Qena (30,000 m^3/d).

- The Fayoum, which is centered around the depression of lake Qarun, and forms an endoreic closed system supplied by the ancient Bahr El-Youssef Canal. Population about 2 million. Irrigated area is 0.50 M feddan.

- The Greater Cairo Area (population 15 million), which receives its water supply from the Nile and the alluvial aquifer. Its effluent is discharged partly to the Nile and partly to lake Manzala via the Bahr El-Baqar drain.

- The Ismailia Canal System, which carries Nile water from Cairo to the Ismailia, Suez and Port-Said Governorates for a total population of 1.8 million and 0.2Mfeddan irrigated area. Two minor piped water schemes also depend on the Ismailia canal, towards El-Arish in North Sinai and El-Tor in South Sinai.

- The Western Delta (West of the Rosetta branch), comprising the Governarates of Beheira and Nubaria (population 3.7 million, irrigation 1.3M feddan) and Alexandria (population 4 million). This system, like the other systems of the Delta, is complex, and includes points where drainage water is recycled and pumped into fresh water canals. Most final drainage to the sea passes through the Maryut and Edko lakes.

- The Middle Delta (between the two Nile branches), comprising the Governorates of Kafr El-Sheikh, Gharbia and Menoufia (population 7.7 million, irrigation 1.21 M feddan). Nearly 2/3 of the final drainage passes through lake Burullus.

- The Eastern Delta (East of Damietta branch), comprising the Governorates of Daqalia, Qalubia and Sharqia (population 10.4 million, irrigation 1.72 M feddan). All drainage (3.3 Bm^3/y) goes to lake Manzala which also receives part of the sewage and industrial effluent of Damietta (population 0.5 million) and Port-Said (population 0.6 million), as well as the Cairo sewage via the Bahr El-Baqar drain (1 billion). Lake Manzala is thus by far the largest sink of drainage water (effluent) in Egypt.

Land Resources Use

The present estimate of cultivated area in Egypt is 7.49 million feddans, of which 7.21 million feddans are in the Nile Valley. Estimates of land-lost at present due to top soil skimming and urban encroachment average 30,000 feddans per year. It is essential to reduce the loss of arable land to urbanisation for three important reasons. First, with increasing population, existing agricultural land areas should not be allowed to be lost. Second, land reclamation is an expensive process, hence it would be desirable not to lose any additional land that is already productive, and then try to compensate for that loss by reclamation. Third, often land lost due to urbanisation is more productive than the reclaimed land.

Economy

For 1999, the following general economic information applies to Egypt:

- Gross Domestic Product (GDP) : $91.9 billion
- Total population: 62.5 million
- GDP growth rate: 5.8%
- Inflation rate: 4.0%
- Average growth rate of population: 2.1% (1996)
- Marchandise Exports: $4.8 billion (crude oil and petroleum products, cotton,textiles, engineering and metallurgical goods, and agricultural goods)
- Marchandise Imports: $15.2 billion (Machinery and transport equipment, livestock, and food
- Main Economic Sectors: agriculture (20 % of GDP), industry (29% of GDP), trade finance and insurance (35 %of GDP) (year 1995).
- Economic Activities in the basin: agriculture, industry, oil and petroleum, tourism/recreation and fisheries/aquaculture.

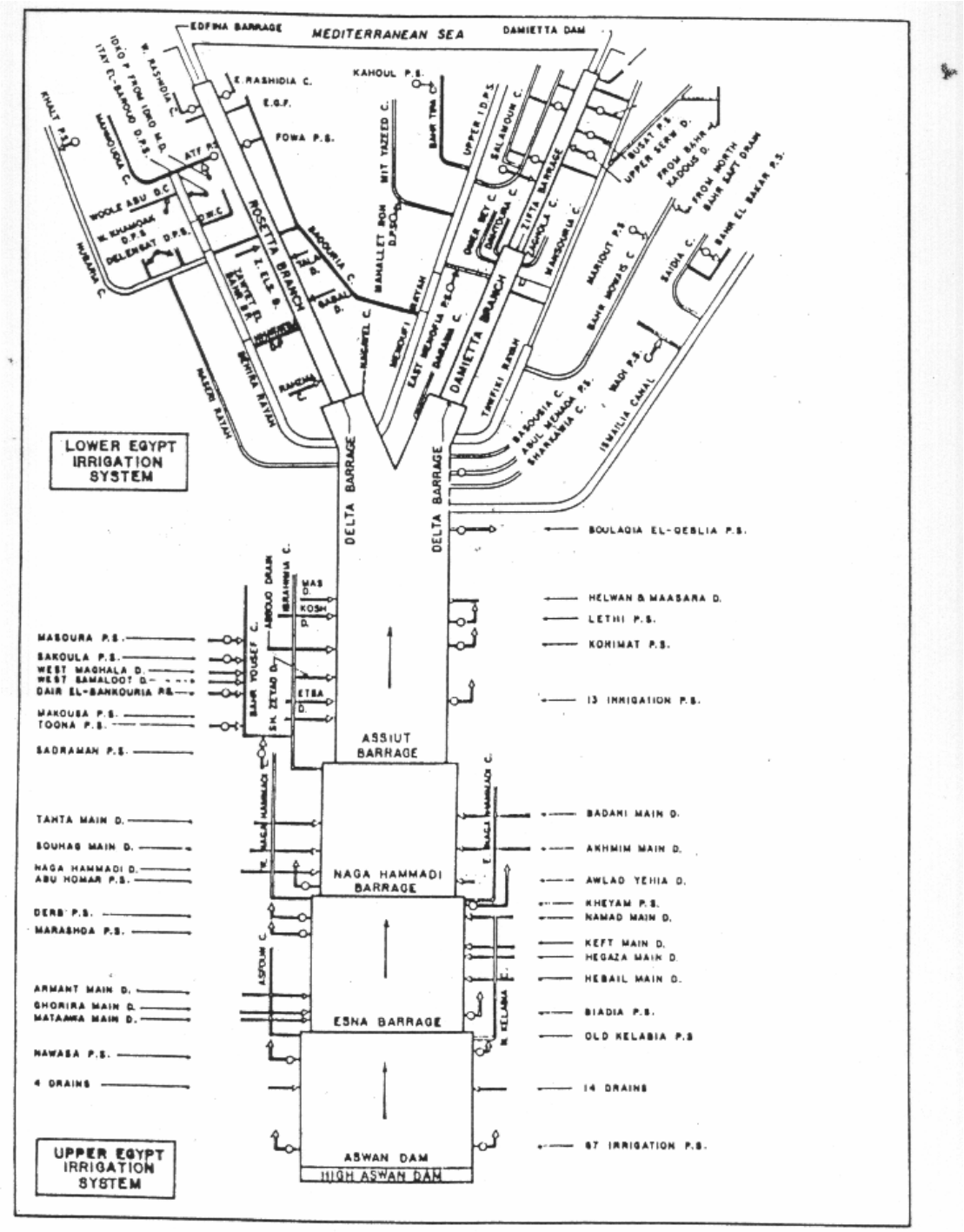

Figure 2 Schematic Water Distribution System in Egypt.

Natural Resources

Water and Land Resources

Land and water are resources of national significance. But a general feature is that these resources are limited: agriculture land (7 million feddans), and freshwater resources (57 billion cubic meters). With the increase of population farmland per person dropped from 0.22 feddans in 1960 to 0.12 feddans in 1984.

The most detailed analysis of land resources of Egypt was completed in 1986 under the Land Master Plan (LMP). This plan concluded that 2.82 million feddans of land could be reclaimed by using the Nile waters. In addition, another 570,000 feddans could be reclaimed by using the groundwater in Sinai and the New Valley. Thus the total land that could be reclaimed, subject to water availability, was estimated at 3.40 million feddans. The LMP study considered land only for irrigated agriculture. Other uses of land like fisheries, forestry, and wildlife habitat were not considered. The LMP study divided the potentially reclaimable land into five categories depending on one or more land-use and management options. These options considered cropping patterns, irrigation and drainage systems, and farm types.

Flood regulation of the Nile River by the Aswan Dam allowed the expansion of irrigation, notably on the western and eastern fringes of the delta. However, the problem of agricultural land losses either in quantity or in quality remains a major issue for the country since the availability of easily cultivable land is limited by fresh water availability. According to the land master plan, only 2.3 million feddans of new lands are potentially irrigable from Nile River water and, despite the considerable investment for reclaiming those lands, the utilization factor remains low: to date, only two thirds of the reclaimed areas are more or less productive.

In Egypt, land can be productive only if water is available for irrigation. As population grows and enjoys a better standard of living and more industrialization, water demands for the municipal and industrial sectors will increase. Since these two sectors are most likely to have higher priority than the agricultural sector, the future of reliable water supply for the reclaimed areas should receive serious attention. Accordingly, efficiency of water-use has to be increased to ensure that lands will continue to receive their water requirements.

Bio-diversity Resources

Water bodies of Egypt are among the most diverse. They consist of: (1) brackish waters in Delta lakes (Manzala,Burullus, Idku, and Maryut), (3) salinewater lakes (Qarun, bitter lakes, Bardawil), (4) freshwater in the flowing Nile and its canals and most notably in the High Dam lake, (5) freshwater aquaculture.

During recent decades, the River Nile ecosystem has been subjected to many ecological stresses that led to significant changes in the physico-chemical properties of the water and consequently affected the biological ecosystem. Construction of High Dam in 1967, the presence of large impoundments and pollution of water by domestic, industrial and agricultural wastes are the most important factors that affect the River Nile environment and its bio-diversity. The Egyptian Bio-diversity Unit performed a complete study on the bio-diversity in Egypt which is called “Egypt

Country Study on Biological Bio-diversity". To review the different flora and fauna species one should consult this study.

Because of Egypt's unique and strategic geographical position along migratory routes of Palaearctic birds wintering in Africa, many Palaearctic bird species migrate through Egypt in internationally significant numbers. The Nile basin is one of the principal routes for migratory birds. The northern lakes (wetlands) are vital resting stations. The country bio-diversity study investigated the economic value of birds in Egypt.

Human Activity Resources

Agricultural

Agricultural requirements include two main parts, the irrigation water for the existing cultivated lands (old and newly reclaimed lands) and the expected future horizontal expansion in cultivated land (new lands). The estimated area of the old agricultural land reached about 7.8 million feddans. The horizontal expansion plan for 1997 aims to reclaim some 3.4 millions to be added to the total agricultural land by year 2017. This area includes 1.2 million feddans from the previous horizontal expansion plan (1982 plan) that will be completed by year 2002, in addition to another 2.2 million feddans that will be added gradually till year 2017.

The Ministry of Agriculture aims to increase the cultivated area from its current level of 7.8 MF to about 8.39 MF in 2002, 8.855 MF in 2007, 9.7 MF in 2012, finally to reach 11.2 MF in 2017. The corresponding cropped area should accordingly increase to 15.37, 16.47, 18.38, and 21.9 MF in the years 2002, 2007, 2012, and 2017 respectively. Meanwhile, this will raise the cropping intensity from 1.77 at present to be 1.96 in 2017 by using the results of agricultural research to cultivate high-yield short life varieties.

As a result of the government's new policy to relocate the population intensity through creating new communities in the Desert area and Sinai, the Ministry of Agriculture reviewed the horizontal expansion plan and update it with coordination with the Ministry of Water Resources and Irrigation MWRI to reflect that policy. The revision included intensive survey using new technologies of remote sensing and satellite images to create the soil characteristics maps for parts of the Western Desert and Sinai and to locate new areas suitable for reclamation. The new updated plan for horizontal expansion of agricultural land, to be completed by 2017, aims to add 3.4 MF to the existing agricultural area distributed as follows:

- 1.2 MF to be reclaimed by year 2002 as a part of the previous plan (1982 plan). This area will be irrigated from Nile River surface water, the renewable groundwater aquifer underlying the Nile Valley and Delta, and drainage water reuse.
- 2.2 MF to be added to the agricultural land by year 2017.

Apart from being the largest consumer of water, agriculture activities is also a major water polluter. Drainage water seeping from agriculture fields are considered non-point sources of pollution. These non-point sources are however concentrated through the collecting agricultural drains to form point sources of pollution for the River Nile, the Northern Lakes or irrigation canals in case of mixing for reuse. Moreover, these non-point sources of pollution may also influence the groundwater quality, although the majority of pesticides and a considerable part of phosphate tend

to be retained by the soil as a result of adsorption mechanisms. Major pollutants in agricultural drains are salts, nutrients (phosphorus & nitrogen) and pesticide residues.

Urbanization

Municipal water requirements include water supply for major urban and rural villages. A part of that water comes from the Nile system, either through canals or direct intakes on the river; the other part comes from groundwater sources. The total municipal water use was estimated to be 4.54 Bm^3 in year 2000. The estimated requirement for the year 2017 is 6.6 Bm^3. A portion of that water is actually consumed and the rest returns back to the system, either through the sewage collection system or by seepage to the groundwater. There are regions like Alexandria, Suez Canal, and the desert areas where the discharge cannot be recovered.

It is worth mentioning that municipal water requirements include water used to irrigate public gardens and parks. In addition, many small and medium size industries spread in cities and villages use this water for industrial production.

According to a report prepared by the World Bank (World Bank, 1993), approx. 85 percent of Egypt's population is connected to drinking water supply and only 24 percent to sewerage services, although the latter percentage is expected to grow rapidly, due to works under construction. The population not connected to sewerage systems relies on individual means of treatment and disposal, mainly onsite treatment. These methods if not properly designed and constructed can contribute serious pollution problems to ground as well as surface water.

In Upper Egypt, from Aswan to Fayoum, there are 8 wastewater treatment facilities with a total capacity of roughly 120,000 m^3/day. Approximately the same number is under construction now. In Greater Cairo, 6 wastewater treatment plants exist, with a total capacity of approx. 2,320,000 m^3/day. In the delta there are more than 30 wastewater treatment facilities with a total capacity of almost 400,000 m^3/day, with some 100,000 m^3 /day under construction. In Upper Egypt and in the Delta, part of the domestic wastewater receives only primary treatment. In the Greater Cairo area, the sewerage systems also serve industries and commercial activities. Therefore, high levels of toxic substances in sewage are reported (Taylor Binnie & Partners, 1992 & El-Gohary,1975-1998). As those toxic substances (heavy metals & organic micro pollutants) are mainly attached to suspended materials, most of it will accumulate in the sludge. Improper sludge disposal may lead to contamination of surface and groundwater.

All treatment plants discharge into agricultural drains, where they act as point sources of pollution. In the areas of the desert fringes, treated domestic water is used for irrigation, thus eventually contributing to the contamination of groundwater resources.

Industrial

There is no accurate estimate for the current industrial water requirement especially with the new government policy to encourage private sector participation in industrial investment. The private sector contribution to the industrial sector currently exceeds 50% of the total national industrial production where many new industries have been implemented and under production while others still under construction.

In 1990, the general authority for industry made a survey that covered 90% of the public sector major factories to estimate industrial needs and requirements. The study included 321 public sector factories representing the main activities of the industrial sector. The results of the study were used to estimate the water requirement for the industrial sector during the year 1995/96 where the estimated value was 7.5 Bm^3/year. The expected water requirements for the year 2017 is 10.6 Bm^3/year where 2.2 Bm^3/year is actually used and the remaining 8.4 Bm^3/year will go back to the system.

Industry is a major contributor to the Egyptian economy. The value added of industry was about $ 12 billion in 1993, representing about 26% of GDP. Extractive industries (oil, natural gas and minerals) contributed 8% of the GDP, whereas manufacturing industries contributed the remaining 18%. The structure of manufacturing industries is as follows: 25% food industries, 17% textiles, 9% machinery, tools, etc., 11% chemicals, and 38% several other remaining industries.

There are some 22000 industrial enterprises, about 650 of which are major industrial facilities. The special distribution of industry in Egypt typically depends on abundance of employment pool, availability of services, access to utilities and transport networks, and closeness to principal markets. The manufacturing facilities are, therefore, often located within the boundaries of major cities in areas with readily available utilities and supporting services. The majority of heavy industry is concentrated in Greater Cairo and Alexandria. Most of the textile industry is located in the Delta between Cairo and Alexandria, in Shoubra El-Kheima and Mehalla El-Kubra where most of the cotton is raised.

In Greater Cairo area, Helwan located 20 km south of Cairo on the East Bank of the Nile represents one of the largest industrial zones in the country. Industrial activities started in the region 1955 and peaked during the mid-sixties. Since 1967, concerned about the growing environmental deterioration, the government has permitted very few enterprises to operate in the area. However, existing units have been permitted to expand capacity, which has over the years added to the environmental problems. The majority of the industries belong to the public sector and include cement and other building materials, metals, iron and steel, coke, chemicals and fertilizer, spinning and weaving, starch and glucose, refractors, automotive industries, and power plants.

Shoubra El-Kheima which lies north of Cairo encompasses 1300 establishments for manufacturing of metals, glass, textiles, engineering, and food products. The textile industries representing 48.3% of the total number are the main contributors to organic load, at almost 52% (26372 kg/day). The metal industry, on the other hand, which only represents 15% of the total number, discharges almost 50% (49.8%) of total waste waters discharged and contributes 7.6% of the total BOD load. Most of the industrial plants in both areas are not provided with end-of-pipe treatment which create severe industrial pollution problems, and hence cause immediate health risks to an estimated 3 million inhabitants (El-Gohary et.al.,1993).

In the central area of Cairo, over 2000 small-scale enterprises are located including tanneries and lead smelters which cause severe environmental problems. The government is currently preparing a plan for relocating polluting industries into the new industrial zones away from the residential areas in Greater Cairo. New production technologies will be implemented and the new locations will be provided with centralized facilities for wastewater treatment. Alexandria's manufacturing

industry constitutes about 30 percent of Egypt's industrial activity. Industrial complexes tend to concentrate near the Mahmoudia Canal (Moharem-Bey, Nouzha and Siouf complexes), and along the coastal areas of Mex and Abu Kir.

With the very high population density in the valley and Delta, several new industrial cities have been established since the mid-1970s in attempts to decentralize industries and create new sites to attract population to settle in new areas to ease the population pressure on existing urban areas. The manufacturing enterprises in these cities are relatively modern and rapidly growing.

The first comprehensive survey for industrial sources of pollution was carried out during the period from 1975 to 1982, as part of a joint Egyptian-USA project. The Egyptian Academy sponsored the project for Scientific Research and Technology and the University of Michigan Ann-Arbor. All data generated by this study was used for the preparation of a database. In 1979, the High Aswan Dam Side Effects Research Institute (HADSERI) started a monitoring program. Point sources were identified. Based on this information, the first inventory for industrial point sources discharging into the Nile River, irrigation and drainage canals was prepared within the frame work of the Water Master Plan of 1981. In 1994 The Egyptian Environmental Agency (EEAA) prepared a database for industrial activities as related to wastewater discharge. The information is based on the situation in 1990. This database lists 321 major public industries discharging into the Nile system, Northern lakes, sea, sewer system and on land. Approx. 35 of these industries discharge directly to the River Nile, about 10 directly to the sea, about 20 to the Northern Lakes, between 10 and 40 to the irrigation canals and the remaining (majority) discharges towards the drainage canals or the local sewerage systems (and then mostly to the drainage canals as well).. In 1996, this database has been updated by El-Gohary et. al. Based on available information, the sum of annual industrial wastewater discharged into the River Nile, the two branches and the irrigation canals are calculated as 169.32 Mm^3/year (Table 3). Around 40% are generated in Greater Cairo. The second contributor is Qena where most of the sugarcane factories are located. The BOD load discharge followed the same trend.

Water consumption, effluent volumes and pollution loads discharged by the different industrial sectors are given in Table 4. From these results it can be concluded that the food & chemical industries contribute the highest loads.

Irrigation canals also receive industrial wastewater. In the Ismailia Canal, 5 industries discharging their wastewater into the first 15km of the canal are identified. The industries comprise a starch & glucose factory, a fertilizer company, a chemical industry, a pharmaceutical industry and an engineering industry.

Northern Lakes also, receive industrial discharges. According to a survey made by DRI (DRI, 1995), 17 factories discharge directly to lake Mariut through pipelines, 4 factories collect their wastewater in trenches, which are dislodged by tractors to the lake and 41 factories discharge indirectly to the lake through near-by drains and/or treatment plants. In the case of Lake Manzala, at least one drain could be identified where industrial pollution takes place close to the outfall of the drain to the lake (Faraskour Drain). Indirectly, the water quality of Lake Manzala is heavily polluted by discharge of contaminated water from Bahr Baqar drain. Also Lake Burullus indirectly receives industrial effluent, mainly through Nashart Drain (Kafr Al-Zayat and Disuq cities; pesticides, textile, etc.).

Table (3) Loads of Pollution Discharged from Industrial Sources into the River Nile, the two Branches and the Irrigation Canals

Governorate	(Mm^3/year)	BOD/year(10^3ton)
Aswan	6.24	7.48
Qena	49.06	29.90
Sohag	15.02	2.54
Assuit	6.54	0.92
El Menia	15.58	5.78
Giza	13.28	43.9
Cairo	45.9	4.42
Qaluibia	9.20	0.07
Alexandria	5.96	3.71
Damietta	0.27	0.05
Gharbia	2.27	0. 9
Total	169.32	99.87

Table (4) Average Water Consumption, Effluent Volumes and Polluting Loads for Industry throughout Egypt

Industry	No.	Water Mm^3/year		Pollution Loads(t/day)				
		Use	Eff.	BOD	COD	Oil	SS	Metals
Chemical	53	127	98	26	178	23	33	0.94
Food	119	296	227	182	142	110	168	0.17
Spinning & Weaving	75	114	88	39	47	24	64	0.3
Engineering	39	13	12	5	6.6	2	3	0.03
Metal/ Metallurgy	11	69	60	15	14	8	24	0.2
Mining	33	19	14	3	1	1	4	0.01
Total	330	638	499	270	389	168	296	1.65

Navigational and Hydropower

The river Nile main stem and part of the irrigation network are being used for navigation. The main navigation activity is the Nile touristic cruises between Aswan and Luxor and the transportation of commodities between Upper and Lower Egypt.

Water demand specifically for navigation occurs only during the winter closure period (about 3 weeks in January and February), when the discharges to meet other non-agriculture demands are too low to provide the minimum draft required by ships. Without extra releases from HAD for navigation, ships suffer serious constraints in navigating the Nile during that period especially in Aswan – Luxor reach. The navigation water goes directly to the sea as fresh water. After changing the winter closure system to be dividing the country into 5 regions instead of two regions only, the amount of water released for navigation dropped to 0.92 Bm^3 in 1994/95 and to only 0.26 Bm^3 in 1995/96.

Since 1990, irrigation has had priority over hydropower in order to maximize the water availability for agriculture and new lands development. Thus, there are no special releases for hydropower at present, and releases for irrigation, municipal, industrial, and navigation purposes are used to pass through the turbines at the High Aswan Dam. The fluctuations in the amount of hydro-power generated has been overcome through the national electricity network where the thermal generation capacity is sufficient to cover any reduction during low releases season.

Fisheries

Fish and fish products are a traditional part of the Egyptian diet. The present per capita consumption of fish is about 7Kg per year compared with 4Kg per capita in the sixties. The rapid growth in demand for fish products are attributed to: (1) high growth rate of population at 2.3% per year, (2) increase in per capita income, and (3) increased number of tourists. A small amount of high value fish is exported.

The total amount of fish produced in 1991 was 296,000 tons. The total value of this production is estimated to be LE 1.5-2.0 billion. The total number of fishermen working in this activity was 181,805. In 1991, production per worker averaged about 1.6 tons valued at LE 8,000 to LE 11,000.

The main sources of contribution to the value of agricultural production are: (1) plant production, (2) livestock production, and (3) fish production. The contribution of plant production to the value of agricultural production reached about 69 percent in 199's. The livestock contribution to the value of agricultural production reached about 28 percent during the 1970's then increased to 32 percent during the 1980's and decreased to around 27 percent in the early 1990's. Fisheries contribution to the value of agricultural production increased from 3 percent in 1970's to around 4 percent in the 1980's and early 1990's. In summary, the contribution of fisheries to the value of agricultural production is modest when taking into account the areas of fisheries in Egypt.

It is estimated that the cultivated area in Egypt is about 7.2 million feddans while the area of fisheries is about 13 million feddans. Fisheries as natural resources including rivers, canals, lakes, and marine are not utilized in the best way. The policy makers and researches should devote more emphasis and attention in order to derive the best way to use these natural resources. The possibilities for further expansion in the level of fish catch in open waters are severely limited by restricted areas available to Egyptian fishermen and the competition from fleets of other countries.

The total fish catch increased from 125 thousand tons in 1962 to around 296 thousand tons in 1991, despite a decrease to around 100 thousand tons during the 1970's. The fish catch from lakes increased consistently from around 45 thousand tons in 1962 to 148 thousand tons in 1991 despite the decrease to 39 thousand tons in 1967. The contribution of fish catch from lakes fluctuated from 35 percent in 1962 to 61 percent in 1972, then declined to 44 percent in 1982. The catch from the fresh water (river and canals) increased from around 18 thousand tons in 1962 to around 38 thousand tons in 1991 and stabilized at 20 thousand tons over the 1967-1982 period.

The aquaculture production of fish increased dramatically from around 100 tons in 1962 to around 35,000 tons in 1991. There are good potentials to produce large quantities of fish from aquaculture.

The value of total catch increased from around LE 16 million in 1962 to around LE 1728 million in 1992, or by 100 times in three decades. The lakes contribution to the value of fish increased from LE 7 million 1961 to around LE 885 million in 1991 while its share fluctuated between 41 percent in 1961 and 52 percent in 1981 and reached the highest in 1977 with 61 percent contribution of the value of fish. The contribution of freshwater to the value of fish increased from LE 18 million in 1961 to around LE 38 million in 1991.

The total number of fishermen were around 180 thousands in 1991 of whom around 112 thousands fishermen working in the lakes and freshwater which represents around 62 percent of the total fishermen.

The brackish water lakes of Egypt are among the most productive standing water bodies due to shallow depths which do not exceed 2 meters, and pouring into them of huge quantities of nutrient-rich water from agriculture drainage. The estimated production of these lakes expressed in tons per feddan per year as follow: Maryut 111, Burullus 345, Idku 470, and Manzala 292. Lake Manzala produces around 39 percent of the total lakes fish production and 25 percent of the total fish production in Egypt.

Annual production of the saline lakes (Qarun, Port Fouad, Bardawil, and the bitter lakes) ranges from 700 to 2400 tons for Qarun, from 100 to 700 tons in port Fouad and from 1000 to 2800 tons in Bardawil.

The fish production in the River Nile and its network of irrigation and canals has increased from 18 thousand tons in 1962 to 38 thousand tons in 1991 representing around 13 percent of the total fish production in Egypt.

The high Dam lake is the largest inland freshwater mass in Egypt which provides a substantial fishery resource. The lake is fertile as demonstrated by vigorous growth of plankton and large population of fish. The statistics show that the high Dam lake fish production remains constant at 20,000 tons per year for a long period.

The aquaculture is the most promising way to increase substantially the fish supply. Its production increased significantly during the last two decades and reached to 35 thousand tons in 1991.

The potentials for increasing the production from fish catch exists in all major natural fish resources: (1) rivers and canals, (2) Lake Nasser, (3) Northern lakes, and (4) marine water. The improvement in resource management is the main factor for increasing the production of fish. The components of fish management include: (1) restocking (2) improved fishing equipment for use in marine water and lake Nasser, (3) improving handling in order to minimize the loss. The expected increase in fish production after improving fish management could reach 25-50 percent of the actual catch in the long range.

Legal and Institutional Framework

Key Institutional Actors

The following institutions are directly involved in the use and management of the Nile Basin resources (Table 5 list the institutions involved);

Table (5) Institutions list

Level	Government Agency
Central	Ministry of Water Resources and Irrigation (MWRI) Ministry of Agriculture and Land Reclamation (MALR) Ministry of State for Environmental Affairs Egyptian Environmental Affairs Agency (EEAA) Ministry of Health (MOH) Ministry of Scientific Research (MSR)
Sectoral	Ministry of Housing Public Utilities and New Communities (MHPUNC) National Organization for Potable Water and Sanitary Drainage (NOPWSD) Ministry of Local Administration (MLA) Ministry of Industry (MOI) Ministry of Interior (MI) Ministry of Agriculture and Land Reclamation (MALR)
Local	Ministry of Water Resources and Irrigation – Regional Branches Ministry of Health - Regional Branches Egyptian Environmental Affairs Agency – Regional Branches General Organization for Greater Cairo Water Supply Cairo Waste Water Organization Alexandria Water General Authority

- Ministry of Water Resources and Irrigation

The Ministry of Water Resources and Irrigation (MWRI) has sole legal responsibility for the planning and management of water resources in Egypt. In its Charter, the MWRI is responsible for providing water of suitable quality to all users. To accomplish this goal, the Ministry has to ensure that appropriate measures are undertaken to protect both the quantity and the quality of Egypt's water resources. In practice, very little has been done. Water quality management occupies a relatively small proportion of the overall activities of MWRI.

The Law 48 of 1982 for the protection of the Nile and its waterways assigns to MWRI the legal responsibility over the following functions:

- Issue and cancellation of discharge permits into Egyptian waterways, which include the Nile River, canal and drainage networks, lakes, and groundwater reservoirs.
- Inspecting wastewater treatment facilities.
- Monitoring locations of intake sites for potable water treatment plants as well as municipal and industrial discharges.
- Ensuring that the Ministry of Health carries out proper samples and analyses of discharges.
- Levying fines for non-compliance.

- Setting regulations and specifications for discharges into water bodies.
- Issue and cancellation of licenses for new floating vessels.
- Issuing licenses for the construction of any establishment that directly discharges into waterways.

The MWRI has delegated the water quality monitoring related tasks of both surface and groundwater to the National Water Research Center (NWRC). NWRC, in turn, consists of the following institutes:

- Nile Research Institute (NRI).
- The Drainage Research Institute (DRI).
- Research Institute for Ground Water (RIGW).

▪ Egyptian Environmental Affairs Agency

According to the New Environmental Protection Law (EPL), Law 4 for the year 1994, the Egyptian Environmental Affairs Agency (EEAA) is responsible of supporting other government bodies in implementing the Law 48 of 1982 through the design of projects and programs aiming towards capacity building on law enforcement.

The New EPL stipulates that EEAA reviews Environmental Impact Assessments (EIAs) of all new and expanding establishments along the banks of surface water bodies and even for new and expanding water and wastewater municipal treatment plants. By means of the EIAs, the EEAA is able to protect Egypt's water resources against further degradation since all new establishments are required to have effective treatment of wastewater and effluent discharges.

The New EPL authorizes EEAA to establish and operate a national environment monitoring network to oversee the conditions of the environment, e.g., land, water and air. In addition, the Law gives sufficient leeway to EEAA to undertake monitoring of existing establishments, considered as high point sources of pollution. EPL also delegates authority to EEAA to supporting the implementations of alternative mechanisms for water pollution control, such as a system of water charges that reflect the scarcity value of water, and a system of sewer charges that reflect the cost of providing the service.

Another task to be fulfilled by EEAA is to identify cost-effective policies for water pollution abatement. This is a very important step towards the design of a more effective pollution control strategy.

▪ Ministry of Health

The Ministry of Health (MOH) is responsible for the public health of all Egyptian citizens. The Law 48 of 1992 assigns MOH direct responsibility for the quality of intake water for drinking and domestic purposes and the quality of municipal and industrial discharges into water bodies. The MOH performs this function through the Environmental Health Department (EHD) and the Environmental and Occupational Health Center (EOHC). The former department carries out regular sampling and analysis to ensure compliance with specifications and standards as per Law 48 of 1982. The latter department is responsible, among other things, for the monitoring of the environment, which includes the Nile River and its main canals; and for setting standards for effluent discharges, e.g., municipal, industrial, and river vessels, potable water sources, and

receiving water bodies. EOHC has 10 analytical laboratory facilities for carrying out physical, chemical and bacteriological analyses.

- Ministry of Housing and Public Utilities

The Ministry of Housing and Public Utilities (MHPU) is responsible for planning and development of the water supply and wastewater sector. The MHPU and its affiliate agencies are the sole agents for the construction of sewers and wastewater treatment facilities all over the country. Unfortunately, the planning and development of the sub-sector have not been guided by a comprehensive assessment of Egypt's environmental protection needs. Although, a relatively large share of GDP has been invested in the construction of municipal wastewater plants, the impacts of the investments on the environment are minimal. In the past, rural water supply and sanitation as well as industrial pollution control has not received adequate attention. Priority on investments should be guided by a comprehensive water management and pollution control strategy for the Nile basin.

The bodies affiliated to MHPU responsible for water supply and wastewater management activities are the following: the National Organization for Potable Water and Sanitary Drainage (NOPWSD), the General Organization for Greater Cairo Water Supply, the Cairo Waste Water Organization, the Alexandria Water General Authority, and the Suez Canal Authority.

- Ministry of Industry

Within GOFI, the Environmental Management Department is in charge of providing technical advice to industrial firms for complying with a MOI decree of 1982 that stipulates that all industrial facilities must install and operate water pollution abatement equipment to conform with Law 48 of 1982.

- Ministry of Agriculture and Land Reclamation (MALR)

The Ministry of Agriculture and Land Reclamation (MALR), through the Soils and Water Research Institute (SWRI), is responsible for conducting research in support of the sustainable development of the agricultural sector. SWRI's main activities in the area of water quality management include the setting of policies on the use of fertilizers, the classification of water resources and soils, and the monitoring of water and soil quality for agricultural purpose. At present, SWRI relies on a modern laboratory for physical, chemical and biological analyses of both water and soil.

- Ministry of Scientific Research

Until 1982, the Ministry of Scientific Research (MSR), through the National Research Center (NRC), was responsible for a relatively large water quality monitoring program of the Nile system. At present, due to financial constraints, NRC is responsible for monitoring only a small number of existing water and wastewater treatment plants in the Great Cairo area and a small number of pumping stations.

- Active NGOs in Egypt

Hundreds of NGOs were established in Egypt taking environmental protection as their specific aim. These NGOs organize workshops, develop environmental journals and newspapers. Their aim is to increase public awareness related to the environmental quality and to protect the Egyptian environment from further deterioration.

Agreements, Laws and Legislation for Environmental Management and Protection

There are numerous laws and regulations that govern Environmental management in Egypt. The most important of these laws and regulations are the following:

- The Law 4 of 1994 redefines the role of the EEAA, and stipulates that this agency is the highest government body responsible for the coordination and supervision of environmental affairs is Egypt. Concerning water resources, this Law specifies that the Law 48 still remains in force. It authorizes the setting of an environmental fund to finance EEAA's activities.

- The Law 93 of 1962 stipulates standards for wastewater discharges into the sewerage system. It also stipulates that permits have to be obtained for the discharge of raw wastewater into public sewerage systems. It gives responsibility to both MOH and MHPU for monitoring discharges to municipal sewerage systems.

- The Law 48 of 1982 regulates the discharge of waste and wastewater into the Nile and its waterways and set standards for the quality of effluents. This Law stipulates clear responsibilities on the MPWWR and the MOH in monitoring the conditions of effluents discharged into the various water bodies, including the Nile river and its associated drain system, lakes and groundwater, ensuring that the quality is within the water quality standards set by the Law. According to this Law, the MOH has the obligation of carrying out periodic sampling and analyzing of wastewater and waste discharges from establishments that are permitted to discharge to waterways and reporting back to the MPWWR. This Law is partially enforced Industrial Water Pollution Control: The MOI decree 380 of 1982 stipulates that all industrial companies, including GOFI, have to operate and maintain water pollution equipment to meet environmental standards. This law is hardly enforced.

- The law 12 for the year 1984 provides the regulating mechanism for the water resources management. This law is implemented through the MWRI and its agencies.

- The law 102 for the 1983 provided the legal framework upon which the government could establish protected areas throughout Egypt. It also regulates the protection of the natural resources.

Table 6 summarizes the laws and regulations related to Nile Basin Resources.

Table (6) National Laws and Regulations related to Nile Environment and Resources in Egypt

Law, Ordinance, Regulation	Year (in force)	Government Agency Concerned
Law 93, Drainage to sewer system	1962	Ministry of Housing, Utilities and New Communities
Presidential Decree no. 421 Ratifying Marpol convention	1962	MHUNC
Ministerial Decree no. 649, Implementation of law 93/1962	1962	MHUNC
Presidential Decree no. 2703, High committee for water	1966	MWRI, Ministry of Health (MoHP)
Law no. 38, Bathing and Washing in Streams	1967	MoHP
Law no. 72, Prevention of oil pollution of sea water	1968	Ministry of Petroleum, EEAA
Ministerial Decree no. 331, Executive committee of water	1970	MWRI
Law no. 74, Clearance of Weeds and Dead Animal Disposals in streams	1971	MWRI
Presidential Decree no. 961, Permanent committee for control of sea water pollution by oil	1972	Ministry of Petroleum, EEAA
Ministerial Decree no. 108, potable water standards	1995	MoHP
Law no. 57, Treatment of ponds, marshes and swamps	1978	MWRI, MoHP, EEAA
Ministerial Decree 7/1, Specifications of potable water	1979	MoHP
Law no. 48, Protection of river Nile from pollution	1982	MWRI
Ministerial Decree no. 170, Establishing High committee of the Nile	1982	MWRI
Ministerial Decree no. 380, Technology and pollution	1982	MOI
Presidential Decree no. 631, Establishing and Environmental Affairs Authority under the presidency of the Council of Ministers	1982	EEAA
Ministerial Decree no. 8, Implementing Law 48/1982	1983	MWRI
Law 12, Irrigation and drainage and License of Groundwater Wells	1984	MWRI
Ministerial Decree no. 43, Regulation of drainage & Waterways	1985	MWRI
Prime Minister Decree no. 1476, Executive committee for Industrial drainage to the river Nile	1985	MWRI
Ministerial Decree no. 9, Amendment of provisions of decree 8/1983	1985	MWRI
Ministerial Decree no. 9, Drainage of wastewater (related to 93/1962)	1988	MHUNC
Law no. 4, Environmental Protection	1994	EEAA
Prime Ministerial Decree no. 338, executive regulations for law 4	1995	EEAA

Law, Ordinance, Regulation	Year (in force)	Government Agency Concerned
Law no. 213, (Follow up of law 12/1984) on Water Users' Organizations	1994	MWRI
Law no. 256, Wastewater Quality Guidelines for Irrigation	1994	MHUNC, MWRI
Law no. 102, establishment and management of Egyptian protected natural areas	1982	EEAA
Ministerial committee under law no. 276, reuse of wastewater in Irrigation	1994	MHUNC, MWRI
Law no. 53 and series of other laws and ministerial laws, protecting birds and wildlife	1966	Ministry of Agriculture and Land Reclamation (MoALR)
Law no. 101, Fees collection on air flight tickets for environmental and tourism development	1985	EEAA, Ministry of Tourism

Egypt has ratified the following conventions and protocols relevant to environment:

- African Convention on Conservation of Nature and Natural Resources (Aliers 1968).
- Convention on Wetlands of International Importance Especially as Waterfowl Habitat Ramsar (Ramsar 1971).
- Convention concerning the Protection of the World Cultural and Natural Heritage (Paris 1972).
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)(Washington 1973).
- Convention for the Protection of the Mediterranean Sea against Pollution (Barcelona 1976).
- Protocol concerning Mediterranean Specially Protected Areas (Geneva 1982).
- Convention on the Conservation of Migratory Species of Wild animals (CMS)(Bonn 1983).
- Bio-diversity Convention (Rio 1992).
- The African-Eurasian Migratory Water-bird Agreement (AEWA) (1998).
- United Nations Convention to Combat Desertification (Paris 1994).

Environmental Management

Egyptian Environmental Policy

The challenge of Egyptian environmental policy is to achieve a balance between the needs of a developing nation and the protection of our natural resources. In doing so, the Ministry of State for Environmental Affairs are required to address the cumulative impact of environmental problems that extend over the past 40 years, mobilize $3.5 billion in investments over the next five years to bring existing industries into compliance with the environmental legislation, build the technical and human infrastructure for environmental monitoring and management, and effect a change in environmentally destructive public behavior.

Fortunately, Egypt's environmental policy – a product of consultation with legislative, political and public representatives, in addition to the private sector – has provided the ministry with the tools to address these important tasks. The policy has been outlined in the Egyptian agenda for the 21st century prepared by the Cabinet of Ministers and the five-year development plan for 1997-2002. It has been shaped by Egyptian commitments to 60 international environmental conventions. And it is supported at the highest levels of government.

The policy objectives are:

- To introduce and integrate environmental concerns relevant to the protection of human health and management of natural resources into all national policies, plans and programs (Strategic Objective).
- To reduce current pollution levels and minimizes health hazards to improve the quality of life in Egypt (Short-term Objective).
- To preserve Egypt's natural resources and bio-diversity, our national heritage, within a context of sustainable development (Medium-term objective).

In pursuit of their environmental mission, the Ministry of State for Environmental Affairs Agency (EEAA), have adopted the following directives:

- Foster partnership, coordination and collaboration between the different segments of Egyptian society at the national level, in part by setting up mechanisms to coordinate activities between the ministries, other organizations and the private sector, and the revision of the 1992 National Environmental Action Plan to adopt a gender-sensitive, participatory-development approach.

- Foster partnership at the bilateral, regional and global levels by supporting the transfer and use of clean technology, finalizing the draft National Energy Efficiency Strategy within the framework of Egypt's National Action Plan for Climate Change, the organizing the International Conference & Trade Fair for Environmental Management & Technology.

- Implement Law 4 of 1994 for the protection of the Environment, whose rigorous provision are being enforced now that the grace period for compliance has expired.

- Develop and upgrade Egypt's 21 natural protectorates and protect bio-diversity, in part by encouraging the sustainable development and management of the protected areas, mobilizing local participation to support the protection of natural reserves, promoting Eco-tourism and sustainable tourism initiatives, and implementing the national Strategy for bio-diversity.

- Support institutional strengthening and capacity building by restructuring the Egyptian Environmental Affairs Agency (EEAA) and its technical departments, providing financial and technical support to the Environmental Protection Fund, establishing new regional branch offices, supporting environmental offices in Egypt's new industrial cities, building up inspection and monitoring capabilities, and setting up a public complaints system.

- Support sustainable environmental management systems by adding an environmental dimensions to large scale national projects, promoting ISO 14000 certification, supporting integrated coastal-zone management systems, preparing environmental action plans for Egypt's Governorates, creating sustainable solid waste management, systems and implementing air quality improvement systems.

- Integrate the use of market-based instruments into the practice of environmental protection, including customs duty exemptions for pollution-abatement equipment, tax benefits and preferential terms on the sale of land for use in environmentally sound projects.

Protected Areas

In the 1980's the Government of Egypt recognized the need to develop mechanism to manage habitats for the conservation of bio-diversirty. Protected area system is considered an important element of this mechanism. The promulgation of law no. 102 for the year 1983 provided for the legal framework for establishing protected areas. Table 7 shows the protected areas in Egypt.

Table (7) Protected Areas of Egypt

Protected area	Size	Year declared	Major habitats and significant species	Impacts and conflicts	Manage-ment	Global recognition
Ashtom El Gamil	1200 ha	1988	Most important wetland habitat for birds, fish catch, cultural heritage in Tanees island,	Wastewater disposal in the lake	Law	None
Saluga and Ghazala islands in the Nile river		1986	Granite substrate with accumulated riverine sediments, Luxuriant natural vegetation represent relicts of riverine forests, genetic resources	Tourism development in the area	Low	None
Wadi Rayan	200km^2	1989	Coastal vegetation, complex ecosystem consisting of 20 plant species, more than 100 bird species, 16 reptile species, 16 mammal species, fish species	Tourism development, bad water quality	High	Italian Funded Project
Lake Qarun	23000 ha	1989	Wintering Waterbirds, salt water fish species.	Bad water quality	High	Netherland Funded Project
Wadi Allaqi	4331 Km^2	1989	River Nile deposits, mineral deposits, ornamental stones, genetic resources, wildlife	Migrant wildlifedestr oy of genetic resources	Law	None
Wadi El Assiuty		1989	Undisturbed wadi with important wildlife, mammals, birds, raptors,	Wildlife management and conservation	Law	None
Hassana Dome		1989	Geological structure and age, fossil contains	urbanization	Law	None
El Maadi Petrified Forest	6 km^2	1989	Petrified remains of a 35 million year old forest, undisturbed desert ecosystem, rich in flora and fauna	urbanization	law	None
Wadi Sannur Cave	600-700 m length 15 m wide	1992	Alabasters quarries	Conservation and management	Law	None
Island on the River Nile	144 island, 37,000 feddan	1998	Flora and Fauna, birds, cultivated plants.	Urbanization, bad water quality	Law	None

Environmental Issues

Table 8 summarizes the threats to the Nile basin environment and resources. The table includes the information on the types of threat, their impacts, their immediate causes, their root causes, and the extent and severity of the impacts. The issues which is identified as severe are particularly serious.

Table (8) Threats to the Nile Environment and Resources in Egypt

Issue	Symptoms / Impacts	Immediate Causes	Root Causes	Extent	Severity
Land Degradation					
Delta coasts degradation	Erosion of the river Nile delta coastal zones	stop of river flood (sediments)	Build of High Aswan Dam	local, at the delta coastal shores	Severe
River-banks, river islands and lake-shore development	Deterioration of the bare lands, loss of land	Construction activities, solid waste disposal soil subsidence, lack of law enforcement	Increased population, urbanization,	localized	Moderate to severe
Deforestation	Increased rate of sedimentation in lake Naser	Decrease in tree cover	Cut of forests for fuel consumption, increased population	local	Low
soil erosion	River bed degradation	Regulated river flows	Clear water flow from HAD	throughout the river	Moderate
Desertification	Loss of fertile land, reduce agriculture production	Soil salinity, water logging, farmers practices	Water-land resources mismanagement, water-land pollution	Local	Moderate
Desertification	Loss of fertile land for other land uses (ex. Urbanization)	Urbanization, land miss-management	increased population,	Throughout the basin	Moderate to High
Range-land degradation	Loss of soil and soil fertility, loss of palatable species, diminution of plant production	Overgrazing, cutting of shurbs,	Inadequate development planning	Local to the fringes of the basin	Low
Agriculture land degradation	Loss of fertile land	Stop of sediments	Build of High Aswan Dam	Over the agriculture land	Moderate

Issue	Symptoms / Impacts	Immediate Causes	Root Causes	Extent	Severity
Disposal of solid wastes	Soil pollution	Improper disposal of industrial, agriculture and domestic wastes	Lack of waste management system, inadequate public awareness and improper law enforcement	Localized, urban areas.	Moderate to severe
Water quality degradation					
Agricultural practices pollution to waterways	Decrease in water quality, Eutrophication of lakes and surface water bodies and groundwater	non-point pollution sources	Agriculture practices, fertilizers use, over use of pesticides	All basin water ways, lakes and groundwater	Severe
Discharge of industrial wastewater	Decrease in surface and groundwater quality	Untreated or partially treated releases of pollutants	poor industrial practices / technology	Close to industrial complexes	Severe
Discharge of domestic wastewater	Decline in surface and groundwater quality	Lack of sanitation facilities, lack of law enforcement	Urbanization, population increase.	Downstream use functions, lakes,	Severe
Water weeds	Decrease in water quantity	Improper weed control	Clear water flow	river, canals and drains	low
Excessive exploitation of groundwater	Decrease in groundwater levels,	Excessive pumping of groundwater	inadequate allocation of Water resources	local	moderate
Reclamation of desert fringes	Loss and deterioration of vulnerable groundwater quality	Increase in salinity, higher nitrates and pesticides concentration	Mobilization of mineral salts and infiltration of agriculture chemicals	Groundwater at the desert fringes	Moderate
Institutional and legal	Deterioration of water quality	Lack of law enforcement	Absence of integrated coordinated action plan	All basin	Moderate
Reuse of drainage water	Saltwater intrusion, salinity increase, and decline in water quality	Increase water demands	Inadequate water resources conservation and management	Local to areas that make use of drainage water	moderate
Bio-diversity Degradation					
Basin development	Loss of valuable flora and fauna species	Urbanization, industrialization, agriculture practices	Increased population, lack of planning guidelines lack of enforcement, lack of conservation measures.	Nile basin	Severe

Issue	Symptoms / Impacts	Immediate Causes	Root Causes	Extent	Severity
Water quality degradation	Loss and decreased number of migratory birds	Urbanization, industrialization, agriculture practices	Increased population, lack of enforcement, lack of conservation measures.	Nile basin as a migratory birds route	Moderate
Water quality degradation	Loss of valuable water Habitat	Urbanization, industrialization, agriculture practices	Increased population, lack of enforcement, lack of conservation measures.	River Nile and other water courses and wetlands	Severe
Man-made damage	Loss of valuable habitat by removal or indirect impacts	Illegal hunting, farmers illegal reclamation of lands and islands	Illiteracy, lack of awareness, poverty, lack of enforcement	Nile islands, valley and delta fringes	Low
Over Exploitation of Resources	Loss of species	Inadequate management system, market value	Increased population, Lack of regulations, public awareness	All basin	Moderate
Wetland degradation	Shrinking of wetland area, loss of shore lines, Loss valuable species	Agriculture land reclamation, aquacultue reclamation and urbanization	Increased population and development, lack of development guidelines and law enforcement	Local to wetland areas	Severe
Introduction of new species	Loss of bio-diversity species	Inadequate management, improper studies, increased economic return from sales	competition, change of habitat,	River Nile system	Moderate to Low
Degradation of protected areas	Loss of bio-diversity species	Water pollution, urbanization, disposal of solid wastes, loss of land	Inadequate resources (financial, human, institutional)	River basin	High
Human Degradation					
Bilharzia, water borne diseases	Deterioration to human health	lack of sanitation facilities and poverty	increased population, inadequate public awareness, inadequate law enforcement	throughout the river	severe

Issue	Symptoms / Impacts	Immediate Causes	Root Causes	Extent	Severity
Human Kidney disorder	Increased number of people with kidney failure	use of high saline and polluted water as drinking water, lack of clean water facilities, water hardness	improper solid and water waste disposal, inadequate public awareness, lack of law enforcement	at the delta region	severe
People understanding of the water scarcity	Loss of water	Public awareness, lack of water conservation practices.	Lack of awareness programs	All basin	moderate
Degradation of cultural heritage	Direct and indirect impacts to archaeological and historical sites, loss of cultural heritage sites	Urbanization, Improper planning, design and construction, lack of archaeological program during construction	Lack of adequate recognition of the importance of cultural heritage, lack of regulations and law enforcement	All basin	Moderat e
People understanding of environment quality	General environmental degradation	Poverty, illiteracy	Lack of environmental education programs	All basin	Sever
Trans-boundary issues	Illiteracy of the African countries sharing the country and their problems	Public awareness	Lack of awareness programs	All basin	moderate
Disaster Preparedness and Remediation					
Rivertine lakostrine Transport and Navigation risks	Grounding/collisions, oil and chemical spills Disposal of waste Impair with water uses Loss of life and properties	Improper design and navigational aids, lack of contingency plans. Lack of waste reception facilities Improper insurance and compensation scheme	Ignorance. Lack of regional water uses criteria and basic data. Improper risk assessment. Inadequate legal frame and enforcement measures	River Nile system	Moderat e to Sever

Issue	Symptoms / Impacts	Immediate Causes	Root Causes	Extent	Severity
Floods	Loss of Human life, resources and property. Migration and refugees. Conflicts	Improper setting of urban centers and development projects. Absences of environmentally sound land use planning. Poverty.	Natural causes. Climate changes	River Nile system	Sever
Droughts	Loss of Human life, resources and property. Migration and refugees. Conflicts	Poverty.	Natural causes and climate changes Improper management of plant coverage, desertification and deforestation	River Nile system	Sever
Climate changes	Desertification, floods, marine water intrusion	Regional changes in meteorological characteristics	Emission of green house gases	Nile Delta	Sever

Recent, Current and Planned Initiatives

Table 9 lists the projects and programs planed or under implementation to address the environmental threats. The list is very long however some important projects and programs are listed below.

Table (9) Recent, Current and Planned Environmental Initiatives, Programs and Projects in Egypt

Programme / Project	Period	Budget (10^6US$)	Implementing Agency
Capacity building for the Environment sector including upgrade of the National Environmental Action Plan	1998-2000	1.08	Ministry of State for Environmental Affairs, Egyptian Environmental Affairs Agency
Water Resources Master Plan			Ministry of Water Resources and Irrigation
Engineered Wetlands	1997-2002	4.5	Ministry of State for Environmental Affairs, Egyptian Environmental Affairs Agency
National Water Quality and Availability Management Project			Ministry of Water Resources and Irrigation
Environmental Policy and Institutional Strengthening			Ministry of Water Resources and Irrigation
National Oil Spill Contingency Plan, Marine Environment.	1997 – 1999	2.4	Egyptian Environmental Affairs Agency
National Oil Spill Contingency Plan, River Nile and Lake Nasser.	2000 – 2002	0.9	Egyptian Environmental Affairs Agency
National Environmental Disaster Plan	1999 – 2002	4.4	Egyptian Environmental Affairs Agency
Used oil & domestic waste collecting systems along the River Nile	1999 – 2001	0.6	Ministry of water resources, Egyptian Environmental Affairs Agency, etc.
Building Capacity for Egypt to respond to united nations framework for climate change convention communication obligations	1996-1999	0.4	Egyptian Environmental Affairs Agency
Genetic Engineering	1997-1999	1.7	Agricultural Genetic Engineering Research Institute, Ministry of Agriculture MoA
Organic Agriculture	underway	0.5	MoA
METAPIII	1996-2001	4.2	Egyptian Environmental Affairs Agency
Conservation of Wetlands and coastal Ecosystems in the Mediterranean Region	1997-2002	2.8	Egyptian Environmental Affairs Agency
Local Initiative Facility to urban Environment	1993-1998	0.85	NGOs
Organizational Support Project	1999-2002		Egyptian Environmental Affairs Agency
Italian Cooperation Project	1998-2002		Egyptian Environmental Affairs Agency, Ministry of water Resources and Irrigation Ministry of Culture

Priority Actions

Table 10 summarizes the priority actions that emerged from the national consultations. For each priority action the following is indicated:

- the trans-boundary issue to be addressed

- the nature of the proposed activity, including more effective environmental planning and management and the relative urgency or priority of the proposed action

Table (10) Priority Actions in Egypt

Environmental Issue	Priority Action	Scale	Emphasis	Urgency
Legislation	Development of laws and regulations	National/ regional	Legislative framework	high
Legislation	Development of Trans-boundary environmental assessment guidelines	National/ regional	Legislative framework	Moderate
Environmental Sustainable development	High-level commitment by governments to achieve conservation and sustainable use and development of the Nile basin	Regional	Commitment for collaboration Public awareness	High
Delta Coast degradation	Development of shore protection management program and master plan, implementing shore protection measures	National	Master plan, shore management	Moderate
River banks, river islands and lake shore development	Development and implementation of mitigation measures for conservation of the environment, Increased priority for the management of solid wastes. Increased Public awareness, law enforcement	Regional, national, local	Management program, Management information, public awareness, enforcement	High
Deforestation	Stop deforestation and implementation of hydropower plans	Regional, national, local	Hydropower development plan, collaboration, law enforcement	High
Soil Erosion	Development of proper operational measures, Upgrade and rehabilitation of all hydraulic structures	National, local	Operational schemes, Upgrade and rehabilitation master plans	Low
Disposal of solid wastes	Increased priority for the management of solid wastes and the development of recycling plans, Increased Public awareness,	Regional, national, local	Capacity building Recycling plans Public awareness	Moderate to high
Desertification	Development of integrated soil and water management program	National, local	Farmers awareness, management program, capacity building	Moderate
Desertification	Development of National Programs to combat desertification, development of national land use plan	Regional, national, local	Programs to combat desertification, collaboration	High
Range-land degradation	Increased priority for sustainable development programs, introduction of management programs to decrease overgrazing, Educational programs.	Regional, national, local	Educational programs, management programs	Moderate to high
Agriculture land degradation	Development of research studies to develop solutions	National	Capacity building	Moderate to Low

Environmental Issue	Priority Action	Scale	Emphasis	Urgency
Agricultural pollution to waterways	Development plan to reduce the use of agro-chemicals and pesticides, law modification and enforcement	Regional, national, local	Capacity building, technical development, farmers awareness	High
Discharge of industrial wastewater	Development of a wastewater management plan, law enforcement Introduction of incentives/taxes policy,	Regional, national, local	Capacity building, technical development, public awareness, co-ordination between enforcement entities	High
Discharge of domestic wastewater	Development of a coordinated action plan to provide improvement for the critical areas, promote conservation and reuse of treated wastewater	Regional, national, local	Capacity building, technical development, public awareness	High
Water weeds	Development and implementation of weed control plans	Regional, National	Technical development, capacity building	Moderate
Excessive exploitation of groundwater	Development of groundwater potential maps and plans, Priority to groundwater management	Regional, national, local	Capacity building Management information, management program	Moderate
Reuse of drainage water	Development of standards and guidelines for reuse, law enforcement, development of reuse policy	Regional, national	Standards and guidelines, capacity building, technical development	High
Reclamation of desert fringes	Development of vulnerability maps, development of management plans,	Regional, national, local	Management information, management plans, capacity building	Moderate
Institutional and legal	Introduction of an integrated, coordinated action plan to develop an instrument for law development and enforcement	Regional, national, local	Institutional reform, capacity building, law development	High
Basin development	Development and implementation of environmental sustainable development plans, Increased priority for the management of solid wastes. Increased Public awareness, law enforcement	Regional, national, local	Management program, Management information, public awareness, enforcement	High
Water quality degradation	Development of a regional program for the conservation of birds habitat,	Regional, National	Management program, capacity building, NGO involvement	High
Water quality degradation	Development of a regional/national program for the conservation of bio-diversity species	Regional, national	Capacity building, management program, NGO involvement	High
Man-made damage	Law enforcement, development of educational programs	Regional, National	Public awareness	Moderate

Environmental Issue	Priority Action	Scale	Emphasis	Urgency
Over Exploitation of Resources	Development of management system, Development of regulation and control mechanism, public awareness	Regional, national	Public awareness, management program, management information	Moderate
Wetland degradation	Develop proper and environmentally sustainable master plan for water and land resources	Regional, national, local	Capacity building, ,guidelines development law enforcement	High
Introduction of new species	Proper management system development, assessment of existing conditions capacity building	Regional, national	Management information, management program, capacity building	Moderate
Degradation of protected areas	Development of institutional capacity and framework for a national and regional network for protected areas	Regional, national	Management Program, capacity building	High
Bilharzia, water borne diseases	Development of public awareness program, Improvement to sanitation facilities	Regional, national	Public awareness	High
Human kidney disorder	Development of public awareness program, Improvement to sanitation facilities, improvement to potable water supply systems	National	Public awareness	Moderate
People understanding of water scarcity	Public awareness, development of a regional educational program for water conservation	Regional, national	NGO involvement Public awerness	Moderate to high
Trans-boundary issues	Development of a regional program to raise the River basin concept to the regular people level (ex, post cards that faces of the river countries)	Regional, National	Public awareness, NGO involvement	Moderate to high
Degradation of cultural heritage	Public awareness to improve the people recognition of the importance of cultural heritage, Development of regulation, law enforcement	Regional, national	Public awareness, law enforcement, capacity building	Moderate
People understanding of environment quality	Development of environmental educational program	Regional, national	Capacity building NGO involvement	Moderate
Environmental Monitoring	Strengthening of environmental laboratory and monitoring capacity, including standardization of sample collection, testing and reporting procedures on a regional basis	Regional National	Capacity building, management information Technical development	Moderate

Environmental Issue	Priority Action	Scale	Emphasis	Urgency
Transport and navigational risks.	1- Feasibility study for using the River Nile System for local/trans-boundary transport of goods. 2- Defining safe navigational channels and hazardous stretches, and identifying navigational aids adequate to the region. 3- Preparation of Legal Frame and ways of enforcement. 4- Formulation of guidelines for vessels design including navigational aid required and anti-pollution measures. 5- Defining port locations and type of waste reception facilities needed. 6- Preparing contingency plans.	National/ Regional	1- Raising Awareness. 2- Data collection. 3- Legislative framework. 4- Technical development. 5- Capacity building. 6- Financial resources.	High
Defining criteria for the River Nile System uses.	1- Identifying potential uses of the River Nile System. 2- Preparing regional agreements and guidelines. 3- Issuing regional discharges/criteria guidelines.	Regional	1- Data collection & dissemination. 2- Concluding agreements. 3- National legislation.	Moderate
Natural Causes (flood/droughts)	1- Preparing criteria for Land Use Plans. 2- Preparing Disaster Contingency Plans. 3- Making financial resources available to poor countries.	Regional	1- Collecting data on Climatic Changes and forecast future possibilities. 2- Identifying availability of resources and clearing mechanisms. 3- Concluding agreement for refugees during disaster events.	High
Climatic Changes	1- Issuing legislative to minimize the emission of green house gases. 2- Preparing regional guidelines for resources management. 3- Making financial resources available to all countries.	Regional	1- Data on green coverage. 2- Monitoring and survey. 3- Concluding regional agreements. 4- Raising the public awareness.	High

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