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THREE COUNTRIES (ARGENTINA, EGYPT, THAILAND) FOR THE 1992
UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT

US/INT/90/281

Part III: Egypt*

Prepared for the Government of Egypt
by the United Nations Industrial Development Organization

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* This document has not been edited.

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CONTENTS

1	INTRODUCTION	1
2	OVERVIEW OF THE INDUSTRY SECTOR	3
2.1	THE INDUSTRY SECTOR AND THE EGYPTIAN ECONOMY	3
2.2	TRENDS IN INDUSTRIAL PRODUCTION	6
2.3	EMPLOYMENT IN INDUSTRY	8
2.4	INDUSTRIAL DEVELOPMENT IN THE FUTURE	9
3	INDUSTRY AND ENVIRONMENTAL ISSUES	10
3.1	THE SITUATION IN 1970	10
3.2	THE SITUATION IN 1990	10
3.3	AWARENESS OF ENVIRONMENTAL ISSUES	18
4	INDUSTRIAL POLLUTION CONTROL LEGISLATION AND POLICY	21
4.1	INDUSTRIAL POLLUTION CONTROL LEGISLATION	21
4.2	INDUSTRIAL POLLUTION CONTROL POLICY	22
4.3	FINANCING FOR POLLUTION CONTROL	29
4.4	COSTS AND BENEFITS OF CORRECTIVE ACTION/NON ACTION	29
5	INSTITUTIONAL CONTEXT FOR POLLUTION CONTROL	30
5.1	KEY INSTRUCTIONS	30
5.2	INSTITUTIONAL CAPACITY FOR POLLUTION CONTROL	39
6	NATIONAL PRIORITIES, EXISTING AND POTENTIAL FUTURE INITIATIVES	42
6.1	NATIONAL PRIORITIES FOR INDUSTRIAL POLLUTION CONTROL	42
6.2	RECENT, ON-GOING AND NEW INITIATIVES	42
6.3	POTENTIAL FOR FUTURE ACTION	46

EGYPT NATIONAL REPORT FOR UNCED 1992**Sectoral Analysis: Industry Sector****Preface**

This report is prepared by Environmental Resources Limited, in the framework of technical assistance provided by UNIDO to the Government of Egypt. This technical assistance project is one of three UNIDO projects to provide assistance to developing country governments in the preparation of industrial subsector analyses for the national reports to be submitted for the United Nations Conference on Environment and Development (UNCED). The report is the output of a mission to Egypt from 18 June to 8 July 1991. The report was prepared with the assistance of Engineer Farouk Bedewe and Chemist Ahmed Shehata from the Egyptian Environmental Affairs Agency (EEAA) and Farouk Mohsen and Abdel Eweiss from the General Organisation for Industry (GOI).

The institutional organisation of the preparation of the Egypt UNCED National Report is represented as follows.

- *Minister responsible for approval of final report:* Dr Atef Ebeid (Chairman of Board of Directors of EEAA).
- *Overall responsibility for preparation:* Dr R. Kazim (Chairman of EEAA).
- *Preparation Committee* responsible for overseeing and reviewing report, comprising:
 - . Ministry representatives
 - . NGOs
 - . Public Authorities
 - . Donor Agencies
 - . Private Sector

This Committee is chaired by Professor Dr Aboul-Fotouh..

- *Formulation Committee*, responsible for actual preparation of the report, and composed of scientific experts from many institutions in Egypt.

The mission to Egypt took place after the UNCED National Report had been completed, and therefore, naturally, it was not possible for the consultant to contribute directly to the preparation of the National Report. This report was therefore prepared separately, with the valuable assistance of members of the Preparation and Formulation Committees. The report is prepared to a format incorporating the headings of the guidelines issued by the UNCED

Preparation Committee for the preparation of Sectoral Analyses, which constituted Attachment I (November 1990) of the overall guidelines for the preparation of UNCED National Reports. It is hoped that this report will supplement the information on the industry sector already contained within the Egypt UNCED National Report.

This report is prepared by Environmental Resources Limited (ERL), as the output of technical assistance provided by UNIDO to the Government of Egypt during the preparation of the Egypt National Report for the United Nations Conference on Environment and Development (UNCED) to be held in July 1992 in Brazil. The report was prepared following meetings held by the ERL consultant during a mission to Egypt from 18 June to 8 July 1991.

The report is prepared to a format which incorporates the headings from the guidelines for the preparation of sectoral analyses for UNCED National Reports (Attachment I, 9 November 1990), entitled "National Report for UNCED 1992: Sectoral Analysis". The report also meets the aims of UNIDO to identify priority areas for future projects in the field of industrial pollution control in Egypt. The report is therefore laid out as follows:

Chapter 2 gives an overview of the industry sector, including its importance to the Egyptian economy, trends in industrial production, and plans for industrial development in the future.

Chapter 3 discusses industry in relation to environmental considerations facing the sector in 1970 and 1990. This includes an evaluation of sources of impact and impacts on receptors. Chapter 4 focuses on the steps which have been taken to mitigate environmental impacts, including environmental legislation and policy; the financing of such initiatives; and cost benefit analysis of pollution control actions.

Chapter 5 analyses the institutional context for industrial pollution control, including a review of the roles and activities of all the government, NGO, research and donor agencies active in the sector. Institutional capacity for pollution control in Egypt is analysed in Section 5.2 in terms of institutional coordination and management, human resources, equipment, and information. The role of women is also briefly discussed.

In Chapter 6 are presented the national priorities for industrial pollution control, as perceived by the consultant. In addition tables are presented showing the major recent, on-going and planned future projects and programs targeting industrial pollution control. Finally in Section 6.3, drawing on the perceived needs for industrial pollution control and the experience in Egypt of how pollution problems have been tackled in the past, the potential for future action is presented. This comprises recommendations for future action in the following areas:

- Provision of pollution control technology in industry
- Institutional strengthening and policy development
- Training and awareness raising
- Pollution monitoring

These recommendations may serve as useful in the identification of priorities for funding of future projects, and as a focus and background to project identification missions in the future.

THE INDUSTRY SECTOR AND THE EGYPTIAN ECONOMY

Industry grew rapidly as a sector in the 1970s and early 1980s, with growth rates of 10 % per annum, and slowing to 7 % per annum between 1985/86 and 1987/88. Industrial exports grew from 5.1% of total visible exports in 1981/82 to 8.2% in 1986/87.

Industry now contributes a significant and growing proportion of Egypt's GDP. As shown in Table 2.1a below, industry and mining contributed 17.6 % of GDP in 1988/89. Of this, mining is a comparatively small sub-sector, less than 1% of the overall industry sector by value. Approximately 1.7 million people are employed in industry and mining, compared to 4.4 million in agriculture.

The main industrial subsectors, broken down according to the categories of the official statistics, are as follows (listed in order of size by value, 1988/89):

- Food industries (28%).
- Spinning and Weaving Industries (21%).
- Engineering and Electrical Industries (18.4%).
- Petroleum Industries (18%).
- Chemicals and Pharmaceuticals (12.4%).
- Building and Material Industries (1.5%).
- Mining (1%).

The other important breakdown of industry in Egypt is between public sector and private sector industry. Traditionally most industry has been held in the public sector, but this is changing and the increase in private sector industry is a goal of the current 5 Year Plan. Currently about 75 % of industry is public sector and 25 % private sector. The breakdown between public and private sector industry for 1976, the closest date to 1970 for which figures were available, are shown in Tables 2.1b and 2.1c. Unfortunately comparable figures for recent years could not be obtained.

Industrial products make up a large share of Egyptian exports, with cotton yarn/textiles, petroleum/petroleum products and engineering/metallurgical goods contributing 64% (££2155 million) of export revenues in 1988/89. However, industrial products also make up a very large share of principal imports (see Table 2.1d).

Egypt is aiming to increase its degree of self-sufficiency in industrial products, in particular consumer goods, in the current 5 Year Plan. However, Egypt is not yet self sufficient in a number of areas. Due to the separate categorisation of import and export statistics compiled by the Central Agency for Public Mobilisation and Statistics, it was not possible to

Table 2.1a *Origin of GDP 1988/89 at Factor Cost*

Sector	% of Total, 1970	% of Total 1988/89
Agriculture	Figures unavailable	20.1
Industry and Mining		17.6
Petrochemicals and Electricity		5.2
Construction		5.0
Trade, Finance and Insurance		23.4
Transport and Communications		9.4

Source: Economist Intelligence Unit, 1991

Table 2.1b *Breakdown between Public and Private Sector Industry, 1976*

Sector	Output		Employment (1974 figures)	
	£E million	%	Thousands	%
Private	735	27.2	623.2	54.2
Public	1962	72.8	526.3	45.8
TOTAL	2697	100	1149.5	100

Source: Arthur D Little, 1977

Table 2.1c *Public and Private Sector Industry: % Held In Each Sector By Value, 1976*

Industry Sector	Public	Private
Textiles	75	25
Food	76	24
Chemicals	71	29
Metallurgy	85	15
Engineering (1975)	81	19
Building materials	82	18
Leather and Wood	0	100

Source: Arthur D Little, 1977

Table 2.1d *Egypt's Exports and Imports, 1988/89*

Exports			Imports		
Sector	Value, £E m	%	Sector	Value, £E m	%
Cotton yarn & textiles	778	23.0	Transport equipment & machinery	4390	24.1
Petroleum & petroleum products	746	22.1	Livestock, food & drink	3512	19.3
Engineering & metallurgical goods	631	18.7	Chemicals, rubber & textiles	2206	12.1
Raw cotton	189	5.6	Wood, paper & textiles	2186	12.0
Other agricultural goods	206	6.1	Fats, oils, fuels, minerals	999	5.5
Total (including others)	3383	100		18175	100

analyse the degree of self sufficiency of industry in detail, and no studies were found which deal with this issue during the course of the consultant's mission.

It should be emphasised that government estimates of GDP do not take into account the large "unofficial" economy, which if included could increase GDP figures by 25% according to some estimates. Within this unofficial economy comes much of the industrial production of the informal sector.

2.2

TRENDS IN INDUSTRIAL PRODUCTION

Trends in industrial production are shown in Table 2.2(a) (by value) and Table 2.2(b) (by tonnes of production). These tables show the rapid increase in all subsectors since 1971, with all sectors except petroleum growing faster between 1980 and 1990 than in the previous decade.

Table 2.2a Value of Industrial Production by Sector (£E million at Current Prices): Trends

Sector	1971	%	1980	%	1988/89	%	% increase in share, 1971-88/89
Building Materials Industries	59.7	3.7	85	1.1	355	1.5	-2.2
Chemicals and Pharmaceuticals	155.9	9.7	629	7.8	2867	12.4	2.7
Engineering and Electrical Industries	235.6	14.6	1030	12.8	4200	18.1	3.5
Food Industries	485.6	30.1	1443	17.9	6500	28.0	-2.1
Mining	12.1	0.01	39	0.005	231	0.01	0
Petroleum Industries	152.2	9.4	3429	42.4	4186	18.0	8.6
Spinning and Weaving Industries	510.9	31.7	1423	17.6	4866	21.0	-10.7

Source: CAPSEM statistics from yearbooks for 1977, 1982 and 1990

Table 2.2b *Trends in Output of Selected Industrial Products*

Sector	1971	1980	1989/90
Cotton yarn (000 ton)	171		249
Wool yarn (000 ton)	11	-	19
Sugar (000 ton)	296	616	964
Cars (unit)	5750	16014	18281
Buses (unit)	349	464	1550
Trucks (unit)	484	1221	1827
Aluminium (refined) (000 ton)	NA	NA	180
Reinforced iron (000 ton)	210	289	1015
Cement (000 ton)	3921	5038	13900
Phosphates (000 ton)	713	679	1085
Phosphate fertilisers (000 ton)	487	488	1516
Nitrogenous fertilisers (000 ton)	380	2584	5045
Soap (000 ton)	150	289	520
Iron ore (000 ton)	473	1776	2050
Salt (000 ton)	421	728	1000
Crude petroleum (million ton)	NA	29.4	43
Detergents (ton)	17869	32810	70

Sources: CAPMAS statistical yearbooks for 1977, 1982 and 1990; Economist Intelligence Unit 1991.

EMPLOYMENT IN INDUSTRY

The distribution of employment in the Egyptian economy is shown in Table 2.3a for the years 1976, 1986/87 (estimates) and 1991/92 (targets). Data for 1976 from the 1976 Population and Housing Census were the closest data to 1970 which could be obtained for comparative purposes with the recent data.

The figures show a 23 % increase in industrial and mining employment between 1976 and 1986/87, with a substantial projected increase of 31 % from 1986/87 to 1991/92.

It was not possible to obtain figures showing the breakdown of employment within different sectors of industry. Also, it was not possible to obtain comparative data for male and female employment in industry, and the only figures obtained are shown in Table 2.3b.

Table 2.3a *Employment in Egypt, (thousands), 1976, 1986/87, 1991/92*

Sector	1976	1986/87 (estimate)	1991/92 (target)	% increase, 1976 to 1986/87
Agriculture	4,881	4430.0	4909.2	-9.2
Industry and Mining	1,403	1,725.0	2,259.0	23.0
Oil and Oil Products	(1)	32.5	36.0	NA
Electricity and Public Utilities	61.8	251.1	183.7	406
Construction	425	561.8	672.6	32.2
Transport and Communications	482	523.6	623.7	8.6
Suez Canal		20.1	20.6	NA
Commerce and Tourism	861	1251.8	1498.6	45.6
Finance and Insurance	88	114.9	139.6	30.6
Personal and social services	1,868	978.3	1154.0	-47.6
Social insurance	-	35.2	38.5	NA
Government Services	-	2,177.3	2,471.2	NA
Other	186,438			NA

(1) no figure given, possibly included in "other" or "manufacturing"

Sources: 1976 Population and Housing Census data, taken from CAPSEM Statistical Yearbook, 1982; Economist Intelligence Unit, 1991

Table 2.3b *Employment in Industry and Mining by Gender, 1976*

Sector	Male (% of total)	Female (% of total)	Total
Mining and Quarrying	32,366 (96 %)	1,465 (4 %)	33,831
Manufacturing	1,279,635 (93 %)	89,847 (7 %)	1,369,482

Source: 1976 Population and Housing Census, data taken from CAPSEM, 1982

2.4 *INDUSTRIAL DEVELOPMENT IN THE FUTURE*

2.4.1 *Plans for the Future*

The current 5 Year Plan (1987/88-1991/92) is the main source of planning for industrial development in the future. For the economy as a whole the current 5 Year Plan emphasises economic reform and stability for the economy, calling for a growth rate of 5.8% per annum, lower than the 8% annual target of the previous plan and the reported actual growth of 6.8%. Central to the new plan is the increased role of the private sector: of the £E46.5 bn scheduled for investment by 1992, it is hoped that £E18 bn will come from the private sector.

The main targets for industry in the current 5 Year Plan are:

- To achieve a 7.2% average annual growth.
- To increase the percentage contribution of industry and mining to GNP from 15.6% (£E6.9 bn) in 1986/87 to 17.9% (£E10.4 bn) in 1991/92.
- To schedule £E12.26 billion for industrial development over the 5 Year Plan period, of which it is hoped 52.5% will come from the private sector and 47.5% from the public sector.
- Self sufficiency in most consumer industries.
- Concentration on intermediate and export industries and local manufacture of equipment and spare parts.
- Upgrading the quality of output.
- Upgrading worker skills.

2.4.2 *Costs and Benefits of Expansion*

No studies have been found analysing the costs and benefits of the industrial growth strategy being pursued.

3

INDUSTRY AND ENVIRONMENTAL ISSUES

3.1

THE SITUATION IN 1970

Industrialisation in Egypt was still in relatively early stages in 1970, and little research material is available on industrial environmental impacts. However, in the 1970s environmental problems stemming from industry were becoming significant, in particular the discharge of industrial waste water into surface waters and the associated impacts on aquatic ecology and sanitation.

There was little attempt in research in the 1970s to distinguish industrial pollution from other sources such as agricultural effluents and raw sewage. This is reflected, for example, in the USAID Draft Environmental Profile of Egypt prepared in 1980. It is therefore difficult to quantify the extent of environmental impacts from industry in 1970 as opposed to other sources.

However, it is certain that industrial pollution has developed into a much more serious problem in the past 20 years.

3.2

THE SITUATION IN 1990

3.2.1

Sources of Industrial Pollution

Currently the principal sources of industrial pollution are as follows.

- *Discharges to water*

There are more than 200 industrial plants discharging effluents directly or indirectly into the Nile between Aswan and the Mediterranean. Examples quoted in a 1986 report (USAID, unpublished) are as follows. The Egyptian Sugar and Distillation Company in Kus/Kom Ombo in Upper Egypt discharges sludge from sugar cane residue directly into the Nile. Its affiliate in Hawamadia, south of Cairo, discharges tons of distillation residue into the Nile each day. The Egyptian Leather Company near Cairo discharged in 1986 120-180 tons of chromium (a toxic heavy metal) per annum into the municipal waste water system and ultimately into the Nile.

It was reported in 1986 (USAID, unpublished) that the Misr Chemical Factory located near Alexandria discharged 10 tons of mercury per year into the Mediterranean. There are also significant impacts arising from oilspills and discharges from oil tankers in the Red Sea and the Gulf of Suez.

- *Discharges to air*

Although vehicles are the main source of air emissions in Egypt, there are also significant emissions of particulates, vapours, gases and smoke from industrial installations. Most industrial furnaces, for example, are fired by heavy fuel oil (Mazot) which contains a high percentage of sulphur (3-4 %), and ashes with a high content of vanadium oxides: this results in emissions of sulphur dioxide, nitrogen oxide, carbon dioxide, carbon monoxide and large quantities of particulates including fly ash, carbon particles, silica, alumina and iron oxide.

Evidence shows that emission rates from manufacturing industry point sources in Egypt exceeds standards applied in developed countries, but little research has been conducted to establish the extent of the problem.

For example, the Egyptian cement industry concentrated in Alexandria and Helwan emits an estimated 600,000 tons of cement (15% of Egypt's total annual production) into the atmosphere. The cement industry at Helwan is currently the target of a World Bank funded waste recovery and pollution control project.

- *Disposal of industrial waste to land*

Inorganic industrial waste sources in Egypt which are disposed of to land are diverse, but the most significant are fluorides and heavy metals (in particular lead, mercury and cadmium). Detergents are also disposed of to the soil, and can have an impact on soil degradation.

- *Disposal of hazardous waste*

Hazardous waste arises from both the major industries (eg. hazardous chemical wastes from dyestuffs and textile finishing plants, pickling wastes from iron and steel industry, tank bottoms from oil refining) as well as from the smaller industries. In many cases, in particular for the hazardous waste arising from small-scale industry, no special precautions are taken and the residues are often burned in open air or dumped. For the larger scale industries there is no coordinated system of hazardous waste disposal and management, and there is concern as to the methods of disposal by contractors.

- *Working practices*

The procedures by which many Egyptian industrial plants are operated are a major source of health and safety impacts on the people working in industry.

A comprehensive analysis of sources of industrial pollution has been undertaken for the Alexandria region (Hamza, 1991), which is the prime industrial centre of Egypt. This survey used as data sources the records of GOE ministries (mainly supplied by the industries themselves), and the

records of the industrial pollution project undertaken by the High Institute for Public Health between 1982-88 (much of which was gathered by monitoring equipment). A selection of the industries in each subsector of the survey is shown in Table 3.2a below. In addition, combining both the data for industry which was included in the survey (75 % of Alexandria's industry) with estimates for the remaining (largely small-scale) industry, the study estimated total waste loads for manufacturing industry in Alexandria. These are shown in terms of liquid effluents, solid residues and trace metals in Tables 3.2b to 3.2d. Although the numbers themselves may not be highly accurate, they certainly indicate the relative contribution of pollutants by different industries.

As a summary of industrial pollution impacts on Egypt's resource base, the following table (Table 3.2e) provides data at the gross level. This table shows contributions of industrial polluting emissions from public sector industry operated by the Ministry of Industry, which represents a major share of public sector industry, and approximately 50 % of Egypt's total industry including the public and private sectors. The figures for pollution have been obtained by questionnaire to industry as part of a study to prepare an industrial pollution map of Egypt, and therefore the results may be underestimated given that industries are likely to err on the side of underestimating their emissions.

3.2.2

Impacts on the Resource Base

- *Surface and Ground Water*

Discharges of industrial effluent find their way into irrigation and drinking water, with obvious harmful effects. The impacts of industrial waste water are combined with those from pesticides and other agrochemicals. The problems of industrial waste water discharges are aggravated by the fact that there is often little or no pretreatment before release, and release is often either direct to a receptor (river or other watercourse) or to a sewage system ill-equipped to cope with the treatment of polluted waste water before release into the river or the Mediterranean. This problem is especially severe around Alexandria.

Impacts on fisheries are a major cause for concern. For example, Lake Mafyut, lying inland from Alexandria where much of Egypt's chemical industry is located, is now almost biologically dead, compared to a situation in the 1970s when it produced over 7000 tons of fish per annum.

Sanitation is also an important impact. The heavy metal and volatile chemical content of Alexandria's city water system is now so high that the water is unsafe to drink.

Table 3.2a Sources of Industrial Pollution: A sample of Representative Industries from the Alexandria Metropolitan Area.

Industry	Employee	Raw Materials		Products	Production capacity (ton/y)	Type & Quantity of waste water		Pollution Load Kg/day			
		Material used	Quantity (Tons/y)			Waste water flow (m ³ /day)	Industrial %	BOD	COD	O & G	SS
El Nasr Wool & Modern textile company (STIA)	6318	<ul style="list-style-type: none"> • Wool 2685 • Cotton 6629 • Synthetic Polymer 348 • Rayon 2669 • Spins & worsteds 472 • Fabrics 2700 • Sodium Hydroxide 235 		<ul style="list-style-type: none"> Spinning Products 11692 Web Fabrics 16547 Outfit worsted 268 Outfit Fabrics 7771 		1140	66.5	348	287	18	280
Pulp & Paper Industry (Rabta)	2373	<ul style="list-style-type: none"> • Rice straw, wood 134805 • Pulp Bagasse, waste paper • Chemicals 16199 • Bleaching compounds 22308 		<ul style="list-style-type: none"> • Paper for writing & Printing 63500 • Cardboard 14000 		14000	91.1	10629	9076		
Miar Chemical Company	4281	<ul style="list-style-type: none"> • Acids, Bases & Salts 677111 		<ul style="list-style-type: none"> • Acids, Bases liquid 161827 • Oxygen peroxide 228 • Hydrogen gas 12760m³ • Chlorine gas 6276432m³ 		3500	90.9	1205	1326	610	
Alexandria Metallic Production Co.	2117	<ul style="list-style-type: none"> • Metallic Materials 36848 • Chemicals 230 • Pastes & Paints 50 		<ul style="list-style-type: none"> • Metallic Container 1192680 • Metallic Household Products 980 • Metallic household instruments 1110 • Other Metallic Forms 75(10³) • Nails 1300 		1350	85.2				
The Egyptian Bottling Co "Popal - Cola" Two Plants	512	<ul style="list-style-type: none"> • Sugar 2985 • Popalcola concentrate 5120 • CO₂ 421 • Sodium Benzate 1227kgm⁴ 		<ul style="list-style-type: none"> Popal Cola 4362927 (case) Soft Drink 		136	80.2	77	181		77
Salt & Soda Company Two Plants	3559	<ul style="list-style-type: none"> Cotton Seeds 260637 Oil & low grasses 62022 Chemicals 646 Cotton Seed Cake 41662 		<ul style="list-style-type: none"> Cotton Seed oil 32532 Purified Corn oil 855 Butter Products 54000 Animal Feed 35000 		3939	49.2	923	1442	27988	23775

Table 3.2b *Liquid Effluents from Industry in the Alexandria Metropolitan Area*

Industry	Discharge	Flow 10 ³ m ³ /d	BOD	COD (tons/d)	SR	O&C
Pulp & paper	S	150	143	267	113	3.2
Paper conversion	L,S,D	18	3.7	5.9	6.1	2.1
Textiles	L,S,D,	137	35.3	73.8	62.4	6.2
Dyes	S	14	12.1	27.1	11.4	0.2
Fertilizers	S	30	0.4	0.7	1.2	0.4
Steel	SE	65	1.2	1.9	1.3	0.9
Oil & soap	SE, L	80	43.5	76.9	53.1	18.4
Tires	SE	13	0.9	1.5	1.2	0.3
Refineries	S,L	230	28.7	66.7	63.4	10.3
Chemical (Inorganic)	S	85	13.5	15.8	60.1	3.6
Tanneries	S	18	12.9	15.9	28.1	1.8
Power	S	324	12.3	18.0	22.7	20.3
Match	L	2	0.6	1.1	0.7	0.2
Electronics	D	1	0.2	0.3	0.4	0.1
Refractories	D	0.5	1.1	1.3	1.9	0.2
Plastics	D	4	0.7	1.4	0.8	0.4
Bottling	SE	12	3.8	5.2	2.1	0.2
Canning	D	6	4.4	6.1	5.8	2.1
Dairy	D	1.5	0.9	1.3	0.87	0.3
Yeast & Starch	SE,L	5	3.6	4.5	3.8	0.1
Brewery	SE	7	1.3	1.8	0.6	0.2
Poultry and slaughter hour	D	4	3.4	5.6	7.9	2.3
Pharmaceuticals	SE	3	1.3	1.8	0.3	-
Grain processing	SE	18	1.7	2.4	1.4	0.3
Total		1229	330.5	604	456.4	74.1

S Sea outfall L Lake outfall D Drainage Canal
SE Sewerage network

Source: Hamza, 1991

Table 3.2c Industrial Solid Waste in the Alexandria Metropolitan Area

	Major constituents tons/d	Disposition
1. Inorganics		
A Water treatment	3300 precipitation&backwash sludges	slurry discharge to drainage canals
B Glass	2.6 cullet 0.2 fibre glass	recycle or re-use incineration
C Cement&ceramics	22 dust	air emission
D Iron & steel	30 slag	open dumping
E Foundries	6 foundry dust	reclaim or dumping
F Chemicals	20 salt refining&processing (CaCO ₃ , Ca(OH) ₂ , CaSO ₄)	direct discharge to the sea
Subtotal	<u>3810.8</u>	
2. Organics		
A Dyes & chemicals	260 organic residues and CaSO	controiled dumping
B Tyres	0.7 pastes and rejects scrap	reclamation reclaim or dump
C Textiles	30.9 reject textile&waste fibre	reprocessing
D Batteries	0.8 sludge (lead 6-9 percent)	dumping
E Plastics	0.9 rejects	reprocessing
F Paper	180 rejects and waste paper	reprocessing
G Tanneries	4 fleshing and rejects	glue manufacture
Subtotal	<u>481.5</u>	
3. Food		
A Poultry	35 viscera&feathers	animal feed
B Flour mills&bakeries	49 bread rejects&flour	animal feed
C Beer	0.5 fermentation sludges	animal feed
D Starch	10.4 processing residues	sewerage discharge
E Yeast	3.6 fermentation residues	swerage discharge
F Canning	33 vegetable&fruit residues 3 fish residues	animal feed animal feed
G Dairy	5 whey	sewerage discharge
H Edible oils	6 spent bleaching earth 0.3 spent sludge(Ni catalyst)	dumping dumping
Subtotal	<u>145.8</u>	
4. Metal and other hazardous wastes		
A Iron	1.3 pickling wastes	neutralization & dumping
B Metal cleaning	0.5 cleaning wastes, solvents	sewerage discharge
C Pharmaceuticals	0	
D Caustics	1.2	discharges to sea
E Oil refining	3.6 tank bottoms(intermittent)	dumping
F Municipal WWT	2 sludges	drying beds
G Service stations	2 crank case oil	reclamation
Total	<u>18.6</u> <u>4456.7</u>	

Source: Hamza, 1991

Table 3.2d Trace Metals in Industrial Effluent in the Alexandria Metropolitan Area

Source	Zn	Cu	Ni	Cr	ug/l Cd	Fe	Mn	Pb
Copper works	594	450	388	ND	ND	1392	144	209
Canning	1300	30	5	20	0.5	2200	340	30
Dairy	1144	185	234	210	0.5	3275	355	255
Tyres	6285	400	ND	1509	0.5	2550	205	45
Textiles	101	107	198	ND	2	320	119	102
Paper conver	11.3*	220	20	360	3	4050	480	410
Electronics	6250	70	ND	50	8	1525	373	255
Oil & Soap	5550	95	60	30	0.5	3625	445	285
Tanneries	2133	603	545	127 *	715	14*	970	1238
Inorganics	381	355	475	ND	29	1775	216	527
Foundry	8400	290	30	460	3	21800	630	260

* Concentrations in mg/l

ND = Not detected

Source: Hamza, 1991

Table 3.2e *Gross pollutant emissions for Ministry of Industry public sector industry*

Industry Sector	No. of sites	%	Production value (£E million, 1990)	BOD	COD	Oil	Suspended solids	Total Dissolved solids	Heavy metals
Tons per day, Q = 1.9 million m ³ per day (average flow rate)									
Food	119	36.1	5463	26	178	23	33	241	0.941
Chemicals	53	16.1	2227	182	142	110	168	666	0.171
Textiles	75	22.7	3996	39	47	24	64	191	0.3
Metal	11	3.3	2166	5	6.6	2	3	13	0.03
Engineering	31	11.8	1811	15	14	8	24	29	0.2
Mining	33	10	290	3	0.4	1	4	11	0.01
Total	322		15953	270	388	168	296	1151	1.65

Source: GOFI unpublished data, 1991

- *Marine Impacts*

The impacts on coastal waters arise from direct discharge, discharge via the Nile, and discharges/oil spills from oil tankers.

The Red Sea and the Gulf of Suez, both susceptible to impacts from oil tankers, are ecologically sensitive seas which have heavy tanker traffic. There have been several oil spills, such as the major spill in 1982 from production facilities in the Red Sea, causing oil deposits on the beaches and coral reefs.

- *Air*

The impact on the air quality is not well researched, although the studies that have been conducted indicate significant impacts. For example, suspended particles in atmosphere at Helwan, a major focus for the cement industry, reduce the solar radiation at noon by 12 % (54 % at sunset), and contribute to a high rate of respiratory illness in the population nearby. The dust also kills trees and plants.

- *Land*

The most significant causes of land degradation are the application of fertilisers and pesticides rather than disposal of industrial wastes to land. However, local concentrations of heavy metals from industry are significant enough to cause impacts on plant growth. In particular, disposal of hazardous waste to land results in serious short- and long-term impacts as the residues are often toxic, persistent and bio-magnifiable. In addition to the direct impacts, there are indirect impacts on groundwater pollution and sanitation.

- *Health and Safety in the Workplace*

Occupational health and safety practices result in significant impacts on human resources (the working population) in Egypt. During this mission it was not possible to acquire data on the extent of occupational health impacts.

2.3

AWARENESS OF ENVIRONMENTAL ISSUES

Awareness in Egypt of the importance of environmental issues generally arose in the academic community in the 1960s. As environmental problems have worsened, public attitudes have begun to change. In particular this is a reflection of the importance attached by Egyptians to the Nile, and the increasing pollution of the Nile.

There have been certain specific events which have highlighted the importance of environmental pollution in the people of Egypt. These include

the dramatic pollution of the beaches around Alexandria in 1985 which resulted in a large fall in tourism.

There is now greater media coverage of environmental issues than ever before in Egypt, but still the awareness of environmental issues is concentrated in the academic community and the Egyptian elite which has travelled extensively to developed countries where environmental issues are prominent.

It is difficult to comment on the attitudes of industrialists. In the public sector, GOFI now has an Environmental Department with some expertise in waste treatment and disposal, and strong relations with the Egyptian Environmental Affairs Agency, which has become increasingly prominent since its establishment in 1982. It is difficult to comment on the attitudes of plant managers and private sector industrialists.

An important development in the increasing awareness of industrial pollution issues has been the increase in the number of conferences dealing with the subject. Some of the more prominent conferences include the following:

- International Symposium on the Effect of Pollution by Liquid Industrial Wastes on Water Expenses, organised by the Academy of Scientific Research and the High Institute of Public Health in 1981.
- Industrial Pollution and Pollution Fighting Laws Conference, organised by Alexandria University in 1982.
- The First Regional Conference for the Protection of the Cairo Environment against Pollution, organised by the National Democratic Party and the Academy of Scientific Research, 1983.
- Symposium on Air Pollution and the Necessary Procedures for its Prevention, held at Alexandria University in 1984.
- The Scientific Panel on Hard Wastes in Egypt, organised by the Ministry of Health in 1985.
- The River Nile Symposium, organised by the Cairo governorate in 1985.
- The 3rd International Symposium on Industrial and Hazardous Wastes, held at the University of Alexandria in 1985.
- Regional Seminar on the Treatment and Re-use of Sewage Effluent, held in Cairo in 1988.
- International Seminar on Industry and Environment Applying Clean Technologies and Pollution Treatment, organised by GOFI and EEAA, Cairo, 1988

- **2nd National Conference on Environmental Studies and Research in Environmental Pollution, at Ain-Shams University, Cairo, 1990**
- **3rd International Symposium on Industry and the Environment in Developing Countries, Alexandria, May 1991.**

4

INDUSTRIAL POLLUTION CONTROL LEGISLATION AND POLICY

4.1

INDUSTRIAL POLLUTION CONTROL LEGISLATION

Principal environmental legislation relating to industry is as follows.

- Law 93, of 1962, on control of waste water. This Law made the control of waste water from industrial plants mandatory and it regulated the quality in the Nile and canals. The Law also gave the GOE authority to construct sewers.
- Decree No.10, 1969 on air pollution. This Decree established a committee under the Minister of Health for air quality protection. This committee was empowered to study sources of air pollution, to recommend policies to prevent air pollution, to establish an air quality measuring system, and to prepare legislation.
- Decree 470, 1971, on air quality ambient standards. This Decree followed from Decree No.10, and set ambient air quality standards and minimum air quality standards for workplaces. However, this Decree has not been enforced.
- Law 48, of 1982, amending Law 93. This Law (which is also known as the Clean Water Act) set stringent standards for the discharge of industrial waste water into watercourses, but there has been little monitoring or enforcement, and little public funding allocated to public sector industry to enable compliance.
- Decree No.380, of 1982. This Decree made it mandatory for all new public sector industries to have appropriate air and water pollution control measures included from the outset. In an additional Decree No.332, GOFI is required not to accept tenders for industrial projects which do not have appropriate pollution control.
- Forthcoming legislation: There are three important items of legislation coming into force shortly.
 - A framework law on environment is expected to be approved and become law in September-October 1991. This important law has several provisions, including new emission standards for % BOD. No details have yet been released.
 - A new law on protection of the marine environment is due to come into force in 1991. No details have yet been released.
 - A "Clean Air Act" is to be passed in 1991, setting standards and strengthening the legislation of Decree 470 of 1971.

4.2

INDUSTRIAL POLLUTION CONTROL POLICY

4.2.1

Environmental Plan of Egypt

As part of the 5 year plan, the EEAA has prepared an Environmental Plan for Egypt covering the plan period of 1987-92. This Plan has four components:

- Pollution control.
- Natural reserves.
- Monitoring networks.
- Protection of the Nile and waterways.

The Plan is still a valid list of priorities in the environmental field, and the aspects relating to industrial pollution control are shown in Table 4.2a.

As is clear from Table 4.2a, industrial pollution control by targeting factories for rehabilitation of technology is a very major component in financial terms of the whole plan. Funding for this and the other components will be provided by the Government of Egypt, but substantial donor funding will also be necessary to enable these projects to be implemented.

In addition to the Environmental Plan of Egypt, government ministries have their own programmes for combating environmental pollution. For example, Ministry of Industry's Programme for Industrial Pollution Abatement consists of the following components.

- Mandatory environmental pollution control for all new industrial projects
- Environmental protection in existing industries
- Technical support to EEAA
- Development of research and monitoring facilities.

4.2.2

Egypt's Policy on International and Regional Industrial Pollution Issues

Maritime Pollution

Egypt has long pursued a policy aimed at limiting pollution of maritime waters, although Egyptian industry remains an important source of pollution to the Mediterranean. Policy initiatives include:

- Egypt signed the Barcelona Agreement in 1978, which aims to protect the Mediterranean Sea against pollution.
- Egypt has participated in a number of studies and projects primarily aimed at preventing pollution of the Mediterranean from petroleum discharges.
- Egypt is a signatory to the Nicosea Charter adopted by 17 Mediterranean coastal countries in April 1990, the aim of which is to ensure better environmental protection. The signatories of the charter aim, partly with donor funding, to undertake a number of programmes which include:

Table 4 2a

Environmental Plan of Egypt: Industrial Pollution Aspects

Main Component	Sub-component	Actions	Total Cost
Pollution Control	Air Pollution	Preparing legislation for a clean air act, to be completed within the first year of the coming 5 year plan	
		Installing monitoring equipment in densely populated areas, industrial areas, recreational areas, and holiday resorts.	LE 300,000
		Recovery and treatment of fine dust issuing from cement factories, including: <ul style="list-style-type: none"> . repair of existing filters . local manufacture of filtering units . application of locally manufactured filters in chemical and other industries 	
	Noise Pollution	Preparing legislation	
		Installing noise control units on vehicles and in factories	LE 200,000
	Solid and Liquid Waste Management	A nationwide case study lasting 5 years	LE 2 million
Environmental Monitoring	Environmental monitoring	A project aimed at providing all national networks with necessary equipment for directing pollution control efforts (5 year project)	LE 4 million
Protection of the Nile and other Waterways from Hazardous Industrial Waste		Treatment of effluent from 44 industrial outlets discharging water into the Nile. (Program started in 1985 with 25 treatment operations at 19 priority factories at a cost of L.E 30 million; remaining factories scheduled to be covered in the 1987-92 period).	LE 500 million
		National contingency plan for protection of coasts and territorial waters from oil spills by tankers (already approved)	LE 20 million

- The setup of waste water treatment facilities in 100 coastal cities by 1995.
- Design of a strategy to eliminate toxic industrial waste pollution of the Mediterranean before 1993 and to create 25 controlled dumping sites by 1995.

Action on Ozone

Egypt has been active in relation to the Montreal Protocol in taking measures to reduce Egypt's CFC consumption. This has involved action by industry, especially the consumer industries such as the refrigeration, air conditioning, aerosols and plastics industries. Egypt does not produce any of the Group I or Group II controlled substances addressed in the Montreal Protocol, so the main activity has been in the adaptation of industrial processes and the manufacture of products so as not to use CFCs.

At the policy level, the EEAA in cooperation with the USEPA undertook a national case study on Egypt to estimate current and future demand for ozone depleting substances, to analyze the specific uses of these substances and to evaluate control options and associated costs. This study made the following recommendations, costing a total of US\$ 4 million for implementation.

- Hold a workshop on CFC-free technologies
- Demonstrate recycling of CFC-12 in auto air conditioners
- Recycle CFC-11 in chillers
- Substitute water-blown foam for CFC-11 blown foam
- Reduce CFC-12 charge in domestic refrigerators
- Substitute hydrocarbons for CFCs in aerosols
- Build ice plants for transport of perishables.

A project has been developed incorporating these measures aimed at reducing CFC emissions by 750 tons per year. Funding is being negotiated with the World Bank.

4.2.3

Progress in the Implementation of Policy

Progress in the Development of Legislation

As was shown in Section 4.2.1, Egypt now has a significant amount of pollution control legislation. Much of the existing and forthcoming legislation is strict in its wording and in the setting of rigid emission standards. However, the lack of enforcement of this legislation continues to be a major problem, and the legislation in itself has been ineffective in contributing to reductions in industrial pollution.

Progress in Institutional Development

As shown in Section 5, Egypt has a large number of institutions with responsibility for pollution control, and it has been successful in developing some of these institutions. In particular:

- The Egyptian Environmental Affairs Agency has been considerably strengthened since its establishment in 1982 (see Section 5.1)
- Capacity for monitoring of pollution control has been improved, and Egypt now has a number of well-equipped laboratories (see below). There remains an important need for training of staff at these laboratories and coordination of their activities within the overall environmental policy framework.

However, there remain important needs for institutional strengthening. Also there remains certain confusion over the responsibilities for pollution control, especially in terms of water pollution, and the enforcement of environmental standards.

Project by Project Approach

Perhaps the most tangible measure of the progress achieved in pollution control is in terms of the individual projects which have been implemented. This is partly because in Egypt it is possible, to a greater degree than is often possible elsewhere, to single out specific industrial plants which are key contributors of pollution.

This has been the approach of the Industrial Sector Pollution Control Project, financed by USAID and implemented by GOFI. The project had as its aims:

- Surveying industries to locate and define industrial pollution abatement needs.
- Implementation of programmes at identified sites to reduce adverse environmental effects of industrial discharges and emissions, in particular to mitigate the pollution problems of the most heavily polluting plants.

Of all the plants in the survey, 13 were selected for analysis of technological approaches to reducing pollution and improving productivity. These analyses were carried out by project teams, one for each plant, comprising US engineers, GOFI counterpart staff, US technical specialists as required, and Egyptian support staff (mostly from universities) contracted to GOFI; each plant was analysed in a period of 6 to 12 weeks. Of these projects, there were insufficient funds to implement all the projects at all the plants, and so a selection of subprojects at 6 plants were implemented, representing priority actions. Table 4.2b shows some of the projects targeted for implementation; most of these projects have now been implemented or are to be implemented by the time of the proposed finish of the overall project in 1992.

Table 4.2b

Industrial Plants Targeted by Industrial Sector Pollution Control Project

Company/Location	Product	Pollution issues	Proposed pollution control
Egyptian Starch Yeast and Detergent Company, Alexandria	Baker's yeast	High organic loading in wastewater due to loss of yeast cake material in the filtering process and packaging operations	Upgrading of existing product filtration and handling facilities to reduce effluent solids and increase yield
Egyptian Starch, Yeast and Detergent Company, Siouf, Alexandria	Rice starch and detergent	High BOD levels in discharged effluent (dewatered starch)	Improved separation equipment for the rice starch, which increases yield and meets compliance standards for discharge
Misr Chemical Industries (MCI) plant, El Mex	Inorganic chemicals	Large mercury losses in the waste streams (10 tons per year to the Mediterranean Sea), with a loading 500 times the international standard.	Removal of mercury by sodium sulphide precipitation, recovery of mercury from the precipitate.
Egyptian Leather Company, Basateen, Cairo	Finished hides and leather	Wastewater from the beamhouse, with high pH, high BOD, sulfides, total dissolved solids and total suspended solids; effluent with high concentration of chromium disposed to sewer	System for removal of chromium salts from the wastewater
El Nasr Company for Fertilisers and Chemicals (SEMADCO), Talkha	Nitrogen-based fertilisers	Discharge of ammonium nitrate from exhaust gas scrubbers serving the neutralisers (18 tonnes/day of ammonia and 5.5 tonnes/day of ammonium nitrate are discharged)	Installation of two new low-emission neutralisers and a new process control system. Recovered ammonia and ammonium nitrate permit a write off period of 2 years for the new equipment

Source: Grogen et al., 1985

The Industrial Pollution programme for the Nile, executed by GOFI, has likewise identified 32 industrial sites draining into the Nile, and executed 17 sub-projects to tackle industrial pollution, including:

- Nasr Coke Company, Helwan.
- Nasr Company for Fertilisers, Talkha.
- Abu Zabal Fertiliser Plant.
- 8 Sugar plants.
- 2 molasses plants.
- Masser Chemicals Spinning and Weaving.
- Masser Company for Dyeing and Spinning.
- Helwan Steel Mill.
- El Nasr Company for Fertilisers, Tulkha.
- El Maleya and Esenaya plant for fertiliser.
- General Company for Metallurgy.
- Alexandria Company for Oil, Soap and Soda.
- El Nil Company for Oil and Soap.
- Kema Fertiliser Company, Aswan.
- Varta Paper Company.
- El Nasr Company for Food.
- Starch and glucose plant in Cairo.

This project by project approach has certainly achieved control of the pollution problems of some of the major polluting industries in Egypt. There have been a number of additional initiatives also targeting specific plants, funded by a variety of donor agencies and the Egyptian government. However, in comparison to the total number of plants that need tackling for their pollution control, the number of projects that have been implemented remains very small. Less than 10% of the plants identified by the Industry Sector Pollution Control Study have had pollution control equipment installed.

Monitoring and Enforcement for Control of Industrial Pollution

Egypt has made considerable progress in building its capacity for environmental monitoring, and it currently has a number of institutions engaged in the monitoring of industrial pollution to air and water. These include the following:

- **Centre for Environmental and Occupational Health:** The Centre has established networks for the monitoring of air pollution (9 stations on the network) and water pollution (11 stations on the network). The water pollution section has facilities for monitoring inland waters.
- **National Research Centre:** NRC has three environmental laboratories focusing on industrial pollution, one for air pollution, one for water pollution, and one for worker health. NRC has also established a Nile River Databank of data on the quality of the Nile's water, with USEPA support.

- **High Institute of Public Health (Alexandria):** The High Institute is a semi-independent branch of the University of Alexandria, which was considerably strengthened in the 1970's through funding by USEPA. The Institute has a well-developed laboratory for research on occupational health and environmental pollution. The Institute has a mobile laboratory which has been used for air and water pollution measurement in industrial pollution research.
- **El Tebbin Metallurgical Institute (TIMS):** The El Tebbin institute is a research institute for the metallurgical industry, under the Ministry of Industry. It has a well equipped laboratory for the monitoring and analysis of industrial pollution based at Helwan near Cairo. This laboratory has been funded by grants from USAID and other donors so that it now has good equipment and 6 technical staff.
- **Remote Sensing Centre:** The Remote Sensing Centre is an Egyptian national centre conducting research using satellite imagery for a number of purposes, which can include industrial pollution. The institute was established in 1972.
- **Meteorological Authority:** The Meteorological Authority has several laboratories and monitoring stations for air pollution. Stations for reference meteorological data are located at Sidi Barrany, Sewa and Hurgada, where measurements are made of concentrations of suspended particulates, carbon dioxide, and other gases.
- **Additional institutions:** Departments of several of Egypt's universities also have laboratories with facilities for research into industrial pollution.

During the preparation of this report, the consultant was unable to examine the work of these institutions directly. However, there appears to be a lack of coordination of the different activities of these institutions. Although the institutions have a good basis for the examination of industrial pollution, there is no coordinated programme for monitoring of different industries, and there remains limited hard data on pollution emissions from industrial sites.

In addition, these institutions have not been actively used by the government ministries to which they are linked for the purposes of enforcement of water and air pollution standards.

One vehicle for the control of industrial pollution is the registration of industrial facilities in terms of their environmental aspects. In recent years GOFI, which is responsible for registration of new Egyptian industry, has required companies to detail their industrial pollution emissions and effluents as part of the registration procedure. It is too early to tell how this information will be used in assisting pollution control, but at the very least it should provide a useful database once more industries are registered in this way.

4.3

FINANCING FOR POLLUTION CONTROL

Throughout this report reference is made to the sources of funding for the pollution control projects and programmes identified. In terms of donor activity, the major projects undertaken by each donor are described in Section 5.1. It has not been possible in this mission to assess funding sources systematically.

4.4

COSTS AND BENEFITS OF CORRECTIVE ACTION/NON ACTION

There has been little effort to evaluate the costs and benefits of action versus no action on a systematic or comprehensive basis. However, on a plant by plant basis, some estimates have been made. It is clear that many of the industrial pollution emissions have a high value if they can be recovered.

For example, at the Misr Chemical Company near Alexandria, it has been calculated (USAID, unpublished 1986), that chemicals and compounds with a monetary value of around £E 15 million per annum are released as liquid waste, whereas the estimated capital cost of recovering the wastes is under \$US 15 million. Similarly, the cement industry could recoup the capital outlay required to recover the cement dust from its smoke stacks in less than two years. Also the brown mud from the sugar cane factories which is now released directly into the Nile could be captured through a relatively simple process and used as a soil conditioner for which it is well suited. These industries are all currently targets of donor funded pollution control projects (see Section 5).

Of course, even these calculations do not take into account the indirect monetary benefits of money saved by the reduced need for cleanup, or the more other benefits of a cleaner environment in terms of tourism revenues, improved fish catches and quality of life.

5 **INSTITUTIONAL CONTEXT FOR POLLUTION CONTROL**

5.1 **KEY INSTITUTIONS**

The key institutions concerned with industry and industrial pollution control are as follows.

5.1.1 **Government Agencies**

Egyptian Environmental Affairs Agency (EEAA)

Role The EEAA was set up by decree (no. 611) in 1982, along with the High Committee for Environmental Affairs, the functions of which were transferred to EEAA in 1985. The EEAA reports directly to the Minister of Cabinet Affairs, currently Mr H.E. Atef Ebeid. The role of EEAA is as follows:

- To prepare a national plan for environmental studies.
- To study foreign environmental legislation and propose environmental legislation for Egypt.
- To make recommendations for action by, and support to, other Egyptian agencies.
- Information exchange within and outside Egypt.
- To recommend standards for industrial emissions and worker health and safety.

The EEAA does not have regulatory powers, but rather can advise and make recommendations. It can use its own funds to encourage line ministries and other agencies to carry out environmental projects.

Action The EEAA was limited in its activity before 1985, when the GOE strengthened its staff and financial resource base. EEAA now has an enlarged staff, and branches in the governorates to supplement its headquarters in Zamalek, Cairo. EEAA is currently (July 1991) in a state of reorganisation and development, and new staff are being hired. The new structure comprises the following technical departments:

- Water and shore protection projects.
- Air protection projects.
- Projects for protection from solid waste, noise and toxic substances.
- Natural protectorates policy.
- Tree planting and park development.
- Environmental education and community sharing projects.
- Information and computer center.

EEAA prepared the Environmental Plan for Egypt, and have prepared numerous projects for industrial pollution control. Interaction with GOFI on the treatment of industrial waste water has been one of EEAA's major foci of

in the field of air pollution control (primarily focusing on vehicle emissions rather than industry), and the investigation of potential GOE action on CFCs. In addition, EEAA is the agency most closely associated with the preparation of the Egypt National Report for UNCLD.

General Organisation for Industrialisation (GOFI)

Role GOFI is an independent arm of the Ministry of Industry, responsible for the planning and implementation of public sector industrial projects, as well as private sector joint venture projects. GOFI has an Environment Department with staff responsible for air pollution, solid waste, waste water, industrial safety and research, in addition to the other Departments (Chemical, Crude Industries, Textiles, Engineering, Metallurgical, Electronics, Mining, Research). Following the legislation of 1982, GOFI has taken on responsibility for ensuring that new projects comply with Law 46 on industrial pollution.

Action GOFI has become active in industrial pollution control in the following ways.

- GOFI has implemented pollution control projects aimed at retrofitting existing industrial plants with pollution control equipment and waste treatment facilities.
- GOFI contracted consultants to undertake a major survey of industrial pollution on a plant by plant basis to identify pollution control projects. Of 330 manufacturing plants identified for pollution control projects by 1987, 16 major projects have so far been implemented.
- GOFI administers the registration of industries with over 5 employees, and currently the registration form requires information on polluting emissions and discharges. This register, which has only recently taken on board environmental issues, will form a major database for the analysis of industrial pollution.
- GOFI has received extensive GOE funds for pollution control on the Nile, and has executed 17 sub-projects.

Ministry of Industry (Moi)

Role: The Ministry of industry is responsible for the operation of Egypt's public sector industry, which it carries out through GOFI (above). However, it plays a role separately to GOFI in the development of policy on pollution control. The El Tebbin Metallurgical Institute falls under the jurisdiction of the Moi, and has a well equipped laboratory for monitoring industrial pollution based in Helwan.

Ministry of Public Works and Water Resources

Role: This ministry issues permits for waste water discharge by industry and municipalities. However, the Ministry has limited resources and capacity for measuring the impact of these discharges on the environment. There is also

potential overlap of interests as the Ministry both administers discharge permits and is responsible for the main water utilisation functions.

Centre for Environmental and Occupational Health

Role: The Centre for Environmental and Occupational Health is an independent entity within the Ministry of Health, established to undertake environmental monitoring for the Government of Egypt. The Centre has responsibilities under the Laws 93 and 48, mainly for the surveillance of environmental parameters affecting public health, but also for water quality, air quality and soil conditions. The Centre is funded by the Ministry of Health and the EEAA, and it has also received substantial support for the acquisition of equipment from USAID, UNDP, WHO, UNICEF and UNEP.

Action: The Centre has established networks for the monitoring of air pollution (9 stations on the network) and water pollution (11 stations on the network). However, there is no evidence that the Centre has played any role, through the Ministry of Health or the EEAA, in the enforcement of water or air emission standards.

Ministry of Health (MoH)

Role: The Ministry of Health is responsible in theory for the monitoring of industry and the enforcement of environmental standards. The Centre for Environmental and Occupational Health is now well equipped to undertake monitoring, but enforcement of environmental controls has not occurred in Egypt yet.

Ministry of Housing, Utilities and New Communities

Role: This Ministry has responsibilities for municipal waste, waste water and sewerage. Its responsibilities do include some industrial waste waters; for example the Ministry owns and operates the cement industry, which is a major polluter. The Ministry also has responsibilities for the enforcement of water pollution standards under Law 93 (of 1962) and Law 48 (of 1982).

Action: It was not possible during this mission to establish the environmental actions undertaken by this Ministry.

General Petroleum Company (GPC)

Role: GPC is a government holding company with responsibility for oil spill clean up.

5.1.2

Universities and Research Institutes

Academy of Scientific Research and Technology (ASRT)

Role: ASRT has 11 councils for scientific research, including a council for research into environmental issues. Research areas are in environmental

pollution, occupational health, environmental mapping of natural resources and environmental education. The National Research Centre is part of the ASRT.

National Research Centre (NRC)

Role: The NRC was established in 1939 and undertakes pure and applied research in 15 specialised branches spanning industry, agriculture, public health and other aspects of the national economy. In relation to industrial pollution, which falls under the Environmental Science Division, the key components are the laboratories for water pollution, air pollution and worker health.

Action: NRC has three environmental laboratories focusing on industrial pollution, one for air pollution, one for water pollution, and the other for occupational health. On the air pollution side, NRC has an integrated research team with expertise in pollution chemistry, environmental engineering, industrial medicine, public health, the effects of pollutants on soil and plants and the relation of pollution to climate. This team has conducted several studies in Cairo, Upper and Lower Egypt. There is a similar team on the water pollution side. The worker health laboratory conducts research into health and safety in the workplace in Egyptian industry. NRC has also established a Nile River Database of data on the quality of the Nile's water, with USEPA support.

The Environmental Science Division submits its own proposed research programme, closely focused on the perceived needs of the country, to the ASRT for funding. In addition the Division's branches undertake work on a consulting basis for private and public sector industry. This consulting work arises, for example, when an industrial company is required or wishes to implement measures to enable it to meet legal pollution control standards. The Division also runs training courses and supervises masters and PhD students.

High Institute of Public Health (HIPH)

Role: The High Institute is a semi-independent branch of the University of Alexandria, established in 1956 by the Ministry of Health and the World Health Organisation, which was considerably strengthened in the 1970's through funding by USEPA. The Institute has a well-developed laboratory for research on occupational health and environmental pollution. The institute provides postgraduate courses (diploma, masters and doctoral degrees) in industrial environmental pollution control and occupational health. The Institute is also active in consulting on environmental health to public and private sector industry. There are 65 professors in the institute.

Action: The High Institute has been active in research into occupational health and industrial pollution issues both within and outside the factory. The Institute is becoming more active in consulting and in providing assistance to develop and implement pollution control programmes ranging

from the provision of new technology to running training programmes. The High Institute is currently pursuing significant programmes in the development and implementation of innovative clean technology for Egyptian industry, and the development of human resources in industry for pollution control.

Institute of Environmental Studies and Research, Ain Shams University

Role: IESR was created in 1983 as an independent institute of Ain Shams University, and functions as a graduate school in environmental studies. Together with Alexandria University, Ain Shams is the only university in Egypt offering graduate degrees in environmental science, although other universities offer courses in related disciplines.

National Centre for Industrial Safety Studies

Role: The centre studies all aspects of industrial worker health and safety, which includes environmental impacts on worker health in industrial workplaces. The centre also provides training to Egyptians and nationals of other African countries.

Institute of High Dam Effects

Role: This Institute is part of the Water Research Centre of the Ministry of Irrigation. It is starting to collect data on the water quality of the River Nile.

Remote Sensing Centre

Role: The Remote Sensing Centre is an Egyptian national centre conducting research using satellite imagery for a number of purposes, which can include industrial pollution. The institute was established in 1972.

5.1.3

Non-Governmental Organisations

There are relatively few NGOs active in Egypt. Those which do have some focus on environment are listed below, although their activities in the context of industrial pollution have not been investigated in this report:

- Arab Office for Youth and Environment.
- Conservation Organisation for National Wealth.
- Egyptian National Man and the Biosphere Committee.

5.1.4

Private Sector Institutions

Although there is an increasing move towards the privatisation of industry, most industry (75%) is still in the public sector. During the preparation of this report, the consultant did not encounter private sector institutions working in the field of industrial pollution control, besides the individual companies involved in specific donor-funded pollution control projects.

5.1.5

Donor Agencies

This section focuses on the industrial and pollution control activities of the multinational and bilateral donors active in Egypt.

World Bank

At the time of preparation of this report (June/July 1991) the World Bank is undertaking project identification and feasibility study for a major energy conservation and industrial pollution control project in the Helwan area, taking in three cement factories, the iron and steel complex, the coke chemical complex, the national metal company, the Helwan company for refractories, the Helwan textile company, and the Cairo South power station. This project, entitled Industrial Restructuring, Energy Conservation and Pollution Control, will focus on the following:

- Energy conservation/pollution control investments - efforts directed towards selecting, designing, installing and operating energy efficient/pollution control equipment and technology that are economically, financially, technically and environmentally viable.
- Development of capabilities in the industrial plants to improve energy efficiency and reducing pollution through proper management techniques, processes, preventive and operation maintenance, and establishment of an air pollution management programme that will address pollution prevention on a continuous basis.
- A restructuring programme to assist selected plants in increasing their efficiency and productivity on the basis of sound economical and financial investments.

In parallel with the project preparation, the Government of Egypt will carry out an environmental impact assessment of the selected industrial plants in the Helwan area.

The World Bank is currently (July 1991) organizing the financial package for the preparation of this project, and is seeking support from other international donors for the amount of \$ 1 million, half of which is for a major environmental assessment of the Helwan area.

The World Bank is also to participate in a workshop on Egypt's environmental master plan which is scheduled for September 1991.

World Health Organisation

WHO have been the executing agency of a UNDP funded project implemented by EEAA targeting institutional strengthening and training in environmental management in Egypt. One of the Egyptian institutions receiving assistance has been the Environmental and Occupational Health Centre.

USAID

USAID is a major donor in Egypt, with industrial projects taking an important share of the total funds. In the past USAID has promoted improvements in industrial productivity in the public sector; currently the main emphasis is on assistance to develop opportunities for private sector industry. USAID has a number of recent and ongoing projects aimed at industrial pollution control, including the following. These projects are discussed in further detail in Section 6.

- USAID has funded the development of waste water treatment facilities in Cairo, Alexandria and other parts of Egypt. Although these are primarily for the treatment of municipal sewage, they do have a role in the treatment of some industrial waste water.
- USAID funded a US\$ 28 million project to assist GOFI in evaluating the adverse environmental impact of existing public sector industries. The project selected a small number of industries for retrofitting with pollution control equipment. This project is part of the Industrial Production project started in 1978 and due for completion in 1992, with a total funding for the overall project of \$US 130 million. Improvements in industrial pollution control have been carried out at 5 industrial companies under the project, with the final one due for completion in 1991/92.
- USAID is currently funding a project to evaluate the potential for implementing energy conservation measures at industrial plants in the Helwan area. These will indirectly have an impact on industrial pollution.

Commission of the European Communities

The CEC through its Delegation in Cairo does not have specific industrial pollution projects underway, although it is active in the field of environment, with a primary focus at present on marine conservation. However, there are industrial pollution components to the following on-going EC funded projects.

- A pilot project submitted by the EEAA was financed for the installation of a floating reception facility in Port Said to collect oil residues from large ships. In addition, funds under the Third Protocol have been used to finance a study of the oil pollution situation at the mouth of the Gulf of Aqaba, and the possibility of establishing an oil pollution combatting emergency centre. A two phase action plan to set up the centre has been proposed, and the first part is currently underway, focusing on the marine park area at Ras Mohamed.
- EC is a joint contributor (with the Netherlands and Italy) to the funding of the Helwan wastewater scheme for the treatment of industrial and domestic wastewater, which has been underway since 1985. The aim is to

treat the wastewater so that it can be used for irrigation. Firms connected to the scheme must have a pretreatment facility.

- In 1989 the EC funded a wastewater management course in Alexandria.
- The EC is funding a wider project targeting the Mediterranean, the Mediterranean Special Programme of Action (MEDSPA), which is an extension of the ENVIREG programme. It is possible that in the future, industrial pollution control projects could be funded in Egypt under this programme.

British Aid

British Aid has been focused on the major Cairo Wastewater Project, which is aimed at municipal waste treatment rather than industrial wastewater. British activities related to industrial pollution include the following:

- UK is funding a training project for the training of National Research Centre (NRC) staff who are working in the monitoring of air and water pollution in Egypt.
- In 1988 UK sponsored a workshop on environmental impact assessment for the EEAA, although this was not well attended.

The British Embassy Commercial Section is preparing an internal report on industrial pollution and wider environmental issues at the time of writing this report (July 1991).

Canadian Aid

CIDA is actively involved in projects with environmental components. The key project with an industrial pollution component is the River Nile Protection and Development Project. Started in 1987, and projected to run until 1992, this project is financed by a CIDA contribution of \$Can 10 million. The counterpart agency is the Water Research Centre, which is linked to the Ministry of Public Works and Water Resources. The project aims at coordinating existing data and improving the monitoring of the side effects of development projects in the Nile Basin, including new industrial complexes.

German Aid

The industrial sector has been the target of a significant proportion of German bilateral aid. Key projects include the following:

- Individual industrial plants have been targeted for rehabilitation to reduce their pollution emissions and effluents. The most important one is the Misr Chemical Company, which (as was mentioned in Section 3.2) is a major source of mercury being dumped into the Mediterranean.

- A grant of DM 25 million has been agreed via KfW (the German agency for financial assistance) for the installation of filters or the change of technology at three cement works in Helwan and Alexandria, to reduce air pollution and recover cement dust. There is also a training component.
- GTZ have been active in a seminar organised jointly with the Goethe Institute and the Governorate of Kalubea concerning industrial pollution in the Shoubra el Kheima region north of Cairo, one of the most heavily polluted parts of Egypt. The seminar has reached a number of conclusions concerning the establishment of institutions to manage pollution control and the enforcement of environmental legislation in the region, and it is likely that this seminar will be the start of further work in the Shoubra el Kheima funded by GTZ.

Currently there are no on-going pollution control projects by GTZ (German Technical Assistance Agency), but environment has a high priority with GTZ. In November 1990 a GTZ pre-appraisal mission came to Egypt and identified industrial pollution and environmental issues generally as important for potential funding; the two governments are to meet in November 1991 and it is possible that technical assistance in the environmental field will be agreed.

In addition, the Friedrich Ebert Foundation, a German NGO which receives funding from the German Socialist Party, has been operating in Egypt since 1980 and has a number of environmental activities based on an agreement signed with the Egyptian government in 1989, including industrial pollution control. EEAA is the counterpart for technical assistance. Friedrich Ebert Foundation has been especially active in the promotion of awareness of industrial pollution problems, and the organisation of meetings between relevant parties to discuss industrial pollution problems. Meetings have been organised between the representatives of industry, the Ministry of Planning and the firms producing waste treatment facilities in an attempt to study the obstacles to the implementation of Law 48 on the protection of the Nile.

Friedrich Ebert is also actively involved in assisting GOFI and EEAA in the preparation of a map of industrial pollution in Egypt, which shows the location of factories in the public sector, and is associated to a set of data on the industrial pollution of each plant which has been collected by questionnaire.

Friedrich Ebert have also recently prepared with GOFI a report on environmental pollution in the major cities of Egypt, but the consultant was unable to obtain a copy during the preparation of this report.

Dutch Aid

There are environmental components to a number of Dutch funded projects, including the Helwan wastewater scheme (with the EC and Italy).

The Development Cooperation Section of the Dutch Embassy has recently (February 1990) commissioned a report entitled *Environmental Policies and Environmentally Oriented Activities of the Egyptian Government and Some Major Development Aid Donors in Egypt*.

Japanese Aid

The Japan International Cooperation Agency (JICA) office in Cairo has recently commissioned an internal report on environmental issues in Egypt which covers industrial pollution and makes recommendations on possible funding by JICA. However, the document is "classified" and could not be obtained by the consultant during the preparation of this report.

5.2 **INSTITUTIONAL CAPACITY FOR POLLUTION CONTROL**

5.2.1 *Institutional Coordination and Management*

The roles and activities of the Egyptian government and other agencies engaged in pollution control have been examined in Section 5.1. Institutional coordination is a key issue in the tackling of industrial pollution, and institutional coordination of pollution control activities has improved significantly since the establishment of the Egyptian Environmental Affairs Agency and its strengthening in recent years. Nevertheless, the coordination of industrial pollution control activities remains an important focus for policy development in the future, as indicated by the following examples of the overlap of responsibilities for different aspects.

- *Responsibility for Industry* Responsibility for industry in the public sector is dispersed between ministries. The Ministry of Industry is responsible for 322 industrial sites in 6 sectors (not petroleum), totalling a production value of £E 16 million (1990 figures, GOFI, unpublished); this represents approximately half of all Egyptian private and public sector industry. Other ministries are responsible for particular industries: the Ministry of Housing, Utilities and New Communities has responsibility for the cement industry, and the Ministry of Health has responsibility for the drugs industry. This means that pollution control programmes run by one Ministry (eg. the programme to map industrial pollution in Egypt, being implemented by GOFI and EEAA) may only cover the industries run by that Ministry, even though it would be sensible for all public and private sector industry to be covered.
- *Responsibility for Enforcement of Pollution Standards* There is overlap particularly in the responsibility for the enforcement of water pollution standards in Law 48. Following the passing of Law 48, GOFI was given responsibility for its enforcement for new industry. However, the Ministry of Health also has responsibility for implementing environmental standards. The Ministry of Housing also has responsibility for wastewater and sewerage, including some industrial waste-waters, and for implementing Laws 48 and 93. The Ministry of Irrigation also has some

responsibilities for water pollution control. In practice, enforcement has tended to occur from the Ministry of Health and the Ministry of Irrigation: inspectors from these Ministries sample effluents from industrial plants and have on occasion used the police to bring polluting industrialists to justice in the courts. However, this is a very unsystematic way of enforcement.

- *Responsibility for Registration and Discharge Permits* GOFI administers registration for all new industries over 5 employees in size. The Ministry of Public Works and Water Resources is responsible for administering discharge permits, however. Both these agencies have potential conflicts of interests in that they both run public sector industries and regulate them.

5.2.2

Human Resources

Egypt has an unusually high level of education among its population, and a pool of environmental experts much larger than that found in most developing countries. There are several large and well-established universities, all of which run courses in subjects related to industrial pollution. It is also possible to undertake postgraduate studies in Egypt in industrial pollution, for example by affiliation to the environmental laboratories of the National Research Centre in Cairo. Egypt is therefore well equipped to meet its training needs in the industrial pollution field through its universities and other educational institutions.

During the preparation of this report, the principal human resource needs in the field of industrial pollution which were identified were as follows.

- There is a need for training at the industrial plant level ("in-plant training") in simple "good housekeeping" practices (eg storage and handling of raw materials, maintenance of filters etc).
- There is a strong need for awareness raising at the industrial plant level as to occupational health hazards and the impacts of industrial pollution.
- At the educational level there is a need to strengthen the institutional capacity for training technicians to "diploma" level, to work in the wastewater treatment plants being set up in Egypt, and which are currently short of trained staff.
- For environmental engineers engaged in pollution control within the government agencies, there is a need for visits to plants in operation in developed countries with equipment which is appropriate for installation in Egypt. This reinforces the argument that Egypt has sufficient trained people in the theory of pollution control, and that Egyptian experts need practical experience.

5.2.3

Equipment

This section deals with the equipment needs of the institutions dealing with pollution control rather than the huge needs for pollution control equipment in the industrial plants of Egypt themselves.

Egyptian industrial pollution control laboratories are well equipped, as has been discussed in Section 4.2. There are additional individual items of equipment needed at specific laboratories (eg equipment for the measurement of atomic absorption has been identified as an equipment need at El Tebbin Institute of Metallurgical Studies). However, there is not a need for new laboratories with extensive new equipment.

One equipment need that is significant is the need for provision of new and improvement of existing computing capacity for EEAA and GOFL. In particular the new database being compiled as part of the project to produce a map of industrial pollution in Egypt should be computerised.

5.2.4

Information Storage and Exchange

One of the most significant problems faced in execution of this mission was in the acquisition of information on environmental pollution. There is a huge wealth of reports, conference proceedings, memoranda, environmental profiles and other miscellaneous documents, located in a variety of different institutions. Also these documents tend not to be located in central information stores within institutions, but with specific individuals. There is an important need to establish an environmental information centre, probably in EEAA, where all relevant environmental information is stored. Mechanisms for update and exchange of information should be established.

5.2.5

Role of Women

Egypt has a policy of equal employment opportunities for women. However, such policies exist in many countries where in practice women do not in reality have equal opportunities.

Figures quoted by the World Bank (1977) from the Ministry of Industry show that female employment accounted for only 5 % of total employment in industry in 1970, the low figure being attributed to social and cultural barriers. Since 1970 the proportion of women engaged in industry has almost certainly risen, in particular in the textiles sector, although in the preparation of this report the consultant was unable to obtain recent figures for the employment of women in industry.

6 NATIONAL PRIORITIES, EXISTING AND POTENTIAL FUTURE INITIATIVES

6.1 NATIONAL PRIORITIES FOR INDUSTRIAL POLLUTION CONTROL

The Egyptian national priorities for industrial pollution control will be indicated in the UNCED report. The following list represents the priority issues as perceived by the consultant, and does not seek to portray the views expressed in the UNCED report, which at the time of writing has not been officially released.

Sectoral Priorities

- Prevention of pollution to the River Nile
- Prevention of pollution to the Mediterranean
- Safe treatment and disposal of hazardous waste
- Prevention of air pollution from industrial sources
- Improvement of occupational health and safety

Environmental Management Priorities

- Development and coordination of environmental legislation and policy
- Enforcement of environmental controls
- In-plant environmental / occupational health & safety training of industrial workers
- National education on industrial pollution issues

6.2 RECENT, ON-GOING AND NEW INITIATIVES

Table 6.2a provides a summary of key initiatives in industrial pollution control. The table shows completed projects, ongoing initiatives and projects which are currently being developed and proposed. Although this list is not exhaustive, it does show the major projects which have targeted or are targeting industrial pollution control.

Table 6.2a *Recent and On-going Projects and Programmes in Industrial Pollution Control*

Title	Agencies involved	Duration	Description	Cost	Status
Environmental Plan for Egypt	Egyptian Environmental Affairs Agency	1987-92	Environmental plan of action corresponding to the 1987-92 5 year plan, with components in pollution control, environmental monitoring and protection of the Nile		Parts have been implemented
Programme for Industrial Pollution Abatement	Ministry of Industry		Programme with components on mandatory pollution control for new industry, environmental protection for existing industry, technical support to EEAA, and development of research and monitoring		On-going, with some parts implemented
Industry Sector Pollution Control Project	Funded by USAID, executed by GOFI	1978-92	Major project to survey public sector industry, and identify key plants where pollution control can be implemented, and to implement measures within the budget	\$US 130 million funding to date from USAID	6 plants have had major industrial pollution abatement projects, including upgrade or replacement of old technology
Industrial Pollution Control of Plants Draining to the River Nile	Funded by GOE, with donor support, executed by GOFI	1980s-ongoing	Major project to identify pollution control requirements for 32 industrial plants draining directly to the Nile; 17 sub-projects have been implemented		17 sub-projects implemented, 33 site studies undertaken
Assessment of Impacts of the Construction of the High Dam	Funding from USAID, project team included Ann Arbor University, Egypt National Research Centre	1975-82	Major project to compile a data base of samples of the River Nile, including analysis of industrial pollution, and preparation of recommendations for reducing pollution		Completed, and partly resulted in passing of Law 48
Preparation of a Map of Industrial Pollution in Egypt	Executed by EEAA, GOFI, part funded by Friedrich Ebert (German NGO)	on-going	Project to use questionnaire survey of all MoI public sector industrial plants, to compile databank on pollution, and to generate a map showing location of all plants		Preliminary results compiled but not published yet

Title	Agencies involved	Duration	Description	Cost	Status
Integrated study of an Industrial Complex in Alexandria	Executed by High Institute of Public Health, Alexandria, funded by USEPA	1978-82	An integrated study of an industrial complex comprising textiles, edible oil production, yeast, starch, match production, industrial gas production industries, all of which discharged untreated effluents into Lake Maryut. A pilot waste water treatment facility was erected to control pollution.		Completed
Industrial Pollution Project	Executed by High Institute for Public Health, Alexandria, in cooperation with USEPA	1982-88	Studies were undertaken of industrial pollution throughout the Alexandria region in a cross-section of industries. Each industry was analysed in terms of waste characterisation, treatment and in-plant control. A mobile laboratory was used for measuring wastewater effluents and solid waste. In some plants clean technology solutions were implemented.		Completed
Innovative Clean Technology	Currently Phase I executed by High Institute of Public Health, Alexandria, with funding from STC. Further phases anticipate funding by USAID (Phase II), and other donors (Phase III)	1991-1997	The first phase was to conduct an initial survey of industry and pollution in the Alexandria region, and to identify the potential for clean technology applications in industry. Phase II will be further detailed research, and Phase III implementation.	Phase II budget: £E 830,000 Phase III budget: £E 3 million Funding for Phases II and III still being arranged.	Phase I complete.

Title	Agencies involved	Duration	Description	Cost	Status
Human Resources and Manpower Development for Industrial Environmental Management	Executed by High Institute of Public Health in Alexandria, funded by USEPA	1990-1993	This project aims at developing human resources for industrial environmental management at 3 levels: <ul style="list-style-type: none"> • key decision makers in industry • engineers and chemists in each sector • foreman and workers in industrial plants 	Additional funding from other sources may be required	Training workshops held in the High Institute have started, but not yet in-plant training.
Industrial Restructuring, Energy Conservation and Pollution Control Project	Government of Egypt and World Bank	Currently (July 1991) under design	The project focuses on the industrial plants in Helwan, and will aim to select, design and install energy efficient / pollution control equipment that are economically and environmentally viable, as well as to develop capabilities within industry for the management of pollution control. The project will include a major environmental assessment of industrial activity in the Helwan area.	Funding package currently being arranged	Project is currently being designed.
Development of Environment Protection Manufacturing Industry		Not started yet (July 1991)	The project aims to provide seed money and knowhow to assist the establishment of an industry to manufacture pollution control equipment in Egypt.	Currently unidentified	Project under formulation
Industry/Nile River Interrelationship			Investigation and recommendations for clean up of River Nile from industrial pollution.	Currently unidentified	Project under formulation
Sugar industry environmental protection			Project to examine pollution from the sugar industry in Egypt, make recommendations and implement solutions.	Currently unidentified	Project under formulation

6.3 **POTENTIAL FOR FUTURE ACTION**

6.3.1 **Provision of Pollution Control Technology in Industry**

During the preparation of this project it has not been possible to identify specific industrial projects that need to be targeted for pollution control, beyond those which have already been identified. There is certainly an important need for funding of pollution control technology and implementation in Egypt, and the following are recommendations as to how this should best be achieved.

- **Development of an Area-Wide Approach** Many industrial plants in Egypt are clustered into key industrial regions. These include, for example, the Helwan area and the Shoubra el Kheima area. It is appropriate to develop area-wide programmes for tackling pollution from industry in these areas, including the development of shared waste treatment facilities, combined in-plant training schemes, provision of pollution control equipment in several plants bringing economies of scale. This approach is being taken up in recent initiatives, such as the World Bank work targeting the Helwan area, in which an environmental assessment of the whole area is to be undertaken. This approach is recommended for other regions in Egypt. Of key importance here is the coordination between donors, as area-wide programmes will often be too large for funding by a single donor agency.
- **Target Projects which have already been identified** Much work has been done in identifying plants which need pollution control equipment. It is not appropriate to launch further plant identification missions before making use of the extensive surveys of industry on a plant by plant basis undertaken by GOFI with USAID and GOE funding. Many of the pollution control projects identified in the USAID funded Industrial Sector Pollution Control Project, for example, have been the subject of preparation of pollution control plans, but have not yet been implemented due to lack of funds. In addition, GOFI and EEAA have identified numerous plants for which pollution control is a priority.
- **Focus on Clean Technology** In future projects for the design and implementation of pollution control technology it will be important to focus on appropriate clean technology rather than costly end-of-pipe treatment. In Egypt there is much scope for the application of clean technology in industry, and many applications need not be costly. This includes waste minimisation to reduce total volume and toxicity of a waste through source reduction, recycling and treatment. The scope for the application of innovative clean technology to Egyptian industry has been examined for several key industries in Alexandria (Hamza, 1991).
- **Coordination of Activities** It will be essential for donor agencies to coordinate their funding priorities and their activities in the field of industrial pollution control. It is understood that steps are being taken to improve donor coordination.

- *Coordination of activity* In this report attention has been drawn to the overlap of responsibilities in certain areas relating to pollution control. This is a key area in which policy development for the future will be important. EEAA, which is currently being restructured, will play a key role in advising on such policy development. Technical assistance will be important to make sure that the experience of other countries in developing environmental policy is taken into account in Egypt, and that coordination of environmental policy can be targeted in the most effective way for combating environmental pollution in all of Egypt's industry, public and private sector. The monitoring and control of industry in the private sector and the various public sector ministries is an important focus.
- *Development of legislation* The problems of enforcement of environmental legislation in Egypt are related to the content of legislation itself. New legislation is coming out which may address the issues. The key problem is in the pollution standards being very rigid, setting targets which are very difficult to reach by industry and which may require investments in pollution control which are not optimal in terms of efficiency and overall pollution control. It may be appropriate to review industrial pollution legislation, and perhaps introduce a graded set of targets. Technical assistance in the review and preparation of industrial pollution legislation may be needed.
- *Development of Policy on Enforcement* Related to the above points, policy should be developed for enforcement of environmental standards. There is a need for clarification of responsibilities for enforcement between the ministries, and ideally for one agency, perhaps EEAA, to take a coordinating role. This should be developed with coordination of environmental monitoring and measurement. Assistance may be needed in the development of such policy.
- *Development of a National Policy on Hazardous Waste Management* There is an important need to develop a national policy to coordinate and manage disposal of hazardous waste, which is currently carried out by private contractors in an unregulated way.
- *Development of Scheme for Registration of Industry and Control of Industry Discharge Permits* Significant progress has been made in the area of industrial registration, and discharge permits are also issued in Egypt. As part of the improvement in coordination of environmental pollution control, these existing procedures should be streamlined.
- *Development of Procedures for Environmental Impact Assessment* Technical assistance may be required in development of a procedure for EIA appropriate to the institutional context for environmental management in Egypt.

- *Assistance to EEAA* The EEAA is currently at a key point in its development, due to its restructuring and expansion. Technical assistance to the nascent departments of EEAA would be valuable in maximising the opportunities for developing the capacity of EEAA.
- *Establishment of an Environmental Information Centre* Information on industrial pollution is very scattered in different institutions at present. Assistance would be very valuable to establish an information centre which would gather information on environmental issues in general, including industrial pollution. Such information would include research, government reports, consultant reports, donor studies etc., and it should be indexed in a computer. The ideal location for such a centre would be in EEAA, which is currently planning to develop its information and computer capacity. As a specific example, it will be important to computerise the information being gathered at present in the project to prepare a map of industrial pollution in Egypt (EEAA/GOFI). Assistance in this area may be appropriate.

6.3.3

Training and Awareness Raising

- *In-plant training* In-plant training in environmentally sound working practices is a key need in Egyptian industry. Such training would be very cost effective in reducing pollution through better handling, storage of raw materials, maintenance of existing pollution control equipment etc. Allied to this is improvement in occupational health and safety. Such training could be provided by industrial training teams based in a university or institutions such as the National Research Centre or the High Institute for Public Health in Alexandria, which would mount training programmes in specific areas. Such programmes would need to be monitored and reviewed, and held regularly. Funding for this activity is an important priority.
- *Development of training capacity at the technician level* The area of greatest need for strengthening of environmental education capacity in Egypt is at the level of diploma, or technician level: at this level technicians need to be trained to work in industries direct and to work in the wastewater treatment plants that are being set up. Funding for establishment of a course for such technical skills, focusing on developing practical skills rather than theoretical skills, is an important priority. Such a course could be located at any one of several universities or research centres in Egypt.
- *Visits to pollution control operations in other countries* Staff of government institutions with responsibilities for pollution control would benefit significantly by being able to visit pollution control operations in the developed world or other parts of the developing world. This would give them practical experience of how pollution control can work. Funding for such initiative is more appropriate than funding of theoretical training, which is already available in Egypt.

- **Awareness Raising** The raising of awareness of industrial pollution issues is an important focus for Egypt. This is necessary for the whole Egyptian population, in particular targeting the industrial workers of Egypt. This can be combined with the in-plant training initiatives identified above, but also additional measures are appropriate:
 - Use of television as a media for building awareness of industrial pollution.
 - Education in schools.
 - Briefing for journalists.

6.3.4 Pollution Monitoring

As has been indicated in this report there are a number of institutions with capacity for environmental monitoring. Projects are already being funded to develop the existing capacity through training, for example at El Tebbin Metallurgical Institute.

The need in pollution monitoring is for coordination of the efforts of the different organisations. In addition it is important that the results of all the various initiatives aimed at monitoring pollution are interpreted together so that an overall indication of the health of the environment becomes possible. This may require the development of models for the interpretation of existing data.

LIST OF PERSONS MET

The following is a listing of all persons met in connection with the project, arranged in alphabetical order by the organisation they represent. The meetings were held over the period 18 June to 8 July 1991.

Academy of Scientific Research and Technology: Professor Aboul-Fotouh Abdel Latif, Chairman of the Committee preparing the Egypt National Report for UNCED

British Embassy: Howard Lattin-Rawson, Second Secretary, Commercial/Aid; Eng Mohammed Abdel Salam, Commercial Officer

Commission of the European Communities (CEC): Jean Rassat, Deputy to the Head of the Delegation

Egyptian Environmental Affairs Agency (EEAA): Eng Farouk Bedewe, Chemist Ahmed Shehata; Abdel Shatei, Technical Officer

El Tabbin Institute for Metallurgical Studies (TIMS): Eduardo Maal (RCG/Hagler, Bailly Inc), consultant to USAID/World Bank, working at TIMS; Yosry F Barakat, Lecturer

General Organisation for Industrialisation (GOFI): Eng Galal Ghorab, Head of Research in Pollution; Eng Farouk Mohsen, General Director of Chemical Department; Eng Mohammed Abdel Wahab Eweiss, Technical Consultant

GTZ: Sanaa El Beblawy, Deputy - Head of Office

High Institute for Public Health, Alexandria: Professor Ahmed Hamza, Professor of Environmental Health; Professor Mohamed Moselhi, Professor of Industrial Medicine and Occupational Health; Professor Ragaa M El Gazaar, Professor of Occupational Hygiene; Safahmy Charl, PhD student

Japan International Cooperation Agency (JICA): Kobayashi Naoyuki, Assistant Resident Representative

National Research Centre, Cairo: Dr Fatma El Gohari, Head, Water Pollution Department

United Nations Development Programme (UNDP): Tharwat Sabry, Senior Programme Officer; Nadia Ebeid, Programme Officer

USAID: Bill Smith, Science and Technical Department

World Bank: Sherif Arif, Environment Specialist, Environment Division, Europe, Middle East and North Africa Region

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