

UNCLASSIFIED

AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D C 20523

EGYPT

ENERGY CONSERVATION AND ENVIRONMENT PROJECT

³
263-0140 01

PROJECT PAPER AMENDMENT NO 1

DATED SIGNED 09/20/93

UNCLASSIFIED

A

PROJECT DATA SHEET

1 TRANSACTION CODE

A = Add
 C = Change
 D = Delete

Amendment Number \

1

DOCUMENT CODE

3

2 COUNTRY/ENTITY
 Arab Republic of Egypt

3 PROJECT NUMBER

263-0140.3

4 BUREAU/OFFICE

PDS/ENV

263

5 PROJECT TITLE (maximum 60 characters)

Energy Conservation & Environment

6 PROJECT ASSISTANCE COMPLETION DATE (PACD)

MM DD YY
 09 30 96

7 ESTIMATED DATE OF OBLIGATION

(Under B below enter 1, 2, 3 or 4)

A Initial FY 88 B Quarter 3 C Final FY 91

8 COSTS (\$000 OR EQUIVALENT \$1 =)

A. FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B FX	C L/C	D Total	E FX	F L/C	G Total
AID Appropriated Total						
(Grant)	(12,500)	(2,500)	(15,000)	(46,900)	(2,600)	(49,500)
(Loan)	()	()	()	()	()	()
Other						
U.S.						
Host Country		1,300	1,300		1,300	1,300
Other Donor(s)						
TOTALS	12,500	3,800	16,300	46,900	3,900	50,800

9 SCHEDULE OF AID FUNDING (\$000)

A. APPRO- PRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH CODE		D OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F LIFE OF PROJECT	
		1 Grant	2 Loan	1 Grant	2 Loan	1 Grant	2 Loan	1 Grant	2 Loan
(1)								49,500	
(2)									
(3)									
(4)									
TOTALS								49,500	

10 SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each)

878 874 840

11 SECONDARY PURPOSE CODE

12 SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code INTR TNG
 B Amount

13 PROJECT PURPOSE (maximum 480 characters)

The purpose of this amended Project is to accelerate the adoption of improved technologies and practices to save energy and protect the environment

14 SCHEDULED EVALUATIONS

Interim MM YY MM YY Final MM YY
 01 92 09 96

15 SOURCE/ORIGIN OF GOODS AND SERVICES

000 941 Local Other (Specify)

16 AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a _____ page PP Amendment)

USAID/Egypt Controller concurs with the proposed methods of implementation and financing

Douglas Franklin
 Douglas Franklin, AD/FM

17 APPROVED BY

Signature *[Signature]*
 Title Henry H Bassford
 Director, USAID/Egypt

Date Signed MM DD YY
 11 04 93

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION

MM DD YY



CAIRO EGYPT

September 30, 1993

ACTION MEMORANDUM FOR THE MISSION DIRECTOR

FROM (A)OD/PDS/PS, Richard Steelman *RS*

THROUGH AD/PDS, Robert Jordan *RJ*

SUBJECT Approval of Project Paper Amendment

ISSUE:

Your signature is required to approve Project Paper Amendment No 1 of the Energy Conservation and Environment Project, No. 263-0140 3

DISCUSSION:

The attached Project Paper Amendment was reviewed by the Project Team. An Executive Committee review was deemed to be unnecessary for the following two reasons: 1) no further issues are pending, and, 2) no additional funding is required, nor will the PACD be extended.

All necessary clearances have been obtained.

AUTHORITY

Paragraph 5 of Mission Order 5-4, Attachment 1, dated March 29, 1993, reserves the authority to approve and sign Project Paper Amendments for the Mission Director.

RECOMMENDATION:

That, by signing the Project Paper Amendment Data Sheet, you approve the subject Project Paper Amendment.

Clearances.

OD/PDS/ENV: RRhoda *RRhoda*

AD/FM, DFranklin *DFranklin*

LEG, TCarter *TCarter*

OD/DIR/CS, JDunlap *JDunlap*

DDIR, CCrowley *CCrowley*

C



UNITED STATES AGENCY for INTERNATIONAL DEVELOPMENT

CAIRO ECHE

September 20, 1993

TO (A)OD/PDS/PS, Richard Steelman
 FROM OD/PDS/ENV, Richard Rhoda
 SUBJECT Energy Conservation and Environment Project
 (263-0140 3) Project Paper Amendment No 1

- 1 The attached Project Paper Amendment has been prepared by the Project Team for submission to the Mission Director

The Project Team and Officers named below have reviewed the document and agree with the format, analysis and presentation

2	<u>Project Team</u>	<u>Clearance</u>	<u>Date</u>
	Marc Madland, PDS/ENV		09/20/93
	Salwa Wahba, PDS/ENV		9/20/93
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	Ted Gehr, PDS/PS		9/20/93
	Peter Sullivan, LEG		9/21/93
	Mark Gellerson, EAP		9/21/93
	Leo Pizzaro, DIR/CS		9/21/93
	Hazem Shawky, FM/FA		9/21/93
	Amanda Levenson, OD/FM/FA		9/21/93
	Mission Env Officer		9/21/93
	Robert Jordan, AD/PDS		9/26/93

- 3 No Executive Committee review is necessary

d

USAID/EGYPT

PROJECT PAPER AMENDMENT

ENERGY CONSERVATION AND ENVIRONMENT PROJECT

(263-0140.3)

SEPTEMBER 30, 1993

E

**PROJECT PAPER AMENDMENT
ENERGY CONSERVATION AND ENVIRONMENT PROJECT
(PROJECT 263-0140.3)**

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GLOSSARY OF ACRONYMS

A & E	Architecture & Engineering
AID	Agency for International Development
AID/W	Agency for International Development/Washington
APG	Arab Pharmaceutical Glass
ASRT	Academy of Scientific Research and Technology
CNG	Compressed Natural Gas
DRTPC	Development Research and Technological Planning Center
EA	Environmental Assessments
ECEP	Energy Conservation and Environment Project
EEAA	Egyptian Environmental Affairs Agency
EEC	European Economic Community
EIA	Environmental Impact Assessment
EPICO	Egyptian International Pharmaceutical Industries Company
EP3	Environmental Pollution Prevention Project
FEI	Federation of Egyptian Industries
GOE	Government of Egypt
HB	Hagler-Bailly, Inc
IEC	Information, Education, Communication Program
LOP	Life of Project
LNECO	Low Cost Energy Conservation Opportunities
LE	Egyptian Pounds (Currency)
M/TA	Management/Technical Assistance
NGO	Non-government Organization
O&M	Operation and Maintenance

OBI	Overseas Bechtel Incorporated
OECP	Organization for Energy Conservation & Planning
PACD	Project Assistance Completion Date
PDS/ENV	Directorate for Program Development and Support, Office of Environment (USAID/Cairo)
PP	Project Paper
PRIDE	Project in Development and the Environment
PSA	Procurement Service Agent
R&D	Research and Development
R&D/ENR	Office of Environment and Natural Resources (AID/W)
R&D/EI	Office of Energy and Infrastructure (AID/W)
SO₂	Sulfur Dioxide
STC	Science and Technology Cooperation Project
TA	Technical Assistance
TCOE	Technical Cooperation Office of Environment (EEAA)
TIMS	Tabbin Institute for Metallurgical Studies
TRENCO	Transportation and Engineering Company
UNDP	United Nations Development Program
USAID	United States Agency for International Development

ENERGY CONSERVATION AND ENVIRONMENT PROJECT

263-0140.3

SUMMARY AND RECOMMENDATION

INTRODUCTION

Egypt must balance the need for social and economic growth, and in particular industrial growth, with environmental considerations which affect the health and welfare of the population. Urban air quality is of particular concern, Egypt suffers from uncontrolled emissions from vehicular and industrial sources. The three main causes are (1) the heavy use of subsidized leaded gasoline, (2) the large concentrations of polluting industries in and around urban areas, especially steel, cement, fertilizer, and chemicals, which contribute to levels of dust and SO₂ that are from two to ten times the maximum safe levels, and, (3) the use of high sulphur fuel oil in industry and for power generation.

The degree of concern for environmental issues is growing steadily in Egypt. At the same time, the Egyptian government is being pressured by multilateral donors who are conditioning development assistance on improved environmental policies. Pending legislation will also ensure a growing emphasis on the environment over the next three to five years. In addition, significant price increases for fuels and electricity are causing further interest in conserving energy.

Private sector industrial firms are becoming more environmentally conscious and interested in improving their competitiveness and efficiency through environmental management. Whether this means that they are willing to invest capital or not depends on their perception of the benefit that will occur. They are aware that the public is beginning to demand environmental improvements, and the implementation of environmental management would result in greater public support, and therefore a competitive advantage. However, few Egyptian industrial firms have implemented pollution prevention measures. Misplaced market signals, because of subsidized fuel, have led these firms to perceive low rates of private benefits to costs for industries to implement environmental controls. Other barriers to wider adoption of environmental control measures include the current non-enforcement of existing environmental laws, lack of information about environmental management and available technologies, and, lack of technical skills to identify, evaluate, install and operate environmental control measures. The revised Energy Conservation and Efficiency Project (ECEP) builds on experience gained to date in energy conservation to address many of these constraints.

The ECEP was authorized on June 13, 1988, with a total funding level of \$49.5 million. The Project was designed to (1) promote

and accelerate the adoption of improved commercial technologies, processes, and practices to save energy and increase industrial efficiency; and, (2) enhance Egyptian institutional capability to implement energy conservation. The original Project Paper (PP) planned about sixty energy conservation and efficiency technology application (TA) demonstrations of ten different technologies cogeneration, waste heat recovery, combustion control, power factor correction, high efficiency lighting, high efficiency motors, energy management systems, process controls, solid fuel boilers, and, insulation and refractors

The main emphasis during the first phase of activity was twofold detailed identification and implementation of energy conservation and efficiency technology applications, and training From February 1990 until September 1993, Project activities included screening investigations in 130 plants in the public and private sector to determine the potential for energy conservation and efficiency, as a result of the screening, 58 plants were addressed by specific studies to determine the technical and economic feasibility of proposed energy conservation technology applications, detailed engineering specifications were developed for 25 specific technology applications, and, implementation of an inexpensive (\$600,000) portable gas analyzer program which, by tuning boilers in 54 plants, is saving energy worth an estimated \$11 5 million per year

The recently established Environment Office in the Directorate for Program Development and Support (PDS/ENV) has been given the lead role in implementing USAID/Cairo's (USAID) strategic objective for the environment In order to more quickly expand AID-financed environmental programs, USAID sought to identify high impact environmental activities that could be quickly implemented The Energy Conservation and Efficiency Project, which already had a substantial environmental impact, was determined to be an appropriate vehicle to achieve this objective The redesigned project continues to stress energy conservation, which is inherently environmentally beneficial, while using the procedures and mechanisms already developed under the ECEP to also more directly address other environmental issues. The amended Project has been re-named the **Energy Conservation and Environment Project**

With the growth in Egypt's population in general and the growth of its industrial sector in particular, increased demand for energy has made the feasibility of energy conservation initiatives in Egypt more valid today than in 1988 when the original Project was designed. Furthermore, the new environmentally-related initiatives under the amended Project will heighten awareness and provide valuable guidance concerning appropriate regulatory approaches and available technologies in the industrial and transportation sectors

PROJECT DESCRIPTION

AID support will remain at the original authorized \$49.5 million with the original Project Assistance Completion Date of September 9, 1996

The amended Project goal is to improve energy efficiency and environmental protection in Egypt. The purpose of this amended Project is to accelerate the adoption of improved technologies and practices to save energy and protect the environment

By the end of the Project, the following will have taken place: \$20 million per year will be saved in energy costs, air emissions will be reduced by 10,000 tons per year in SO_x, 1,500 tons per year in NO_x, and 1,500 per year in CO, forty firms will be replicating environment/energy technology applications, and, three local architect and engineering firms will be capable of implementing industrial energy/environment management programs

In addition, the institutional capacity of those entities participating in the ECEP will be enhanced, allowing for the continuation of energy conservation and environmental protection activities beyond the PACD. This will be accomplished by the: (1) expansion of the managerial, technical, and training capability in the Tabbin Institute for Metallurgical Studies (TIMS), the Development Research and Technological Planning Center (DRTPC), and the Federation of Egyptian Industries (FEI) to include expertise in energy conservation and environmental management; (2) development of a number of private sector Egyptian firms capable of implementing various broad aspects of energy conservation and environmental management in the private sector, (3) achievement of a heightened awareness within GOE regulatory bodies and the industrial and transportation sectors of energy conservation and environmental management, and, (4) increased ability of the Egyptian environmental and energy sectors to identify problems and implement the appropriate policies and actions to resolve them

The ECEP, which already had a substantial environmental impact, has been re-designed to: (1) modify energy conservation activities, moving away from the provision of high cost equipment to stress dissemination, replicability and sustainability of energy conservation activities, (2) increase the environmental aspects of future energy conservation activities, (3) add low-cost and no-cost energy conservation/environmental protection activities, (4) add a component to do initial pilot testing of ways to limit vehicle emissions, and, (5) develop an institutional capability and infrastructure for environmental management in Egypt

On-going energy conservation measures, including equipment procurement already initiated or planned under the Project, will be completed. New energy conservation activities will be focussed on demonstrations of low-cost/no-cost and other technologies that have

large environmental benefits as well as on dissemination of information, replication of proven methods and demonstrations to support these activities. These efforts will maximize both energy conservation and its resulting positive environmental impact.

The environmental activities will include environmental assessments (EA) of production facilities, the procurement of selected equipment to facilitate the EAs, assistance to institutions' individual environmental efforts, analyses of environmental issues in support of policy improvements, and a pilot vehicle tune-up program.

The direct outputs during the life of project will be

- 1) Thirty energy conservation technology application (TAs) demonstrations and six pilot environmental protection demonstrations completed. By September 1993 a total of thirteen technology applications have been, or shortly will be, implemented in nine private sector companies, and twelve technology applications have been, or shortly will be, implemented in nine public sector companies. Portable gas analyzers, one of the Project's technology applications, have been installed in seventy companies.
- 2) Seventy courses in fifteen specific energy conservation topics held in the U S and in-country for three thousand professionals and twenty courses in ten specific environmental management topics held in the U S and in-country for five hundred professionals. To date, about fifty courses have been given to several thousand participants. A total of twenty courses were held between March 1992 and February 1993. The courses were attended by over 1,300 local practicing engineers and managers, an increase of 65 percent over the previous year. The 1993 Training Program includes sixteen courses, covering nine topics, including four which are being presented for the first time by ECEP.
- 3) 25 energy/environmental technology-specific manuals and thirty energy/environmental technical briefs developed and distributed. To date, twenty energy technology-specific manuals were produced. In addition, the ECEP agencies produced newsletters and technical briefs which were distributed widely throughout Egypt. The ECEP mailing list increased to 4,000 names. A second database tracks energy use in over 200 major industrial firms.
- 4) Ten studies of key energy and environmental issues in the industrial and transportation sectors completed. The amended Project includes a component of policy assistance, including studies to provide information to policy makers that will (a) extrapolate demonstration results to industry-wide conclusions, (b) identify capital costs to achieve specific

pollutant levels; (c) provide detailed environmental characterizations of industries, and, (d) identify constraints placed on the private sector relative to the environmental management process

The current Energy Conservation and Efficiency Project Management/Technical Assistance (M/TA) Contractor is Overseas Bechtel Incorporated (OBI) with Hagler-Bailly, Inc (HB) as a major subcontractor. The existing M/TA Contractor's basic responsibilities will continue, but with expanded attention towards energy activities with large environmental benefits and low-cost/no-cost technical applications. M/TA services for the environmental activities of the amended Project will be provided through a buy-in to the EP3 in the AID/R&D/ENR Office. The new M/TA Contractor will assist TIMS, DRTPC and FEI in implementing the environmental activities of the amended Project.

Under the amended Project, USAID will provide additional funding to TIMS, DRTPC and FEI for a) recruiting technical environmental staff and additional administrative personnel, and, b) arranging or conducting local training, workshops and seminars for environmental management topics.

\$19.2 million is budgeted for energy conservation and environmental protection equipment and monitoring instrumentation. This is significantly less than the \$37 million considered in the original Project Paper. The re-designed energy conservation activities will focus less on the purchase of equipment and more on providing technical assistance for companies who are interested in a particular activity and willing to commit their own resources on the equipment.

Generally, the organization of the amended Project is very similar to that being implemented successfully in the existing Energy Conservation and Efficiency Project. This re-design, however, has included a number of actions to improve the effectiveness of the on-going energy conservation related aspects of the Project. Improvement in replicability and sustainability of energy conservation activities has been addressed by reallocating existing funds within the existing Project budget to reduce emphasis on higher cost energy conservation technology applications (TA), require significant investment sharing by industrial participants, add several local consulting firms to help implement the Project, add new programs to address low cost/no cost technologies and practices, and, increase emphasis on promotion, information dissemination, training, and policy analysis.

Project feasibility analyses indicate that the proposed project is viable from a technical, economic, financial, social, administrative, and environmental standpoint.

COST ESTIMATES AND FINANCIAL PLAN

The project cost estimates are summarized below

Table 1. Summary Cost Estimate and Financial Plan (000).

Use of Funds	USAID - \$
Management/Technical Assistance and Training	24,054
Local Management/ Technical Assistance	5,996
Equipment	19,200
Audit and Evaluation	250
TOTAL	49,500

The AID obligation remains at its originally authorized \$49.5 million in life-of-project funds, as summarized below

Table 2. Obligation of Project Funds (\$000).

Project Element	Obligation Schedule			Total
	FY 88-92	FY 93	FY 94	
Management/Technical Assistance and Training (Local and U S)	11 000	5 000	14,050	30,050
Equipment	13 200	6,000	0	19 200
Audit and Evaluation	100	0	150	250
TOTAL	24 300	11,000	14 200	49,500
CUMULATIVE TOTAL	24 300	35 300	49 500	--

AID annual obligations cover the expenditures for management and technical assistance services, training, commodities, and audit and evaluation. The AID annual projected expenditures by project elements are shown in Table 3 below

Table 3. Expenditure Projections (\$000).

Project Element	Expenditure Schedule					Total
	FY 88 92	FY 93	FY 94	FY 95	FY 96	
Management/Technical Assistance and Training	6,255	3 913	4 274	5,050	4,562	24,054
Local Management/ Technical Assistance	1 397	666	1 101	1,350	1,482	5,996
Equipment	3 341	3 494	6,400	3 255	2 710	19,200
Audit and Evaluation	0	0	65	185	0	250
TOTAL	10 993	7 407	11,840	9 840	8,754	49,500
CUM TOTAL	10 993	19 066	30,906	40,746	49,500	

The following table shows estimated expenditures broken down by sector, i e , whether they are on-going energy conservation activities, re-designed energy conservation activities, or environmental protection activities

Table 4. Expenditure Projections by Type of Activity (\$000).

SECTOR	Expenditure Schedule		Total
	FY 89 93	FY 94 96	
Original Project Paper Energy Activities	17 949	18,426	36,375
Re-designed Energy Activities	800	7,000	7,800
Environmental Activities	317	4 758	5,075
Audit and Evaluation	0	250	250
TOTAL	19 066	30 434	49 500

PROJECT NEGOTIATION STATUS

The proposed amended project activities, required resources, and implementation arrangements have been discussed with the appropriate implementing agencies. The implementing agencies agree with the objectives and implementation guidelines set forth in the amended project.

RECOMMENDATION

The Project Team recommends that the Mission Director approve the amended Energy Conservation and Environment Project by signing the Project Amendment Data Sheet.

LIST OF CONTRIBUTORS

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1.0 PROJECT BACKGROUND AND RATIONALE

1.1 INTRODUCTION

The recently established Environment Office in the Directorate for Program Development and Support (PDS/ENV) has been given the lead role in implementing USAID/Cairo's (USAID) strategic objective for the environment. In order to more quickly expand AID-financed environmental programs, USAID sought to identify high impact environmental activities that could be quickly implemented. The resulting re-design of the existing Energy Conservation and Efficiency Project, which already had a substantial environmental impact, reflects that approach. The amended Project has been re-named the Energy Conservation and Environment Project (ECEP).

1.2 BACKGROUND

The Energy Conservation and Efficiency Project (ECEP) was authorized on June 13, 1988, with a total funding level of \$49.5 million. The Project Assistance Completion Date (PACD) is September 9, 1996. The Project was designed to

- (1) promote and accelerate the adoption of improved commercial technologies, processes, and practices to save energy and increase industrial efficiency; and,
- (2) enhance Egyptian institutional capability to implement energy conservation.

The original Project Paper (PP) planned about sixty energy conservation and efficiency technology application (TA) demonstrations of ten different technologies:

- cogeneration,
- waste heat recovery,
- combustion control,
- power factor correction,
- high efficiency lighting,
- high efficiency motors,
- energy management systems,
- process controls,
- solid fuel boilers, and,
- insulation and refractors.

All major pieces of equipment are procured in the United States and provided on a grant basis to participating companies. The companies support ancillary equipment installation costs, and in the case of the private sector, pay customs duties and taxes. The original PP budgeted \$37 million for the purchase of energy conservation and efficiency equipment. The rest of the funding

was allocated for technical assistance, training, promotional activities, travel, vehicles, and office support

Three Egyptian agency counterparts are implementing the Project:

- **The Federation of Egyptian Industries (FEI):** responsible for promoting replication in industry as well as maintaining an overall data base of information on ECEP activities,
- **Tabbin Institute for Metallurgical Studies (TIMS):** responsible for technology demonstrations in public sector plants, and,
- **The Development Research and Technological Planning Center (DRTPC):** responsible for technology demonstrations in private sector plants

The United States M/TA contractor, Overseas Bechtel, with Hagler-Bailly as a subcontractor, is providing management and technical assistance to the three agencies. In February-March 1992, the first evaluation of the ECEP was undertaken. It found that the ECEP was being effectively implemented and was successfully promoting the adoption of accelerated technology. On the other hand, the evaluation found that ECEP was only partially successful in strengthening Egyptian institutional capability and thus ensuring sustainability of accomplishments.

1.3 PERCEIVED PROBLEM

Despite substantial energy resources, Egypt faces a number of serious energy problems that strain the economy and are likely to constrain future economic development. Some of these problems are outside the GOE's control, while others result from inadequate or ineffective energy policies and practices. These interrelated problems include subsidized energy prices which promote inefficiency and have an adverse impact on the national budget, unusually high energy consumption, possible future energy shortages due to high demand growth, the high cost of meeting future demand, the decline in oil export revenues, and, the high cost of energy losses to the economy.

In addition to resolving their energy problems, Egypt must balance the need for social and economic growth, and in particular industrial growth, with environmental considerations which affect the health and welfare of the population. Urban air quality is of particular concern, Egypt suffers from uncontrolled emissions from vehicular and industrial sources. The three main causes are

- (1) The heavy use of subsidized leaded gasoline. The number of cars in Cairo has increased at a rate of ten percent annually in the last ten years, resulting in a lead content in vegetables grown near the city that is ten times higher than rural areas and a blood lead level for Cairo residents that is above the World Health Organization maximum safe standard
- (2) The large concentrations of polluting industries in and around urban areas, especially steel, cement, fertilizer, and chemicals, which contribute to levels of dust and SO₂ that are from two to ten times the maximum safe levels. In Helwan, 600,000 tons of cement dust escapes to the atmosphere each day, and 29 percent of Helwan's school children are suffering from lung diseases, compared to nine percent in rural areas of Egypt
- (3) The use of high sulphur fuel oil in industry and for power generation. The rate of growth in consumption of electricity was ten percent annually over the last decade

Private sector industrial firms are becoming more energy and environmentally conscious and interested in improving their competitiveness and efficiency through energy conservation and environmental management. Whether this means that they are willing to invest capital or not depends on their perception of the benefit that will occur. They are also aware that the public is beginning to demand environmental improvements, and the implementation of environmental management would result in greater public support, and therefore a competitive advantage. However, few Egyptian industrial firms have implemented pollution prevention measures. Misplaced market signals, because of subsidized fuel, have led these firms to perceive low rates of private benefits to costs for industries to implement environmental controls. As energy prices continue to increase, however, firms are beginning to see the benefit of adopting energy conservation techniques. Additional barriers to wider adoption of environmental control measures include: the current non-enforcement of existing environmental laws, lack of information about environmental management and available technologies, and, lack of technical skills to identify, evaluate, install and operate environmental control measures. The revised Energy Conservation and Efficiency Project (ECEP) Project builds on experience gained to date in energy conservation to address many of these constraints.

The amended Project will heighten energy and environmental awareness and provide valuable guidance concerning appropriate regulatory approaches and available technologies. With the growth in Egypt's population in general and the growth of its industrial sector in particular, increased demand for energy has made the feasibility of energy conservation initiatives in Egypt more valid today than in 1988 when the original Project was designed. Furthermore, the new environmentally-related initiatives under the amended Project will focus on the industrial and transportation sectors.

1.4 CONFORMITY WITH THE GOE'S DEVELOPMENT STRATEGY

The degree of concern for environmental issues is growing steadily in Egypt. At the same time, the Egyptian government is being pressured by multilateral donors that are conditioning development assistance on improved environmental policies. Pending legislation will also ensure a growing emphasis on the environment over the next three to five years. In addition, significant price increases for fuels and electricity are causing further interest in conserving energy. The amended Project is adapting to these changing conditions in Egypt.

The growing GOE emphasis on privatization is also reflected in the re-design of the Project. The amended Project will focus on private sector industries and will only consider those public sector companies that have a strong possibility of being privatized. While recognizing the significance that public sector firms hold, there is a higher probability of project success working with private sector firms.

Egyptian goods exported to the European Economic Community (EEC) are significant, and the GOE would like to see them increase. Pending regulations within the EEC, however, are expected to require that exporters to the EEC meet relatively strict environmental standards for production. Thus, unless Egyptian firms begin to strengthen their environmental standards, growth of exports to the EEC may be curtailed.

Finally, the Egyptian Environmental Affairs Agency (EEAA) is in the process of expansion and change, i.e., its role as a regulatory and enforcement body is being strengthened. Hence, the EEAA will be kept informed of Project activities, provided with data, and involved in a coordinating and advisory capacity.¹

¹Annex J Institutional Analysis describes in some detail the roles and responsibilities of GOE environmental organizations including TIMS, DRIPC, FEI, EEAA, various ministries, research centers, and university centers. The paragraphs in the text summarize the current role of the EEAA, the essence of the new Environmental Protection Law, and the shortcomings in implementation of the many

The EEAA was established by Presidential Decree 631 in 1982. The Agency is in the formative stages of a re-organization to strengthen its role in environmental protection and policy formulation. Current responsibilities have focused on coordination among the numerous agencies involved with environmental issues and on the completion of studies to define the problem and to develop options. Major existing responsibilities are

- to draft a National Plan for environmental studies and propose priorities for implementation,
- to coordinate with implementing authorities and to monitor follow-up actions,
- to study environmental legislation in developed countries and to draft legislation for Egypt,
- to propose standards, specifications, and conditions for environmental protection,
- to examine environmental projects, approve budgets from the Environmental and Tourism Fund for such projects, and monitor progress,
- to prepare information programs to increase public awareness and to organize the exchange of environmental information; and,
- to implement pilot and demonstration projects

A key element of the Egyptian Environmental Action Plan is the proposed "Environmental Protection Law" to give the EEAA increased powers and duties. In particular, EEAA would

- formulate environmental policy, plans, and legislation,
- specify and oversee enforcement of environmental regulations and standards,
- be responsible for oversight of Environmental Impact Assessments (EIA) required of all new investment projects;
- be responsible for ensuring that all requirements in the EIAs are respected,
- have the power to inspect or to oversee the inspection of industrial plants, and,
- have the power to enforce the law

In addition, the EEAA would administer all natural preserves and collect and disseminate environmental data for public awareness and education, as well as control such data to ensure an accurate database for scientific investigations

environmental laws already passed by the Egyptian parliament

Despite the increased role in for EEAA there are a multitude of environmental laws in Egypt and responsibilities for environmental protection and enforcement of that legislation is widely dispersed. There are seventeen Ministries responsible for 81 laws, 34 Presidential decrees, 17 Prime Ministerial decrees, and 287 Ministerial decrees (see Figure 1-1) It is notable that the Ministry of Petroleum & Mineral Resources and the Ministry of Industry each have only one environmental law applicable to their operations There are only two for the Ministry of Water Resources and three for the Ministry of Energy and Electricity Egypt has ratified 34 international environmental convention protocols as of December 1990

Figure 1-1 Enumeration of Existing Egyptian Environmental Legislation (By Sector)

EGYPTIAN ENVIRONMENTAL LEGISLATION BY SECTOR				
MINISTRY	LAWS	PRES. DECREES	PRIME MIN. DECREES	MINISTR. DECREES
Cabinet	1	2	15	-
Housing	12	-	-	21
Reconstruction	2	-	-	-
Oil/Mineral Resources	1	-	-	-
Social Security	2	-	-	1
Supplies	4	2	-	64
Culture	2	1	-	-
Interior	8	-	-	11
Tourism	2	-	-	-
Health	21	4	1	103
Industry	1	4	-	22
Electricity	3	-	-	-
Transport	7	19	-	7
Water Resources	2	-	-	4
Agriculture	6	-	-	27
Commerce and Trade	1	1	1	12
Manpower	6	1	-	15
TOTAL	81	34	17	287

The most recently established law (protection of the Nile waterways) was enacted in 1984, while nearly 65 percent of the laws are at least 15 years old The shortcomings in implementation of these laws have different causes, the most important being

- lack of awareness of the seriousness of environmental pollution by policy makers and the public,
- the laws deal in an indirect way with pollution control and are outdated in many cases, i e , some new sources of pollution and environmental deterioration have not been legislated,
- most penalties are very light as they have not been updated, i e , a heavy fine forty years ago is inconsequential now,
- there is no consistent system for monitoring, sampling, and detecting pollution effluent, which is an absolute requirement for any legal action,
- many existing laws do not give clear nor quantified values for pollutants, e g , the automobile law states that "no heavy smoke should come out of motor car exhausts," and the marine law states that "waste dumped into the sea should not be harmful to marine life."

In all fairness, there are many Egyptian laws that set very well defined standards and limits that conform with those in developed countries. However, this also has a negative effect on compliance as the standards are so unrealistic given the current Egyptian environment that no attempt is made to meet them.

1.5 RELATIONSHIP TO USAID STRATEGY, AID POLICIES, AND SIMILAR PROJECTS

The primary goal of the Mission's Country Program Strategy for FY 1992-1996, dated May 1992, is the enhancement of Egypt's role as a model of stability, democracy, free markets and prosperity in the region. A comprehensive approach to the political and economic development of Egypt is essential if Egypt is to achieve this program goal. Three program sub-goals are essential: increased economic growth, enhanced human resource productivity and quality of life; and strengthened democratic systems. USAID's strategic objective for the environment falls under the sub-goal of enhanced human resource productivity and quality of life.

The Mission's strategic objective for the environment is "enhanced protection of fresh water and urban air resources." Specifically, three strategic "Program Outcomes" have been established:

- (1) Environmental policy and institutional reform,
- (2) Reduced waste discharges to the Nile river system, and,
- (3) Promotion of improved technologies for environmental protection

For the short-term, the Mission has pursued this objective within its on-going water and energy programs. ECEP is being re-designed to focus on the third strategic Program Outcome.

Two AID projects and one USAID project have the most potential for near-term assistance to the Project Amendment, either through close collaboration or more formally through buy-in arrangements. The two Projects managed out of AID/W are the following:

Project in Development and the Environment (PRIDE): A Near East Regional Bureau project that has been underway for approximately two years. The PRIDE objective is to promote technical, analytical, and informational support for sound environmental and natural resource use for economic growth.

Environmental Pollution Prevention Project (EP3): A joint AID/W Office of Environment and Natural Resources (R&D/ENR) and Office of Energy and Infrastructure (R&D/EI) project that has recently been contracted. The objective of EP3 is to reduce worldwide industrial and urban environmental pollution.

In addition, a Near East Regional Bureau initiative for U S /Near East industrial partnerships for the introduction of pollution prevention and waste minimization technology (Clean Technology) is anticipated as a "buy-in" to the EP3 Project through a proposed fifth component to the PRIDE. The component will focus on two Near East Bureau subgoals: increased efficiency, productivity, and competitiveness of selected economies in the private sector, and, sustainable development of the Near East region's natural resources. The component will increase efficiencies of selected firms through the adoption of pollution prevention technologies, increase awareness in the private sector of the advantages of pollution prevention over pollution control, and increase knowledge of Near East firms about appropriate sources for U S pollution prevention products.

Science and Technology Cooperation (STC) Project: This is a collaborative effort among USAID/Cairo, the GOE Ministry of Scientific Research, and the Egyptian Academy of Scientific Research and Technology (ASRT). Like the ECEP, the STC Project is currently being re-directed towards a more environmental focus. The original overall project goal is to improve production processes and develop new products and technologies relevant to Egyptian needs. There are seven major problem areas under study in STC Project efforts.

- local raw materials as substitutes for imported materials,
- process development,
- new products,
- equipment manufacturing,
- computer-based technology,
- waste and by-product utilization; and,
- clean technology

The last two problem areas have direct relevance to the ECEP Project Amendment

The two AID/Washington projects and the USAID/Cairo STC Project are complementary to this amended Project in that the amended ECEP provides:

- (1) an established institutional framework for access to Egyptian private industry,
- (2) opportunities in manufacturing plants for use of pollution prevention processes and clean technologies, and,
- (3) a heightened awareness within industry of environmental management in general, and pollution prevention specifically, through broader promotional, training, and institutional development activities

Annex H includes additional U S Government, bilateral, and multilateral donor programs that have application to environmental initiatives in Egypt

1 6 RELATIONSHIP TO OTHER DONOR SUPPORT AND STRATEGY

The re-designed ECEP will be the only multi-industry, bilateral project directly focussing on in-plant environmental management activities in Egypt. The only other project with a large industrial-sector impact is the proposed multi-donor pollution control project in Helwan sponsored by the World Bank. In addition, several plant-specific projects will be conducted with German assistance. Both the World Bank and the German assistance, however, focus on "end-of-pipe" pollution control, e g , smoke stack scrubbers and cement dust precipitators. If successfully implemented, they will complement, rather than compete with ECEP.

For the ECEP re-design, cognizant representatives of seven bilateral donor missions (Germany, Italy, Denmark, Netherlands, Canada, Great Britain, and Japan) and three multilateral donor

missions (EEC, UNDP, and the World Bank) were interviewed in Cairo to ascertain:

- (1) their past and present environmental project experiences both in scope and implementation;
- (2) their planned activities in the environmental arena, and,
- (3) "lessons learned" that may be applied to the development and implementation of a project in the industrial sector

Although each donor is primarily responsive to the distinct priorities of their home Ministries, global awareness of environmental imperatives, especially since the 1992 UN World Environmental Conference in Rio de Janeiro, present significant opportunities in Egypt to address environmental problems. Recent multilateral coordination in the environmental field in Egypt has exemplified the high priority to the environment of all donor missions

A number of general conclusions and patterns were universally found among all of the donors regarding their involvement in the environmental sector in Egypt

- there is a general increase in the number of planned projects to promote environmental improvement,
- most bilateral donors are focusing on specific sectors within the environment in Egypt, and,
- there is a present focus on supporting the World Bank's institutional and implementation initiatives in the strengthening of EEAA'S authority, structured around the multidonor supported development of the GOE Environmental Action Plan

Several bilateral donor missions, coordinated by the World Bank, provided experts from their respective countries to assist the Bank in supporting the development of the Environmental Action Plan in December 1992. Each donor was given responsibility for developing an environmental implementation plan for an assigned sector. In mid-March 1993, these same experts met at the World Bank's headquarters in Washington D C to further coordinate their plans and to suggest assignments for their respective Cairo missions. In addition, a multi-donor subgroup has been formed in Egypt to establish a core program for high priority problem areas and to identify specific projects for multidonor co-financing. One of the priority thrusts of the amended ECEP Project will be to gain the interest of other potential donors through early successful pilot demonstrations. A matrix of individual donor environmental activities is presented in Annex H.

2.0 PROJECT DESCRIPTION

2.1 PROJECT GOAL AND PURPOSE

The amended Project goal is to improve energy efficiency and environmental protection in Egypt

The purpose of this amended Project is to accelerate the adoption of improved technologies and practices to save energy and protect the environment

2.2 END OF PROJECT STATUS

By the end of the Project, the following will have taken place

- \$20 million per year will be saved in energy costs,
- air emissions will be reduced by 10,000 tons per year in SO_x, 1,500 tons per year in NO_x, and 1,500 per year in CO,
- forty firms will be replicating environment/energy technology applications, and,
- three local architect and engineering firms will be capable of implementing industrial energy/environment management programs

In addition, the institutional capacity of those entities participating in the ECEP will be enhanced, allowing for the continuation of energy conservation and environmental protection activities beyond the PACD This will be accomplished by the

- (1) expansion of the managerial, technical, and training capability in the Tabin Institute for Metallurgical Studies (TIMS), the Development Research and Technological Planning Center (DRTPC), and the Federation of Egyptian Industries (FEI) to include expertise in energy conservation and environmental management,
- (2) development of a number of private sector Egyptian firms capable of implementing various broad aspects of energy conservation and environmental management in the private sector,
- (3) achievement of a heightened awareness within GOE regulatory bodies and the industrial and transportation sectors of energy conservation and environmental management; and,

- (4) increased ability of the Egyptian environmental and energy sectors to identify problems and implement the appropriate policies and actions to resolve them

2.3 PROJECT OUTPUTS

The main emphasis during the first phase of activity was twofold detailed identification and implementation of energy conservation and efficiency technology applications, and, training. From February 1990 until September 1993, Project activities included:

- Screening investigations in 130 plants in the public and private sector to determine the potential for energy conservation and efficiency,
- as a result of the screening, 58 plants were addressed by specific studies to determine the technical and economic feasibility of proposed energy conservation technology applications,
- detailed engineering specifications were developed for 25 specific technology applications, and,
- implementation of an inexpensive (\$600,000) portable gas analyzer program which, by tuning boilers in 54 plants, is saving energy worth an estimated \$11.5 million per year (See Table 2-1)

The ECEP, which already had a substantial environmental impact, has been re-designed to

- (1) modify energy conservation activities, moving away from the provision of high cost equipment to stress dissemination, replicability and sustainability of energy conservation activities,
- (2) increase the environmental aspects of future energy conservation activities,
- (3) add low-cost and no-cost energy conservation/environmental protection activities;
- (4) add a component to address vehicle emissions, and,
- (5) develop an institutional capability and infrastructure for environmental management in Egypt

On-going energy conservation measures, including equipment procurement already initiated or planned under the Project, will be completed. New energy conservation activities will be focussed on demonstrations of low-cost/no-cost and other technologies that have large environmental benefits as well as on dissemination of information, replication of proven methods and demonstrations to support these activities. These efforts will

maximize both energy conservation and its resulting positive environmental impact

The environmental activities will include environmental assessments (EA) of production facilities, the procurement of selected equipment to facilitate the EAs, assistance to institutions' individual environmental efforts, analyses of environmental issues in support of policy improvements, and a vehicle tune-up program

The direct outputs during the life of project will be

2.3.1 Environment/Energy Technology Applications

Output: Thirty energy conservation technology application (TAs) demonstrations and six pilot environmental protection demonstrations completed

Progress to Date: By September 1993 a total of thirteen technology applications have been, or shortly will be, implemented in nine private sector companies, and twelve technology applications have been, or shortly will be, implemented in nine public sector companies. Portable gas analyzers, one of the Project's technology applications, have been installed in seventy companies (see Table 2-1)

Table 2-1: TECHNOLOGY APPLICATIONS AND LOCATIONS

(September 1993)

<p align="center"><u>PRIVATE SECTOR</u> (13 Technology Applications in 9 companies)</p>	<p align="center"><u>PUBLIC SECTOR</u> (12 technology applications in 10 companies)</p>
<p><u>Power Factor Improvement</u> Giza Cables 7-Up Arab Contractors</p> <p><u>Combustion Control</u> Arab Aluminum Asfor Crystal Arab Pharmaceutical Glass</p> <p><u>Waste Heat Recovery</u> Arab Aluminum Asfor Crystal</p> <p><u>Energy Management System</u> EIPICO Ramses Hilton</p> <p><u>Cogeneration</u> Alumisr</p> <p><u>Insulation/Re-fractory</u> Arab Aluminum</p> <p><u>High Efficiency Lighting</u> Ramses Hilton</p>	<p><u>Power Factor Improvement</u> El Shoubagy TRENCO National Metals</p> <p><u>Combustion Control</u> Egyptian Copper Works Sonaga Delta Steel</p> <p><u>Waste Heat Recovery</u> Semadco-Suez Egyptian Copper Works Delta Steel</p> <p><u>Energy Management System</u> El Nasr Coke & Chemical</p> <p><u>Process Control and High Efficiency Motors</u> El Nasr Pharmaceuticals</p> <p><u>Cogeneration</u> Abu Zaabal</p>

2.3.2 Training and Promotion

Output: Seventy courses in fifteen specific energy conservation topics held in the U S and in-country for three thousand professionals and twenty courses in ten specific environmental management topics held in the U S and in-country for five hundred professionals

Progress to Date: About fifty courses have been given to several thousand participants. A total of twenty courses were held between March 1992 and February 1993. The courses were attended by over 1,300 local practicing engineers and managers, an increase of 65 percent over the previous year. The 1993 Training Program includes sixteen courses, covering nine topics, including four which are being presented for the first time by ECEP.

Output: 25 energy/environmental technology-specific manuals and thirty energy/environmental technical briefs developed and distributed.

Progress to Date: Twenty energy technology-specific manuals were produced. In addition, the ECEP agencies produced newsletters and technical briefs which were distributed widely throughout Egypt. The ECEP mailing list increased to 4,000 names. A second database tracks energy use in over 200 major industrial firms.

2.3.3 Policy Development

Output: Ten studies of key energy and environmental issues in the industrial and transportation sectors completed.

The amended Project includes a component of policy assistance, including studies to provide information to policy makers that will (1) extrapolate demonstration results to industry-wide conclusions, (2) identify alternatives and then ascertain capital costs to achieve specific reductions in pollutant levels, (3) provide detailed environmental profiles of industries, and, (4) identify constraints placed on the private sector relative to the environmental management process.

Further detail of outputs are described in the Table below.

Table 2-2 Activities Included in Project Amendment

ENERGY CONSERVATION	ENVIRONMENT
<p>Demonstrations</p> <p><u>Complete 30 demonstrations</u></p> <p>Complete projects in Table 2-1 and implement additional low cost/no cost energy conservation opportunities (LNECO) across a broad number of plants, similar to Portable Gas Analyzer activities to date Examples include</p> <ul style="list-style-type: none"> • Steam system surveys, • Energy accounting and metering systems, and, • Water treatment for boilers and cooling towers 	<p>Pilot Demonstrations</p> <p><u>Complete 6 pilot demonstrations</u></p> <p>Conduct selected pilot demonstrations in the industrial and transportation sectors, including (see Annex I for additional information on the following programs)</p> <ul style="list-style-type: none"> • Industrial Environmental Management, and, • Automobile Tune-up Program
<p>Training</p> <p><u>Conduct 70 courses in 15 topics for 3000 persons</u></p> <p>Expand current training program to include new TAs, especially LNECO's, and plants</p> <p>Carry out a Training Effectiveness Assessment of training programs conducted to date</p>	<p>Training</p> <p><u>Conduct 20 courses in 10 topics for 500 person</u></p> <p>Provide training in conducting environmental surveys and preparing feasibility studies and procedures for evaluation and selection of environmental technologies</p> <p>Provide classroom and in-plant training for plant personnel and other professionals for environmental system operation, procurement, installation, and operations and maintenance</p> <p>Conduct a Training Effectiveness Assessment of training programs conducted to date</p>

ENERGY CONSERVATION	ENVIRONMENT
<p>Promotion</p> <p><u>Develop 20 technology-specific manuals and 15 technical briefs</u></p> <p>Implement an energy conservation advisory service</p> <p>Implement a promotion campaign to alert industry to new opportunities in the amended Project</p> <p>Expand current information dissemination program to include LNECOs and new TAs</p> <p>Develop directories of Egyptian consultants and equipment suppliers, and other directories and databases to support industry</p>	<p>Promotion</p> <p><u>Develop 5 technology-specific manuals and 15 technical briefs</u></p> <p>Promote environmental management to Egyptian industrial manufacturing plants, consulting firms, government agencies, and the general public by providing information on environmental service firms, pollution reduction/control technologies, eligibility criteria, and application procedures</p> <p>Develop directories of Egyptian consultants and equipment suppliers, and other directories and databases to support industry</p>
<p>Policy Development Studies</p> <p><u>Conduct six policy studies</u></p> <p>Conduct policy studies in a broad range of energy conservation issues, including</p> <ul style="list-style-type: none"> • Switching industrial fuel from mazout to natural gas, • Analysis of the air quality protection aspects of energy conservation, • Analysis of the potential opportunities for co-generation on the national level, • Analysis of demand-side energy management, and, • Assessment of national energy conservation needs 	<p>Policy Development Studies</p> <p><u>Conduct four policy studies</u></p> <p>Conduct policy studies in a range of environmental management issues, such as</p> <ul style="list-style-type: none"> • Study of the conversion of transportation fleets to compressed natural gas, • Investigation of methods for quantifying environmental benefits of pollution prevention measures, • Cross-sectoral fuels optimization assessment, • Establishment of a pollution abatement policy support program for the 10th of Ramadan City, and, • Assessment of storage tank management in Egypt

2.4 PROJECT INPUTS

AID support will remain at the original authorized \$49.5 million to be used to provide the following inputs

2.4.1 Management/Technical Assistance and Training

The current Energy Conservation and Efficiency Project Management/Technical Assistance (M/TA) Contractor is Overseas Bechtel Incorporated (OBI) with Hagler-Bailly, Inc (HB) as a major subcontractor. The existing M/TA Contractor's basic responsibilities will continue, but with expanded attention towards energy activities with large environmental benefits and low-cost/no-cost technical applications. M/TA services for the environmental activities of the amended Project, including policy studies, will be provided through a buy-in to the EP3 in the AID/R&D/ENR Office. The new M/TA Contractor will assist TIMS, DRTPC and FEI in implementing the environmental activities of the amended Project.

The new M/TA Contractor will provide environmental training activities through the amended Project. The new Contractor will plan and implement a complete program of training for all associated Project personnel. This work will include providing oversight and coordination of the training activities performed by others, training of Egyptian trainers, and direct training of GOE implementing agency officials, participating plants, and other professionals as determined through a Training Needs Assessment. (Draft Work Statements are presented in Annex I)

2.4.2 Local Project Management and Technical Assistance

Under the amended Project, the USAID will provide additional funding to TIMS, DRTPC and FEI for a) recruiting technical environmental staff and additional administrative personnel, and, b) arranging or conducting local training, workshops and seminars for environmental management topics.

2.4.3 Equipment

\$19.2 million is budgeted for energy conservation and environmental protection equipment and monitoring instrumentation. This is significantly less than the \$37 million considered in the original Project Paper. The re-designed energy conservation activities will focus less on the purchase of equipment and more on providing technical assistance for companies who are interested in a particular activity and willing to commit their own resources on the equipment.

3.0 COST ESTIMATE AND FINANCIAL PLAN

3.1 PROJECT COST ESTIMATE

The project cost estimates are summarized below

Table 1. Summary Cost Estimate and Financial Plan (000).

Use of Funds	USAID - \$
Management/Technical Assistance and Training	24,054
Local Management/Technical Assistance	5,996
Equipment	19,200
Audit and Evaluation	250
TOTAL	49,500

3.2 AID PLANNED OBLIGATION

The AID obligation remains at its originally authorized \$49.5 million in life-of-project funds, as summarized below

Table 2. Obligation of Project Funds (\$000).

Project Element	Obligation Schedule			Total
	FY 88-92	FY 93	FY 94	
Management/Technical Assistance and Training (Local and U S)	11 000	5 000	14 050	30 050
Equipment	13 200	6 000	0	19 200
Audit and Evaluation	100	0	150	250
TOTAL	24,300	11 000	14 200	49 500
CUMULATIVE TOTAL	24 300	35 300	49 500	--

3.3 AID EXPENDITURES PROJECTIONS

AID annual obligations cover the expenditures for management and technical assistance services, training, commodities, and audit and evaluation. The AID annual projected expenditures by project elements are shown in Table 3 below.

Table 3. Expenditure Projections (\$000).

Project Element	Expenditure Schedule					Total
	FY 88 92	FY 93	FY 94	FY 95	FY 96	
Management/Technical Assistance and Training	6,255	3,913	4,274	5,050	4,562	24,054
Local Management/Technical Assistance	1,397	666	1,101	1,350	1,482	5,996
Equipment	3,341	3,494	6,400	3,255	2,710	19,200
Audit and Evaluation	0	0	65	185	0	250
TOTAL	10,993	7,407	11,840	9,840	8,754	49,500
CUM TOTAL	10,993	19,066	30,906	40,746	49,500	

The following table shows estimated expenditures broken down by sector, i.e., whether they are on-going energy conservation activities, re-designed energy conservation activities, or environmental protection activities.

Table 4. Expenditure Projections by Type of Activity (\$000).

SECTOR	Expenditure Schedule		Total
	FY 89 93	FY 94-96	
Original Project Paper Energy Activities	17,949	18,426	36,375
Re-designed Energy Activities	800	7,000	7,800
Environmental Activities	317	4,758	5,075
Audit and Evaluation	0	250	250
TOTAL	19,066	30,434	49,500

3.4 FUNDING RESPONSIBILITIES

The funding for the revised energy conservation activities and the environmental activities will be made available by redirecting the on-going energy conservation activities. Total Project funding will remain at the original authorized \$49.5 million. All funds will be provided in the form of direct payments and grants.

3.5 HOST COUNTRY CONTRIBUTIONS

Mission Policy:

Current Mission policy (Mission Order 3-31) mandates that Project Paper and Project Agreement budgets include the total estimated host country in-kind and cash contributions. The estimate shall be projected on an annual basis over the life of project and may be categorized by GOE budget chapters (BAB 1, 2 or 3) to facilitate monitoring. The policy also specifies that all contributions shall be quantifiable and/or monetizable project costs to be borne by Egypt in implementing the project.

Impracticality of Quantifying Level of GOE Contribution:

When analyzing potential sources of host country contributions to the project, two sources of counterpart support were identified: TIMS, FEI and DRTPC as project implementing agencies, and contributions (in cash and in-kind) from the participating plants. The host country contributions provided to the project to date by the implementing agencies has been LE 4.2 million. These contributions are expected to continue throughout the ECEP's LOP.

The participating plant contributions have been, in most cases, about twenty percent of the value of the equipment installed in the demonstration plants. Project feasibility studies augmented by reports from participating companies indicate that for public sector companies, USAID equipment contributions of \$8.6 million was matched by participating company contributions of LE 3.6 million (thirteen percent) in cash and in-kind. For private sector companies, \$4.7 million in USAID funded equipment was matched by LE 3.8 million (24 percent) in company contributions. By the PACD, we estimate that \$19.2 million in AID equipment will be matched by participating companies contributions of about LE 13 million to the Project activities. This is substantially less than the original 1988 PP estimate of \$37.5 million of AID equipment matched by participating companies contributions of LE 64.7 million.

Companies already have contributed an estimated LE 3 million for ECEP initiated activities which received no AID equipment funding. By the PACD, we expect this type of Egyptian contribution to reach approximately LE 150 million, which will include an estimated LE 90 million for two large cogeneration

activities fully funded by SEMADCO's Talka Fertilizer Plant and by El Nasr Coke and Chemical. These two plants, as well as others, undertook these activities on their own after benefitting from ECEP technical assistance.

Unfortunately, companies do not have separate accounting systems to measure costs specifically attributable to ECEP. These costs include customs, transport, ancillary equipment, installation, start-up and monitoring of ECEP-financed equipment. Furthermore, the value of the plants' contributions will not be known until a plant is selected for a demonstration site. Hence, while we do estimate the value of host country contributions, the supporting accounting documentation is not available to verify our estimates.

Mission Approach:

Although not in conformance with standard Mission policy on host country contributions, the Mission recognizes that the host country contribution can not be documented and monitored quantitatively at this time. Rather, the Mission will monitor the host country contribution to the Project by ensuring that participating companies, both in the public and private sectors, fulfill their total obligations to each activity, i.e. equipment clearance, transportation, and installation, procurement and installation of ancillary equipment, and, compilation of energy savings data during the six month monitoring period. To the extent possible, the Mission will also monitor company investments in ECEP subprojects which do not include any AID-financed equipment.

3.6 AUDIT, ASSESSMENT, AND EVALUATION COVERAGE

The project budget includes \$250,000 to cover the estimated auditing costs, in addition to monitoring and evaluations, which are further discussed in Section 5.0 of this project paper.

During the life of this Project, non-federal recipient audits will be performed to determine whether the recipients have properly accounted for and used AID funds for the purposes intended in accordance with applicable laws and regulations. USAID will ensure that all commitments over \$25,000 under this Project are in the Mission's audit universe. The Mission will schedule audits for those commitments over \$25,000 and ensure funds are available for audits (see budget line item in Table II) in accordance with AID/W guidance dated 3/31/92 on Audit Management and Resolution Program.

The Regional Inspector General for Audit will perform quality and compliance reviews of non-federal/recipient audits under this Project and provide or arrange for additional audit coverage requested by USAID, if deemed necessary.

3.7 METHODS OF IMPLEMENTATION AND FINANCING

The following table illustrates the methods of implementation and financing for AID funds as planned in the ECEP Amendment

Table 5. Proposed Methods of Implementation and Financing.

Services	Approximate Value (\$000)	Proposed Method of		Implementing Agency
		Implementation	Financing	
Management/TA Services	74 054	AID Direct	Direct Payment	AID
Equipment	19 200	AID Direct	Direct Payment	DRTPC/TIMS
Local Management Services	4 271	Project Implementation Letters	Direct Reimbursement	DRTPC/TIMS
Information and Dissemination	1 725	Project Implementation Letters	Direct Reimbursement	FEI
Audit/Evaluation	250	AID Direct	Direct Payment	AID
TOTAL	49 500			

4.0 IMPLEMENTATION PLAN

4.1 PROJECT APPROACH

Generally, the organization of the amended Project is very similar to that being implemented successfully in the existing Energy Conservation and Efficiency Project. The roles and responsibilities of participants in the existing Project are not discussed at length here, having been described in the original Project Paper. The Institutional Assessment provided in Annex J of this Project Paper Amendment and the Administrative Analysis in Annex C provide additional discussion of responsibilities.

This re-design has included a number of actions to improve the effectiveness of the on-going energy conservation related aspects of the Project. Improvement in replicability and sustainability of energy conservation activities has been addressed by reallocating existing funds within the existing Project budget to

- reduce emphasis on higher cost energy conservation technology applications (TA),
- require significant investment sharing by industrial participants,
- add several local consulting firms to help implement the Project,
- add new programs to address low cost/no cost technologies and practices, and,
- increase emphasis on promotion, information dissemination, training, and policy analysis

4.2 MANAGEMENT AND ADMINISTRATIVE ARRANGEMENTS

a) Energy Conservation Activities:

Considering the success of the Project to date, the design team concluded that the Project Amendment should make use of the same basic organizational structure as the existing Energy Conservation and Efficiency Project. As with the existing Project, implementation will be divided into two separate sets of activities, i.e., one for the public sector and one for the private sector. The responsibilities of the three primary Egyptian implementing agencies are as follows:

- The Development Research and Technological Planning Center (DRTPC) responsible for training, technology demonstrations and the incorporation of energy conservation and environmental management in private sector plants

- Tabbin Institute for Metallurgical Studies (TIMS) responsible for training, technology demonstrations and the incorporation of energy conservation and environmental management in public sector plants
- The Federation of Egyptian Industries (FEI) responsible for promoting replication in industry through information dissemination and development of a data base of information on energy conservation and environmental management

The responsibilities of the Egyptian implementing agencies have been modified in the amended Project to improve the sustainability of energy conservation in Egypt after the end of the Project. Several private sector Egyptian consulting firms will be selected as contractors. These firms will share responsibility for analysis and design associated with implementing the technology applications (TA) in the private sector. The contractors will be selected, in accordance with small value procurement procedures, to perform the TA designs and analyses. DRTPC and TIMS will continue to be responsible for selection of TAs as well as oversight and management of all work

Use of local consultant firms does not imply any deficiency in the performance to date of DRTPC or TIMS. Rather, by placing the capability to perform this type of work in more Egyptian private sector firms through contracts with the implementing agencies, the likelihood of several trained teams of personnel remaining in existence for a significant period after the end of the project is increased. The development of such a capability is critical to the amended Project's purpose of accelerating the adoption of energy conserving technologies.

b) Environmental Activities:

For the expanded activities in the environmental area, the responsibilities of the implementing agencies are very similar to those for energy conservation activities. FEI will expand its role to perform similar functions in the environmental area as it performs now for energy conservation concerns.

It is anticipated that over the life of the Project, the Egyptian "Environmental Protection Law" will pass Parliament and the EEAA will gain importance within the Egyptian environmental community as it begins to formulate policy, develop additional specific legislation, review environmental impact assessments, oversee inspection of plants by outside contractors, and enforce environmental laws. The EEAA will require data such as that generated from the Project for its monitoring activity, and more importantly, it can use the results of Project policy studies for its potential role in developing regulations. Hence, the EEAA will participate in Project implementation in the following capacity

- The amended Project incorporates the EEAA in a coordinating capacity so that the programmatic structure, technical assistance, and environmental measures are supportive of EEAA regulations and standards. Representatives of EEAA will be invited to regular Project meetings to ensure this coordination
- The EEAA will serve as a mechanism for identifying sources of additional funding through its Technical Cooperation Office for the Environment (TCOE). This office designs environmental projects to implement the Egyptian Environmental Action Plan and serves as a focal point for multilateral and bilateral donor activities. The TCOE will be continuously appraised of Project activities and be closely involved with development as funding options are identified

Details on the amended Project's staffing requirements can be found in Annex C - Administrative Analysis

4.3 PROCUREMENT PLAN

4.3.1 Management/Technical Assistance

a) Energy Conservation Activities:

The current Energy Conservation and Efficiency Project Management/Technical Assistance (M/TA) Contractor is Overseas Bechtel Incorporated (OBI) with Hagler-Bailly, Inc. (HB) as a subcontractor. Their contract was extended on February 15, 1993 by a modification to cover activities until the September 1996 PACD. The modification brought the total amount of the incrementally-funded contract to \$42,112,242. This contract will remain in place to complete the activities described in the Project Amendment. The existing M/TA Contractor's basic responsibilities will remain unchanged. As a result of the re-design, the equipment portion of the modified contract was reduced by \$3,735,000; thus, the total amount of the incrementally-funded contract will be reduced to \$38,377,242.

b) Environmental Activities:

Activities under the amended Project that are non-energy related environmental activities are not within the scope of the existing M/TA contract. Insufficient time remains before the PACD to permit an open procurement for a new M/TA contractor for these activities. Therefore, M/TA services for the environmental activities of the amended Project will be provided through a buy-in to the Environmental Pollution Prevention Project (EP3) in the AID/R&D/ENR Office. The buy-in to the EP3 will assist TIMS, DRTPC and FEI in implementing the environmental activities of the amended Project.

The new M/TA Contractor's responsibilities will include:

- providing management, technical assistance and training services to DRTPC, TIMS, FEI, and public and private enterprises relative to specific subprojects at all project stages,
- advising USAID/Cairo on whether specific measures should be approved and funded,
- reporting regularly to USAID/Cairo on project status and performance, and,
- coordinating efforts of all participants in environmental activities

These responsibilities are amplified in Annex C

Under the amended Project, USAID will also provide additional funding to TIMS, DRTPC and FEI for recruiting technical/environmental staff and additional administrative personnel. TIMS and DRTPC staff will be increased by a Technical Manager for Environmental Activities and up to four field environmental engineers to provide support for demonstrations. TIMS and DRTPC will also contract for up to 36 person/months of short-term consultants for promotion, information dissemination, training, and policy assistance efforts. FEI staff will increase by one Program Administrator for Environmental Activities, one information dissemination/library specialist, and one office administrator. FEI will receive funding for 36 person/months of consultant support for additional promotion, information dissemination, and training activities for environmental initiatives under the amended Project.

c) Monitoring and Evaluation:

The Mission will also contract for the services of a single firm to provide evaluation services, which would include assessment of energy savings, environmental impacts, degree of replication and sustainability, and economic and financial impacts of the subprojects. The firm would periodically evaluate Project progress and assess the performance of both M/TA Contractors' technical assistance for program management as well as the implementation capabilities of TIMS, DRTPC and FEI. This could be done by short-term, in-country visits on at least a semi-annual basis throughout the Life-Of-Project. The firm would also be expected to undertake a final project impact evaluation.

USAID will also contract for the services of an independent contractor to conduct financial audits of the Project, as required.

4.3.2 Equipment

The re-designed energy conservation activities will put less emphasis on the purchasing of equipment by AID, and concentrate on the provision of TA to apply proven techniques. For private sector firms, equipment that provides a quick payback as a result of cost savings in materials or resources would be expected to be bought by the firm. In general, AID funds will not be used to purchase waste treatment equipment, which invariably increases energy consumption. However, AID funds will be available under the energy M/TA contract to purchase environmental waste minimization equipment if it results in energy conservation as well.

4.3.3 Mode of Contracting and Financing Procedures

For the new M/TA Contractor, the AID direct contract mode is recommended, rather than a host country contract, because the new M/TA contractor will be providing management and technical assistance to both the public and private sectors. In addition, TIMS, DRTPC and FEI have no experience with administering large host country contracts. Given this, and the Contractor's important Mission advisory role, especially in approving subprojects and evaluating the performance of DRTPC and TIMS, it was concluded that a host country contract was not appropriate for M/TA services.

4.4 TRAINING PLAN

Except for the addition of environmental management technologies and practices to the existing subject matter and appropriate additions to target groups, the objectives of the training program for the amended Project remain essentially unchanged from those of the Energy Conservation and Efficiency Project.

- (1) develop end-user skills and capabilities to adopt and assimilate energy conservation and environmental management practices and technologies;
- (2) upgrade the skills of local GOE and private sector institutions to support and accelerate this process;
- (3) develop a cadre of local engineering, analytical, and managerial personnel who can form and support Egyptian engineering and consulting companies to continue the advancement of energy conservation and environmental protection after the PACD.

Each new pilot demonstration program will contain a training activity, based on the identified needs in the specific area of concern. The training portion of each program or sub-project will be integrated with on-going training programs to the extent possible.

A range of short- and long-term training programs will be developed and presented in Industrial Environmental Protection, Systems Performance Monitoring, Vehicular Pollution Control, Alternative Fuels for Vehicles, and other topics. Approximately 430 Egyptian personnel will receive training in-country and sixteen will receive training in the U S

Training courses will be presented to all participants of the Project, the implementing agencies (DRTPC, TIMS, and FEI) and also to other participants such as the Ministry of Industry, Egyptian architectural and engineering (A&E) firms, Egyptian consulting firms, and key personnel (engineers, line managers, and senior supervisors) in participating industrial plants. Table 4 presents an illustrative training plan. A strong emphasis is placed on training personnel from Egyptian industrial enterprises and professional firms (approximately eighty percent of the total training effort).

As the amended Project progresses, the training responsibility will be shifted to Egyptian trainers to enhance the potential for sustainability. The specific overall training program will be developed based on a detailed needs assessment developed during the first few months of implementation of each pilot program. The needs assessment will be completed with the close collaboration of all project participants.

In addition to the needs assessment, the training program will have provisions for a periodic training "effectiveness assessment." To the extent possible, each training activity will include a "follow-up" program activity so that the value of the program can be determined and a longer-term contact can be maintained with the specific individuals and organizations involved. This is another way that sustainability of the amended project can be assessed.

Finally, training needs will change as the various selected pilot demonstrations are implemented. Sufficient flexibility to accommodate these changing needs will be designed into the overall training program.

Table 4 - Illustrative Training Plan

TARGET	NUMBER OF TRAINEES		
	In Egypt	In U.S.	TOTAL
Direct Project Beneficiaries			
Industrial Enterprises	100	3	103
A/E Firms, Consultant Firms	50	2	52
Other Egyptian Participants	200	5	205
TIMS and DRTPC	50	2	52
Ministry of Industry	10	2	12
Federation of Egyptian Industries	20	2	22
TOTAL	430	16	446

The new M/TA Contractor will play an important role in the training activities of the amended Project. The new Contractor will plan and implement a complete program of training for all associated Project personnel. This work will include providing oversight and coordination of the training activities performed by others, training of Egyptian trainers, and direct training of GOE implementing agency officials, participating plants, and other professionals as determined through a Training Needs Assessment.

4.5 IMPLEMENTATION SCHEDULE

Major project re-design events are summarized below

<u>Activity</u>	<u>Timing</u>
1. Project Paper Amendment Approved	Sept 93
2. PIL to Revise Annex I of ProAg Signed	Oct 93
3. Environmental Audits Started (Interim Contract)	Oct 93
4. M/TA PIO/T Signed	Oct 93
5. M/TA Buy-in Contract Signed	Dec 93
6. Pilot Auto Tune-up Program Started	Jan 94
7. M/TA Contractor Mobilized	Jan 94
8. Training Started	April 94
9. Pilot Plant Environmental Demonstrations Begin	Feb 94
10. New Applications Selected	On-going
11. Evaluation	FY 94-96
12. PACD	Sept 30, 1996

5.0 MONITORING AND EVALUATION PLAN

5.1 MONITORING RESPONSIBILITIES

5.1.1 GOE Implementing Agencies

The primary responsibility for monitoring day-to-day activities of the environmental component is vested in the GOE implementing agencies. TIMS and DRTPC will develop a status tracking system to monitor environmental activities and submit detailed status reports to the appropriate M/TA Contractor and USAID on a monthly basis. These quarterly reports will include the number of proposals, approvals, on-going subprojects, sectors of application, types of applications, size of investments, status and performance of applications, implementation schedules, and status of the information dissemination program.

Public and private sector companies participating in the ECEP will be required to monitor the performance of their subprojects and provide relevant information on a monthly basis to DRTPC and TIMS.

5.1.2 Management/Technical Assistance Contractors

The M/TA Contractors will use the same reporting formats and practices as currently used under the existing Energy Conservation and Efficiency Project for the amended Project activities. The long-term M/TA Contractors will report regularly to the Mission on the status of both the private and public sector components and will advise the Mission on GOE implementing agencies' performance. This reporting will include brief status reports as part of monthly invoices and detailed quarterly reports. These reports will include information on all technical assistance, training, and special studies which have been completed by the M/TA Contractors.

5.1.3 USAID/Cairo

USAID's primary monitoring role, undertaken by the Office of Environment in the Directorate for Program Development and Support (PDS/ENV), will be to ascertain the effectiveness of the overall implementation process and compliance with amended Project policies and procedures. Monitoring activities will cover operating procedures, annual subproject implementation and financial plans, progress reports submitted to the Mission by DRTPC, TIMS, and the M/TA Contractors, and assessment/evaluation of technical reports generated.

5.2 EVALUATION

As one of the first focussed efforts to implement demonstrations of pollution prevention activities in Egypt, the amended Project's impact will be of interest and value to a broad audience within the GOE, other USAID Missions and Bureaus, other donors, and other countries. In this context, an evaluation approach is recommended that provides relatively frequent periodic reviews of project progress on such indicators as: measured savings on energy conservation and pilot environmental activities, environmental impact, suitability of activities selected, impact of training and promotional activities, number and quality of replications, and energy saved and pollution prevented therefrom, prognosis for sustainability, and, recommendations for improvement. The firm or individual selected to perform the evaluation function would be an objective party that would visit Egypt periodically to assess the performance of both M/TA Contractors, USAID, TIMS, DRTPC, FEI and participating companies. This could be done by short-term, in-country visits on at least a semi-annual basis throughout the remaining life-of-project.

Key questions to be answered during the periodic evaluations and the final evaluation include

- Have the methods used met their objective?
- Have there been additional applications of these methods and technologies in other plants in Egypt?
- Have Egyptian organizations established a capability for delivering these technologies and methods without significant external assistance?
- Has the Project achieved its purpose?
- What has been the economic and financial return of ECEP subprojects?

The answer to the first question should be easily determined through the monitoring process which is built into the amended Project design. This assessment should also determine the level of success or failure, particularly if initial feasibility analyses for pilot demonstrations indicated a significantly different result. This will allow for changes in plant selection criteria or modification to energy conservation and environmental intervention methods and/or equipment.

Determining whether a demonstrated energy conservation or environmental technology or method has been replicated is usually difficult, since it is likely that not all additional installations will be brought to the attention of Project personnel. However, reasonable estimates of replications can be determined from discussions with equipment vendors, from follow-up calls to organizations which visited the demonstration plants, and from the results of annual questionnaires sent to FEI-member industrial companies. FEI questionnaires will further assist the

project evaluation by seeking advice on how the project might be improved and why a respondent did or did not select an approach applicable to their plant

An assessment will be made of the success that the amended Project achieved in developing an institutional infrastructure of Egyptian organizations to provide the required expertise to implement energy conservation and environmental management programs without external assistance after the PACD. This can be done through discussions with industrial plants, equipment vendors, engineering service organizations, financial institutions, and trade associations

In addition, a careful analysis will be undertaken of the economic and financial returns of ECEP subprojects

6.0 SUMMARIES OF ANALYSES

6.1 SUMMARY OF TECHNICAL ANALYSIS

The proposed project re-design is determined to be technically appropriate and cost effective. A full technical analysis appears in Annex B. The following are illustrative examples of the kinds of pilot environmental applications which the re-designed Project will undertake.

A. Auto Tune-up Pilot Program

As a pilot demonstration to determine the feasibility of implementing the anticipated FY 94 Cairo Air Project, one tune-up center will be established to perform one thousand vehicle tune-ups. This pilot activity will

- demonstrate the benefits of tune-ups for the motoring public,
- introduce new technology for automotive maintenance in the country, and,
- quantify savings from auto tune-ups.

The project will install imported electronic engine analyzers in one workshop in Cairo. Mechanics in the workshop will receive training in the operation of the analyzers. The workshop will then offer tune-ups to the general public. Motorists will give a refundable deposit prior to participating and then monitor their fuel consumption before and after receiving a tune-up. They will report their fuel consumption to the workshop in order for their deposit to be refunded.

A similar demonstration project was conducted in Pakistan in 1989. The results from tuning over three hundred participating vehicles indicated that tune-ups can reduce fuel consumption by up to eleven percent. Projection of these savings over the country translated into an annual cost saving of \$11.77 million.

Studies conducted in developed countries have shown that tuned vehicles can reduce fuel consumption by up to fifteen per cent. Savings of these magnitudes would have a significant impact on the energy bill of Egypt as well as increase the quality of air.

B. Environmental Audit for Edfina Food Company

Edfina Food Company, located in Alexandria, Egypt, was the subject of an Environmental Audit conducted by Weston International in 1983. An audit update was conducted through AID/NE's WEC Project in 1993.

In both the 1983 and 1993 audits, in-plant water conservation and reuse were cited as areas requiring major improvements.

Recommendations rendered included such process changes and modifications as the installation and replacement of cooling towers, the replacement or installation of piping and water canals, and, chemical treatment of recycled water. The updated audit also recommended changes in the process of food handling, such as stacking and rinsing of both fresh and frozen foods; and, improvements in the cannery operations, including cooling processes and control of evaporation and drift losses. In order to reduce water losses, increase food quantity and quality preparation, and decrease pollutant discharges into the city sewerage system, the audit recommended the installation of electronically-operated solenoid valves on cooling water, and the installation of recycle lines that would only allow water usage when equipment is operating.

While the above are only illustrative examples of applications that can be implemented to reduce air pollution and contaminant discharge into major bodies of water and city sewerage systems, the applications are proven and replicable.

6.2 SUMMARY OF FINANCIAL ANALYSIS

Both energy conservation and pollution prevention activities can increase a firm's overall efficiency of production, reduce operating costs, and result in higher profits.

Investments in ECEP energy conservation subprojects are resulting in attractive financial returns. As of September 1993, \$12.6 million had been invested by AID, the GOE, and various companies in active (or completed) ECEP subprojects which were returning annual energy savings estimated at \$19.6 million (at international prices). This results in a payback period of only 0.64 years. In addition, ECEP engineers have worked with companies willing to spend their own funds to replicate ECEP technologies. When these known replications are added to ECEP direct subprojects, the total investment becomes \$51.4 million, the annual energy savings is \$37.7 million, and the payback is 1.36 years.

The pilot environmental activities under the amended project will focus on low cost pollution prevention technologies with attractive paybacks for the firm. Although it is difficult to measure the financial returns on investments in industrial pollution prevention, there is abundant evidence from the U.S. (and to a lesser extent from Egypt) that pollution prevention activities can significantly reduce a firm's production costs, and thereby increase its profits. Such activities often have a payback period of less than one year.

In sum, there is clear existing evidence that the financial return to energy conservation activities in Egypt is high. Also,

based on both anecdotal evidence from Egypt and a wealth of experience from other countries, there is strong reason to believe that the financial returns to pollution prevention activities in Egypt is also high. As explained in the financial analysis in Annex E, most of the funds directed to environmental activities within the ECEP are for local management, the redesign and interim implementation, training, policy studies and information dissemination, which are components inappropriate for conducting financial analyses. The limited funds going to environmental pilot demonstrations (\$1.5 million out of total project funding of \$49.5 million) will be used with the intention of determining whether these activities are financially viable or not.

The detailed financial analysis appears in Annex E.

6.3 SUMMARY OF ECONOMIC ANALYSIS

Even though the environmental benefits to society of the ECEP cannot be measured at this time, return on energy savings alone are sufficient to justify AID's investment in this Project. Furthermore, ECEP is a demonstration project and its technologies already are being replicated by numerous companies. Assuming replications produce an additional \$10 million a year in energy savings, the return on AID's \$49.5 million investment is roughly \$47.7 million per year for a payback of about 1.04 years. See Annex E for further analysis on payback periods.

The proposed pilot auto tune-up program appears to be economically justifiable at first glance, although more detailed analysis is needed. The benefit to vehicle owners in the auto tune-up program includes a reduction in their fuel bills of up to five percent. Furthermore, if all Cairo autos were tuned-up, it would free oil for export worth an estimated \$12 million annually, as well as benefit society by reducing air pollution.

The amended ECEP will also assess the feasibility of operating Cairo vehicles on Compressed Natural Gas (CNG). Egypt currently imports diesel fuel at \$0.22/liter and distributes it nationwide at \$0.08/liter. In light of this subsidy for diesel fuel, the conversion of diesel vehicles to CNG would have a large beneficial impact on the economy.

In the future, USAID will fund a study to investigate the environmental costs and benefits of proposed pollution reduction interventions for Egypt so that the exact implications of these interventions and their economic justification are better understood. Even now, however, there is strong reason to believe that the economic returns to pollution prevention activities are high.

A more detailed economic analysis appears in Annex D.

6.4 SUMMARY OF SOCIAL SOUNDNESS ANALYSIS

The amended project is socially and culturally feasible to the extent that it enhances the overall health of the Egyptian population, saves energy in the transportation sector, saves energy and increases productivity for the industrial sector, and reduces hardships caused by the removal of subsidies and increases in energy prices in the long-term

The amended Project will produce significant social benefits and future environmental improvements for all Egyptians. Adoption of the environmental management process in industry and transport will reduce environmental pollution in urban areas, providing both national and global returns, decreased waste, increased productivity, and improved economic growth prospects. The amended Project will also heighten public awareness of environmental issues and provide valuable guidance concerning appropriate regulatory approaches. The methodology demonstrated in this amended Project will provide a valuable foundation for environmental improvements that will beneficially effect future generations of Egyptians and the world at large. A full social soundness analysis appears in Annex F.

6.5 SUMMARY OF ADMINISTRATIVE ANALYSIS

An assessment of the specific Project Amendment implementing organizations roles and responsibilities appears in Annex C - Administrative Analysis. An assessment of needs and capabilities appears in Annex J - Institutional Assessment.

Concerning the administrative capabilities of participating individual plants, the amended Project will have a direct impact on the required conditions for a successful energy conservation and environmental program. For instance, the plant owner's commitment and available capital are critical requirements that ECEP can address by offering financial assistance and the potential for payback on the measures implemented. To ensure sustainability, the Project will focus on those plants which, through their earlier interest and actions under the original ECEP, have shown a strong desire to improve their plant from an energy conservation and environmental standpoint.

A key step in the development of programs for the participating plants in this Project will be the evaluation of their internal management structure and procedures. No plant can successfully implement energy conservation or environmental management programs if it has not put in place a well defined internal management structure that defines responsibilities, levels of authority, and reporting requirements. It is necessary for industrial plants to establish in-place procedures for gaining access to external expertise. The amended Project will provide this.

A large number of development projects that have included the installation of complex systems have suffered serious set-backs after system start-up due to the lack of adequate operations and maintenance procedures and equipment. The amended Project will avoid many of these problems by emphasizing no-cost and low-cost measures that are integrated into plant operations. Also, in the selection of participating plants, strong consideration will be given to the demonstrated ability of the plant to adequately sustain good operation and maintenance of its facilities. To further reinforce this priority, improvements in operations and maintenance (O&M) will be an important feature of the training effort in the Project.

The general availability in Egypt of local, experienced installation contractors, the existence of competent Architectural/Engineering firms, and the number of competent laboratories with analytical capability will have a direct effect on Project success. In addition, the enforcement of environmental regulations is limited by the lack of trained people for monitoring and control within the GOE, and in particular the EEAA.

Given these current conditions in Egypt, the amended Project must carefully select participating plants, and allow flexibility in the implementation of programs.

ANNEX A
REVISED LOGICAL FRAMEWORK

Project Title and Number: Energy Conservation and Environment (263-0140.3)

PROJECT DESIGN SUMMARY

Life of Project

From FY 88 to FY 96

LOGICAL FRAMEWORK

Total U S Funding: \$49.5 million

Date Prepared September 19, 1993

NARRATIVE SUMMARY	OBJECTIVE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p><u>GOAL</u> To improve energy efficiency and environmental protection</p>	<ul style="list-style-type: none"> * National product/energy ratios (by industrial group) * Reduced industrial air emissions * No firms with energy conservation (EC) or environment programs (sustainable) * Number of firms with increased product/energy ratios * Improved industrial energy and environmental policies 	<ul style="list-style-type: none"> * National Accounts * GOE/EEAA Monitoring System * Survey * Survey * Observation 	<ul style="list-style-type: none"> * Political Stability * GOE stops energy subsidies by 1995 * Strengthened role of GOE EEAA. * Enforcement of GOE environmental laws
<p><u>PURPOSE</u> To accelerate adoption of improved technologies and practices to save energy and protect the environment</p>	<ul style="list-style-type: none"> * \$20M/yr in energy savings * Reduced Air Emissions SOx 10 000 tons/yr NOx 1 500 tons/yr CO 1 500 tons/yr * 40 firms replicating environment/energy technologies * 3 A&E firms capable of implementing industrial energy/env mgt programs 	<ul style="list-style-type: none"> * Project monitoring reports * Project monitoring reports calculations linking fuels burned to emissions * Surveys & observations * Observation 	<ul style="list-style-type: none"> * Private industry and A&E firms open to replications * Financing available for replications * Suppliers engage in marketing campaigns * Demo technologies are appropriate & economic
<p><u>OUTPUTS</u> Demonstration Subprojects</p>	<ul style="list-style-type: none"> * 30 Energy conservation demonstrations * 6 Pilot environment demos 	<ul style="list-style-type: none"> * Project records 	<ul style="list-style-type: none"> * Companies have funds to cover their share
<p>Policy Studies</p>	<ul style="list-style-type: none"> * 10 studies completed 	<ul style="list-style-type: none"> * Project records 	<ul style="list-style-type: none"> * Data are available
<p>Training and Promotion</p>	<ul style="list-style-type: none"> * 3500 trained * 25 manuals produced 	<ul style="list-style-type: none"> * Project records 	<ul style="list-style-type: none"> * Qualified trainees
<p><u>INPUTS</u> Technical/Mgt Assistance/Trg Local Project Mgt & TA Equipment Evaluation and Audit PROJECT TOTAL</p>	<p>\$24 054M 5 996M (in LE for GOE mgt agencies and local engineering contracts) 19 2M 0 25M \$49 500M</p>		<ul style="list-style-type: none"> * AID can scope & process contracts in timely fashion * M/TA contractors are competent & dedicated

ANNEX B
TECHNICAL ANALYSIS

ANNEX B

TECHNICAL ANALYSIS

1 GENERAL

The Technical Analysis in the original Project Paper for the Energy Conservation and Efficiency Project identified three initial industrial target sectors (cement, chemicals, and metallurgy) and ten technologies for implementation, i.e., Process Controls, Energy Management Systems, Combustion Controls, Waste Heat Recovery, Cogeneration, High Efficiency Electric Motors, Power Factor Improvement, Insulation, Solid Fuel Fired Boilers, and High Efficiency Re-lamping. A detailed discussion of the technical analysis is in Annex D to the original Project Paper.

The technologies were selected using five criteria: (1) energy savings, (2) economic merit, (3) proven technology not used in Egypt, (4) replicability, and (5) can be provided by U.S. suppliers. The technology list was not all inclusive and other technologies meeting the selection criteria were to be added as appropriate. Over the four years since project implementation, a number of these technologies have been implemented in Technology Applications, thereby demonstrating their feasibility in selected sectors of the Egyptian industrial sectors. All of the original ten technologies focused on energy conservation. The amended Project broadens the technology consideration to include those with primarily environmental benefits.

2 IMPROVING PROJECT REPLICABILITY AND SUSTAINABILITY

Revisions to the approach of the Project regarding energy conservation were suggested in the March 1992 Project Evaluation, by the Project team as a result of Project experience, and by a number of cognizant individuals interviewed. Major points that were recommended for change included:

- Require significant plant participation in investment in energy conservation on future technology applications- Originally, the Project was designed with a Revolving Fund, which would be left in place after the Project PACD, to fund energy conservation work. This fund was never initiated and was replaced by a system of grants, because of the complexity associated with operating the fund. However, one hundred percent grants are less reasonable now because of the significant increase in energy prices in Egypt and such grants do not move the industry toward accepting the technologies based on their pay-back. In addition, increased cost sharing can increase the number of Technology Applications that can be implemented. The implementing agencies have recently

been successful in getting the participating plants to invest in energy conservation measures on a somewhat informal basis

- Reduce the emphasis on high cost Technology Applications- many of the individual Technology Applications that have been implemented or are planned have capital costs of \$500,000 or more per plant. The disadvantages of high cost measures include the following
 - lower replicability in capital poor industries
 - less effectiveness in training large numbers of people
 - effect on a reduced number of plants within a given overall Project budget
 - higher O&M costs (less likely to be implemented)
 - any failures are bigger "white elephants "

On occasion there are advantages to large energy conservation or environmental management projects from technical, economic, social, and programmatic standpoints. For instance, they are sometimes useful for gaining the interest of key decision-makers and, on an individual installation basis, the larger ones may be more economical due to economies of scale. In general however, their ability to accelerate adoption of new technologies, methods, or practices is not as great as low cost measures.

- Expand the definition of Technology Applications to include low cost/no cost energy conservation opportunities (LNECO's)- with a given budget, a greater number of companies can participate in the Project if low cost/no cost measures are allowed. In addition, by introducing a series of successful, inexpensive and relatively simple measures into the same companies, they begin to develop a relationship with the team members and increase their confidence in the value of energy conservation. Examples of these LNECO's are portable gas analyzers to measure combustion efficiency, steam system surveys and upgrades, water treatment programs for boilers and cooling towers, and power factor improvement. The Project's experience with the Portable Gas Analyzer initiative has been very positive, demonstrating the effectiveness of the LNECO approach.
- Eliminate the requirement that Technology Applications be in one of the ten target technologies and in the specified industries- successful applications were found for only six of the original target technologies, for various reasons. The Project could move more quickly and

would not lose any effectiveness by accepting applications of any good technologies that were replicable and met the other criteria. In addition, the majority of energy conservation Technology Applications that will be implemented in the Project are already in the pipeline.

- Permit local purchase of equipment- a number of cases have been encountered in the Project in which some of the equipment necessary was available on the local market. However, AID regulations did not permit local procurement. In these cases, significantly higher prices were paid and significant delays were encountered. Nurturing a local market for equipment can help achieve the goal of the Project. Significant relaxation of these limitations is not expected, however.
- Increase the emphasis on financing alternatives- the adoption of energy conservation within Egypt is significantly constrained by capital availability. Industries in most cases, simply do not have sufficient capital to internally fund energy conservation measures. The Project would accelerate the adoption of these technologies by investigating and taking steps to develop alternative financing options. Energy Service Companies (ESCO's) in the U.S. actively seek industrial energy conservation opportunities that they could develop. The Project should seek to match these ESCO's with Egyptian industry. Similarly, local banks and other investment options should also be addressed.
- Increase the participation of local consulting firms- DRTPC, at the current time, is the only organization in the private sector that has been trained in all aspects of energy conservation technology applications. Continued replicability of these technologies after the PACD will require trained teams of consultants to apply them. The performance of DRTPC has been very good. However, the DRTPC Energy Conservation and Efficiency Project office will close after the Project, though DRTPC will continue to operate in its broader areas. By adding private consulting firms to the implementing group and thoroughly training them, the probability of the commercial survival of at least several trained teams is increased significantly. Also, the promotional value of established firms canvassing industry for energy conservation projects to sustain their teams is important to the long term adoption of the technologies.
- Increase the emphasis on outreach, promotion, information dissemination, training, and policy reform- all of these types of activities have been pursued to some degree in

the Project to date. However, most of the cognizant individuals interviewed believed that the incremental value, in terms of accelerating the adoption of these technologies, of additional Technology Applications as currently implemented has been declining. The relatively large increases in energy costs as the GOE has lowered subsidies and other changes since the initiation of the Project have altered the character of the energy market.

Increased awareness, access to information, training, and elimination of policy barriers are believed to be more critical, and effective, at this stage. Thus, the amended project calls for a re-allocation of funds to place greater emphasis on these areas, and a slightly reduced emphasis on Technology Applications. Note that by their nature, these types of activities are less expensive than Technology Applications. Also, the modifications previously discussed above, such as increased cost sharing and greater emphasis on LNECO's will tend to decrease the Project equipment budget requirements. This will free sufficient funds to make significant improvements in the areas of promotion, information dissemination, training, and policy assistance.

3 INCREASING THE PROJECT'S ENVIRONMENTAL ASPECTS

The term "environmental aspects" covers a very broad range of activities. It is necessary to select a narrower group of activities for funding under the amended Project in order to provide an adequate focus. The following considerations were used in the selection of new environmental activities:

- Activity does not overlap other donor programs
- Greater weight given to activities that leverage Project funds by doing work that complements or feeds into other Programs
- Activity addresses significant Egyptian pollution problem
- Significant results can be achieved within the funding constraints of the Project
- Activity can be completed within the time constraints of the Project
- Greater weight given to activities that address critical questions relative to potential Mission Projects
- Greater weight given to activities that support the Privatization of Egyptian enterprises

A process of elimination to select appropriate activity areas was conducted. One broad categorization scheme for types of environmental activity is provided below. Although certainly other schemes can be found, this scheme is adequate to illustrate the selection rationale.

- Environmental policy and planning
- Infrastructure development
- Research and assessment
- Training, awareness, and education
- Global issues (greenhouse gases, CFC's, biodiversity)
- Pollution control/prevention technologies and methods
- Resource conservation

Of these areas, pollution control/prevention fits most closely the on-going energy conservation technology application orientation of the existing ECEP. In addition, pollution prevention can offer the end user the opportunity for payback of his investment, another key element of the existing ECEP. Other types of activities within the above group will be used to support and to help accelerate the adoption of the methods and technologies that will be the primary focus of the environmental activities in the Project.

Within the category of pollution control/prevention, one must select the sector(s) that will be addressed from a list such as the following:

- Industrial
- Agricultural
- Residential
- Commercial/Institutional
- Transportation
- Power

Of these sectors, residential pollution was eliminated in part because the Mission already has a large domestic wastewater program, as do other donors. Residential air pollution sources are not major relative to other problems. Lead paint in Egyptian homes and residential solid waste are significant pollution problems, but programs to address them would not fit the institutional framework of the existing ECEP as well as other areas.

The agricultural sector is the focus of many donor programs and not a good match to the existing ECEP framework. The commercial/institutional sector was part of the original ECEP design. However, this sector is not particularly important from the standpoint of the overall Egyptian environmental problem. Hospital/medical hazardous waste is a significant example of institutional pollution, but it does not offer particularly good pollution prevention or payback opportunities. Also, that area would not match the capabilities of the ECEP implementing agencies as well as other areas.

The power sector is being addressed in a number of AID and other donor programs. It does fit well with the energy orientation of ECEP and it is a significant pollution source within Egypt. The amended ECEP will include some policy development studies related to environmental aspects of fuels use in the Power sector.

The two remaining sectors, industrial and transportation, have been selected for inclusion in ECEP because they meet the selection criteria above. Both sectors have important energy/environmental issues. The industrial sector is the major focus of the existing ECEP and many pollution prevention opportunities can be found to provide a return on investment to end users. The transportation sector is extremely important to the air quality pollution in Cairo. In addition, efforts to reduce pollution from the transportation sector always have significant energy implications.

Many of the targets of opportunity within Egypt for environmental programs are not sufficiently well-defined or understood to permit movement directly to a full "demonstration-level" project. In addition, in many cases the uncertain attitude or commitment level of the GOE and the uncertain status of its regulatory institutions and infrastructure tend to make full "demonstrations" inappropriate at this time. The amended Project provides flexibility that allows the Mission to respond to changing priorities and conditions over the remaining life of the project.

Given that one of the areas the Project will focus on is environmental pollution from the industrial sector, one must determine if the Project should narrow its focus further to include one specific medium (air, water, solid waste) and one or several specific industries e.g., the chemical industry.

U.S. experience has shown that focusing on one medium over another will frequently result in the shifting of the problem. For instance, hazardous sludges often result from many water treatment approaches. A multi-media approach that minimizes the overall pollutional impact of a specific plant is best. Thus, the Project will not focus on any particular type of industrial pollution medium.

INDUSTRIAL SECTORS

Egyptian Industry is diverse and any demonstration program must be based on an understanding of it. The intent here is to provide guidelines and not to establish a rigid framework to prevent excursions. A good opportunity in a particular plant that might not be found in this general review may be identified during later work.

Information that could be used to assess a specific industry in terms of the above selection criteria is relatively limited and most has been reported for major category groupings such as food and chemicals. The "Industrial Environmental Map Progress Report" of 1991 presented data on what were deemed to be six environmentally significant industrial categories. It must be noted that these groupings did not match exactly the standard industrial code classifications, but the data presented is useful for obtaining a relative ranking of sectors. Table B-1 identifies

average water use in each of the six sectors, the number of factories, the water discharge volume, and estimated pollutant load from each per day. These six broad sectors are also summarized in Table B-2 in terms of their economic significance in the country, the relative environmental hazard, number of firms near Cairo and Alexandria, and relative opportunity for application of pollution prevention measures.

Table B-1 Average Water Use by Industry and Daily Pollution Load by Type

INDUSTRY	NO OF PLANTS	WATER USE MILLION M ³ /YR	DISCHARGE MILLION M ³ /YR	POLLUTION LOAD IN TONS/DAY				
				BOD	COD	SS	TDS	OIL
Food Industry	119	296	277	182	142	168	665	110
Chemical Industry	53	127	98	26	178	33	241	23
Textiles	75	114	88	39	47	64	191	24
Metal/Metal Products	11	69	60	15	14	24	29	8
Engr Fabrication	39	13	12	5	6.6	3	13	2
Mining	33	19	14	3	0.4	4	11	1
TOTAL	330	638	549	270	338	296	1151	168

Note Percentages of pollution loads for heavy metals were reported by Dr Galad Saad as follows:

- 1 Chemical industry - 0.941 tons/day (57% of total)
- 2 Textile industry - 0.3 tons/day (18.1% of total)
- 3 Food industry - 0.171 tons/day (10.4% of total)

The total discharge of the above industries is 549 million cubic meters of water annually (1.8 million cubic meters/day). Concentration of pollutants are as follows:

Soluble materials (TDS) 628 ppm
 Chemical organic load (COD) 212 ppm
 Suspended solids (SS) 162 ppm
 Organics (BOD) 147 ppm
 Oils and greases (OIL) 147 ppm
 Heavy metals (HM) 0.9 ppm

Table B-2 OVERVIEW OF EGYPTIAN INDUSTRIAL SECTOR

INDUSTRY SECTORS	NAT L ECON SIGNIFICANCE		MAGNITUDE OF ENVIRONMENTAL HAZARD	APPROX NO OF FIRMS	LOCATION		PRODUCTION VALUE (MILLION L E)	OPPORTUNITY FOR POLLUTION PREVENTION
	%	\$M			CAIRO	ALEX		
Chemical	8	770	HIGH	53	23	25	2,227	MEDIUM
Food	31	2,986	MEDIUM	119	33	57	5,463	HIGH
Textile	16	1,541	MEDIUM	75	24	46	3,996	HIGH
Engr Industry	9	867	MEDIUM	39	30	7	1,811	HIGH
Metals	36 ¹	3 467	HIGH	11	7	3	2 166	HIGH
Mining/Others	N/A	N/A	HIGH	33	10	7	290	MEDIUM
TOTAL	100	9 631		330	127	145	15 953	

1 Percent National Economic Significance and dollar amount are for both Metals and Mining/Others categories

Note

a Public owned industrial companies, production values for 1989-1990 in L E , based on Ministry of Industry data

b Industry is 29 percent of Egyptian GDP This translates to \$9,631 million in 1991 (Sources World Bank, World Resources Institute, 1992)

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More work has to be performed to obtain relevant data on all industries.

The criteria developed for ranking industrial categories for the Project Amendment were

- Economic significance of the industry nationally,
- Significance of environmental hazards in plants in the classification,
- Number of firms in the classification that could replicate the process,
- Significant pollution prevention opportunities
- Location of significant numbers of plants in the classification near Cairo/Alexandria
- Plants in the industry classification are generally of a size and have types of operations that could be significantly affected by equipment investments of the magnitude planned within the Project
- Industry is not being addressed by other donor programs.

These criteria are separate from the plant selection criteria that have been described elsewhere and are intended to identify individual plants within an industry group. Again, this sectoral selection process is intended to provide general directions or guidelines and is not intended to be restrictive. The degree to which an industrial facility's management is an "early-adopter" and enthusiastic about environmental management is assumed to be the primary determinant of the likelihood of successful implementation within that plant. The impact of a successful demonstration within that plant is assumed to be based on consideration of factors such as those in the above list. Based on the data identified to date, the following broad ranking of industrial sectors has been made

HIGH PRIORITY

Food
Chemicals
Textiles

MEDIUM PRIORITY

Paper
Metals
Leather

Ceramics

Engineering/Fabrication

- Fabricated Metal
- Industrial and Commercial Machinery
- Electronic and Other Electrical Equipment
- Transportation Equipment
- Specialty Equipment

LOW PRIORITY

Lumber and Wood Products
Furniture and Fixtures
Petroleum and Coal Products
Rubber and Plastic Products
Stone Products
Cement
Concrete and Plaster Products
Nonmetallic Mineral Products

SELECTION OF PARTICIPATING INDUSTRIAL FIRMS

The basic approach for Industrial Environmental Management applications within the Project is to help carefully selected firms advance their programs in environmental management. Most of these firms will be selected because they have been identified as early-adopters of environmental management. The Project will help their programs to be implemented more quickly and with more pollution prevention methods and technologies than they would without assistance. Plant selection criteria should include consideration of the following factors:

- Plant is economically viable. For the public sector, the plant is a candidate for privatization.
- Plant is not unique. Measures selected for plant would likely be replicable.
- Competence of plant management.
- Geographic location.
- Plant management has demonstrated interest and commitment to environmental protection.
- Plant size and type of operations are such that reasonable levels of improvement can be made within limited capital constraints.
- Type and amount of air and/or water pollution from the plant is significant.

In recent months, significant changes have been observed in the concern of Egyptian industries about environmental matters. First, the European Economic Community (EEC) is expected to require that all Egyptian firms exporting to the EEC meet rigorous environmental standards. A large number of firms would be affected in Egypt and many are concerned. Secondly, a number of public sector firms have

recognized that they will eventually be privatized and that it is in their interest to remedy some of their environmental problems

An initial group of potential candidates for participation in this part of the Project have been identified through several channels, in particular

- Participants in the existing Energy Conservation and Efficiency Project who have been recommended by the Project team as being very environmentally concerned and who have taken initial measures in the environmental area. Two of the best prospects are
 - Arab Aluminum, and
 - Alummisr

- Participants in the on-going STC Clean Technology and environmental programs who have been recommended by the STC Office as being interested in participating in a broader environmental program. Implementation of pollution prevention concepts developed in the STC Office under the AID S&T Project is another of the potential initiatives under this amended ECEP. The initiative for the STC pollution prevention programs could be integrated with this environmental management program for some of the plants. The "STC" initiative addresses specific technologies and the environmental management pilot addresses all environmental concerns within a plant. The following sub-projects in the STC program are described in detail in the discussion of that program and are excellent candidates for participation in the environmental management pilot demonstration as well
 - Abou Qir Company for Fertilizers and Chemical Industries,
 - Dyestuffs and Chemicals Company (ISMADYE)
 - Edfina Company for Preserved Foods
 - Misr Beida Dyers Company
 - Al-Ameria Petroleum Refinery
 - Zoraian Company for Tableware

- Miscellaneous firms identified as likely candidates during plant visits and interviews with cognizant personnel. Three firms have been identified as having initiated or are about to initiate significant pollution control systems
 - BTM Textiles
 - Lecico Ceramics
 - Misr Chemical and Coatings Co

POLLUTION PREVENTION

The terms pollution prevention, clean technology, and waste minimization are used interchangeably. Pollution prevention means

the reduction, to the extent feasible, of any waste that is generated or subsequently treated, stored or disposed of. The techniques focus on source reduction or recycling activities that reduce either the volume or toxicity of the waste generated. Unlike many waste treatment methods, pollution prevention can be practiced at several stages in most industrial processes. Pollution prevention can save money - often substantial amounts - through more efficient use of valuable resources and reduced waste treatment and disposal costs. Many of these methods can be implemented for little or no capital cost.

The U S EPA has estimated that no-cost/low-cost measures can generally achieve 50 percent reductions in effluent pollution levels on average for the types of industries that have been selected for this Project. In addition, Drs F A El Gohary, S S. Nawar, and H L. Ali reported in the "Proceedings of the Fifth International Conference of CPE IX" in Leuven Belgium, in 1985 that similar magnitude reductions were achievable in Egypt, based on their analysis of 50 plants. Finally, based on the "Industrial Environmental Map Progress Report", 1992 by the Friedrich Eber Foundation, Professor S Galal Abd El Hamid estimated the same 50 percent potential reduction value for pollution discharge to the Egyptian waterways using these techniques.

Given the limited capital available in Egypt and the importance of environmental protection, any approaches that can reduce the cost of pollution control in industry must be taken.

The strategy used to accelerate the adoption of industrial environmental management in Egypt through these ECEP demonstrations will be as follows:

- Prove that pollution prevention is a broadly applicable approach and that it can play a major role in the overall environmental management program of an individual industrial facility and within Egypt as a whole.
- Prove that pollution prevention reduces the costs of environmental management compared to conventional pollution control technologies and that payback of investment costs can be achieved. Low-cost and no-cost methods and technologies will be emphasized in the Project. Analyses will be performed to demonstrate the costs of meeting pollution standards by both conventional pollution control and pollution reduction methods.
- Develop a cadre of Egyptian firms with first-hand experience and training in the development and implementation of broad pollution prevention programs in industrial facilities.
- Perform policy studies that will identify appropriate steps to advance environmental management in Egypt, especially in the industrial sector.

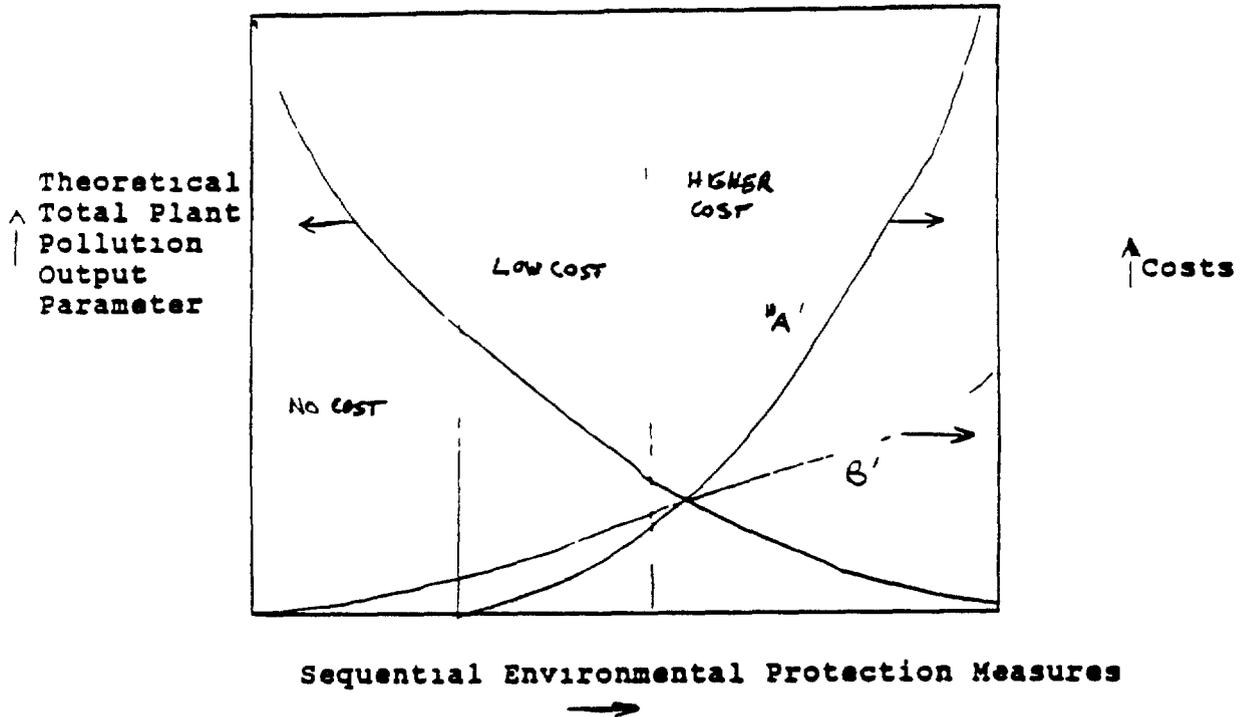
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- Implement a program of information transfer and training to provide Egyptian firms with the knowledge needed to implement industrial environmental management, in general, and pollution prevention, in particular

ASSUMPTIONS

A number of assumptions have been made in the design of the project's industrial environmental management demonstration component. Some of these assumptions have been described above. The following figure illustrates a theoretical, generalized relationship that has been used to formulate the approach taken for the Project. The horizontal axis of this graph is the hypothetical, optimized sequence of steps or measures that a plant management can implement to reduce the environmentally important wastes from the plant. The left vertical scale is a theoretical parameter that is used to represent the total pollutant output of the plant. The right hand vertical line represents costs. For Curve "A," this scale can be read as the cumulative cost to implement the measures. For Curve "B," this scale is the cumulative cost savings for the plant resulting from the measures implemented. Curve "A" on the graph illustrates the fact that the first measures taken in a total environmental protection program cost nothing or very little, and yet they can have a very significant impact on reducing the pollution from the plant. Curve "B" shows that cost savings to the plant can begin even with these first, no cost measures. The graph is divided into three sectors: No-cost measures, relatively low cost measures, and higher cost measures.

FIGURE B-3: THEORETICAL RELATIONSHIP BETWEEN PLANT POLLUTANT OUTPUT, AND COSTS FOR AN OPTIMIZED SERIES OF POLLUTION PREVENTION MEASURES



The Project will develop a sequence of real measures that can be taken to reduce the pollutants coming from the plant, and essentially define these curves for each specific plant. Pollution prevention measures are expected to predominate. However, pollution control measures in some cases may be expedient solutions

The Project will focus on the no-cost and the low-cost portions of the curves for the participating plants. Higher cost measures will be implemented only as they advance the overall purpose of the Project and only on those plants that have successfully moved through the no-cost and low-cost measures.

It is assumed that specific measures not implemented through this "whole Program" approach to solving the plant's problems will be less successful because they have not been implemented with the overall context in mind. The behavioural changes and attitudes necessary for the plant to move sequentially from no pollution

measures to some higher level have not been demonstrated. If a plant manager is not willing to implement no cost and low cost measures that can have significant cost savings, his commitment to keeping a higher cost measure operating must be questioned. Measures that offer a significant return on investment should be cost shared by the plant.

It is assumed that in capital equipment costs will be adequate to implement a number of low cost measures at each plant, and have a significant impact on the plant's environmental impact. Reported experience in the US and elsewhere suggests that numerous types of pollution prevention measures cost much less than this. In fact, the ability to have a significant impact on the plants environmental impact within the Project's capital constraints will be a major consideration in the final selection of participating plants.

ANNEK C

ADMINISTRATIVE ANALYSIS

ANNEX C

ADMINISTRATIVE ANALYSIS

General Administrative Structure

The energy conservation-related activities of the amended Project remain divided into a public and a private sector component. Management services, technical assistance, training, and information dissemination assistance should continue to be provided to both components. The roles and responsibilities of participants in the existing Energy Conservation and Efficiency Project will remain essentially unchanged in the amended Project, which is renamed the Energy Conservation and Environment Project (ECEP). They are described in some detail in the original Project Paper. The Institutional Assessment provided in Annex J of this Project Paper Amendment provides additional discussion of responsibilities.

Activities under the amended Project that are primarily environmental in nature are not within the scope of the existing Energy Conservation and Efficiency Project contract. Therefore, project management and technical assistance support must be provided by other means.

For the expanded activities in the environmental area, the responsibilities of the implementing agencies are very similar to those for energy conservation activities, in that TIMS and DRTPC will share the technical and management role. TIMS and DRTPC will subcontract to various groups including private sector firms, OEPD, and others for implementing the environment related activities. FEI will expand its role to perform similar functions in the environmental area as it performs now for energy conservation concerns.

Addition of Private Sector Consulting Firms

One change has been made in the responsibilities of the Egyptian implementing agencies in the amended Project to improve the sustainability of energy conservation in Egypt after the end of the Project. Several private sector Egyptian consulting firms will be added as subcontractors. These firms will be given responsibility for analysis and design associated with implementing the technology applications/demonstrations. Three or four subcontractors will be selected, in both the energy conservation area and the environmental area, based on a limited competition to perform the designs and analyses for specific applications. The Mission must approve the nominated candidate firms, the selection procedure, and the selected subcontractors. The Development Research and Technological Planning Center (DRTPC) will continue to be responsible for selection of the demonstrations in the energy conservation and environment areas and oversight and management of all work in the private sector. DRTPC and the M/TA Contractors

will be responsible for providing training to the Egyptian subcontractor firms.

This change does not imply any deficiency in the performance to date of DRTPC or TIMS. In fact, the Mid-Term Project Evaluation completed in 1992 and all other indications point to the satisfactory performance of DRTPC. Rather, by placing the capability to perform this type of work in more Egyptian private sector firms, the likelihood of several trained teams of personnel remaining in existence for a significant period after the end of the project is increased. The survival of such a capability is critical to the amended Project's purpose of accelerating the adoption of energy conserving and environmental management technologies and practices.

Additional Long-Term M/TA Contractor for Primarily Environmental Activities

The additional M/TA Contractor should establish a small Project Office in Cairo staffed by an ex-pat Chief-of-Party, two Egyptian engineers with environmental experience, and one office administrator with some financial experience. The staff of the Project Office in Cairo should have extensive experience in working in the private sector in environmental areas. The Cairo office will require sufficient office equipment to conduct normal office support functions. The additional M/TA Contractor should also maintain a Home Support Office staffed by one half-time engineer as a Liaison Project Manager, with 18 personmonths of technical and Project administrative support, and 12 personmonths of normal office support functions over the 3-year life-of-project.

Over the past four years, the Energy Conservation and Efficiency Project has developed a capability within DRTPC, TIMS, and FEI to implement energy conservation and efficiency projects, to train managers, engineers, and technicians in the public and private sector to identify energy conservation opportunities, and to conduct public awareness information dissemination activities. The amended Project will expand this managerial, technical, and training capability to include expertise in the implementation of environmental management initiatives. The basic roles of these GOE implementing agencies should generally remain the same under the amended Project as under the current Project.

Finally, the additional M/TA Contractor should work with the GOE, DRTPC, TIMS, and FEI to ensure (1) the sustainability of the amended Project, and (2) accelerated adoption of energy conservation and environmental technologies and practices throughout Egypt. The additional M/TA Contractor will specifically support and assist the implementing agencies and project-related Egyptian industrial trade organizations to develop a cadre of Egyptian firms capable of performing all the required elements of environmental management in Egypt after the PACD.

Long-Term M/TA Contractor Responsibilities Under the Amended Project

The general responsibilities of the two long-term M/TA Contractors in Cairo remain as they are for the existing Energy Conservation and Efficiency Project, i.e., they include

- Providing assistance to DRTPC, TIMS, FEI, and public and private enterprises in project management, technical assistance, training, marketing and promotion, information dissemination, investment promotion, and policy development at all project stages,
- Advising the Mission on whether specific measures should be approved and funded,
- Reporting regularly to the Mission on project status and performance,
- Providing services as a Procurement Services Agent as requested by project participants [for some environmentally-related new activities, commodities will be procured through buy-ins]

In meeting these responsibilities, the M/TA Contractors will provide the following specific services (some of these services for environmentally-related activities may be secured through a buy-in)

- a Project Management - The resident Project Managers, as well as the U S Liaison officers, will oversee the amended Project activities and assist DRTPC and TIMS with day-to-day project management, monitoring, and coordination of the private and public sector components
- b Long-term and short-term U S Consultants - Identification and contracting for consultants to assist (as needed) DRTPC, TIMS, and public and private sector companies in:
 - (1) performing audits and feasibility studies,
 - (2) reviewing and approving all technology application and environmental management proposals,
 - (3) marketing energy conservation and environmental management initiatives,
 - (4) training services to DRTPC, TIMS, FEI, and public and private sector enterprises at all project stages.

- c. Training - Identification of training centers, universities, and A/E firms to arrange training courses, both classroom and on-the-job; preparation of training manuals and assistance to DRTPC and FEI in offering local training courses to industrialists and A/E firms.
- d. Investment Promotion Services - development of financing mechanisms for firms for energy conservation measures, identification of funding requirements, assisting in developing technical specifications, preparing Requests for Quotations and Invitations for Bids, assisting in analyses and selecting winning offers
- e. Marketing and Promotion Services - Assistance to DRTPC, FEI, and TIMS in organizing workshops and seminars, enhancing the existing energy conservation information center to include environmental data, and conducting promotion and marketing services with DRTPC, FEI, TIMS and public and private sector firms.
- f. Policy Assistance - Conduct of, and increased emphasis on, policy studies in a broad range of energy conservation and environmental management issues, conduct of specific studies to assist in policy development.

Responsibilities of GOE Implementing Agencies in Support of the Amended Project

General responsibilities for these agencies will remain essentially the same as under the existing Energy Conservation and Efficiency Project. Specific activities will be expanded to include environmentally-related efforts

- The Development Research and Technological Planning Center (DRTPC) responsible for project administration, accounting, and financial management, technical assistance and training; all aspects of identifying and implementing energy conservation and environmental technology demonstrations, and the incorporation of energy conservation and environmental management in the private sector;
- Tabbin Institute for Metallurgical Studies (TIMS) responsible for project administration, accounting, and financial management, technical assistance and training, all aspects of identifying and implementing energy conservation and environmental technology demonstrations, and the incorporation of energy conservation and environmental management in the public sector,
- The Federation of Egyptian Industries (FEI): responsible for promoting replication in the public and private

sector through information dissemination on energy conservation and environmental management practices and technologies, and development of a data base of information on environmental technologies

Government of Egypt Ministries and Authorities

Ministry of Industry

The Ministry of Industry (MOI) implements the public sector component of the existing Energy Conservation and Efficiency Project through the management of a Project Secretariat, i.e., the Tabbin Institute for Metallurgical Studies (TIMS), with guidance and approval from a Steering Committee. As mentioned above, the recommendation is for TIMS to continue its activities under the amended Project for the public sector (with assistance from the M/TA Contractors)

- a Project Steering Committee - The Chairman of the Steering Committee is the Minister of Industry or his designated representative. The Steering Committee is composed of the Minister of International Cooperation, the Executive Director of the Project Secretariat, the Director of TIMS, the Chairman of FEI, the Chairmen of the Metallurgical and Chemical Authorities, the USAID Mission Project Officer (ex-officio), and the Director of DRTPC (ex-officio). The Steering Committee will meet as appropriate (but not less than semi-annually) to be briefed on the status of the projects. The Steering Committee's responsibility under the amended Project will be to encourage GOE policy makers to remove policy barriers to environmental management programs.
- b Project Secretariat - The Project Secretariat is responsible for day-to-day project management and implementation of the public sector component. It is staffed by TIMS and an Executive Director with technical and management responsibilities as noted above. The Secretariat will continue to provide these same functions for activities under the amended Project.

The Egyptian Environmental Affairs Agency (EEAA)

Section VI.A described the current responsibilities of the EEAA. Over the life of the amended Project, the Egyptian "Environmental Protection Law" will pass Parliament and the EEAA will be gaining importance within the Egyptian environmental community as it begins to formulate policy, develop additional specific legislation, review environmental impact assessments, oversee inspection of industrial plants, and enforce the environmental laws. In this regard, the EEAA will be an imposing institutional force in all aspects of the amended Project as activities develop and

infrastructure in Egypt to implement energy conservation and environmental programs.

A recommendation is made to include the EEAA in implementation of the amended Project for two major reasons

- 1 **The EEAA will become a growing force in environmental activity in Egypt** - There was a unanimous feeling among cognizant persons interviewed that the EEAA's role in environmental affairs in Egypt would not be seriously felt in day-to-day industrial activity for 3 to 5 years. By that time, environmental programs will be implemented in the industrial and transportation sectors and a small, but strong, cadre of Egyptian engineering and consulting companies will be widely disseminating the philosophy. Coordination will be maintained with the EEAA so that the programmatic structure, technical assistance, and implemented environmental measures of the amended Project will be supportive of EEAA regulations. Data collected during pilot demonstrations under the amended Project will be shared with EEAA to assist in quantifying emission and effluent standards and in policy formulation.
- 2 **The EEAA can serve as a mechanism to identify sources of additional funding for amended Project activities** - The EEAA has established a Technical Cooperation Office for the Environment (TCOE). This office serves as a focal point for multi-lateral and bi-lateral donor activities and as a preparer of environmental projects to implement the Egyptian Environmental Action Plan. Also, an important element of the Project is to seek out and encourage sources of funding to "leverage" the limited budget available from the Mission. Collaboration with the TCOE would be beneficial to activities of the amended Project and should be encouraged. The TCOE will be continuously appraised of Project activities.

Recommended Staffing Requirements

For the energy conservation activities of the amended Project, the staffing requirements will remain the same as under the current Energy Conservation and Efficiency Project. The following additional staffing is necessary to support new environmental initiatives.

Additional M/TA Contractor

Project Office

Chief-of-Party: Senior environmental engineer with program management experience in the public and private industrial sector in developing countries (Full-Time Position)

Field Engineers Three Egyptian industrial/environmental engineers with hands-on experience working with private and public industrial plant management and process engineers (Full-Time Positions)

Administrative Support One Office Administrator/Financial Analyst with experience working on USAID programs (Full-Time Positions)

Home Office Support

Liaison Project Manager Engineering manager with experience managing technical projects in developing countries Extensive knowledge of USAID and U S government environmental programs (Half-Time Position)

Administrative Support(18 PM) Program Manager/Administrator with experience working on similar USAID projects in developing countries

Office Support (12 PM) Normal administrative and secretarial functions to support an overseas project in a developing country

Development Research and Technological Planning Center (DRTPC)

Technical Manager Egyptian industrial/environmental engineer with hands-on experience working with industrial plant management and process engineers Program management of USAID programs and involvement with Egyptian government programs is beneficial (Full-Time Position)

Field Engineers Four Egyptian industrial/environmental engineers with hands-on experience working with industrial plant management and process engineers (Full-Time Positions)

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Office Support: Three administrative, financial, and secretarial staff members (Full-Time Positions)

Tabbin Institute for Metallurgical Studies (TIMS)

Technical Manager Egyptian industrial/environmental engineer with hands-on experience working with industrial plant management and process engineers Program management of USAID programs and involvement with Egyptian government programs is beneficial (Full-Time Position)

Field Engineers Four Egyptian industrial/environmental engineers with hands-on experience working with industrial plant management and process engineers (Full-Time Positions)

Office Support Three administrative, financial, and secretarial staff members (Full-Time Positions)

Federation of Egyptian Industries (FEI)

Program Administrator Egyptian program administrator with experience working on USAID programs and with workshop/seminar and conference planning experience (Full-Time Position)

Information Specialist Egyptian Information Specialist skilled in database development and library science (Full-Time Position)

Administrative Support Office Administrator/Secretary with experience working on USAID programs (Full-Time Position)

ANNEX D
ECONOMIC ANALYSIS

ANNEX D

ECONOMIC ANALYSIS

I INTRODUCTION

This Annex discusses the economic justification for the energy conservation and pollution reduction activities to be carried out under the amended Project. Relatively little attention is given to energy conservation activities since they were treated in detail in the original Project Paper. Instead, attention is focused on the economic implications of various environmental interventions to be demonstrated under the amended Project. These demonstrations include Industrial Environmental Management Programs and an Automobile Tune-up Program.

The economic benefits resulting from the amended Project can be divided into two broad categories, which--in turn--can be divided into two sub-categories:

Private Benefits to Individuals or Firms:

- Energy conservation or pollution prevention activities by firms can increase their overall efficiency of production, reduce operating costs, and result in higher profits. Individuals can also benefit from such activities. For example, automobile tune-up programs will lower the costs to individuals of operating their vehicles.
- In addition, pollution prevention is often a less expensive means of attaining a given level of effluent discharge than is pollution control. The result is, once again, higher profits for the firm.

The private benefits to individuals or firms are discussed in detail in Annex E - Financial Analysis.

Social Benefits:

- It is a well documented fact that high levels of pollution often result in damage to buildings, other physical infrastructure such as sewer systems and wastewater treatment plants, and natural resources such as forests. Reducing pollution typically benefits society as a whole by reducing the types of damage described above.
- Pollution prevention activities typically also benefit other individuals or firms. Often these benefits are not readily valued in markets. For example, downstream or downwind health benefits typically result from reduced effluent discharge. Alternatively, reduced water pollution may permit the growth of a fishing industry and encourage the development of tourism.

- It is the sum of private and social benefits associated with a given energy conservation or pollution reduction activity which should be compared with the economic cost of the activity in order to determine its economic justification. The comparison of private benefits with costs is particularly important since it largely determines a firm's or individual's willingness to implement the specific activity.

II SOCIETAL BENEFITS

Reducing industrial or transportation sector pollution has a direct and measurable benefit to society - although the quantification of such benefits, as discussed below, is often difficult.

" There is remarkably little data to link the amount of air pollutants emitted from an energy consuming source to the cost of the actual damage that it causes. The words are spoken about cause and effect, but the extent of consequential damage in economic terms is not well defined. In poorer countries, environmental damage from energy use is compounded often with more prominent factors related to poverty, a heritage of industrial pollution and service industry problems.

" Even amongst the industrialized countries, there are only a few which have researched into a reasonably complete equation of the economic cost of air pollution control against the economic gains to be made in reduced damage (that damage to include value judgement on all related matters including loss of amenities). For those few countries in the world with good data, the correlation between source and damage is rarely clear-cut and the economic quantification of damage is well-recognized to be subject to divergent and local value judgements. In developing countries, it is suggested that much more work needs to be done to define the more important special factors in this equation for the specific country concerned.¹

The Mission will fund a study to investigate the degree to which these environmental costs and benefits can be determined for Egypt. It is hoped that payback estimates can eventually be developed for environmental measures in the same manner as energy savings are now used to justify energy conservation measures.

¹ Homer, John, "Natural Gas in Developing Countries-Evaluating the Benefits to the Environment," World Bank Discussion Papers, 1993, ISSN 0259-210X, 190,

Even at this point, however, there are strong reasons to believe that the social benefits resulting from the project will be significant

- * **The air quality in Cairo is severely degraded due to completely uncontrolled emissions from industrial and vehicular sources.** Dust levels in Cairo are four times higher than the natural background. Air pollution levels are many times higher than international standards, i.e., total suspended particulates - 8 times, sulfur dioxide - 4 times, smoke and lead - 3 times, nitrogen dioxide and carbon monoxide - 2 times. Any program that can reduce these emissions will have significant societal benefits in the form of reduced health problems leading to lower morbidity and mortality rates and increased worker productivity.
- * **As population expands, Egypt is faced with two powerful constraints to continued economic growth: water and arable land.** A rapid expansion of its industrial sector, if left unchecked, will pump tons of toxic chemicals into limited water resources and onto arable land. Important segments of the tourism industry are also potentially at risk. A Project that can help move the GOE more quickly and wisely toward the mitigation of this problem is obviously of critical importance.
- * **Consider finally the implication of Project activities for Egyptian infrastructure and antiquities.** USAID has invested heavily in upgrading Cairo's sewer systems and wastewater treatment plants. Many types of industrial wastewater can damage this infrastructure or limit its effectiveness. For instance, corrosive chemicals can shorten useful lifetime by destroying pipes. Toxic chemicals can upset operation of wastewater treatment plants and destroy the value of sludge for use as soil conditioners. Fats and greases can clog sewers. Air pollution can damage antiquities - as has already occurred in Giza. A Project to accelerate adoption of industrial environmental control would address this problem and help protect both the large investment already made in infrastructure and Egypt's priceless antiquities.

III. SUMMARY

There is clear existing evidence that the economic return to energy conservation activities in Egypt is high. There is strong reason to believe - based on both anecdotal evidence from Egypt and a wealth of experience from other countries - that the economic returns to pollution prevention activities in Egypt are also high. In the context of the current regulatory environment, well designed pollution prevention activities should result in private and social benefits far in excess of their corresponding costs. The Mission plans to further study this issue within the context of the amended Project.

ANNEX E
FINANCIAL ANALYSIS

ANNEX E

FINANCIAL ANALYSIS

This annex discusses the financial justification for the energy conservation and pollution reduction activities to be carried out under the amended Project

A. Financial Return on Individual Energy Conservation Subprojects

In early 1988, the economic and financial analysis of the current Energy Conservation and Efficiency Project (ECEP) indicated that all selected energy conservation technologies or applications had simple paybacks of 0.1 to 6 years with an average of less than 2 years

During ECEP implementation, detailed economic feasibility studies are undertaken for each ECEP energy subproject. To qualify for ECEP funding, the subproject must have a "simple" payback period of less than five years. For ECEP activities, the simple payback is the AID funded equipment cost divided by the annual energy savings (calculated at international prices)

The "simple" payback period calculated in the ECEP feasibility studies are not conservative in that they exclude several factors which would make the payback period longer. First, they exclude participating company contributions that include ancillary equipment, equipment customs clearance and transport, installation, and operation/maintenance costs. In general these average about 20% of the AID funded equipment and thus push the required payback up to about six years. Second, the "simple" payback period does not include the engineering, specification writing, procurement services, and staff training costs of subprojects, these also average about 20% of the equipment cost pushing the payback up to seven years. Third, the "simple" payback period ignores the delay between the time the investment outlay is made and the time when energy savings start. This delay ranges from about three to nine months and averages about six months; thus it pushes the simple payback up to about 7.5 years. In summary, when all costs are added, the ECEP "simple" five year payback period criteria essentially limits ECEP to

¹ Energy Conservation and Efficiency Project (ECEP), Project Number 263-0140.3, Project Paper dated June 13, 1988 (Page 21-22) and Annex E - Cost Effectiveness Analysis, U S Agency for International Development

subprojects that pay for themselves in about 7.5 years. Thus the ECEP payback criteria for subprojects is not overly restrictive.

The "simple" payback period also ignores any consideration of the useful life of the investment. An equipment investment with a five year payback is obviously not attractive if the equipment stops functioning after three years. ECEP demonstration subprojects have a useful life in the 10 to 20 year range, except for the portable gas analyzers which generally last about five years, but pay for themselves in a few months.

The ECEP subprojects selected for implementation have had estimated simple payback periods substantially below five. Completed feasibility studies for subprojects being funded by ECEP have "simple" payback periods ranging from 0.28 for Power Factor Improvement at the National Metals Company to 3.50 for Cogeneration at the ALUMISR Aluminum Company. However, as discussed above, these exclude a sizeable portion of the costs.

When the excluded costs are added, the full payback periods indicate that ECEP demonstration subprojects are still financially attractive, see Table X below. The costs in Table X include the actual equipment cost (FX AID-Funded), project estimates of plant cash and in-kind contribution, and estimated engineering costs (ranging from 10% to 30% of FX equipment cost depending on technology sophistication). The Table X energy savings per year are based on the international prices of actual monitored savings (Act) or estimated savings from ECEP feasibility studies (FS). The Table X payback period is the total subproject cost divided by annual energy savings.

As indicated in Table X, annual energy savings for "Active and Completed" ECEP subprojects is about \$1.5M in the private sector and \$6.5 in the public sector. The payback for public sector subprojects (1.25) is far shorter than that in the private sector (2.54) because public sector companies generally are far less energy efficient.

The portable gas analyzer program is reported separately because it is an example of the low-cost, no-cost types of technologies that are being emphasized in the ECEP as a result of the amendment. The program is based on a device which computes fuel efficiency by analyzing stack gases. The device is used to tune-up industrial boilers so that their fuel use is optimized. The \$600,000 program has reduced energy use in over 50 plants by an average of over 10%. It already is saving energy worth about \$11.6M annually, for a payback of about 0.05 years. Energy savings is calculated by comparing energy efficiency before the tune-up with energy efficiency after the tune-up and multiplying the efficiency gain by annual boiler fuel consumption based on factory records. While this methodology may overstate the amount

TABLE X ECONOMIC AND FINANCIAL RETURN FOR ECEP ENERGY SUBPROJECTS

ECEP - ACTIVE OR COMPLETED SUBPROJECTS

PLANT	Tech	Current Status	----- COSTS (\$) -----			Total Cost	LNERGY SAVINGS/YR \$/yr		PAYBACK (cost divided by savings per year)
			FX AID-Funded	Plant Funded	Engineering				
<u>PRIVATE</u>									
ACMC	PFI	Complete	201,314	33,227	30,197	264,738	148,330	Act	1.78
Giza Cables	PFI	Complete	108,527	19,309	16,279	144,115	108,725	Act	1.33
ALUMISR	COG	Monitor	475,000	208,788	142,500	826,288	152,000	FS	5.44
Arab Pharm'I Glass	CCS	Install	134,429	20,467	40,329	195,225	58,016	FS	3.37
Arab Aluminum Co	CCS/IRM	Procure	810,682	133,561	162,136	1,106,379	306,932	FS	3.60
Asfour Glass	CCS/WHR	Install	302,000	46,530	90,600	439,130	125,403	FS	3.50
EIPICO	EMS	Install	309,000	119,683	92,700	521,383	175,000	FS	2.98
Ramses Hilton	EMS/HEL	Install	213,707	21,212	64,112	299,031	350,000	FS	0.85
Seven-Up	PFI	Complete	49,567	10,465	9,913	69,945	100,010	Act	0.70
ω Subtotal			2,604,226	613,242	648,767	3,866,235	1,524,416		2.54 Total 2.62 Average
<u>PUBLIC</u>									
Delta Steel	CC/WHR	Procure	482,320	43,000	144,696	670,016	250,000	FS	2.68
Egypt Copper Works	CCS	Monitor	192,728	24,000	57,818	274,546	250,000	FS	1.10
El-Shourbagi Textile	PFI	Complete	117,645	11,000	23,529	152,174	48,464	Act	3.14
National Metals	PFI	Monitor	510,300	60,000	76,545	646,845	900,605	FS	0.72
SEMADCO	WHR	Complete	67,132	20,000	20,140	107,272	392,000	Act	0.27
Somaga Refractory	CCS	FS	195,000	60,000	58,500	313,500	312,000	FS	1.00
TRENCO	PFI	Procure	818,550	30,000	81,855	930,405	618,574	FS	1.50
Coke & Chemicals	EMS	FS	400,000	25,000	120,000	545,000	392,000	FS	1.39
Egypt Copper Works	WHR	Monitor	200,000	40,000	60,000	300,000	112,500	FS	2.67
SEMADCO II	WHR	Procure	1,400,000	200,000	280,000	1,880,000	1,350,000	FS	1.39
El Nasr Pharmaceutical	PC	Procure	360,000	30,000	108,000	498,000	307,699	FS	1.62
Abu Zaabal	CG	Install	1,341,000	200,000	268,200	1,809,200	1,568,000	FS	1.15
Subtotal			6,084,675	743,000	1,299,283	8,126,958	6,501,842		1.25 Total 1.55 Average
<u>PORTABLE GAS ANALYZERS</u>									
Private Sector	17 plants		85,000	34,000	68,000	187,000	111,962	Act	1.67
Public Sector	37 plants		185,000	74,000	148,000	407,000	11,440,000	Act	0.04
Subtotal			270,000	108,000	216,000	594,000	11,551,962	Act	0.05
TOTAL - COMPLETED AND ACTIVE			8,958,901	1,464,242	2,164,050	12,587,193	19,578,220		0.64 Total 1.88 Average

ECEP - PLANNED OR PROPOSED SUBPROJECTS

PLANT	Tech	(AID Funded Equipment) ----- COSTS (\$) -----			Total Cost	ENERGY SAVINGS/YR \$/yr	PAYBACK
		FX AID- Funded	Plant Funded	Engineer- ing			
<u>PRIVATE</u>							
Orient Glass	WHR,IRM,CCS	1,502,512	375,628	450,754	2,328,894	396,905	5.87
El Gezira Sheraton	COG	451,696	78,636	135,509	665,841	553,025	1.20
Portable Gas Analyzers	20 plants	100,000	40,000	80,000	220,000	135,000	1.63
Subtotal		2,054,208	494,264	666,262	3,214,734	1,084,930	2.96
<u>PUBLIC</u>							
Egypt Copper Works	WHR (AI)	200,000	20,000	60,000	280,000	110,625	2.53
National Metal	Scrap	1,570,000	150,000	471,000	2,191,000	635,670	3.45
Alexandria Cement	CCS	400,000	50,000	120,000	570,000	750,000	0.76
Portable Gas Analyzers	30 plants	150,000	60,000	120,000	330,000	7,000,000	0.05
Subtotal		2,320,000	280,000	771,000	3,371,000	8,496,295	0.40
TOTAL - PLANNED AND PROPOSED		4,374,208	774,264	1,437,262	6,585,734	9,581,225	0.69 Total
TOTAL - ECEP COMPLETED, ACTIVE, PLANNED OR PROPOSED SUBPROJECTS		13,333,109	2,238,506	3,601,312	19,172,927	29,159,445	0.66

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ECEP INDIRECT SUBPROJECTS

(AID Funded Feasibility Study, Company Funded Equipment)

PLANT	Tech	----- COSTS (\$) -----			Total Cost	ENERGY SAVINGS/YR \$/yr	PAYBACK
		PLANT FUNDED FX	LE	Engineer- ing			
<u>PRIVATE</u>							
Cleopatra Hospital	COG	169,000	6,061	50,700	225,761	20,800	10.85
ARACEMCO (1)	WHR	132,000	100,000	39,600	271,600	68,000	3.99
ARACEMCO (2)	CCS	90,000	70,000	27,000	187,000	80,000	2.34
BTM	PFI		7,000	2,500	9,500	10,000	0.95
Subtotal		391,000	183,061	119,800	693,861	178,800	3.88 Total
<u>PUBLIC</u>							
Kafr El-Zayat Chemicals	WHR	120,000	11,500	36,000	167,500	100,000	4.53 Average
El-Nasr Glass	CCS	380,000	10,000	114,000	504,000	187,500	1.68
Misr Spinning & Weaving	HEL	480,000	80,000	144,000	704,000	130,200	2.69
Mid-Egypt Spinning	HEL	366,000	56,000	109,800	531,800	91,000	5.41
Misr Aluminum	WHR	360,000	72,000	108,000	540,000	225,481	5.84
Kaha Foods	PC	150,000	20,000	45,000	215,000	99,562	2.39
Kahira Pharmaceutical	PFI	45,970	15,000	9,194	70,164	118,191	2.16
Yayat	PFI	83,000	10,000	16,600	109,600	36,603	0.59
El Tramco-WH	PFI	9,552	20,000	1,910	31,462	6,849	2.99
Tourah Cement	PFI	450,746	225,373	90,149	766,268	1,071,098	4.59
Talkha Fertilizer	COG	8,000,000	3,500,000	500,000	12,000,000	2,100,000	0.72
Coke & Chemicals	COG	10,500,000	4,600,000	750,000	15,850,000	4,200,000	5.71
Subtotal		20,945,268	8,619,873	1,924,654	31,489,795	8,366,484	3.77
TOTAL INDIRECT SUBPROJECTS		21,336,268	8,802,934	2,044,454	32,183,656	8,545,284	3.21 Average
TOTAL ALL ECEP DIRECT SUBPROJECTS AND ECEP INDIRECT SUBPROJECTS		34,669,377	11,041,440	5,645,766	51,356,583	37,704,729	3.77 Total 1.36

LEGEND TO TECHNOLOGIES

CCS Combustion Control System
 COG Cogeneration
 HEL High Efficiency Lighting
 HEM High Efficiency Motors
 PCS Process Control
 PFI Power Factor Improvement
 WHR Waste Heat Recovery

ABBREVIATIONS

ACT = Pay back based on actual monitoring data
 FS = Pay back based on feasibility study

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of fuel savings, there is no doubt that the portable gas analyzers program is extremely successful

Adding the portable gas analyzers to the other active or completed subprojects results in an estimated total annual energy savings of about \$19.5M with a payback of about 0.64 (bottom of first page of Table X). When "planned and proposed" subprojects are added, the estimated annual energy savings becomes about \$29M with a payback of about 0.66 years. These estimates coupled with the actual data from selected subprojects indicate the financial viability of subprojects directly funded by ECEP.

In addition to energy savings from the direct ECEP subprojects, ECEP is responsible for energy savings from several indirect subprojects. In a number of cases, ECEP has directly stimulated energy investments by companies. After attending ECEP seminars and learning the advantages of energy conservation, many companies sought ECEP assistance. In several cases, ECEP is supplying the engineering and specification writing for companies which are spending their own resources for the needed equipment. In other cases, companies are implementing ECEP technologies completely on their own. This is a further verification of the financial viability of this type of investment.

Some companies are using the ECEP feasibility studies to justify their own expenditures for engineering and specification writing as well as for the equipment. Two large energy cogeneration investments fall into this category. In 1991/92, ECEP was particularly interested in medium scale industrial cogeneration subprojects and initiated contacts with two large companies: El Nasr Coke and Chemical Company in Helwan and the Semadco Fertilizer Plant in Talka. While the ECEP feasibility studies indicated the subprojects were acceptable, USAID decided against funding either one because they were too big (about \$12-15M each), too complex, and would divert the attention of the Project away from its overall objective of promoting replications of proven energy conservation technologies. The companies have decided to fund these subprojects on their own.

Indirect ECEP subprojects are expected to save an additional \$8.5M in annual energy for a payback of 3.77. Taken together direct and indirect ECEP subprojects are expected to save about \$38M per year for a payback of about 1.36 (third page of Table X). While achievement of this annual energy savings requires substantial inputs from sources other than AID, a \$49.5M investment by AID which produces an annual savings of \$38M should be viewed in a favorable light.

In summary, past investments in energy conservation subprojects are reaping solid financial returns. Future investments are expected to obtain similar returns.

B. Financial Return on Environmental Investments

Although the financial benefits of the ECEP's environmental activities cannot be measured as thoroughly as the energy conservation activities at this time, projected returns on energy savings alone, as outlined in the previous section, could offset the investment in riskier environmental activities

The following table shows estimated expenditures broken down by sector, i e , whether they are on-going energy conservation activities, re-designed energy conservation activities, or environmental protection activities

Expenditure Projections by Type of Activity (\$000).

SECTOR	Expenditure Schedule		Total
	FY 89 93	FY 94 96	
Original Project Paper Energy Activities	17 949	18 426	36,375
Re designed Energy Activities	800	7 000	7,800
Environmental Activities	317	4,758	5,075
Audit and Evaluation	0	250	250
TOTAL	19 066	30 434	49,500

The table below further disaggregates the expenditures for environmental activities.

EXPENDITURE PROJECTIONS FOR ENVIRONMENTAL ACTIVITIES
(\$000)

<u>Local Management</u>	<u>Amount</u>
FEI	375
DRTPC	450
TIMS	450
Local Management Subtotal	1,275
Datex (redesign and interim implementation)	800
<u>EP3 Buy-in</u>	
Audits and Pilot Demonstrations	1,500
Training	600
Policy Studies	500
Information Dissemination	400
EP3 Subtotal	3,000
TOTAL	5,075

Total funding obligated for the ECEP remains at \$49.5 million. As the table above illustrates, from this total \$5.075 million will be provided by AID for environmental activities. Of this amount, \$1.275 million will be used for local management, \$0.8 million for the redesign and interim implementation, \$0.6 million for training, \$0.5 million for policy studies, and \$0.4 million for information dissemination. For these components, it is inappropriate to undertake financial analyses. This leaves \$1.5 million for environmental audits and pilot demonstrations out of total project funding of \$49.5 million. The purpose of the pilot demonstrations is to determine, among other things, whether or not these environmental activities are financially viable for private firms, since this will largely determine a firm's willingness to implement the specific activity. It is for this reason that the activities are designated as "pilot" demonstrations. Data will be collected under the demonstrations to determine the financial costs and benefits derived from the

activities. It is intended that payback estimates can be developed for environmental measures in the same manner as energy savings are now used to justify energy conservation measures

There is, however, strong reason to believe - based on both anecdotal evidence from Egypt and a wealth of experience from other countries - that the financial returns to pollution prevention activities in Egypt is high. While vehicle tune-ups are considered an environmental investment, they can save enough fuel to provide an attractive financial return. Vehicle tune-ups could reduce gasoline consumption by three-to-five percent.² If all vehicles in Cairo were tuned it would free more oil for export worth an estimated US\$12 million annually. Conversion of diesel vehicles to Compressed Natural Gas (CNG) would save considerable amounts of diesel fuel resulting in even greater benefits to the economy since the subsidy for diesel fuel is so large (Egypt imports diesel fuel at US\$0.22/liter and distributes it nationwide for about US\$0.08/liter). Project assumptions about the financial returns on investments in pollution prevention will be verified during the evaluation of pilot demonstration activities.

In a recent assessment of the business opportunities in the environmental sector in Egypt,³ the size of the industrial pollution control market was estimated to be US\$430 million in 1992 and US\$1.15 billion in 1997. If pollution prevention could reduce the capital requirements by half, that would represent a savings of US\$215 million to US\$0.6 billion. These would be real savings to Egyptian industries. A Project that could successfully demonstrate the savings potential of pollution prevention, and thus encourage its adoption, would be very valuable.

In the U.S., industry has learned that focusing on pollution treatment or control instead of pollution prevention is very expensive and implies a continuing escalation of environmental costs to keep pace with increasing industrial output. It has been estimated that by 1984 the U.S. spent about \$60 billion on industrial environmental protection and that if pollution prevention had been aggressively pursued \$30 billion could have

² A similar tune-up demonstration project in Pakistan resulted in average fuel savings of 11 percent, and a payback period of a little over 2 years. These results indicate a strong economic justification for such a demonstration project.

³ Profile of the Environmental Business Sector in Egypt, Project in Development and the Environment, RCG/Hagler-Bailly Inc., Near East Bureau of USAID, Project Number 398-0365, October 1992.

been saved. Moreover, there is abundant evidence from the U.S. (and to a lesser extent from Egypt) that pollution prevention activities can actually reduce a firm's production costs, thereby increasing its profits. Such activities typically have a payback period of less than one year.⁴

C. Summary

There are strong indications that the financial return to energy conservation activities in Egypt is high. Also, based on both anecdotal evidence from Egypt and a wealth of experience from other countries, there is strong reason to believe that the financial returns to pollution prevention activities in Egypt is also high. Most of the funding directed to environmental activities within the ECEP is for local management, the redesign and interim implementation, training, policy studies and information dissemination, which are inappropriate for conducting financial analyses. The limited funding going to environmental pilot demonstrations (\$1.5 million) will be used with the intention of determining whether these activities are financially viable or not.

⁴ See the Economic and Financial Analysis of the EP3 Project for details.

ANNEX F
SOCIAL SOUNDNESS ANALYSIS

ANNEX F

SOCIAL SOUNDNESS ANALYSIS

The purpose of the existing Energy Conservation and Efficiency Project was to promote and accelerate the adoption of improved technologies, processes, and practices to save energy and increase productivity in Egypt. The existing Project was found to be socio-culturally feasible to the extent that it saved energy in the short-term and reduced the hardships associated with energy price increases in the long-term.¹ Energy prices have increased substantially in Egypt and the existing Project has played a role in easing the transition to higher prices by introducing energy conservation technologies and practices. Private sector and public sector firms have shown an increasing interest in the energy conservation opportunities as energy prices have risen and indications of increased adoption of these technologies are beginning to appear. A number of plants have instituted measures on their own after hearing of the Project successes or after attending one of the seminars or workshops. With the growth in Egypt's population and in the industrial sector, increased demand for energy has made the sociocultural feasibility of energy conservation initiatives in Egypt more valid today than in 1988 when the existing Project was designed.

The social analysis for incorporation of environmental initiatives into the amended Project follows a similar methodology as that used in the original Project Paper for energy savings. In fact many of these environmentally-related initiatives save significant amounts of energy as well as reduce the use of scarce natural resources and increase the general health and safety of the Egyptian population.

The Social Soundness Analysis (Annex F) to the Project Paper of the original Energy Conservation and Efficiency Project is more applicable now than when it was written in 1988 since energy-saving opportunities have been expanded in the amended Project to include environmental aspects that will further protect the health and welfare of the population, and increase productivity and competitiveness by reducing waste to increase the ratio of product output to resource input.

The new initiatives under the amended Project focus on the Industrial and Transportation sectors. Emissions from vehicles contribute substantially to air pollution in Egypt, especially in Cairo. High air pollution levels have been linked to incidence of several medical conditions. Legislation to stem mobile source air

¹ Energy Conservation and Efficiency Project (ECEP, Project Number 263-0140 Project Paper (Page 22-23) and Annex F, June 13, 1988, U S Agency for International Development.

pollution is limited and not enforced. However, given the enormity of Cairo's air pollution problem, some controls on vehicle emissions will be required in the near future. The amended Project includes initiatives to address vehicle fuel efficiency and maintenance, two of the most critical elements of vehicular emissions. While national programs of this nature will take years to implement, the impact on the development of Egyptian environmental businesses can only be positive over the long-term.²

Interviews with representatives of five private industrial firms revealed that they are environmentally conscious and interested in improving their competitiveness and efficiency through environmental management. Whether this means that they are willing to invest capital or not depends on their perception of the benefit that will occur. They are aware that the public demands environmental improvement and its implementation would result in greater public support and therefore competitive advantage. Plant managers representing seven public industrial firms also expressed concern about the need to increase environmental management and control for similar reasons, plus the added overriding incentive that environmental improvements are necessary to attract private financing for privatization. In addition, they are aware that internal environmental conditions in these public plants require improvement for worker safety and health.

However, few Egyptian industrial firms have implemented pollution prevention measures. The design team's interviews and assessments indicate that the greatest barriers to wider adoption of environmental control measures are the current non-enforcement of existing environmental laws, lack of information about environmental management and available technologies, and lack of technical skills to identify, evaluate, install and operate environmental control measures.

In general, public industrial plants are older and were built with little or no concern for environmental pollution prevention or for retrofitting pollution control equipment. Private sector plants are generally newer and therefore have incorporated varying degrees of pollution prevention techniques in some of the process design. This distinction in the level of plant design, combined with the economic motivation factors inherent in private versus public management, leads to a divergence in ability to contribute financially to further environmental cleanup.

Currently, enforcement of environmental laws relating to transportation and industry is at best modest, and in general non-

² Profile of the Environmental Business Sector in Egypt, Project in Development and the Environment (PRIDE), October 1992, Pages 65-67

existent. It is common knowledge, however, that forthcoming enactment of the new Egyptian Environmental Action Plan will create environmental regulations enforced by a more powerful environmental authority. Donor agencies are ready to assist in environmental cleanup behind this new authority. Public plants know they must be able to be privatized and all operations know they are in a competitive market. Finally, public awareness is growing and environmental consciousness will be expected in the industrial and transportation sectors in the near future.

The amended Project is designed to address capital cost and institutional barriers and to provide strong incentives for participation in an environmental program.

- The Technology Applications and environmentally-related pilot demonstration technologies to be used are proven elsewhere and commercially available, and thus relatively low in risk.
- The Federation of Egyptian Industries (FEI) and major environmental NGOs will increase awareness about potential cost savings and improvements in health and safety and in the ambient environment by publicizing the amended Project and results of the Technology Applications supported by the amended Project.
- The amended Project offers technical assistance and training to develop expertise in environmental management planning and to properly evaluate, adapt, install and operate environmental control technologies.
- Finally, environmental management planning and technical assistance provided by the amended Project will allow for rational responses to the phasing of the implementation of the new Environmental Action Plan.

Given these carefully designed incentives, a strict selection process for project participation, strong public pressure, looming environmental law enforcement, and the pressure for privatization of public enterprises, there is no reason to believe that firms in the Egyptian industrial and transportation sectors not participate.

Benefit Incidence and Social Consequences

The most direct benefits of activity under the amended Project will accrue to the public and private firms and their workers in which the environmental initiatives are introduced and the technologies are installed. The principal benefits for participating enterprises will be access to foreign exchange and other financial assistance for environmental control equipment investments, and technical assistance and training in planning, designing,

installing, operating, and evaluating pollution prevention technologies. These will help them reduce costs through resource recovery and more efficient waste treatment, improve productivity through more efficient process controls and a healthier and safer workforce, improve international competitiveness, and strengthen technical and managerial capabilities. U S and Egyptian environmental and process control equipment and service companies will also benefit directly from the amended Project through increased sales

This amended Project will expand the institutional capacity within Egypt to manage, identify, design, adapt, operate, monitor and evaluate environmental investments and establish the necessary infrastructure to finance these investments. This amended Project will also expand to some degree the capabilities of laboratory sampling and analysis within Egypt. As a result, effects extend far beyond the direct amended Project beneficiaries to the rest of the industrial and transport sectors, the research and analysis support sectors, the banking sector, and ultimately the economic welfare of all Egyptians

Benefits will accrue to enterprises outside the group participating directly in the project as they apply the managerial, technical and economic information disseminated by FEI to make their own environmental improvement investments. Tertiary benefits will accrue to industrial facility workers and their families through improved safety and health along with improved worker efficiency and productivity, reduced environmental pollution to the air, water, and soil, thereby increasing production efficiency and the quality of life

In the longer-term, financial institutions will benefit from the fees they collect on environmental technology loans and Letters of Credit, and the development of a new line of service. In addition, the improvement in their customers' competitiveness and profitability will increase their credit worthiness and should reduce loan losses. The amended Project will increase the technical expertise of the Tabbin Institute for Metallurgical Industries, the Development Research and Technological Planning Center, participating Egyptian architect/engineering and environmental management firms, and participating analytical laboratories so that they will be better able to meet the technical assistance needs of public and private enterprises. The amended Project will also enhance the ability of FEI to serve its members

By saving resources through pollution prevention practices, and by increases in worker productivity through improved worker health and safety, the GOE will be able to improve its foreign exchange position through increased industrial competitiveness and increased raw materials exports. This additional foreign exchange will be available for productive investments that will improve the overall

quality of life in Egypt

Increased industrial productivity and competitiveness may result in increased industrial exports, which will increase foreign exchange earnings and local employment. In addition, the amended Project will increase the general level of technical and managerial expertise in Egypt's industrial, transport, financial, and scientific communities. This expertise will help the GOE to better plan and manage its development efforts.

Finally, this amended Project embraces USAID's overall environmental objective of "enhanced protection of Egypt's fresh-water and air resources," through all its three Program Outcomes of environmental policy and institutional reform, reduced waste discharges to the Nile River system, and promotion of new technologies for environmental protection. The amended Project will produce significant social benefits and future environmental improvements for all Egyptians. Adoption of the environmentally sound practices will reduce environmental pollution, which provides both national and global returns, decreased waste, increased productivity, and improved economic growth prospects. The amended Project will also heighten public awareness of environmental issues and provide valuable guidance concerning appropriate regulatory approaches. The methodology demonstrated in this amended Project will provide a valuable foundation for environmental improvements that will beneficially effect future generations of Egyptians and the world at large.

Spread Effects Replications of Environmental Management Process

One of the key criteria for selecting pilot demonstration facilities is the replicability potential. The success of the amended Project in promoting replications will depend primarily on the effectiveness of information dissemination and publicity efforts, the availability of credit, and the policy climate for environmental investments.

To this end, amended Project funds have been allocated to publicity and project promotion campaigns designed to reach beyond the enterprises that participate directly in the demonstrations through seminars, workshops, and publications. In addition, firms that "host" demonstrations must agree to allow representatives of other firms, including competitors, to visit the sites and obtain information about costs and performance.

The amended project will also fund the development of a comprehensive environmental industrial database which will enable FEI to inform its members on the state of environmental management in each subsector, make international comparisons, identify markets for various technologies and management services, and eventually promote new applications. These significant resources will be

available to Egyptian industry to provide technical, informational, managerial, and financial guidance and assistance

Finally, the amended Project includes a component of policy assistance including studies to provide information to policy makers that will, (1) extrapolate demonstration results to industry-wide conclusions, (2) identify capital costs to achieve specific pollutant levels, (3) provide detailed environmental characterization of industries, and (4) identify constraints placed on the private sector relative to the environmental management process. Workshops will also be conducted to ensure adequate review and dialogue concerning potential legislation and other issues

The Role of Women

In Egypt, the great majority of industrial plant workers, engineering and technical professionals, and managers are male. Although there is no amended Project element designed specifically to enhance the role of women with regard to industrial pollution prevention, every attempt will be made to encourage women to attend workshops and seminars and to participate in the environmental management initiatives. The growing numbers of female university graduates in engineering and management disciplines will be the foundation for the growth of female industrial engineers and technicians in Egypt. They can equally benefit from the amended Project's technical and managerial assistance and training.

ANNEX G

INITIAL ENVIRONMENTAL EXAMINATION



CAIRO EGYPT

THRESHOLD DECISION BASED ON INITIAL ENVIRONMENTAL EXAMINATION

Project Location Egypt

Project Title/ID Energy Conservation and Environment Project Amendment (263-0140 03)

Funding (Fiscal Year and Amount) FY88 - FY96 \$49.5 million

IEE Prepared By

Date

Anne E. Patterson
Anne E. Patterson
Environmental Advisor, NE/DR/ENR

June 24, 1993

Environmental Action Recommended

Negative Determination as per 22 CFR 216.3(a)(2)(111)

Associate Mission Director's Concurrence

Date

Jeffery A. Malick
Jeffery Malick, AAD/PDS

June 28, 1993

Decision of Environmental Coordinator, Bureau for the Near East.

Approved: _____

Date: _____

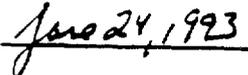
Clearances

GRWhaley, Mission Env Officer
RRhoda, OD/PDS/ENV
PSullivan, LEG

GRW Date: 6/24/93
RR Date: 6/24/93
PS Date: _____

INITIAL ENVIRONMENTAL EXAMINATION

- 1 Project Location Egypt
- 2 Project Title/ID Energy Conservation and Environment
Project Amendment 263-0140 03
- 3 Funding (Fiscal Year and Amount) FY88 - FY96, \$49 5 million
- 4 IEE Prepared By Date

Anne E Patterson
Environmental Advisor, NE/DR/ENR

- 5 Action Recommended Negative Determination as per 22 CFR
216 3(a)(2)(111)
- 6 Discussion of Major Environmental Relationships of Project
Relevant to Attached Impact Identification and Evaluation Form.

Background

The purpose of this amended project is two-fold. 1) to promote, implement, and accelerate the adoption of improved commercial technologies, processes, and practices to save energy and protect the environment, and 2) to improve Egyptian institutional capabilities, particularly in the private sector

The amended project will focus on several key strategies. The managerial, technical, and training capabilities of several local organizations will be expanded to include expertise in energy conservation and environmental management planning, energy and environmental surveys and feasibility studies, equipment installation and performance monitoring. Additionally, the project will seek to develop four private sector firms capable of implementing various broad aspects of energy conservation and environmental management in the private sector. Finally, the ECEP project will seek to heighten awareness of energy conservation and environmental management within GOE regulatory bodies and the industrial and transportation sectors through technology demonstrations, pilot studies, and broader promotion, training, institutional development, and policy assistance activities

Discussion

Pursuant to 22 CFR 216.3(a)(2)(111), the originator of the proposed project amendment has reviewed the potential environmental impacts of the action summarized in the foregoing IEE, and has determined

that the technical assistance aspects of the proposed project, if implemented as described, will not have a significant negative impact on the environment, and that the energy conservation and environmentally sound technologies installed consequent to the project would only have beneficial effects on the environment. To ensure compliance with A I D environmental procedures, technology demonstration activities will be monitored and documented. A fixed proportion of project funds will be set aside to document and evaluate the environmental impacts of each technology demonstrated at the demonstration site. This documentation can be used, in turn, to satisfy reporting requirements in the form of objectively verifiable indicators as well as other evaluation tools. The environmental status of the project will be reviewed periodically during implementation by means of routine site visits by USAID/Egypt technical staff. Any required corrections in implementation will be made on the basis of these findings.

Pursuant to 22 CFR 216.3(a)(2)(iii), the originator of the proposed project recommends a negative determination of significant environmental effect for the Energy Conservation and Environment Project, and requests NE Bureau approval of a negative threshold decision for these activities.

ENVIRONMENTAL IMPACT IDENTIFICATION AND EVALUATION FORM

ENVIRONMENTAL IMPACT INDICATOR AREAS/ENVIRONMENT CONSIDERATIONS

A LAND USE

- 1 Changing the character of the land through.
 - a Land clearing N
 - b Construction (roads, buildings, piping) N
 - c Extraction of minerals/natural resources N
 - d Creation of deposits of unwanted materials (waste spoils) N
 - 2 Alteration of natural barriers (dunes, marshes) N
 - 3 Foreclosing important future uses N
 - 4 Potential for endangering populated areas N
 - 5 Other factors
- NONE

B SURFACE AND GROUND WATER

- 1 Effects on Quality
 - a Introduction of industrial pollutants N
 - b Introduction of agricultural pollutants N
 - c Introduction of urban/sewage wastes N
 - d Introduction of biomedical wastes N
 - e Potential for transnational impacts N
- 2 Effects on Quantity
 - a Changes in water flow rates N
 - b Increasing probability of floods N
 - c Potential for changing demand/supply relation N
 - d Potential for transnational impacts N
 - e Potential for evaporation losses N

C AIR

- 1 Potential for increased NO_x, SO_x, HC, CO₂/CO emissions N
 - 2 Potential for increased particulate emissions N
 - 3 Potential increase of noxious odors, vapors, pathogens N
 - 4 Noise pollution N
 - 5 Other factors:
- NONE

- * N - No perceived environmental impact
- L - Little environmental impact
- M - Moderate environmental impact (substantiate)
- H - High environmental impact (substantiate)
- U - Unknown environmental impact

ANNEX H
COMPLEMENTARY USAID, US GOVERNMENT,
AND OTHER DONOR PROGRAMS

Complementary USAID, US Government, and Other Donor Programs

There are a number of USAID, U S government agency, and other donor programs that should reinforce the amended Project. An integral part of the planning and re-design process was to identify these programs, assess their objectives and planned activities, and determine where they may be complementary to the amended Project design

While the USAID/Cairo Mission did not have a formal environmental strategy prior to 1992, many of its activities have had a positive environmental affect, mostly in the wastewater sector but also indirectly through rehabilitation and upgrade of power plants and improved irrigation management These projects include

Fresh-Water Resources (Total LOP Funding - US\$3 15 billion)

Alexandria Wastewater System Expansion - design, construction and start-up of a sewage development program to alleviate flooding in residential areas and to dispose of raw sewage in recreational beaches

Provincial Cities Development - alleviates water-borne diseases in Fayoum, El Minia, and Beni Suef by constructing water treatment plants and sewage systems

Cairo Sewerage II - extension of sewage treatment in Cairo and expansion of treatment plant capacity

Canal Cities Water and Wastewater II - alleviate water-borne diseases in Port Said, Ismailia, and Suez

Water and Wastewater Institutional Support - enhance the capability to plan, finance design, construct, operate, and maintain municipal water and wastewater systems throughout Egypt.

Local Development II - finance construction of water and wastewater systems, roads, and other community facilities in rural areas.

Irrigation Management Systems - improves water resource planning, and the design, construction, operation, and maintenance of irrigation infrastructure

Science and Technology Cooperation - applies Egyptian researchers to problems of industrial waste treatment and recycling, pollution prevention, lake ecosystems, improved sewage disposal, and solid waste composting (see detailed summary in section below on AID projects with the most potential for near-term support).

National Agricultural Research - develops and transfers improved technologies for water quality management, water reuse, new lands development, integrated pest control, and environmentally

sustainable agriculture.

Agricultural Production and Credit - policy reform component has reduced subsidies on fertilizers and pesticides to reduce their contribution to water pollution

Air Resources (Total LOP Funding - US\$ 631 million)

Rehabilitation and Modernization of the Aswan High Dam - reduces the need to build additional thermal power plants that emit greenhouse gases and other pollutants by improving the efficiency of Egypt's largest renewable energy facility

Alexandria Electric Network Modernization - improves efficiency of electrical distribution network to deliver more power without additional capacity growth

Power Sector Support - policy component is reducing electricity subsidies, capital component is focused on improving efficiency of electrical generation, transmission and distribution

Energy Conservation and Efficiency Project - promotes and accelerates the use of improved commercial technologies for saving energy, increasing energy efficiency, and reducing air pollution (Described in detail in Section III C)

Additional complementary projects are either underway or in the process of implementation by AID/Washington Bureau, the U S Environmental Protection Agency, and the United Nations Table H-1 describes the potential relationship among the key programs in matrix form The following is a brief summary of the purpose and objectives of them

AID/Washington Projects

Environmental Policy and Training (EPAT) Project - EPAT is an AID/Washington, Research and Development Bureau project to encourage and support economic policies that promote sustainable use of natural resources and enhancement of environmental quality The EPAT Project has a strong training component that could support efforts on industrial pollution prevention envisioned under the EA component. In Phase II of the EA component (under the long-term M/TA contractor), buy-ins to EPAT could be considered for training in broader aspects of environmental policy and regulation issues.

Project in Development and the Environment (PRIDE) - PRIDE is a USAID/Washington regional office project to provide Europe and Near East Missions with technical, analytical, and informational support to promote sound environmental and natural resource use for long-term sustainable economic growth. An important aspect of PRIDE is strategic planning which can be supported by the EA component with respect to industrial pollution prevention activities In

addition, both projects have strong private sector development components. these activities can be complementary, i e while PRIDE focuses on a wide range of environmental management concerns, the EA component seeks to strengthen the private sector capability to analyze and implement pollution prevention mechanisms and to encourage waste minimization and cleaner production processes.

Environmental Education and Communications Project (GREENCOM) - GREENCOM is an environmental information dissemination and education project that will adapt to environmental priorities of host countries, The Project Paper is being developed While the EA component will focus initially on commercially available technology, GREENCOM could reinforce environmental awareness in Egypt, for example, through its proposed Center for Information Exchange which will be a conduit for information on environmental technological innovations

Environmental Health Project (EPH) - This project is the proposed successor to the Water and Sanitation for Health (WASH) Project EPH takes a health perspective in providing services to the water and health sanitation sectors for institutional development and training, hygiene education, finance, community participation; policy development, engineering technical assistance, and solid waste and wastewater management. EHP can address issues from a health perspective while the EA component takes the complementary approach from a pollution prevention perspective.

Environmental Pollution Prevention Project (EP3) - This is a worldwide project to reduce industrial and urban environmental pollution The project focuses on providing pollution prevention technologies, control techniques; and financial assistance to implement process changes and install cleaner production equipment EP3 will concentrate on supplying information through centers as well as services in technical assistance and training.

Local Accident Mitigation and Prevention (LAMP) - This project is an initiative of A I D.'s Office of Foreign Disaster Assistance The project expands on a United Nations Environmental Program (UNEP) program called Awareness and Preparedness for Emergencies at the Local Level (APELL) LAMP will increase awareness of the consequences of water and airborne pollution among local authorities, industry, the local community, and interest groups. In this regard, LAMP should be involved in many information dissemination and awareness programs that are complementary to EA component initiatives.

Environmental Training Program (ETP) - This project offers USAID personnel information, tools, and intellectual resources to effectively integrate environmental concerns into their jobs. For Mission Environmental Officers and Project Officers, ETP offers Environmental Impact Analysis Workshops, basic training in environmental issues, and a wide variety of technical workshops.

EA component experience can provide "case studies" and other information for ETP programs. ETP can be a resource for Egyptian managerial and technical personnel to use as part of the EA component training and awareness initiatives.

Global Energy and Environmental Management (GLEEM) - This proposed AID/Washington, Research and Development Bureau project concentrates on the linkages between energy, environment, and sustainable development to expand energy availability while reducing environmental impact. It includes elements dealing with capital mobilization for the energy sector, power sector institutional performance, integrated resource planning and policy formulation, and increased private sector participation in energy supply and services. There is an obvious relationship between energy supply and urban/industrial pollution, especially when cogeneration systems are used. Many GLEEM activities could have a complementary or cooperative element with the EA component.

Urban Environmental Strategy of the Office of Housing and Urban Programs (PRE/H) - This project seeks (1) to integrate urban environmental concerns into program design, (2) to test new private sector approaches to providing environmental services that are typically municipally financed, and (3) to help improve urban environmental analytical capability of donors and host countries. PRE/H's environmental activities are often concerned with improving the effectiveness and efficiency of municipal administration to complement and support improved industrial pollution prevention, a key element of the EA component.

AID Private Sector Revolving Fund (AID/PSRF) - AID's Bureau for Private Enterprise considers loans or guarantees for projects that have substantial development impact by promoting sound environmental development, generating net employment opportunities, earning net foreign exchange, developing managerial and technical skills, or transferring technologies. Many EA component technology applications will meet these criteria and therefore be eligible in principle for assistance under the AID/PSRF program..

Environmental and Natural Resources Information Center (ENRIC) - This is an AID/Washington, Research and Development Bureau project that has as its central focus a database that tracks environmental and natural resources activities supported by A.I.D. through both project and non-project assistance. The EA component could establish an electronic link with the ENRIC database and thereby provide the program officers and the Egyptian industrial community with current information on environmental components, their cost, and who implements them.

Other US Government Projects

Trade and Development Agency (TDA) - This Department of Commerce program promotes economic development by funding feasibility studies, consultancies, training programs, etc. TDP uses U S experts to conduct technical feasibility studies that show promise for substantial sale of U S goods and services. TDP-funded activities can be used to supplement those funded by the EA component

Pollution Prevention Information Clearinghouse (PPIC) - This clearinghouse is operated by EPA's Office of Environmental Engineering and Technology Demonstration and Office of Pollution Prevention. It is dedicated to reducing industrial pollutants through technology transfer, education, and public awareness. PPIC helps to establish government and industry pollution programs, locate and order documents, identify upcoming events, conferences, workshops, training sessions, and seminars, find grant and other project funding opportunities, and identify environmental legislation. This activity could serve as an excellent resource for EA component information dissemination and awareness initiatives

Alternative Treatment Technology Information Center (ATTIC) - Operated by the U S EPA, this Center assists in the selection of hazardous waste clean-up technologies. Includes a literature search database and a library of over 1600 references, treatability databases which compare removal efficiencies; and vendor and expert contact lists

International Environmental Technology Clearinghouse (IETC) - The U S EPA is developing this clearinghouse to provide current information on other clearinghouses environmental technologies both to domestic and international communities. Scheduled for demonstration in mid-1992, the IETC includes the participation of USAID, U S Department of Energy, and private sector organizations.

United Nations Projects

International Cleaner Production Information Clearinghouse (ICPIC) - This is a computerized information system run by the United Nations Environment Program's Industry and Environment Office (UNEP/IEO). It is electronically accessible to the PPIC and provides information exchange on cleaner production processes from UNEP/IEO working groups, including pollution prevention data on specific industry categories such as electroplating, textiles, solvents, etc. Much of these data may be applicable to technology applications initiated under the EA component.

AID Projects With Potential for Near-Term Support

Two AID/Washington projects and one USAID/Cairo project deserve special interest because they have the highest potential for near-term support to amended Project activities PRIDE, EP3, and STC

PROJECT IN DEVELOPMENT AND THE ENVIRONMENT (PRIDE)

The focus of PRIDE is on three of four priority problem areas identified in 1989 through a series of Near East Regional Bureau (NE Bureau) background analyses and a report by the World Resources Institute.¹

- (1) water and soil resource degradation and mismanagement
- (2) energy shortages, inefficiencies, and the environmental impact of energy production and consumption
- (3) urbanization and industrial pollution

The project is also consistent with the NE Bureau's strategic objectives

- Foster efficient resource use and conservation, especially of water and energy
- Promote the concept of waste minimization and pollution prevention in resolving problems facing the industrial sector in ensuring air, soil, and water quality
- Increase accountability and local empowerment in addressing environmental and natural resource issues
- Foster private sector solutions and policy at the local, national, and regional levels

¹ Evaluation of the Project in Development and the Environment - Scope of Work, USAID Project No. 398-0365, Near East Regional Bureau, Washington, D C., March 1993.

TABLE H-1

COMPLEMENTARY UNITED STATES PROGRAMS AND AGENCIES							
Programs/Agencies	Technology Transfer	Training	Feasibility Studies	Technology Demonstrations	Financing Loans, Grants	Trade Links	Private Sector Development
EPAT	X	X					
PRIDE	X					X	X
GREENCOM		X					
EHP	X	X	X	X			X
EP3	X	X	X	X	X		
LAMP		X					
ETP		X					
GLEEM	X						X
PRE/H		X					
AID/PSRF					X		
TDA	X	X	X		X	X	X
ENRIC	X						
PPIC	X						
ICPIC	X						
ATTIC	X						
IETC	X						

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The purpose of PRIDE is to assist USAID Missions and host country institutions to:

- identify and address critical environmental issues that threaten economic growth, public health, and ecological sustainability
- mobilize the private sector and NGOs to provide cost-effective solutions to these problems
- develop effective information sharing among AID Missions, host country institutions, and AID/Washington on experience to date with different environmental initiatives and policy reform programs

Based on these three needs four components were designed into the PRIDE program

- 1 Strategic Planning - Assist developing countries with development and management of national environmental programs
- 2 Policy Analysis - development of environmental policy prerequisites for the implementation of standards and regulations
- 3 Private Sector Development - initiatives to identify industries, introduce pollution prevention, and facilitate linkages with U.S. companies
- 4 Education and Training - promotion of information, education, and communication to enhance technology transfer

A fifth component is being considered for the PRIDE, a Pollution Prevention Demonstration Component. This component will support the Near East Bureau's goal of promoting sustainable economic growth in the Near East region. The component will increase efficiencies of selected firms through adoption of pollution prevention technologies, increase awareness in the private sector of advantages of pollution prevention over pollution control, and increase knowledge of Near East firms about appropriate sources for U.S. pollution prevention products.

The component is expected to have five major elements:

1. **A Clean Technology Office and Database of U.S. Technologies Applicable to the Near East** - A Clean Technology Office will be established in Washington, D.C. as a buy-in to the EP3 Project (see description below) to provide overall project implementation, management, and support. The Office will have primary responsibility for identifying commercially available

low- and medium-cost clean technologies, supplying product information, and gathering information essential for the operation of the program

- 2 **In-Country Centers for Promoting Clean Technologies** - Centers will be established in Morocco and Tunisia to perform two functions
 - promoting interest and demand for the pollution prevention approach in Near East firms
 - facilitating purchase by Near East firms of clean technologies
- 3 **Demonstration of U S. Clean Technologies in Plants in the Near East** - Initially, each Center will concentrate on three or four clean technologies with wide application throughout the Near East industries. CTP will focus on low-cost (US\$50,000) to medium-cost (under US\$500,000) products that will be retrofitted into existing facilities without jeopardizing current production volume or quality, or introduced into the design of new industrial plants
- 4 **Creation of Linkages Between U.S. Clean Technology Suppliers and Near East Users** - In-country Centers will identify specific companies which can make use of U S. clean technologies
- 5 **A Clean Technology Information, Education, and Communication (IEC) Program** - an IEC program will be integrated with EP3 information initiatives to assist in-country Center staff

ENVIRONMENTAL POLLUTION PREVENTION PROJECT (EP3)

The goal of EP3 is reduction in environmental pollution associated with urbanization and industrialization. Traditionally, efforts at urban and industrial pollution management have concentrated on "end-of-pipe" pollution treatment. Treatment of pollution is ultimately unsustainable as the principal means of pollution management, especially in developing countries. Experience in developed countries has confirmed that pollution prevention through waste minimization and cleaner production technologies is an alternative that is less expensive, more cost-effective, and sustainable. Applied as a means of pollution management, pollution prevention promises to improve plant efficiency, rapidly enhance the quality and quantity of natural resources for production, and make it possible for more financial resources to be directed to economic development investments.

The purpose of EP3 is to create conditions for decision makers in the public and private sectors to implement proper urban and

industrial pollution management, i e , ²

- knowledge of the means for pollution prevention and control
- familiarity with the advantages of cleaner production methods
- assistance for introducing industrial process and equipment innovations that minimize waste generation.

EP3 will accomplish this primarily by

- providing technical assistance, training, and information services for environmental awareness and pollution prevention at the plant, industry, and national levels
- strengthening and expanding in-country sources of technical expertise for pollution prevention
- identifying, promoting, and expanding sources of financing and creating linkages between host country firms and U S suppliers of expertise and equipment
- helping to improve national environmental policies, laws, regulations, and their implementing institutions
- promoting and serving as a catalyst for international cooperative activities to encourage, combine, and coordinate pollution prevention activities of USAID and other donor agencies

During its 5-year Life of Project, EP3 will operate on three closely linked tracks (a) EP3 operations at the AID/Washington level, (b) EP3 Country Support Programs in selected AID-assisted countries, and (c) short-term training and technical assistance available for all AID-assisted countries. EP3 Country Support Programs is the element that has the most direct relevance to needs of the amended Project.

EP3 Country Support Programs encompass over 25 possible discrete types of activities. Each program is tailored to the priorities of the host country and requires host country Mission approval. If all 25 activities are required, the country support is provided for about 3 years. The activities are organized under 5 broad components introduced in two phases. The progress and response received in Phase I will determine the exact set and character of

² Environmental Pollution Prevention Project (EP3) - Project Paper, Project No. 936-5559, USAID Research and Development Bureau, Office of Environment and Natural Resources, Washington, D C , April 1992.

activities pursued in Phase II

EP3 Country Support Program Phase I

National EP3 Strategy Development:

- rapid assessment of the pollution prevention and control policy and regulatory environment
- identification of in-country experts and sources of financing for equipment
- selection of the industrial target industry category or "hot-spot" and initial plants
- preparation of a national EP3 strategy

Phase I Plant Level Innovations (in each target plant):

- training for personnel and conduct of pollution audits and assessments
- formulation and execution of programs of low cost/no cost pollution prevention innovations
- evaluation of pollution prevention performance
- development of an "action plan" for introducing more capital-intensive pollution prevention innovations

EP3 Country Support Program Phase II

Phase II Plant Level Innovations (in target plants that have successfully introduced low cost/no cost pollution prevention measures):

- technical and economic appraisals for capital-intensive technology
- assessment of supplier information and development of loan applications for financing
- installation of pollution prevention equipment.

In addition, EP3 will work with other projects and donors to provide limited financial support for pollution prevention equipment in initial target plants in cases where:

- the equipment has widespread application in the industrial category
- the recipient plant agrees to serve as a demonstration site for others
- a small amount of leverage financing will substantially expedite acquisition of full financing from other sources and thus facilitate rapid installation of the equipment.

Phase II Industry Category/Hot-Spot Level Activities:

- training for plant managers and personnel including on-site, in-plant training and demonstration-based training

- using equipment introduced in target plants
- identification and resolution of pollution prevention and control problems on an industry- or hot-spot basis
- establishment of links with in-country and US suppliers of pollution prevention expertise and equipment.

Phase II National Program Development and Policy Reform:

- development of a national program for pollution prevention and control training, information, and technical assistance that is linked to pollution prevention databases worldwide
- studies in support of policy, regulatory, enforcement, and incentives reforms
- strengthening the capacity of institutions with pollution prevention responsibilities
- mounting of pollution prevention awareness programs
- conduct of special programs for specific target groups
- designing, conducting, and evaluation related USAID initiatives

The selection of host countries for EP3 Country Support Programs will be based on analysis of the severity of urban and industrial pollution, the likelihood of success and significant beneficial effect on the environment, and the level of demonstrated institutional interest and commitment to pollution prevention efforts.

Finally, in addition to the Country Support Programs, EP3 will maintain a short-term training and technical assistance service operated largely on a buy-in basis. This service is available to respond to any need associated with the larger context of urban and industrial pollution issues, pollution control and treatment, and general environmental quality management:

- design, conduct, and evaluation of environmental initiatives
- environmental resource management and planning
- methodologies for determining indicators that are related to environmental resource management.

EP3 Phase I Country Support Program activities will be largely core-funded, while Phase II activities will be largely buy-in funded. Pollution prevention equipment will be financed principally by commercial sources and/or programs of other development assistance agencies and host country governments. Accomplishments over the 5 year EP3 project are expected to include Country Support Programs in at least 5 countries with low cost/no cost innovations implemented in 6 to 8 plants in each country with 2 plants implementing higher capital cost pollution prevention measures.

SCIENCE AND TECHNOLOGY COOPERATION (STC) PROJECT

The Science and Technology Cooperation (STC) Project is a collaborative effort among USAID/Cairo, the Ministry of Scientific Research, and the Egyptian Academy of Scientific Research and Technology (ASRT).³ The STC Project facilitates coordination of efforts among the research development and engineering (RD&E) community (universities, research institutes, engineering firms, consulting offices, etc.), the industrial production sector, and the services sector. The overall project goal is to improve production processes and to develop new products and technologies relevant to Egyptian needs by

- Directing the efforts of the RD&E community to serve the production and services sectors (end-users)
- Responding only to services requested by end-user sectors
- Working in collaboration with end-user sectors to
 - formulate the problem,
 - identify its causes, limitations, and impacts, and
 - carefully define deliverables and specifications.

The STC is a special unit established by a Presidential Decree within the Academy of Scientific Research and Technology. A Steering Committee provides overall policy guidance and oversight for the STC Projects. The Steering Committee is chaired by the Minister of State for Scientific Research and vice-chaired by the President of the Academy of Scientific Research and Development. The actual day-to-day operations of the STC Project are conducted by the Project Secretariat, headed by the Executive Director.

The STC Project Secretariat consists of three main offices

- **Technical Liaison Office (TLO)** - responsible for specifying subprojects, developing communication between researchers and end-users, identifying future problem areas, and disseminating research results.
- **RD&E Management Office** - responsible for soliciting, processing, and evaluating research proposals, negotiating, awarding, and monitoring contracts; coordinating relationships between Egyptian institutes and the Secretariat.

³ Science and Technology Cooperation Project and National Development, Ministry of Scientific Research, the Academy of Scientific Research and Technology, and USAID/Cairo, February, 1992, Cairo, Egypt.

- **Training and Staff Development Office** - responsible for identifying training requirements and RD&E management training opportunities

The STC Project adapts this system to provide better and more efficient services to private and public sector clients on a case-by-case basis. Problem identification is generally carried out by visits to production units and meeting with potential user groups to analyze responses to STC's questionnaires and advertisements. Background studies are then sponsored in specific fields which would identify priority problems. Seminars and workshops in which representatives for the end-user sectors meet with representatives of the RD&E community are periodically held to encourage dialogue on issues of the greatest importance. Based on recommendations made by specific technical consultants, the STC Secretariat selects the appropriate contracting process for a specific problem. Contracts range from special requested studies of less than three months to the more usual efforts that require between one and three year to complete.

The STC Project is providing services for 21 end-user groups that range from large, basic materials industries (chemical, metallurgical, fertilizers, etc) through small-scale production and computer management, to biotechnology and genetic engineering firms. As of February 1992, the Project had signed or negotiated 54 contracts.⁴ Examples of STC subproject budgets and their estimated economic impact are given for 15 subprojects. The total funding was approximately 8.5 million L.E. Estimated production increase or savings in imports was estimated at 430 million L.E.

There are seven major problem areas under study in STC Project efforts

- 1 Local raw materials as substitutes for imported materials
- 2 Process development
- 3 New products
- 4 Equipment Manufacturing
5. Computer-based technology
- 6 Waste and by-product utilization
- 7 Clean technology.

The last two problem areas have direct relevance to the amended Project. The following is a listing of specific efforts in those two categories. A few key efforts are described in more detail in Annex K on pollution prevention efforts in Egypt.

⁴ Science and Technology Cooperation Project - Serving Egyptian Production Sectors, Cairo, Egypt, 1991/1992.

Waste and By-Product Utilization

- Recovery of chromium from the industrial wastewater
- Recovery of urea from Abou-Qir Company wastewater and its reuse
- Process development for recovery and use of cellulosic fibers from white liquor and water reuse
- Process development for the use of steel-slag in the construction industry
- Agglomeration of iron oxide pellet-fines used in iron and steel industry
- Use of cement dust in production of economical products
- Development of innovative technology for the use of tire wastes
- Use of wood wastes resulting from the production of matches
- A process for recovery of vegetable oil from bleaching earth
- A process for the concentration of black liquor and its use in the clay brick industry

Clean Technology

- In-plant modifications to conserve water and optimize residue handling
- Safe handling of hazardous wastes of ISMADYE and efficient use of water in industrial processes
- Application of reactive rinsing technique in the electroplating process
- In-plant modification and improvement of handling processes to reduce wastes at Al-America Petroleum refinery

Other Donor Programs

The amended Project will be the only multi-industry, bi-lateral project directly focussing on in-plant environmental management and control activities in Egypt. The only other project with a large industrial-sector impact is the ongoing multi-donor pollution control project in Helwan sponsored by The World Bank. Several plant-specific projects will be conducted with German assistance.

Cognizant representatives of seven bi-lateral donor missions (Germany, Italy, Denmark, Netherlands, Canada, Great Britain, and Japan) and three multi-lateral donor missions (EEC, UNDP, and The World Bank) were interviewed in Cairo to ascertain:

- (1) their past and present environmental project experiences both in scope and implementation
- (2) their planned activities in the environmental arena

- (3) "lessons learned" that may be applied in the development and implementation of a project in the industrial sector.

Although each donor is necessarily responsive to the distinct priorities of their home Ministries, global awareness of environmental imperatives (especially as emphasized by last year's UN World Environmental Conference in Rio de Janeiro), present significant opportunities in Egypt to address environmental problems. Recent multi-lateral coordination in environmental activity in Egypt has given priority to the environment in all donor missions.

A number of general conclusions and patterns were universally found among all of the donors regarding their involvement in the environmental sector in Egypt:

- A general increase in the number of planned projects to promote environmental improvement
- Most bi-lateral donors are focusing on specific sectors within the environment in Egypt
- A present focus on supporting The World Bank's institutional and implementational initiatives in the strengthening of authority for the environment under the EEAA (structured around the multi-donor supported development of the GOE Environmental Action Plan)

A matrix of individual donor environmental activities is presented in Table H-2

Table # 2 Description of Other Donor Projects

DONOR	US\$ MILLIONS	ENVIRONMENTAL SUBSECTOR	DESCRIPTION OF PROJECTS
Germany	360 (30% grants)	Air Industrial wastewater Industrial management Agri pest management Domestic wastewater Solid waste Nile resources	<ol style="list-style-type: none"> 1 Dust emission reduction from cement factories in Helwan (64.5 million DM) 2 Misr Chemical Industries high tech production & chloralkali & derivatives 3 Study of CFC replacement in industry under Montreal Protocol 4 Environmental equipment fund for the private sector 5 Nag Hammadi Barrage 6 Sugar factory Guitrga wastewater system improvement 7 Ductile iron pipe plant (El Nasr Casting) air and water pollution reduction 8 Sewage treatment Kafr El Sheikh Governorate 9 Aswan solid waste disposal 10 Environmental impact studies requirement for credit in industry & agriculture
Italy	150 (Grants only)	Domestic wastewater Greenbelt Agri water resources	<ol style="list-style-type: none"> 1 Cairo wastewater treatment plant (East Bank) 2 Village wastewater (new) 3 Mediterranean coastal greenbelt 4 Institutional compliance of GOE Ministries vis a vis environmental Action Plan (World Bank coordinated activity for the GOE Environmental Action Plan)
Denmark	????	GOE Envir Masterplan Environmental Impact Wetlands	<ol style="list-style-type: none"> 1 Aswan/North Sinai Gov't Environ Profile Development & project implementation 2 EEAA institutional development (World Bank coordinated activity) 3 Riverboat wastewater 4 Lake Manzallah Project wastewater dump conversion to model wetlands (w/UNDP)
Netherlands	????	Water quality Agricultural drainage Water monitoring Water modelling	<ol style="list-style-type: none"> 1 Monitoring of agricultural drains 2 Monitoring/control of Water Resources Pollution Project (start w/groundwater) 3 Inst dev in planning/modelling for Min of Public Works & Water Resources 4 Water quality research management for EEAA (World Bank coordinated activity)
Canada	????	Water quality Water laboratories Water Modelling Agricultural drainage Non gv't organization Solid waste	<ol style="list-style-type: none"> 1 Quality control of laboratories for Ministry of Public Works 2 Hydrological model of the Nile River 3 Dozens of NGO sponsored local environmental initiatives 4 Management Information Systems development for EEAA (World Bank coordinated) 5 Garbage composting demonstrations in Cairo

Table # 2 Description of Other Donor Projects (Continued)

DONOR	US\$ MILLIONS	ENVIRONMENTAL SUBSECTOR	DESCRIPTION OF PROJECTS
Great Britain	????	Environmental Impact Assessment Mining wastewater Education in schools	<ol style="list-style-type: none"> 1 Sewage network for East Bank of Cairo Sewage Project 2 Phosphate mine improvement near Edfu and rural development 3 Coal mine with wastewater reuse in North Sinai 4 Environmental Impact Assessment institutional development in 2 Governorates 5 Structural reform Technical Assistance for private industry (new project) 6 NGO sponsored school environmental awareness (new project)
Japan	????	????	<ol style="list-style-type: none"> 1 Sinai groundwater 2 Giza wastewater pipeline
European Economic Community	200 EC/yr (Grants only)	Greenbelt Domestic wastewater Oil spills	<ol style="list-style-type: none"> 1 Park in Sinai 2 Helwan domestic wastewater collection treatment reuse and monitoring 3 Oil collection and treatment in Gulf of Aqaba
UNDP/World Bank	????	Biodiversity Industrial Chemical Conversion	<ol style="list-style-type: none"> 1 Replacing CFCs in manufacturing plants 2 Coordination of implementation (institutions and projects) vis a vis GOE Environmental Action Plan (World Bank coordinated activity) 3 Red Sea Ecosystems Project 4 Lake Manzallah Project wetlands

1/2

ANNEX I
DRAFT WORK STATEMENTS

ANNEX I

DRAFT WORK STATEMENTS

1 INDUSTRIAL ENVIRONMENTAL MANAGEMENT TECHNICAL ASSISTANCE

BACKGROUND

State of the Environment in Egypt

Egypt must balance a need for social and economic growth, which is characterized as industrial growth, with the fact that the country is in a hyper-arid region (rainfall is less than 50 millimeters annually), has a single source of water (the Nile River) for 95 percent of its requirements, has less than three percent of its land area under cultivation, and has an annual population growth rate of 2.4 percent. There is a growing recognition in Egypt that economic development and the health and welfare of the population are closely linked to the proper management of the country's scarce natural resources and fragile environment.

Egypt's very limited water resources are becoming increasingly polluted because of the excessive and improper use of the resource. Poor water management in agriculture is leading to the salinization of good land, reducing productivity and requiring larger investments for rehabilitation of acreage. Untreated or poorly treated urban and industrial toxic and hazardous wastes pollute Egypt's surface and groundwater endangering the health of hundreds of thousands of people. Often the soil is so contaminated with toxic materials and heavy metals that it may never be used again to grow food. Poor water quality in most of the Nile River leads to large expenditures of capital to pre-treat it so that it can be used as a supply for drinking water, industrial, commercial, and agricultural activities.

Urban air quality in Egypt suffers from uncontrolled emissions from vehicular and industrial sources. The three main causes are

- (1) The heavy use of subsidized leaded gasoline (the number of cars in Cairo has increased 10 percent annually in the last 10 years resulting in a lead content in vegetables grown near the city ten times higher than rural areas and a blood lead level for Cairo residents that is above the World Health Organization maximum safe standard),
- (2) The large concentrations of polluting industries in and around urban areas, especially steel, cement, fertilizer, and chemicals, which contribute to levels of dust and SO₂ that are 2 to 10 times maximum safe levels (in Helwan, 600,000 tons of cement dust escapes to the atmosphere - 29 percent of Helwan's school children suffer from lung diseases compared to nine percent in rural areas of

Egypt); and

- (3) The use of high sulphur fuel oil in industry and for power generation (with a growth rate in electricity consumption of 10 percent annually over the last decade)

Solid waste is another growing environmental problem in Egypt, both in resort areas along the Red Sea and Gulf of Aqaba coastlines and in urban areas. In urban areas, about 15,000 tons of urban solid waste is collected each day from households (68%), commerce (15%), street sweepings (12%), and industry (5%). The Egyptian Environmental Action Plan (May 1992) states that the current management of solid waste has not yet detected any severe or harmful situations. However, the rapidly increasing population and strong development of the industrial sector calls for immediate attention to reduce future problems involving municipal and industrial solid waste. Egypt has no formal systems for removal and handling of the 20,000 to 50,000 tons per year of hazardous waste from industry, hospitals, etc. These wastes are currently either burned (creating toxic air pollution), dumped in sewer drains (causing water pollution), dumped on vacant land or in wetlands (contributing to future long term environmental problems).

Need for Environmental Activities

The Government of Egypt (GOE), with the assistance of the United States Agency for International Development (USAID/Cairo Mission), established the Energy Conservation and Efficiency Project (ECEP). The objectives of the existing ECEP are to.

- (1) promote and accelerate the adoption of improved commercial technologies, processes, and practices to save energy and increase industrial efficiency, and
- (2) to enhance Egyptian institutional capability to implement energy conservation

The project, which started in 1988, is being jointly funded by USAID/Cairo and the GOE. The ECEP has recently been authorized through 1996 at a total USAID/Cairo Mission (the Mission) funding level of approximately US\$49.5 million. The ECEP is implementing a series of energy conservation and efficiency technology application (TA) demonstrations in selected industrial plants. Ten different technologies have been considered for demonstrations as part of the original ECEP.

- Cogeneration
- Waste heat recovery
- Combustion control
- Power factor correction
- High efficiency lighting
- High efficiency motors
- Energy management systems

- Process controls
- Solid fuel boilers
- Insulation and refractories

In February-March 1992, the first evaluation of the ECEP was completed. The evaluation found that the ECEP was effectively implemented and was successfully promoting accelerated technology adoption. Stressing the strong linkage between industrial energy use and air pollution, the evaluation stated that the ECEP has a vital role in the Mission's evolving environmental strategy

During FY92, the Mission updated its overall strategy and added environmental protection objectives. For the short-term, the Mission began to pursue these new objectives within its on-going water and energy programs. The Mission also decided that the ECEP should be re-designed to

- (1) modify energy conservation activities to improve replicability and sustainability,
- (2) increase the environmental aspects of future activities,
- (3) add a component to address non-energy pollution, and
- (4) develop an institutional capability and infrastructure for environmental management in Egypt

The amended Project has been re-named the Energy Conservation and Environment Project (ECEP). The amended Project goal is to improve energy efficiency and environmental protection in the commercial, industrial and transportation sectors in Egypt. The purpose is to accelerate the adoption of improved technologies and practices in these sectors to save energy and protect the environment.

The on-going Energy Conservation and Efficiency Project has established an institutional framework capable of supporting an expanded scope. The expanded scope includes the following general considerations:

- The strong industrial orientation of most of the activities to date is an excellent basis for industrial environmental activities;
- Technologies that offer savings of some resource to provide a return to the owner for the capital investment tie in well to current initiatives.

CONTRACT OBJECTIVES

To provide program management and technical assistance to the Government of Egypt (GOE) and the USAID/Cairo Mission (the Mission) with a variety of environmental activities identified during the re-design of the Energy Conservation and Efficiency Project and implemented under the amended Energy Conservation and Environment

Project (ECEP) The activities are centered on demonstrations of industrial environmental management methods and technologies. Tasks will be supported under six specific areas: Project Management, Technology Demonstrations, Training, Information Dissemination, Investment Promotion, and Policy Development.

Demonstrations will be conducted in eight or nine industrial facilities. Pollution prevention methods and techniques will be the primary focus of the work. Where appropriate, other techniques will be used. The strategy used to accelerate the adoption of industrial environmental management in Egypt through these demonstrations will be as follows:

- Demonstrate that pollution prevention is an effective, broadly applicable approach and that it can play a major role in the environmental management program of an industrial facility and in Egypt as a whole
- Prove that pollution prevention is more cost-effective environmental management than conventional end-of-pipe pollution control technologies and that payback of investment costs can readily be achieved. Low-cost and no-cost methods and technologies will be emphasized in the Project.
- Develop a cadre of private sector Egyptian firms with first-hand experience and training in the development and implementation of broad pollution prevention programs to assist industrial facilities
- Perform policy studies that will identify effective steps to advance environmental management in Egypt, especially in the industrial sector
- Implement a program of information transfer and training to provide Egyptian firms with the knowledge needed to implement industrial environmental management

RELATIONSHIPS AND RESPONSIBILITIES

The contractor will be responsible to Dr. Richard Rhoda, Director of the USAID/Cairo Environment Office, for overall coordination, production, and completion of all tasks. The contractor will coordinate all day-to-day activities with Marc Madland and/or any other individual designated by Richard Rhoda over the course of the Project. Contacts with relevant GOE ministries, agencies, and institutions, as well as private sector industries and organizations will be provided as needed for specific tasks.

The Mission and the GOE will provide the contractor with copies of all available and relevant technical reports and assist in scheduling meetings with key Egyptian private industry and government sector personnel.

The on-going activities of the existing ECEP technical assistance contractor, Overseas Bechtel with Hagler-Bailly, will continue and coordination and cooperation with them will be required. Regular management meetings between USAID/Cairo, the current technical assistance contractor, and the environmental technical assistance contractor will be conducted to ensure coordination of all Project activities.

An interim Contractor has been selected by the Mission and is implementing the environmental activities of the Project until the long-term technical assistance contractor is in operation in country.

A Monitoring and Evaluation Contractor will be selected to closely monitor Project progress and effectiveness, review critical issues at the request of the Project Officer, and perform required evaluations.

SCHEDULE

Management and technical assistance services shall be provided until the current PACD, September 30, 1996.

REPORTS AND OTHER DELIVERABLES

The contractor shall submit reports and provide briefings and other deliverables specified in each delivery order. These may include the following:

Quarterly Progress Reports - for contractor activities of three months or longer duration, the contractor will submit two copies of brief (maximum 6 pages, single spaced) quarterly reports to the Mission. The reports will review progress towards achieving objectives specified, issues and proposed means to address problems, and any modifications proposed in planned activities.

Buy-in Activity Final Report - the final report for each activity will (1) summarize the accomplishments of the delivery order, (2) describe the activities including locations and individuals involved, and level of effort for each individual, (3) contain a detailed fiscal report, (4) describe work methods, and (5) recommend future action related to unfinished work or project continuation.

TASKS

TASK 1: Project Management

The contractor shall expand existing management capabilities in relevant Egyptian institutions to include the environmental area. The lead agency in Egypt for the implementation of environmental activities for the Private Sector will be the Development, Research

and Technological Planning Center (DRTPC). DRTPC and TIMS will select subcontractors for environmental tasks and will provide technical oversight to activities by the Federation of Egyptian Industries (FEI) in promotion and information dissemination. Specifically, these organizations are responsible for the following:

Development Research and Technological Planning Center (DRTPC) - Responsible for project administration, accounting, and financial management, technical assistance and training, all aspects of identifying and implementing technology demonstrations, and the incorporation of appropriate technologies and practices in the public sector. All Egyptian firms participating in the Private Sector, except FEI, will be subcontractors to TIMS.

The Federation of Egyptian Industries (FEI) - Responsible for promoting replication in the public and private sector industry through information dissemination on technologies and their implementation, as well as development of a data base of relevant information on the status of these technologies.

Contractor responsibilities will be described in each specific delivery order. General responsibilities are:

- Providing management, technical assistance and training services to DRTPC, TIMS, FEI, and public and private enterprises relative to specific sub-projects at all project stages,
- Advising USAID/Cairo on whether specific measures should be approved and funded,
- Reporting regularly to USAID/Cairo on project status and performance, and
- Coordinating efforts of all participants in environmental activities.

The contractor shall establish a long-term office in Cairo headed by a full-time through September 1996 U.S. Chief-of-Party (COP), a U.S. Environmental Engineer for two years, two full-time Egyptian Engineers, plus two Egyptian Support Staff. The contractor shall maintain through the U.S. Office appropriate project backstopping technical, administrative, clerical, and secretarial support necessary for efficient project management and contract administration. The total level of effort for this home support shall be 16 person-months for each year of the life of project.

The contractor shall provide all necessary facilities, materials, personnel, and services to assist the Mission in selected activities under this contract. The contractor shall be responsible for providing or arranging for all logistic support in the U.S. and for coordinating all logistic support for its overseas performance of this contract. The contractor shall select,

mobilize, and support in a timely manner U.S. technical experts acceptable to the Mission for the conduct of environmental activities described in Mission delivery orders under this contract

Task 2. Technology Demonstrations

The basic approach for Industrial Environmental Management applications is to help carefully selected firms advance their programs in environmental management. Most of these firms will be selected because they have been identified as early-adopters of environmental management. The Project will help their programs to be implemented more quickly and with more pollution prevention methods and technologies than they would without assistance. Plant selection criteria should include consideration of the following factors

- Plant is economically viable. For the public sector, the plant is a candidate for privatization
- Plant is not unique. Measures selected for plant would likely be applicable to similar plants.
- Competence of plant management
- Geographic location
- Plant management has demonstrated interest and commitment to environmental protection
- Plant size and type of operations are such that reasonable levels of improvement can be made within capital constraints.
- Type and amount of air and/or water pollution from the plant is significant

It is expected that most of the participating industries will be identified by the Interim Contractor. At least two of the firms should provide opportunities to demonstrate fuel and chemical storage tank leak detection and management approaches.

The institution building and training that will be part of the intervention and information learned (see Task 3 and Task 4) can then be used to further advance the movement of a broader segment of industry toward effective environmental management. The initiative should not be oriented to specific technologies but be based on the assumption that pollution prevention is a broadly applicable approach that can benefit most industrial firms.

The following general steps should be implemented for each Industrial Environmental Management application.

- Assignment of Team
- Detailed Plant Survey
 - Development and Implementation of Sampling and Testing, Quality Assurance/Quality Control Program

- Analysis of Management Structure and Practices
- Detailed Engineering Analysis of Processes
- Development of Environmental Management Program
 - Analysis of Technical Options
 - Preliminary Design of Selected Measures
 - Development of Draft Program
 - Negotiations With Plant Management
- Implementation of Program
 - Design
 - Procurement
 - * Order
 - * Ship
 - * Pass Customs
 - Installation
 - Debugging
 - Determine Performance
 - Operations and Maintenance

The environmental management plan that is developed from these interventions will provide a guide for the plant to move from current pollution conditions to lower levels of pollution along a least cost curve. A sequence of measures should be identified, costed, and designed, that the plant could implement to achieve any desired level of cost-effective pollution control. The plant may choose to not move to the lowest pollution levels during the course of the Project, but significant reductions are expected. Individual steps in the demonstration process are described below.

Assignment of Team

The M/TA contractor and the implementing agency will identify requirements for selection of team members to develop and implement the program at the plant. The optional sources for team members will be:

- DRTPC
- Tabbin Institute
- US staff or Consultants of the M/TA Contractor
- DRTPC Subcontractors
- TIMS Subcontractors

Factors to be used in the assignment of team members are:

- Type of expertise required
- Emphasis on use of Egyptian expertise
- Use of US staff primarily as trainers of Egyptian members and reviewers of their work

Sub-task 1. Detailed Plant Survey

The detailed plant survey is intended to result in a thorough understanding of all relevant aspects of the plant including

physical and technical characteristics as well as management and personnel issues. The survey is to go beyond the generic requirements of an environmental audit such that data are to be gathered are adequate to permit engineering design and implementation of selected corrective measures

Development and Implementation of Sampling and Testing, Quality Assurance/Quality Control Program

All decisions in the Program will require detailed knowledge of the characteristics of the plant's effluent and waste streams. Development of a baseline condition is very important, as well, in assessing Program success as well. Also, to the degree that the plant is typical, the baseline data will be of significant importance to the GOE by adding to the existing knowledge of the overall industrial pollution conditions in the country. Finally, these data will support the promulgation of appropriate environmental regulations and standards.

The sampling and testing program should be designed to determine peak and average values of pollutant concentration and quantity. Development of the testing program will require a detailed knowledge of the operations throughout the plant. In some cases, levels of contaminants related to occupational health will also be important.

DRTPC and TIMS laboratory facilities or a Subcontractor to DRTPC or TIMS will be used. If frequent monitoring is an important component of a specific plants Program, purchase of sampling and analytical equipment can be considered within the Project

Analysis of Management Structure

The survey team will interview plant management personnel and review plant organizational material to understand precisely who is responsible for environmental matters within the plant, what is that person's level of authority, his level of training, who does that person report to, what are the mechanisms used to affect environmental concerns, and what is the environmental budget

Analysis of Management Practices

From observations of plant operations and interviews, the survey team will develop an understanding of existing procedures in the plant related to environmental management. Determine how waste is disposed of, who handles it, what equipment is used, where waste is stored, and what reporting or recording information is collected

Detailed Engineering Analysis of Processes

The survey team will review and confirm in the field existing documentation on the plant operations, including materials, flow

rates, types and sizes of processes, apparent efficiencies and condition of equipment. From this, detailed material balances will be developed.

Sub-Task 2. Development of Environmental Management Program

After gathering the information identified above, the team is in a position to begin work to formulate the environmental plan

Analysis of Technical Options

The technical team will begin by identifying optional approaches to reduce pollution levels and improve occupational safety and health. Options will be categorized by cost level and basic approach (materials changes, process changes, recycling, end-of-pipe treatment, procedural changes, etc). Each option will be evaluated for technical feasibility and cost effectiveness, effect on plant operations, product and productivity, equipment availability, and other factors. From this analysis, the team will develop a sequence of measures expected to improve the environmental characteristics of the plant with identification of the expected performance level of each.

Preliminary Design of Selected Measures

The measures identified in the above analysis will be developed through the Preliminary Design stage, and will include preliminary specifications, cost estimates, identification of potential equipment suppliers, preliminary layouts, major components, control strategies, and flow diagrams.

Selection of Funding Options

The team will evaluate each measure against selection criteria for funding under the Project. Some measures will not have any capital costs to be funded, some will be paid for by the plant, some will qualify for a grant under the Project, and others may be left for later funding as it becomes available. The implementing agency and the M/TA contractor will work to identify potential alternative funding sources such as other donor programs or other programs within U.S AID.

The Programs will emphasize pollution prevention and waste minimization techniques (these terms are used interchangeably here), but will also identify end-of-pipe measures when needed to achieve goals in a capital-constrained economy.

Project Funds will be available for funding of limited amounts of energy related equipment. Criteria for funding of equipments under this Project should include the following types of considerations:

- **Replicability of Measure**
- **Measures Within Private Industries that Provide Paybacks of More Than Three Years (Private Industry Should Pay for Quick Payback Measures)**
- **Measures That Aim for the First 75% Pollution Reduction**
- **Weighing Pollution Prevention Measures Greater Than Pollution Control**
- **Measures That Are Directed Toward Critical Plant Pollutants**
- **Measures That Improve the Sustainability of the Program**
- **Measures That Motivate Workers By Improving Working Conditions/Incentives for further environmental cleanup**

Development of Draft Environmental Management Program

All steps above will be documented and assembled within a single Program document that will be presented to the plant management for its review and comment

Negotiation with Plant Management

The Program will define specific obligations of the plant management and the implementing agencies. These obligations and the support that the plant will receive from the Project will be negotiated and a contract between the Plant and the implementing agency will be signed.

Sub-Task 3 Implementation of Environmental Management Program

Upon signing the contract, the implementing agency will begin to fulfill its responsibilities under the program. Six major steps are included for most measures: design, procurement, installation, debugging, verification of performance, and O&M.

Design of Systems

Primary responsibility for final design of the selected measures will fall on the Egyptian members of the team, working with the plant personnel and American experts of the M/TA Contractor staff. Design will include development of drawings, specifications, and bid documents. The role of the US team members will be as advisors, specialists, and reviewers.

Procurement of Equipment

Ordering - The plant management will be responsible for procurement of local equipment. The buy-in contractor will be responsible for U S equipment using U S AID approved procurement procedures including competitive bidding of major components.

Shipping - The prime MT/A Contractor (OBI) will be responsible for shipping procured equipment and a two years supply of spare parts on U S flagships to Egypt

Customs - The plant management will be responsible for receiving/acceptance of the equipment and getting the equipment through Egyptian Customs

Installation

The plant management will be responsible for installing equipment in accordance with the specifications

Debugging

The plant management and the team will coordinate their work during initial system start-up and debugging to ensure successful operation

Performance Testing

Analyses will be performed by the team and the selected laboratory to determine the effectiveness of the installed system

Operations and Maintenance

The plant management will be responsible for all aspects of the system including operations and maintenance, after receipt in Alexandria (Port of entry)

Task 3. Training

The contractor shall plan and implement a complete program of training for all relevant Egyptian personnel. The broad objectives of the training program are to

- (1) develop end-user skills and capabilities to adopt and assimilate environmental management practices and technologies,
- (2) upgrade the skills of local GOE and private sector institutions to support and accelerate this process, and
- (3) develop a cadre of local engineering, analytical, and managerial personnel who can form and support Egyptian engineering and consulting companies to continue the advancement of environmental protection

Each technology demonstration program in Task 2 will contain a training activity, based on the identified needs in the specific area of concern. The training portion of each program or sub-project will be integrated with on-going training programs to the extent possible

A broad range of short- and long-term training programs will be developed and presented in topics such as Industrial Environmental Protection, Pollution Prevention, and Systems Performance Monitoring. Training courses will be presented to all participants, i e , the implementing agencies (DRTPC, TIMS and FEI) and also to other participants such as the Ministry of Industry, Egyptian Architectural and Engineering (A&E) firms, Egyptian consulting firms, and key personnel (engineers, line managers, and senior supervisors) in participating industrial plants

A strong emphasis is placed on training Egyptian private and public sector personnel. The contractor shall ensure that the training responsibility is shifted to Egyptian trainers to enhance the potential for sustainability. To the greatest extent possible, each training activity will include a "follow-up" program activity so that the program can be evaluated and a contact can be maintained with the specific individuals and organizations involved. These "follow-ups" may be conducted by the Monitoring and Evaluation Contractor.

Technical Assistance Contractor activities will include providing oversight and coordination of the training activities performed by others, training of Egyptian trainers, and direct training of GOE, implementing agency, Egyptian subcontractors, and participating industrial plant and other professionals as determined through a Training Needs Assessment. The Interim Contractor is expected to complete the Training Needs Assessment. The contractor shall complete the following general activities:

- Provide training to conduct environmental surveys and for preparation of feasibility studies and procedures for evaluation and selection of environmental technologies,
- Provide classroom and in-plant training for plant personnel and other professionals for environmental system operation, procurement, installation, and operating and monitoring, and
- Conduct a Training Effectiveness Assessment of training programs

Task 4. Information Dissemination

Information Dissemination activities fall into three categories:

- (1) preparation of technical reports and materials in conjunction with short-term advisory services - short-term experts involved with training activities will provide documents relevant to the particular industry and environmental problems.
- (2) procurement of training equipment and materials - as requested by delivery order, training materials (e.g. library materials) to support the GOE and Mission

environmental programs shall be identified, procured, and shipped. Materials and equipment are expected to be limited to off-the-shelf items that are not restricted for export to Egypt.

- (3) production or adaptation of training materials. - the contractor shall produce new or adapt existing training materials that support specific Egyptian of Mission environmental programs. This may include the conversion of video tapes to local formats, adaptation of films, handbooks, and booklets, and modification of training-of-trainers materials for local use

The contractor will also assist DRTPC, TIMS and FEI in organizing workshops and seminars, and in enhancing the existing Energy Conservation Information Center to include environmental data. The contractor shall complete specific activities as directed by delivery orders which may include the following

- Promotion of environmental management to Egyptian industrial manufacturing plants, consulting firms, and government agencies by providing information on environmental service firms, pollution reduction/control technologies, eligibility criteria, and application procedures,
- Development of directories of Egyptian consultants and equipment suppliers, and other directories and databases to support industry, and
- Implementation of Curriculum Development Programs for universities and vocational/technical schools.

Task 5. Investment Promotion

The contractor shall complete the following general activities as directed by specific delivery orders

- Investigate and assist in the development of financing mechanisms for industrial environmental management in Egypt (especially pollution prevention technologies), including bank loans, other donor programs, etc ,
- Identify requirements of each funding source, associated constraints, and the potential for meeting significant levels of funding needs, and
- Conduct promotion and marketing services with DRTPC, TIMS, FEI, and public and private sector firms.

Task 6. Policy Development

As directed by specific delivery orders, the contractor shall conduct work to assist the GOE and the Mission in environmental policy development. This work will include studies and directed efforts such as the following

10th. OF Ramadan City Industrial Environmental Management Program

BACKGROUND

The 10th of Ramadan City is a new industrial city located 55 km east of Cairo. The first stage of the city was started in 1978 to hold 150,000 people. The second stage was started in 1988 to hold 200,000 people. The city is to be constructed in four stages, with a planned population of 5 million people. Currently, about 30,000 people live in the city which houses 476 diverse, privately-owned industries. This city offers an opportunity to evaluate potential policies and methods of affecting environmental impacts of industry on a city-wide basis.

Water supply for the city is a combination of Nile water from the Ismailia channel and groundwater. The industries discharge their wastewater into the municipal wastewater system which has no treatment plant. The wastewater is discharged to a lagoon from which it evaporates and infiltrates into the soil. The lagoon is a health hazard to the area, plus a nuisance due to odor and mosquitoes, and it is a threat to the groundwater reservoir, a significant source of potable water. The city has been promised a wastewater treatment plant within the next five years, but because of unexpected expenditures due to the October 1992 earthquake, the plant may be delayed.

Six of the 476 industries in the city have their own treatment plants. One factory, the BTM textile factory, has an advanced wastewater treatment plant, with reuse of treated wastewater. The other 470 factories have no treatment at all. Occasionally, the industries have created environmental problems and even damaged the existing sewer network.

Three years ago, the local Industry Committee of the Investor's Association started an environmental awareness program in cooperation with the city administration and the local Technological Institute. The aim was to provide a better basis for enforcement of the environmental law. To accomplish this objective, the city needs funds for implementation of the program and a central laboratory at the Technological Institute for monitoring of the industrial discharges.

There is an interest by nearly all members of the community to solve the environmental problems of the city. Some of the companies have started their own clean-up programs. However, there

is a lack of understanding between the city and the industries on how to share the environmental costs, i e., for an improved wastewater treatment. The major environmental issues identified are:

- The industrial wastewater discharge is not sufficiently monitored because an industrial wastewater control program is not operational,
- The wastewater system is occasionally damaged by the discharges of industrial wastewater,
- The existing wastewater treatment lagoon is creating health, environmental, nuisance and ecological damage and is threatening groundwater reservoir,
- A wastewater treatment plant is planned and sorely needed. To optimize its size, an industrial discharge and pretreatment evaluation is needed for the development of realistic design criteria, and
- There is not a cost sharing program between the industry and the city regarding environmental investments, operation and maintenance

TECHNICAL APPROACH

Other activities within the ECEP, such as the information dissemination, training, investment promotion activities should be designed to impact the 10th of Ramadan or other cities industries as much as possible. Also, specific industries in this City may be particularly effective as part of the group of ECEP demonstration plants. Beyond these types of actions, there is a need for a study to define and formulate a general industrial pollution abatement program for the industries on which to increase the positive attitude in the local industrial community toward reducing environmental problems. As the industrial sector in the 10th. of Ramadan City consists of a large number of small industries, such a program would serve as a good example for small private industries all over Egypt. The World Bank or other donors can use the information developed in this study to implement the larger program in the 10th of Ramadan and/or other cities.

Part of the program should be to develop an effective monitoring and control system for industrial discharges. The local technological institutes should be supplied with the necessary staff and equipment for that function

A major element of the program should be to promote sustainable development by reducing pollution through the use of clean technologies. Common benefits of this approach are:

- cost-savings by waste reduction;
- more effective use of raw materials and energy,
- reduced emissions,
- reduction of adverse health and environmental impacts, and
- substitution of hazardous substances and materials.

ACTIVITIES

- 1 Design an industrial wastewater monitoring and control program Include a design for the establishment of an industrial wastewater control laboratory The design should address equipment, staffing, quality control, and training requirements
- 2 Assist in the development of a city ordinance for the issuing of discharge permits
- 3 Assist in the design of a discharge fee system to cover the costs of the sewage system
- 4 Design a one-year course on environmental management and clean technologies for 20 -30 people
- 5 Investigate the establishment of an information center for environmental management and clean technologies in the local Technological Institute.
- 6 Design a demonstration program on environmental management and clean technologies in 8-10 industries within 10th of Ramadan City

The expected level-of-effort for U S experts is twelve person-months Egyptian experts are expected to provide 36 person-months, not including in-kind services of participating firms and organizations.

Initial Assessment of Leaking Storage Tanks in Egypt

This Policy Assistance Study is intended to scope the potential problem of fuel leakage from above-ground and underground storage tanks in Egypt. US experience has indicated that many buried steel tanks, such as those used at most gas stations, can be expected to leak within about 20 years after installation. The actual time required is highly variable and dependent on many factors. In the US, an aggressive Program is being implemented to test tanks, evaluate groundwater, require fuel and tank management systems, dictate installation requirements and replacement schedules

Above-ground tanks can also pose dangers due to leaks and spills. The major environmental problem associated with these tanks is that very small quantities of leaking fuels can mix with groundwater and contaminate large quantities over a very large area. Rising groundwater, in the Delta region in particular, would tend to exacerbate the problem. Surface spills can contaminate critical water sources as well. The limited arable land and the significance of water resources in Egypt dictate that this real hidden threat should be assessed. Under the proposed study, a preliminary evaluation will be made to determine the scope of the potential problem in Egypt.

The expected level-of-effort for U S experts is twelve person-months. Egyptian subcontractor to DRTPC and TMS level-of-effort is expected to be about 48 person-months.

2 PILOT AUTOMOBILE TUNE-UP PROGRAM

Note---This Statement of Work and the ones that follow are not part of the general Technical Assistance Statement of Work in Number 1 above, although they could be performed by the same contractor.

BACKGROUND

Transportation accounts for 20% of the commercial energy consumption in Egypt. Nearly 1.3 million of Egypt's 2 million automobiles are over 10 years old. These vehicles usually are poorly maintained and operate inefficiently. Emissions from automobiles (especially in Cairo where there are over 700,000 automobiles) are a major contributor to air pollution; some estimates indicate 80 percent of all contributors.

The Government of Egypt (GOE) plans by 1995 to require all vehicles entering a defined area of Central Cairo to display a renewable certificate stating that the vehicle has met an emission standard. Currently, the testing of vehicle emissions is not done, either by public institutions or through private garage vehicle maintenance facilities.

A pilot automobile tune-up program, in which a sample of the existing automobile stock is tuned using simple, standard engine tuning equipment, will bring several benefits to promote a better environment and provide financial and economic benefits to both the motorists and the public at large. Vehicle fuel efficiency will be increased leading to more oil available for export and reduced emissions of oxides of carbon and nitrogen, hydrocarbons, and heavy metals, including lead.

TECHNICAL APPROACH

The program's purpose is to quantify benefits from vehicle tuning. To accomplish this, the following approach will be followed:

- one or more vehicle tune-up stations will be established at existing auto repair facilities
- programs will be established at trade schools to train mechanics to perform tune-ups

¹ *Environmental Action Plan, Arab Republic of Egypt, May 1992*

² *Auto Engine Analyzers Potential Impact on Energy Use and the Environment, A. Ahmed, R. P. Smith, and G. N. Jamy, International Energy Conservation Symposium 1990, Karachi, Pakistan*

- sets of simple, standard engine tune-up equipment (strobe lights, dwell meters, voltmeters, etc.) will be procured and provided to a large number of tune-up facilities
- initially, tune-ups and normal replacement parts (spark plugs, points, filters, etc) will be provided at no cost to the general public to encourage participation
- one or more auto engine analyzers will be procured to take "before and after" measurements of randomly selected tune-up participants to establish a database for analysis of fuel efficiency improvement and emission reduction
- promotional materials will be developed and distributed to increase awareness of efficiency in transportation and to encourage participation in the tune-up program
- the benefits to the country will be extrapolated using data from the pilot program and accepted economic and financial assumptions

ACTIVITIES

- Subtask 1 Finalize Program Design - Designs for similar programs in other developing countries will be reviewed and modified based on experiences and local conditions of Cairo. The final program design will be submitted for recommendations and approval before implementing the program
- Subtask 2 Equipment Procurement - All equipment required for the program will be procured only through accepted USAID procedures. Spare parts for at least two years will be purchased.
- Subtask 3 Develop Training Programs and Establish Tune-up Facilities - Training programs will be developed in collaboration with local trade schools. Automobile service facilities will be visited and appropriate ones selected
- Subtask 4 Implementation of the Tune-up Program - To assure success, implementation will occur in phased steps including program promotion through advertizing in the mass media. Tune-ups will be conducted on at least 800 vehicles by the trained mechanics who will also be responsible for data collection. Tune-ups will continue for a period of one year
- Subtask 5. Data Analysis and Reporting - Data shall be analyzed on a periodic basis to ensure completeness, precision, and accuracy. Detailed

monthly reports shall be completed and consolidated every six months to summarize and analyze data and to identify program elements that may require modification

Subtask 6. Estimation of Program Benefits - Based upon an analysis of collected data (vehicle population, emissions, usage, etc) the national benefits of an expanded program will be estimated. Results of this analysis will provide insight and guidance to the laws and regulations governing vehicle use, customs tariffs and duties for vehicles and vehicle maintenance equipment, establishment of standards for vehicle emissions, and establishment of requirements and regulations for a vehicle emissions certification program envisioned in the Egyptian Environmental Action Plan

STAFFING AND PROGRAM RESOURCES

This two-year program will require the services of one full-time Egyptian Task Leader, and an experienced Auto Tune-up Specialist and a Transport Modeling Specialist on a part-time basis. In addition, expatriate short-term consultants may be required for specific elements of the program, e g , development of training courses, specification of equipment, and cost-benefit analyses.

US Consultants-	person-months
Local Experts-	person-months
Other local technicians-	240 person-months
Equipment-	\$200,000

3. STUDY FOR THE CONVERSION OF TRANSPORTATION FLEETS TO COMPRESSED NATURAL GAS

BACKGROUND

Cairo has extremely poor air quality, due in large part to old, inefficient transit buses (there are over 35,000 buses in Cairo). Much of the population relies on public transit, which exposes them daily to high levels of petroleum-based combustion emissions. For example, tests have shown that traffic policemen in Cairo have 14 percent carbon monoxide in their blood - a principal cause of mental retardation - and three times the World Health Organization's (WHO's) safe standard for lead levels in the blood. The level of nitrous oxide in the air is three times the WHO safe standard and the level of total hydrocarbons is dangerously high.

The Government of Egypt has demonstrated a commitment to controlling vehicle emissions, although actions to enforce that commitment have not yet been implemented. In 1987, the EEAA and the Ministry of Interior introduced a program for controlling pollution from vehicles. A Higher Committee to Improve Traffic Services was established to investigate the matter. A number of studies were carried out culminating in government plans to require by 1995 that all vehicles in certain areas of Cairo to display a renewable certificate stating that the vehicle has met an emissions standard (1992, Environmental Action Plan of the Arab Republic of Egypt).

Existing studies in Egypt include emission measurements, aerometric emission modeling, projections of future emissions, recommended emission reductions, and recommended means of achieving these reductions in the transportation area, mainly the governorates of Cairo, Giza, and Shoubra. These studies were produced by the Foreign Relations Supreme Council of Universities at Cairo University, in collaboration with the University of Wisconsin. Results show that emissions from vehicular transportation produced 99.9 percent of the carbon monoxide, 99.3 percent of the hydrocarbons, and 100 percent of the lead emission in the air relative to all other sources (industrial, electricity generation, refuse burning, etc). Emission regulations have been proposed based on American standards to be achieved by 1994/1995 in a carefully regulated program of annual reductions based on improved engine maintenance and periodic checks at authorized emission testing centers.

TECHNICAL APPROACH

Conversion of transit buses to compressed natural gas (CNG) is a relatively simple operation that can alleviate a large part of the petroleum-derived emissions in Cairo. There are at least two approaches that can be taken.

- (1) Conversion of transit buses to a dedicated CNG operation: This requires either conversion of existing engines or installation of new CNG engines in existing buses.
- (2) Conversion of transit buses to dual-fuel (diesel-CNG or gasoline-CNG) operation: This relies mainly on conversion of existing engines, including either-or operation of the engines or operation on a combination of fuels (80% CNG and 20% diesel, or diesel only)

ACTIVITIES

To be most effective, the initial effort should target a motivated, self-regulated fleet of transit buses, for example the 3,700 buses owned and operated by the Cairo Transport Authority (CTA). The program would focus on centralized refueling stations that could be expanded to include compression stations for the loading of CNG. The infrastructure already exists at the CTA to implement the program. The Contractor shall perform a study aimed at determining the feasibility of large scale CNG conversions for the bus fleet and shall develop a plan for implementing the program. The Contractor shall perform the following subtasks:

- Subtask 1 Technology Assessment - Evaluate the status of the technology in terms of the best conversion approaches, i.e., dedicated, or dual fuel, in terms of appropriateness for the Egyptian bus fleet. Identify limiting factors and advantages, disadvantages, and costs of each approach. Investigate alternative CNG compression station options in terms of location, compressor size and number, reliability, and costs.
- Subtask 2 Operational Assessment - Investigate policies and practices of the bus fleet likely to impact on the success of the conversions. Consider such factors as age of fleet, annual bus additions and retirements, maintenance, current fueling patterns and use patterns, and capabilities of maintenance staffs. Identify changes required.
- Subtask 3. Training Plan - Identify training requirements for the conversion program and design a training program to meet these requirements.
- Subtask 4. Impact Assessment - Evaluate the environmental and safety impacts of the proposed program.
- Subtask 5 Cost Estimates - Develop and summarize costs for each aspect of the implementation program.
- Subtask 5. Report Preparation - Document the results of each

subtask and the conclusions and recommendations for all aspects of the proposed program

STAFFING AND PROGRAM RESOURCES

A one-year program is anticipated that will require the part-time services of a Program Director, one Automotive Engineer, and one experienced Transport Modeling Specialist. In addition, short-term consultants may be required for specific elements of the program, i.e., development of training courses, specification of equipment, cost-benefit analyses, etc.

US Consultants -	6 person months
Local Experts -	24 person months

4. CROSS-SECTORAL FUELS OPTIMIZATION ASSESSMENT

BACKGROUND

This one year major policy assistance study will be aimed at investigating fuels production and usage in all energy sectors in Egypt to determine approaches to minimize energy consumption, and to optimize energy costs, foreign exchange, and environmental protection. The transportation, industrial, commercial, residential, and power sectors will be included. All fuels including oil, mazout, natural gas, and renewable energy will be addressed. OEPD and others have performed assessments of specific segments or fuels. The overview of fuels availability and usage in Egypt has not been addressed, however. Fuels usage plays a critical role in the country's environmental problems, especially air pollution, and in the economy. The current status of usage and availability of some fuels, such as natural gas, is not clear. The study will provide valuable information for policy planning in many areas of the Egyptian economy.

ACTIVITIES

The Contractor shall perform the following subtasks.

- Subtask 1 Obtain data from available sources within the country sufficient to define all liquid, gaseous, and solid fuels in Egypt in terms of magnitude of the resource, existing extraction and refining capabilities, fuels characterization, methods of transportation, exports, points and types of usage, actual costs, subsidies and income for each step from extraction through usage, and air emissions characteristics. Policies and plans related to any aspect of fuels production and usage will also be identified. Expected growth in each sector in energy demand should be identified. International costs and markets for each fuel type shall be determined. Data shall be evaluated relative to completeness and accuracy and major weaknesses identified.
- Subtask 2. Analysis - The contractor shall analyze data collected to identify non-optimum characteristics of current fuels production and usage in Egypt and recommend policy changes.

Specific assessments will be made of such issues as the following:

- a. Determine the degree to which usage of natural gas, a clean burning fuel, can be expanded in both new sectors and sectors currently using it Identify the limitations represented by the existing and planned gas pipelines, production, and the size of Egypt's reserves. Estimate potential environmental and economic benefits associated with expanded usage in each sector Identify physical and policy barriers to this expanded use
- b Evaluate the economic feasibility of the removal of sulfur from mazout for industrial applications Evaluate the export market for mazout and trade-offs between internal usage and exports

Subtask 3 Report Preparation - Document all data gathered and analyses, including conclusions and recommendations

STAFFING AND RESOURCES

The study is expected to take one year Labor requirements are as follows

US Consultants -	24 person months
Local Experts -	48 person months

ANNEX J
INSTITUTIONAL ASSESSMENT

**ENERGY CONSERVATION AND ENVIRONMENT PROJECT
PROJECT PAPER AMENDMENT**

INSTITUTIONAL ASSESSMENT REPORT

SUMMARY OF FINDINGS:

MAY 13, 1993

Prepared for

**U S Agency for International Development
Environment Office, USAID/Cairo Mission
Cairo, Egypt**

Prepared by:

**Datex, Incorporated
2101 Wilson Boulevard, Suite 100
Arlington, Virginia 22201**

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I. INTRODUCTION

The Energy Conservation and Efficiency Project addresses the serious energy problems facing Egypt. The project, which started in 1988, has recently been authorized through 1996 at a total funding level of approximately US\$ 49.5 million.

The current Project focuses on ten different technology applications: cogeneration, waste heat recovery; combustion control, power factor correction; high efficiency lighting, high efficiency motors, energy management systems, process controls, solid fuel boilers, and insulation and refractors. Thirty demonstrations of these technologies are planned during the life of the project. Funding is also provided for technical assistance, training, and promotional activities.

Three local Egyptian agencies are implementing agencies: (1) the Development Research and Technological Planning Center (DRTPC - Cairo University); (2) Tabbin Institute for Metallurgical Studies (TIMS - Ministry of Industry), and (3) the Federation of Egyptian Industries (FEI - Ministry of Industry). DRTPC is responsible for technology demonstrations in the private sector, TIMS is responsible for technology demonstrations in the public sector, and FEI is responsible for promoting replication in industry as well as maintaining an overall data base of information on Project activities. Overseas Bechtel, Inc. (Prime Contractor) and RCG/Hagler-Bailly, Inc. (Subcontractor) are providing technical assistance and procurement services to the three local implementing agencies.

In February-March 1992, the first evaluation of the Project was completed. The evaluation found that the Project was effectively implemented and was successfully promoting accelerated technology adoption. On the other hand, the evaluation found that the Project was only partially successful in enhancing Egyptian institutional capability and, thus, ensuring sustainability of accomplishments. The evaluation team pointed out specific areas for improvement:

- Place higher emphasis on privatization
- Add Low cost/No cost energy conservation opportunities
- Add industrial cost sharing
- Coordinate with other energy projects
- Push for removal of customs duties
- Translate manuals to Arabic
- Reduce payback to three years
- Allow local purchase of equipment
- More frequent steering committee meetings
- Add budget to Management/Technical Assistance (M/TA) contractor

- Change M/TA's office location
- Co-locate implementing agencies
- Greater participation in GOE environmental program
- Promote use of world market energy prices

Finally, the evaluation team recommended that USAID spend a large effort working with the Government of Egypt (GOE) on an environmental program as a part of the existing Project. Independently, in FY 1992, the USAID/Cairo Mission (the Mission) updated its overall strategy and added an environmental component. The Mission's strategic objective for the environment is "enhanced protection of fresh water and urban air resources." In the near-term, the Mission is pursuing this objective within its on-going water and energy programs. Thus, the Mission decided that the existing Energy Conservation and Efficiency Project should be re-designed to focus more directly on Mission environmental strategy.

The re-designed Project will (1) promote, implement, and accelerate the adoption of improved commercial technologies, processes, and practices to save energy and protect the environment; and (2) improve Egyptian institutional capabilities, particularly in the private sector. Adoption of the amended Project technologies will reduce energy consumption and environmental pollution, decrease waste material, increase productivity, and improve economic growth prospects. The amended Project also will establish an institutional capacity to undertake and manage environmental and energy conservation-related investments and programs through studies, workshops, seminars, technical assistance, and technology demonstrations.

The re-design effort was divided into two phases. In Phase I (completed in May 1993), the contractor (Datex, Inc. of Washington, D.C.) compiled data, completed analyses, and developed an overall design for the amended Project. In Phase II, the contractor will assist the Mission and the GOE in initiating implementation of the amended Project.

This Assessment Report is a deliverable of Phase I which summarizes the findings of the institutional assessment of (a) the three local agencies implementing the current Project, and (b) public and private sector environmental organizations. The report conclusions are based on data collected during a country visit in February-March 1993 which included interviews and selected plant visits.

II. OVERVIEW OF EGYPTIAN CONTEXT

Environmental protection in Egypt has only recently become an issue, more as a result of increasing world pressure than as a response to public outcry which was the driving force in most developed countries. For example, the World Bank has put conditions on industrial loans that require initiation of clean-up procedures and in one case at least, the actual closing of a lead plant in Helwan. The International Monetary Fund and other donors have insisted on policy reform and the removal of price subsidies on energy, fertilizers, and other commodities before they will become involved in additional financing of projects.

As a result of this pressure, the GOE has passed numerous laws and decrees to protect the environment, but these have not been very effective due a failure to establish clear standards, institute an effective monitoring and control program, and employ a strict enforcement policy. Responsibilities for environmental protection in Egypt are widely dispersed. There are currently 17 Ministries responsible for 81 laws, 34 Presidential decrees, and 17 Prime Ministerial decrees. While many of these Ministries have issued implementing regulations, the Ministries lack the commitment and/or resources to administer and enforce them effectively.

The main problems with the current environmental situation in Egypt stem from a GOE centralized bureaucratic system that is apparently unable or unwilling to make the necessary compromises and commitment for enforcement of policy decisions that are often unpopular at the Ministerial level. These problems include:

- lack of awareness on the part of decision-makers and the public of the serious health hazards and economic impact of environmental degradation, and the resultant low priority industrial environmental management,
- inadequate implementation and enforcement of existing regulations, and unduly light penalties for noncompliance,
- a need for environmental consideration in all national planning, and stronger capability for monitoring, sampling, and detection of pollutants; and
- a lack of environmental information, sufficient trained and skilled manpower, and financing for capital requirements

To address this problem and provide a central focus for the environment, the GOE established the Egyptian Environmental Affairs Agency (EEAA) within the Ministry of Cabinet Affairs. The EEAA,

with the leadership of the World Bank and financing from a number of donors, developed the GOE "Environmental Action Plan" in 1991-1992. The Minister of Cabinet Affairs presented the Action Plan in late May 1992 to donors in Cairo and to the UN World Environmental Summit in Rio de Janeiro in June 1992. The Action Plan establishes a sound framework for GOE environmental initiatives in 9 areas. (1) Land, (2) Water, (3) Air, (4) Natural and Cultural Heritage, (5) Marine and Coastal, (6) Solid and Hazardous Waste, (7) NGOs and Media, (8) Institutions, and (9) Population. The Action Plan candidly discusses the seriousness of the problem and lays out a comprehensive list of "policy actions" to be taken over the next 10 years at a total cost of about US\$ 1.5 billion.

The "Egyptian context" for implementation of a USAID-funded environmental program is complex and difficult. It is riddled with bureaucratic, institutional, structural, and societal constraints. Despite some very significant "steps in the right direction" with regard to environmental management and pollution control for Egypt, the country continues to suffer from a number of serious deficiencies. Some of these require substantial investment in time and money to solve, i.e., enforcement of the considerable policy reform and coordination at all levels of the public and private sector, and some can be significantly mitigated by simple changes in existing practices and/or low-cost/no-cost "investments" in infrastructure and hardware. For example, while in many cases, equipment is old and inefficient, considerable environmental benefits could be achieved in the industrial and power sector even without new regulations and policies by rapid improvement in procedures for operations, maintenance, and repairs. In the agricultural sector, significant improvement could be realized by careful management of fertilizer use and giving care to the application of pesticides.

Experience suggests that much of what is needed in environmental management is a philosophy that is foreign to the Egyptian public sector, and somewhat less so to the private sector. Bureaucratic and institutional difficulties should not be underestimated and must be overcome. Unless ingrained procedures and practices are changed, new policies, equipment, and even entire facilities will not have the desired effect on reducing environmental degradation. There are two key reasons for this; (1) inadequate (and insufficiently skilled and environmentally aware) management staff in many industries, and (2) a lack of motivation, due in part at least, to low pay and GOE-imposed constraints.

New clean and energy efficient U.S. technologies together with environmentally sound processes and procedures can easily be installed and/or introduced into the Egyptian industrial sector. There are certainly enough new programs on the horizon to do just that; the Environmental Health Project (EHP), the Environmental

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Pollution Prevention Project (EP3), the Project in Development and the Environment (PRIDE), the Clean Technologies Project (CTP), etc. However, any new industrial environmental project in Egypt must go beyond an isolated sale of goods and services. In order to assist in the development of a sustainable environmental program, a project must incorporate a very significant awareness campaign and training program across all levels of each industrial sub-sector. What is needed is a U S /Egyptian collaboration in a "step-by-step" approach that (1) understands and works within the existing Egyptian industrial environment, and (2) incorporates an incentive structure to reward behavioral change on an industry, plant, and individual worker level.

III. TABBIN INSTITUTE FOR METALLURGICAL STUDIES

The Tabbin Institute for Metallurgical Studies (TIMS) was founded in Helwan in November 1968 under the Ministry of Industry (MOI) as a scientific facility for continuous engineering education, training, research, and industrial consultations. The Institute is directed by a Board of Directors, headed by the Chairman of Metallurgical Industries Corporation. The Board has a membership of 10 professionals selected from the TIMS staff, the Ministry of Industry (MOI), and the Academy of Scientific Research and Technology. TIMS is administered on a daily basis by a full-time Rector, Professor Dr. Adel Soliman Abdel-Khalik.

The main objective of TIMS is to prepare graduates to meet the specific technological, planning and economic requirements of careers in the metallurgical, mining, coke, refractory and other related industries. Specifically, students and faculty are involved with

- industrial development, planning and productivity enhancement,
- completion of scientific research related to a wide range of industrial problems,
- technical and technological services and consultation to industrial companies,

¹ Egyptian Industrial Environmental Management Program, Phase I - Re-design Report, Annex A - Complementary U S Programs and Agencies, produced by Datex, Inc for the USAID/Cairo Mission, March 19, 1993

² Personal conversation with Prof. Dr. Adel Soliman Abdel-Khalik, Tabbin Institute of Metallurgical Studies, February 1993

- organization of local and international meetings, seminars, symposia, and conferences; and
- scientific publications, including research papers, text books, and translations of technical documents.

The Tabbin Institute is divided into the following scientific departments

- Ferrous and Non-ferrous Metallurgy
- Foundry Production
- Heat Treatment and Physical Metallurgy
- Metal Forming
- Industrial Furnaces
- Automation of Industrial Processes
- Mechanical Equipment
- Economics, Planning, and Industrial Organization
- Chemical and Mining Engineering
- Welding Technology
- Basic Sciences

The Tabbin Institute staff consists of 6 Professors, 16 Associate Professors, 7 Lecturers, 8 Assistant Lecturers, and 6 Instructors. TIMS has graduated about 750 students, 600 of them were awarded a Diploma of Higher Studies which is equivalent to a M.Sc. degree. According to published statistics, 593 students (79 percent of all graduates) were graduated between 1970 and 1980. The largest number of graduates in a single year was 76 in 1973, the smallest was 7 in 1990. In 1991, 26 students graduated. As would be expected, 73 percent of all graduates find work in the metallurgical industry. Only 2.4 percent of all graduates have gone to work in Arab countries other than Egypt.

Other activities at TIMS that are related to the proposed USAID/Cairo Mission Environmental Activity include training programs, research and consulting, and conferences and seminars. Training programs at TIMS are short-term (1-2 weeks) and long-term (up to 3-6 months). They are designed to inform the professional community of new trends in the industrial sector. About 400 training programs with more than 3,400 attendees (17,700 hours) were completed through 1991. About 60 percent of all training programs have been conducted since 1986-1987. TIMS conducts applied research to solve technological, managerial, economical, and production problems facing industry. More than 600 research topics have been completed through 1991. TIMS staff members spend consultation time in Egyptian industries on a regular basis.

³ Prospectus - 1991, Tabbin Institute for Metallurgical Studies, Egyptian Ministry of Industry, Helwan, Egypt.

According to the TIMS Prospectus - 1991, the Institute has 26 specialized laboratories for chemical analyses and materials testing. TIMS has drawing, printing, and computing centers and a mechanical workshop for preparation of samples, welding, and machining of metals.

TIMS is cooperating with many faculty of engineering and science in Egyptian universities. Staff members have run two international scientific conferences in Cairo (in 1971 and 1972) and 7 scientific seminars, symposia, and workshops in Cairo (two in 1980, two in 1981, two in 1989, and one in 1990). TIMS has Agreements of Cooperation with Suez Canal University, the American University in Cairo, and the Organization for Energy Planning in Cairo. TIMS has conducted cooperative research with 9 research institutions in Germany, France, the United Kingdom, Poland, Hungary, Austria, and Russia. TIMS has been selected for research and implementation projects by the Islamic Development Bank, the World Bank, the United Nations International Development Organization, the United Nations Development Programme, and the U.S. Agency for International Development.

Since 1980, TIMS has been involved with four donor-funded projects that involve field and research activity similar to that required under the proposed USAID/Cairo Mission Environmental Activity, i.e.

- 1 Field survey, project selection, and implementation of energy conservation projects in industry, and
- 2 Research, studies and measurements related to industrial pollution monitoring and control.

United Nations Development Program and United Nations Industrial Development Organization (UNDP and UNIDO)

In 1980, the UNDP funded an Energy Conservation in Industry Project (ECIP) at a level of about US\$ 400,000 matched by an equal "in-kind" GOE contribution. The project supported energy conservation activity in the glass and copper industries. Two additional energy conservation projects have been supported by the United Nations Industrial Development Organization. Total United Nations funding to date has been about US\$ 1.3 million. The UN intended to establish a "revolving fund" for the projects where the Egyptian users would repay loans through profits from energy savings. However, with all the equipment being imported at world market prices and low subsidized oil prices in Egypt for the public industries, cash flows were not conducive to any reasonable payback.

One of the key products of these UN projects was design, construction and instrumentation by TIMS of a "mobile energy conservation unit," an instrumented van which is used to collect and analyze air and water samples at industrial sites. Tabbin "cost-shares" the expense of the van by providing operating and maintenance support. The Institute is currently re-building the van to install new instrumentation. Other activity included energy audits and development of energy conservation projects at the Egyptian industrial plants and development of energy efficient hardware and control software for use in the steel industry.

The World Bank

In late 1992, the World Bank funded a project at TIMS to monitor and analyze air emissions in the Helwan area from cement and iron and steel manufacturing plants. TIMS staff took stack samples and analyzed them in in-house laboratories. They have written what appears to be a very comprehensive report on the project (a copy of the report was not available since it is still being reviewed by the World Bank). The project was on a very short time schedule. The TIMS staff were housed at the Institute during the project as samples were required to be taken and analyzed throughout the day.

United States Agency for International Development (USAID)

The USAID/Cairo Mission has funded two large energy and environmental projects at TIMS; (1) the Energy Conservation and Efficiency Project (ECEP), and (2) the establishment of the Central Laboratory for the Study of Industrial Pollution (CLSIP).

The Energy Conservation and Efficiency Project (ECEP) was started in 1987. Under the final ECEP design and re-design, the Tabbin Institute administers the public sector activity and DRTPC administers the private sector. The initial ECEP design was to have a loan/grant program where about 60 percent of the funding would be loans and 40 percent grants. This approach was not implemented because the great majority of the loans were small, i.e. about US\$ 500,000 each, and the Egyptian financial banks found that the cost of administrative processing of the small loans was not cost-effective. This experience was similar to that encountered by the UNDP during the implementation of their energy conservation project.

The most important facility at TIMS with regard to environmental activity is the USAID/Cairo-funded CLSIP which was established in

⁴ Personal conversation with Prof / Dr./Eng. Ahmed Amin Abdul Maguid, Executive Director, Energy Conservation and Efficiency Project, Tabbin Institute for Metallurgical Studies, February 1993.

April 1990 within the framework of the GOE Project for Environmental Pollution Control. The main objectives of the laboratory were to:

- conduct the required field measurements for monitoring pollution levels from industrial activities, and
- facilitate studies and research of the control of environmental pollution

The CLSIP is supplied with instrumentation, equipment and materials at an investment cost of more than US\$ 1 million plus US\$ 150,000 equivalent from the GOE. The CLSIP consists of the following specific laboratories.

- Instrumentation Laboratory - contains equipment for chemical analyses,
- Gas Analysis Laboratory - measurements of gas content in air and equipment for the measurement of particulate and noise air pollution, and
- Analytical Chemistry and Microbiology Laboratory - inspects and studies water pollution, industrial wastes, organic and inorganic chemical materials, salts, and petroleum and its by-products.

The CLSIP is prepared to participate in and/or conduct a wide array of industrial pollution studies⁵

- the execution of general policies for the prevention of industrial pollution and preparation of studies in this field,
- consequences of industrial processes on the environment and studies and research on pollution prevention,
- collection of data on air, land, water, and noise pollution for industry,
- recommendations on effluent and emission standards and pollution precautions to industrial plants,
- chemical, organic, and bacterial analysis for water, air and land;

⁵ Central Laboratory for the Study of Industrial Pollution (CLSIP) - Technical Specifications, Ministry of Industry, Tabbin Institute for Metallurgical Studies, Helwan, Egypt, January 1991

- conduct of required analyses and research to ensure compliance with environmental regulations in industrial zones,
- training programs for specialists in the field of environmental preservation for industrial pollution, and
- advice and consultation on the selection of pollution control equipment

Capabilities and Constraints

A visit was made to the Tabbin Institute and a laboratory walk-through was conducted by the Tabbin staff. The TIMS laboratory has an excellent supply of very good monitoring and control equipment and what appears to be a competent staff to operate it. A previous visit to TIMS in August 1992 by a Team member found most of the equipment under dust covers and in a condition that indicated that the instruments had not been used for some time. In February 1993, this was not the case - apparently because of the recent World Bank project to sample, monitor, and analyze air emissions from the cement and metals manufacturing industries in the Helwan area. The staff personnel interviewed were energetic, interested, and committed to involvement in any industrial pollution monitoring and control program. The Tabbin Institute could represent a facility that has the equipment and the capability to play a significant part in the Egyptian efforts to address environmental concerns.

Under the United Nations ECIP, TIMS conducted the following activities.

- trained approximately 230 public and private industrial managers and engineers in energy management techniques,
- sponsored the "mobile van" in visits to over 20 industrial plants to measure energy use and to identify conservation opportunities, and prepared "case studies" of 30 plants primarily in the public sector,
- held 12 energy conservation workshops and organized study tours to European industrial facilities; and
- conducted energy audits in the metallurgical, glass, and fertilizer industries

Under the USAID/Cairo Mission ECEP, TIMS has had significant participation in 25 energy conservation activities; i.e., 5 procurement actions (2 combustion control, 2 cogeneration, and 1 power factor correction), 13 energy conservation studies that

developed equipment specifications(4 waste heat recovery, 3 combustion control, 2 cogeneration, 2 power factor correction, and 2 improved lighting), and 8 energy plant "screenings" (3 waste heat recovery, 2 solid fuel boilers, 2 insulations, and 1 cogeneration)

The Project Paper for the ECEP component of the Science and Technology for Development Project (USAID 263-0140) stated that "TIMS has the necessary technical skills to identify energy conservation oppoprtnunities, provide general energy management training, and organize energy conservation seminars and workshops. The major weakness of TIMS is a lack of adequate project management, accounting, and administrative skills " "TIMS does not have adequate experience to identify specific technology applications and provide technical assistance to industrial enterprises on their installation, operation, and maintenance " ⁶ The Environmental Activity component will broaden TIMS responsibility to include environmental aspects of plant interventions. Over the past four years under the ECEP, TIMS has certainly improved its technical skills through participation in 25 energy conservation activities. Progress has been made in developing in-house administrative skills.

There is one additional cautionary note gleaned from previous interviews with industry representatives. Apparently the private sector in Egypt did not want TIMS involved as the technical institution under the ECEP. This may be an expression of the classical response by the private sector to what is perceived as unnecessary government involvement. It might also be a reflection of past experience with TIMS. If TIMS is to be given a broader role (perhaps by the EEAA) in the eventual formation of an Egyptian program for industrial environmental pollution protection, this must be taken into account for long-term success of the program.

IV. DEVELOPMENT RESEARCH AND TECHNOLOGICAL PLANNING CENTER

In January 1977, the Massachusetts Institute of Technology (MIT) and Cairo University (CU) established a collaborative research program. The main objective of the program was to enhance the capability at Cairo University to carry out applied research in science and technology development. The CU/MIT project funded more than 20 policy-oriented research and education programs between MIT, CU, and GOE organizations. As a result of this success, the program was formalized in 1979 by USAID/Cairo Mission funding to

⁶ Project Paper for S&T for Development (263-0140), Energy Conservation and Efficiency Component (263-0140 3, Document #1000A, Final Version, Third Amendment, Annex G - Institutional Assessment, Page G-7, dated May 15, 1988, United States Agency for International Development

establish the Development Research and Technological Planning Center (DRTPC)

In 1986, when the USAID grant ended, the DRTPC began to function as an autonomous, "not-for-profit" research center (with respect to technical, financial, and administrative functions) at Cairo University established under Article 196 of Law No. 49 for the year 1972 related to the organizations of Universities in Egypt. The Center is managed by a Board of Directors, which represents the ultimate authority for policy-making. Current members are the President and Vice-president of CU (Chairman and Vice-Chairman of the Board), the Deans of the Faculty of Economics and Political Science, and Engineering, and Professors of Engineering and Law. Additional Board members from outside of CU are the Ministers of Housing Rehabilitation and New Communities, Electricity and Energy, Cabinet Affairs and Administrative Development, Industry, and the State Minister of Military Production.

The DRTPC draws upon the faculty and graduates students at CU to conduct scientific and technological research for GOE ministries, public and private companies, and international organizations. Occasionally, outside faculty and international experts and organizations are used in implementing certain projects. DRTPC also organizes conferences, seminars, and symposia. The Center depends on its own funding resources from overhead charges, fees for service, and revenue from training courses.

Since 1979, the DRTPC has completed over 100 studies and research projects, both in collaboration with MIT and independently under contract to GOE organizations and industrial companies. These activities cover a broad range of disciplines, energy, industrialization, transportation, irrigation, hydrology, urban planning, economics, social sciences, health, and the environment.

The DRTPC was significantly expanded under the USAID/Cairo Mission Energy Conservation and Efficiency Project (ECEP). A separate division of the Center was established to do ECEP activities. The "ECEP Component" of the DRTPC is run by Prof. Samer L. A. El Haw, Director of DRTPC and Executive Director of the ECEP Component, and Dr. Mohamed Salah Elsobki, Technical Manager. In addition, under the ECEP funding, the DRTPC is supporting 15 full-time positions; 3 Cairo University faculty, 2 outside University Faculty (Ain Shams University and one other), 7 outside engineers, 2 administrative staff, and 1 secretary.

The DRTPC ECEP Component has been intimately involved in plant interventions since April 1991. They have worked with the M/TA contractor in development of ECEP plant selection criteria and have established additional "qualitative" measures such as management commitment to energy conservation, age of equipment, perceived

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ability of the plant staff to maintain any new equipment, etc In a visit to the DRTPC, the Executive Director stated that in a typical ECEP Component activity, DRTPC conducts the complete ECEP evaluation process with in-house personnel [Overseas Bechtel/Egypt (OB/E) was credited with providing this training]

- 1 screen industry and identify energy conservation opportunities that fall within one of the 10 technologies considered by ECEP,
- 2 conduct a preliminary feasibility study and a detailed study if findings warrant,
- 3 develop specifications for equipment which are then sent to Bechtel-San Francisco (OB/SF) for review,
- 4 issue an RFQ to a short-list of qualified U S bidders,
- 5 evaluate offers with concurrence of OB/SF and OB/E,
- 6 see that the local Egyptian plant assumes ownership at point-of-entry and installs the equipment; and
- 7 monitor the installation for a period of approximately 6 months

When asked if the DRTPC could serve a role in any environmental activity in Egypt, Prof El Haw stated that he is able to contract with any member of the faculty of Cairo University. This is a formidable pool of talent that he believed was expert in pollution issues He stated that often there are concerns that the university community (and DRTPC in particular) is too "academic" to be useful in the solution of "real world" problems (similar statements were heard during some private sector interviews conducted for the Institutional Assessment) He stressed that the DRTPC project teams generally have academic, public sector, and private sector ties and therefore are a "bridge" that could guarantee "applied, real world" solutions to problems. Professor El Haw also said that DRTPC can "pull in" experts from any private or public , foreign or domestic source

⁷ Personal conversation with Prof Samer L. A. El Haw, Director of DRTPC and Executive Director of the ECEP component, and Dr. Mohamed Salah Elsobki, Technical Manager of the ECEP Component, Cairo University, February 22, 1993

Capabilities and Constraints

Since April 1991, the DRTPC has completed a number of activities directly related to the provision of technical and managerial expertise needed for the USAID/Cairo Mission Environmental Activity component. These include

- Optimal Planning and Operation of the Martin Furnaces of the National Company for Metallurgical Industries,
- Treatment of the Sanitary Sewage Water at ArisCom;
- Design and Implementation of an Energy Management System at the Ramsis Hilton Hotel and the Egyptian International Pharmaceutical Industries Company;
- Power Cogeneration System at Alumisr;
- Design and Implementation of a Combustion Control System and a Waste Heat Recovery System from the Exhaust of a Glass Melting Furnace at Crystal Asfour and the Arab Pharmaceutical Glass Company,
- Prevention of Air Pollution at the Transportation and Engineering Company, Alexandria, and
- Power Factor Improvement at 7-UP Comapny, The Medical Center of Arab Contractors, and Giza Cables Company.

Included in the above are independent interventions by the ECEP Component of the DRTPC that have resulted in completion of 3 ECEP Technical Assistance Projects (TAPs), two more TAPs are nearly completed, one is about to start, and three more are in the early stages of consideration

The DRTPC has also conducted the following related training courses and symposia:

- Training for students from Yemen in the field of potable water in rural areas and purification of sewage water;
- Training courses on power factor correction and high efficiency lighting,
- a colloquium on energy and development; and
- a training course on the control of industrial quality.

The Project Paper for the ECEP component of the Science and Technology for Development Project (USAID 263-0140) stated that

"DRTPC's greatest strength is its project management, accounting, and administrative skills and capabilities. DRTPC has managed and implemented a USAID project for nine years ... (through mid-1988). DRTPC staff . . . have administered and monitored up to 40 projects at one time."⁸ the Project Paper further states that full-time technical staff, staff specialized in energy conservation, and additional administrative staff would be required for the ECEP

This assessment of the ECEP Component of the DRTPC found no reason to doubt the validity of these previous findings. The ECEP has funded the required full-time staff at the DRTPC and the newly-established ECEP Component appears to be fully capable of performing its technical, managerial, and publication responsibilities. There may be a need for additional full-time staff specifically skilled in environmental industrial pollution control and prevention if the DRTPC is to assume a significant role in a new Environmental Activity Component.

V. FEDERATION OF EGYPTIAN INDUSTRIES

The Federation of Egyptian Industries (FEI) is a public sector organization that was established under the Ministry of Industry in 1922. FEI's primary responsibility is to represent private industry and to work with the Minister of Industry to set government policy to encourage industrial development. All companies with more than 25 employees or more than LE 5,000 of capital must become members of FEI. There are currently about 14,000 members spread across 13 "industrial chambers," i.e.

- Petroleum and Mining
- Metallurgical Industries
- Engineering Industries
- Woodworking Industries
- Spinning and Weaving Industries
- Chemical Industries
- Printing, Binding, and Paper Products
- Leather Industries
- Food Industries
- Cereals Industries
- Building and Construction Industries
- Cinema Industry
- Leather and Fur Tanning Industry

⁸ Project Paper for S&T for Development (263-0140), Energy Conservation and Efficiency Component (263-0140 3, Document #1000A, Final Version, Third Amendment, Annex G - Institutional Assessment, Page G-11, dated May 15, 1988, United States Agency for International Development.

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Each chamber has a Board of Directors with 10 elected members and 5 members appointed by the Minister of Industry. The chambers hold regular meetings and several of them usually publish a quarterly newsletter.

About half of the members come from two industrial chambers, Food Industries (4,000 members) and Spinning and Weaving Industries (3,000 members). The FEI has three branch offices; "10th. of Ramadan City," "6th of October City," and a "regional" office in Alexandria. An additional office in Cairo office is dedicated to ECEP activity.

The Federation has four departments, Financial, Legal, Administrative, and Technical. In 1988, the FEI had a staff of 120, of which 80 worked for the Chambers and 40 for the Federation. In February 1993, the FEI has a staff of approximately 300, about 100 professional and 200 administrative. The organization is entirely funded by membership dues, 60 percent to the chambers and 40 percent to the Federation. In 1988, the Federation's budget was only averaging about LE 300,000 annually.

Capabilities and Constraints

The public and private sectors in Egypt are under increasing pressure to address environmental problems. Many industries are beginning to take action on their own in the belief that environmental regulations that will be forthcoming once the EEAA get organized and the Environmental Protection Law passes Parliament. For example, in the "10th of Ramadan City," environmental pollution is becoming a serious problem as over 500 industries are operating with little or no control. The local community has established an "industrial committee" to set emission and effluent standards and to monitor compliance.

Mohamed Kamal, Executive Director of the FEI's ECEP Office, stressed that the FEI needed an "information center" for environmental information. He said that he has been getting an increasing number of inquiries from industry concerning environmental issues. He believed that the infrastructure for such a center is in place in the form of the ECEP Office of the FEI, but that funding is needed to collect the data and to disseminate it. M. Kamal said that the FEI had not organized any formal environmental activity as yet. The only activity that he was aware of has been on an informal basis through personal contacts among the membership.

⁹ Personal conversation with Mohamed Kamal, Executive Director, Federation of Egyptian Industries, Energy Conservation and Efficiency Office, Zamalek, Cairo, Egypt.

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VI. PUBLIC SECTOR ENVIRONMENTAL ORGANIZATIONS

A. The Egyptian Environmental Affairs Agency (EEAA)

The EEAA was established by Presidential Decree 631 in 1982. The Agency is in the formative stages of a re-organization to strengthen its role in environmental protection and policy formulation. Current responsibilities have focused on coordination among the numerous agencies involved with environmental issues and on the completion of studies to define the problem and to develop options. Major existing responsibilities are:

- to draft a National Plan for environmental studies and propose priorities for implementation,
- to coordinate with implementing authorities and to monitor follow-up actions,
- to study environmental legislation in developed countries and to draft legislation for Egypt,
- to propose standards, specifications, and conditions for environmental protection,
- to examine environmental projects, approve budgets from the Environmental and Tourism Fund for such projects, and monitor progress;
- to prepare information programs to increase public awareness and to organize the exchange of environmental information, and
- to implement pilot and demonstration projects

A key element of the Egyptian Environmental Action Plan is the proposed "Environmental Protection Law" to give the EEAA increased powers and duties. In particular, EEAA would:

- formulate environmental policy, plans, and legislation;
- specify and enforce environmental regulations and

¹⁰ Environmental Action Plan, pages 69-70, Government of the Arab Republic of Egypt, May 8, 1992.

¹¹ Environmental Program - USAID/Egypt, page 8-9, USAID/Cairo Mission, November 1992 and Environmental Action Plan, page 70, Government of the Arab Republic of Egypt, May 8, 1992.

standards;

- be responsible for Environmental Impact Assessments required of all new investment projects,
- be responsible for ensuring that all requirements in the EIA are respected;
- have power to inspect industrial plants, and
- have power to enforce the law.

In addition, the EEAA would administer all natural preserves and collect and disseminate environmental data for public awareness and education, as well as control such data to ensure an accurate database for scientific investigations

Dr M A Fawzi, Director for Water and Coastal Areas Protection for the Egyptian Environmental Affairs Agency (EEAA) was visited on February 22, 1993. He stated that the new EEAA has a formidable job to do, i.e., to essentially establish the equivalent of the U S Environmental Protection Agency in only three years as the Egyptian industry is expected to comply fully with existing environmental laws and new laws being considered by the Egyptian Parliament by that time. The EEAA intends to apply different compliance standards for older plants and new plants during the transition to an environmentally sound industrial sector. The sector is concerned over cost of compliance and the potential for the laws not to be equally enforced. Ministries are concerned about overlapping responsibilities and jurisdictions and vested interests, i.e. the Ministry of Agriculture is worried about fertilizer restrictions, the Ministry of Industry is worried about industrial restrictions, etc

Dr. Fawzi said that the transition of the EEAA to a "Central Environmental Agency," which was recommended in the national Environmental Action Plan, will most likely undergo a name-change to the "Egyptian Environmental Protection Agency (EEPA)" because the Ministers do not like the implications of a "central" enforcement agency. Dr. Fawzi said that the new EEPA will require environmental impact statements, set effluent standards for various sectors, and establish monitoring and control procedures using existing Egyptian R&D facilities. The EEAA staff is currently very small since the organization has only a coordinating role. When the EEPA is established, the staff will grow under Salah Hafez, the Director, in keeping with its regulatory and enforcement role. The current EEAA organization is divided into six sectors: Water and Oceans; Air, Land; Protected Areas, Solid/Hazardous Wastes; and Public Awareness. In response to a question about EEPA enforcement, Dr. Fawzi stated that the organization intended to

- conduct random visits to industrial plants and take measurements of effluent streams and emission,,
- require plants to record the amount and quality of effluent,
- shut down a plant that is in non-compliance, and
- enforce all environmental laws equally between the public and private sectors

Dr Fawzi believes that the capability exists in Egyptian organizations to monitor and enforce an environmental program. He further stated that 60 percent of Egypt's environmental problems would be solved by privatization. He said that the real problem is one of management among the various players. He did say that short courses to provide hands-on training may be needed so that organizations such as the Academy of Sciences and the National Research Center would be better able to implement any environmental program, i.e. Egypt has plenty of "educated people" capable of this work, but they need more "trained" people.

Finally, a visit was made to Dr Tarek Genena, Director of the EEAA's Technical Cooperation Office for the Environment (TCOE) in Mohandessin. The TCOE provides a support function directly to the Director of the EEAA in three areas:

- as a focal point for multi-lateral and bi-lateral donor activities,
- as coordinator between donors to reduce redundancy in project funding; and
- as a preparer of environmental projects and programs to implement the Egyptian Environmental Action Plan (EEAP)

Dr Genena expressed support for a USAID/Cairo Environmental Activity. He gave an opinion that the EEAA standards development and enforcement "system" would be in place and functioning in about 5 years.

The GOE is thinking in terms of the EEAA becoming a relatively small coordinating body that has very important powers in a broad range of areas to ensure that environmental and natural resource management in Egypt improves rapidly on an integrated cross-sectoral basis. To accomplish this, the EEAA must have the strong backing and support of all Ministries, Governorates, and other authorities. The draft Environmental Protection Law supports this approach.

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The EEAA must rapidly become an authoritative institution of some strength if it is to have the needed immediate effect on existing environmental practices and policies in Egypt. To be effective as a "small but powerful coordinating body," the EEAA needs very strong political backing from the President and the Prime Minister, substantially increased human and financial resources, and strengthened powers. This strengthening must include powers to set standards and propose legislation across the board, and most importantly, to coordinate the environmentally relevant activities of all Ministries, Agencies, Governorates, and other local governing bodies. The EEAA has a cadre of qualified staff and is in the process of recruitment in anticipation of a growing role in environmental regulation and management. Currently, the staff are mainly chemists, geologists, agricultural engineers, and zoologists. To make up for deficiencies in specific disciplines, the EEAA has recruited some experts in environmental fields to act as consultants, specifically in marine life, land use, and environmental legislation.

The EEAA will also have to use the private sector to provide independent assessments of environmental issues; develop close and cooperatives relations with the scientific community in Egypt, and to represent Egypt in international and regional environmental meetings.¹²

B. Role and Responsibilities of Egyptian Ministries and Authorities

There is a multitude of environmental legislation in Egypt and responsibilities for environmental protection and enforcement of that legislation is widely dispersed. As mentioned previously, there are 17 Ministries responsible for 81 laws, 34 Presidential decrees, 17 Prime Ministerial decrees, and 287 Ministerial decrees (see Table VI-1). It is notable that the Ministry of Petroleum & Mineral Resources and the Ministry of Industry each have only one environmental law applicable to their operations. There are only two for the Ministry of Water Resources and three for the Ministry of Energy and Electricity. Egypt has ratified 34 international environmental convention protocols as of December 1990.¹³

¹² Egypt: Environmental Management and Institutional Arrangements, Fairclough, A.J., Environmental Resources Limited, London, England; for the World Bank funded in part by the UK Overseas Development Administration, Reference 1544, March 1992.

¹³ Management of Environmental Resources (Institutional Aspects), Group #9 Working Paper in support of development of the Environmental Action Plan, November 1991.

The shortcomings in implementation of these laws have different causes. Some of the more important reasons are:

- There is a lack of awareness of the seriousness of environmental pollution by policy and decision makers and the public
- The laws deal in an indirect way with pollution control and are outdated in many cases. Some new sources of pollution and environmental deterioration are not legislated
- Most penalties are very light as they have not been updated, i.e., a heavy fine 40 years ago is inconsequential now
- There is no consistent system for monitoring, sampling, and detecting pollution effluent, which is an absolute requirement for any legal action
- Many existing laws do not give clear nor quantified values for pollutants, e.g., the automobile law states that "no heavy smoke should come out of motor car exhausts," and the marine law states that "waste dumped into the sea should not be harmful to marine life "

Table VI-1. Enumeration of Existing Egyptian Environmental Legislation by Sector

EGYPTIAN ENVIRONMENTAL LEGISLATION BY SECTOR				
MINISTRY	LAWS	PRES. DECREES	PRIME MIN. DECREES	MINISTR. DECREES
Cabinet	1	2	15	-
Housing	12	-	-	21
Reconstruction	2	-	-	-
Oil/Mineral Resources	1	-	-	-
Social Security	2	-	-	1
Supplies	4	2	-	64
Culture	2	1	-	-
Interior	8	-	-	11
Tourism	2	-	-	-
Health	21	4	1	103
Industry	1	4	-	22
Electricity	3	-	-	-
Transport	7	19	-	7
Water Resources	2	-	-	4
Agriculture	6	-	-	27
Commerce and Trade	1	1	1	12
Manpower	6	1	-	15
TOTAL	81	34	17	287

Note In all fairness, there are many Egyptian laws that set very well defined standards and limits that conform with those in developed countries. However, this has as much of a negative effect on compliance as unclear values, as the standards are so unrealistic given the current Egyptian environment that no attempt is made to meet them. It is imperative that all standards be reviewed and that a realistic, step-by-step approach be taken to their update

The newest law (protection of the Nile waterways) was enacted in 1984. Nearly 65 percent of the laws are at least 15 years old.

C Role and Responsibilities of Universities and Research Centers

Summaries of the responsibilities of key organizations in the environmental field are given below. One major public sector organization not listed, the Tabbin Institute for Metallurgical Studies (TIMS), is described Section III of this report

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Academy of Scientific Research and Technology

The Academy is responsible for supporting scientific research and applying modern technology in all fields of development. It also forms the national policy for R&D necessary to support the national development plan. The Academy has about 1600 scientists, specialists and experts divided into 13 disciplinary councils and four interdisciplinary divisions. Among these councils is the "Environment Research Council," a group concerned with:

- the formulation and execution of a national program for environment-related research and studies,
- the effects of production practices on the environment,
- proposing appropriate technologies for avoiding environmental hazards and preserving eco-systems, and
- proposing technologies for rational use of natural resources

National Research Center

The Center is the focus for applied scientific research, particularly in the fields of industry, agriculture, public health, and all essential factors of the national economy. The Center is made up of 15 disciplinary research branches, including an "Environmental Research Branch" consisting of

- Water Pollution Laboratory - specializing in pollution in drinking water and industrial waste water. The laboratory studies the sources of water pollution and its control methods.
- Air Pollution Laboratory - specializing in pollution in industrial cities and surrounding areas, studying the sources of air pollution, and control methods and environment-oriented planning of cities and industrial zones.
- Vocational Health Laboratory - specializing in investigating health risks in the workplace.

Oceanographic and Fisheries Research Institute

The Institute completes research on fisheries development, protection of coasts against erosion and pollution due to development, and the proper use of water resources.

Petroleum Research Institute

The Institute provides the petroleum industry with technical and applied research and studies to assist the industry to fulfill the objectives of the national development plan. The institute has undertaken research in treating the harmful effects of oil pollution.

Theodore Belharz Research Institute

This Institute conducts experimental research pertaining to Belharziasis infection and control. The Institute also trains cadres of local, regional, and international technical personnel in how to deal with the disease.

Remote Sensing Center

The Center transfers space technologies from developed countries to Egypt. It has been active in detecting the source of pollution and identifying polluted areas.

The Agriculture Research Center (ARC)

The Center has 14 institutes and 3 central laboratories specialized in different branches of agricultural research. The Center has 32 experimental stations for field crops and animal production distributed nationwide. Verification trials and experiments are conducted on farmers's fields in 18 governorates. ARC focuses on research to increase agricultural production, to establish and execute policy for new seed development, and to suggest new legislation for the execution of agricultural policy.

Desert Research Center

The Center develops plant, animal, and mineral resources and well as studies Egyptian deserts and desertification. The Center has four departments: Water Resources, Soils, Plant Production, and Animal Production.

Water Resources Research Center

This Center consists of 11 research institutes that address most of the problems facing Egypt's irrigation improvement and water resources development. One of the major objectives is to outline and implement long-term policies for managing water resources in Egypt, both surface and groundwater.

National Center for Industrial Safety

The Center is concerned with the working environment with special attention to safety and vocational health, raising productivity, and securing a sound environment for workers. The Center is mostly concerned with health issues and industrial medicine. It has organized training courses on industrial safety.

Metals Research Development Center

The Center contributes to development of air and solid waste projects through applied research on pollution control sources, including engineering design on mitigation techniques.

Environmental and Occupational Health Center

The Center is active in monitoring of air, water, and soil, training cadres of technicians in the field of environmental and occupational health. The Center conducts research to help establish standards of pollutants in collaboration with other research centers and institutions.

Environmental Studies and Research Institute (Ain Shams University)

The Institute was established to conduct research and studies to identify appropriate solutions for environment-related problems. The Institute offers advanced courses leading to M.Sc. and Ph D. degrees and organizes seminars and meetings to increase public awareness of environmental issues.

Public Health Institute (University of Alexandria)

The Institute conducts applied research for raising public health standards for combating biological and chemical environmental pollution, endemic diseases, occupational health, environmental health as related to housing and drinking water, and community health.

Marine Health Research Center (University of Alexandria)

This Center focuses on marine pollution issues as well as pollution in Mariout lake, and on treating industrial waste.

General Organization for Industrialization (GOFI)

This organization is the focus of industrial processes in the Ministry of Industry. In 1978, GOFI established a general Administration for Environmental Protection. GOFI contributes in the field of environmental research and study by projects in:

- water, air, and solid waste protection;
- toxic substances;
- planning for treatment of industrial pollution,
- preparing plans to develop, upgrade, and follow-up implementation of projects;
- local manufacture of environmental equipment, and
- collecting and documenting data in all industrial facilities.

GOFI contributes to the establishment of an industrial database by developing the industrial environmental map. GOFI also contributes to environmental training and improvement of environmental awareness through seminars, internal, and external conferences.

Suez Canal University

The University houses a center of environmental research and other environment-related activity, e g , a Deputy Director for Environment and Community Services, faculty involved with many scientific and research centers for environmental issues, and laboratories which conduct environmental projects.

Faculty of Agriculture, Land, and Water Section, Alexandria Univ.

This is a group of experts and specialists in 8 laboratories equipped for research activities. The Section conducts studies and research in the fields of desertification, water quality evaluation, heavy metals research, and dissemination of environmental information

It is clear that a strong technical capability is available within the research centers and institutes mentioned above. However, many are very specialized and will require specific training and/or recruitment of additional environmentally-trained staff to become productive in research and study of industrial environmental pollution issues. The supply of advanced equipment for environmental studies would also be useful to enhance the national capacity to conduct meaningful and practical research

An apparent problem when one considers the brief summaries of the types of research and studies conducted by each organizations is the assurance of coordinated effort among them given the limited amount of funding that has historically been available for environmental research and development. Coordinating the often specialized efforts of the 19 centers and institutions mentioned above, research conducted in the relevant departments of 12 Egyptian universities, and the efforts of competent authorities in related GOE agencies is an imposing task. The EEAA must seek the experience of other countries and the support of international organizations to effectively develop and implement the required

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infrastructure quickly.

VII. PRIVATE SECTOR ENVIRONMENTAL ORGANIZATIONS

Interest in the environment in Egypt is beginning to grow. The establishment of a special component of the Development Research and Technological Planning Center (DRTPC) and the Federation for Egyptian Industries (FEI) under the ECEP are good examples of how the USAID/Cairo Mission has been a part of the growing environmental movement in Egypt. The Environmental Activity component of the ECEP should be able to profit from this existing infrastructure to "spread the word" about sound environmental management practices throughout the industrial private sector. Detailed descriptions of these organizations are given in Sections IV and V of this report, respectively.

There are about 80 Non-government Organizations (NGOs) in Egypt that are interested in environmental affairs. About 68 NGOs are listed as reasonably active by the EEAA's Technical Cooperation Office for the Environment (TCOE). These organizations have varied agendas with regard to overall objectives for often very specialized environmental concerns, e.g., pharmacology, chemistry, medicine, zoology, various aspects of health, energy, social service, cultural heritage, botany, human rights, nutrition, afforestation, and earth science. While all are concerned with environmental protection, fourteen are specifically listed by the TCOE as having the "environment" as their objective and three as having "industry" as their objective. They are:

Environment

- The Central Society for Environmental Conservation
- The Arab Youth and Environment Office
- The Nature Preservation Society
- The Environmental Protection Society of Assiut
- Friends of the Alexandria Environment Society
- The Civil Society for Environment Protection
- Friends of the Environment and Development Association
- The Suez Environment Protection Society
- Environment Preservation Society
- "Balady" Society
- Environment and Resource Protection Society
- The Azbakia Environmental Service Society
- Khadra Society for Environmental Development and Protection
- Egyptian Youth Society for Development and the Environment
- The National Environment Protection Society

Industry

- The Egyptian Society for Development of Packaging and Wrapping
- The Egyptian Society for Industry and the Environment
- The Egyptian Society for Industrial Medicine

It is fair to say that categorically all of these institutions suffer from weak financing and a general lack of public awareness. While some NGOs have GOE representation on their boards, there is a general lack of GOE recognition of the existence and potential of NGOs. In some cases there are unclear roles and/or overlapping concerns among somewhat similar NGOs and divergent approaches to solutions.

The AID/Washington Near East bureau's Project in Development and the Environment (PRIDE) recently completed an activity that defines the environmental sector in Egypt, describes products and services that the country will need, and identifies market opportunities.¹⁴ The report states that despite the lack of enforcement and the limited public awareness and funding, an environmental business sector does exist in Egypt. An estimate is made that over 100 companies operating in Egypt (both Egyptian and foreign-owned) provide some products or services that can be defined as "environmental business". This sector is a mix of public and private enterprises, generally the public firms manufacture hardware while the private firms provide services. The great majority of these companies provide environmentally related goods and services as a small part of their total corporate products. They generally fall into the following categories:

- large engineering and design companies (mostly privately owned),
- construction companies (mixed public and private),
- agents/distributors of imported equipment (mostly private);
- public sector manufacturers of water supply equipment;
- consultants (individuals, research institutes, and private companies).

Foreign companies participate in Egypt's environmental business sector primarily through export of equipment to Egypt or through direct contact with donor agencies or the GOE.

¹⁴ Profile of the Environmental Business Sector in Egypt, Project in Development and the Environment (PRIDE), USAID Contract No. ANE-0178-C-00-1046-00, October 1992

More than 60 private sector companies were interviewed during the PRIDE study. Market demand was mentioned as the most important factor for increased interest in environmental business. Given sufficient demand for products and services, the private sector companies felt that growth would occur without outside intervention. To realize these business opportunities, however, the private sector companies felt that they needed assistance in several areas:

- the necessary technical skills to capitalize on environmental opportunities, i.e., training in environmental specializations is necessary (especially in technical consulting and operation and maintenance);
- access to foreign products and services, i.e., a need to understand how to find suitable equipment to import, and
- better access to financing

The PRIDE study found that equipment must often be adapted to meet Egyptian requirements. Low-cost technologies that are easy to maintain and that do not require expensive replacement of spare parts are the most appropriate for the private sector to offer. Local assembly and manufacturing, or quick methods for import, are also important elements for successful implementation.

Business activities in the environmental sector were categorized into specific areas and an assessment was made of the private sector opportunities in each area. Results of this assessment were as follows:

- 1 Environmental Monitoring and Testing - while at least seven GOE or university-sponsored research institutes have capability in this area, the GOE needs to improve and increase its capabilities. Private companies may have difficulty competing with these organizations until the market for services grows substantially.
- 2 Municipal Water and Wastewater Treatment - this is an attractive market in Egypt. Many companies have capability in this area and competition is stiff, nearly half of the 60 private sector companies surveyed by PRIDE were already active in the market. Most are very large companies that construct sewage systems.

3. Industrial Wastewater Treatment - This market is just beginning in Egypt and will grow substantially over the near-term as the need is great. Many companies have the capability to import equipment to treat effluent, but few specialize in this area. Only a few companies in Egypt can provide operation and maintenance services for treatment facilities.
4. Environmental Consulting Services - Some expertise exists in Egypt, but much more will be required. Until more local consultants are trained, there will be a need for foreign consultants operating in partnership with Egyptian firms. There is virtually no competition among Egyptian companies in this market. Currently private and public firms each provide about half the services.
5. Water Purification Systems - Egypt has had a market for water purification systems for a least five years. As water pollution becomes more of a problem, the need for pretreatment of water for industrial processes will grow. To date, most water purification equipment is imported, although Egyptian companies are beginning to manufacture water treatment systems for municipalities. Competition is strong among foreign suppliers. Competition among Egyptian companies has not yet emerged.
6. Municipal Solid and Hazardous Waste Collection and Disposal - the growing number of private providers of municipal solid waste collection indicates that private firms will increasingly be buyers of collection equipment. The operation of municipal solid waste disposal facilities will most likely be contracted to private firms; in 1991, there were 85 companies collecting and delivering solid waste to disposal sites. Due to a lack of demand, few companies offer hazardous waste treatment or safe disposal services.
7. Waste Recycling and Associated Businesses - Recycling business activity in Egypt is considerable. Most recycling is related to solid waste management in Cairo, where long-established private sector waste collection, sorting, dealer networks, and recycling workshops operate. Private sector collectives and individuals collect approximately one-third of Cairo's waste. Competition among small-scale recycling companies is strong. The system is operated largely by a unique subculture consisting of two groups of collectives; the Wahis (as administrators) and the Zaballeen (as the collectors).

8. Point Source Air Pollution Control - Many Egyptian companies provide services and products to address air pollution, although none specializes in air pollution control because the market is small. Emission control equipment requires specialized consulting services before it is purchased and installed. Several companies in Egypt manufacture dust collectors and baghouse filters. Twenty of the 60 companies interviewed in the PRIDE study said that they provided products or services that address air pollution, although most are agents/distributors for foreign equipment.
9. Mobile Source Air Pollution Control - Given the enormity of Cairo's air pollution problem, some controls on vehicle emissions will have to be required and enforced in the coming decade. However, because the market for mobile source air pollution equipment has yet to develop, there is currently no significant competition in Egypt.

The USAID/Cairo Mission has established a reasonably sound and working infrastructure at the upper levels of the industrial private sector through the efforts of DRTPC and FEI under the ECEP. Experience in other countries has conclusively shown, however, that very little advancement is made in industrial pollution prevention and/or control without a strong public awareness that is embodied in an active and effective environmental movement. The involvement of the public in the solution of many environmental problems and public acceptance of the necessary cost is vital to successful environmental management programs. The best way to accomplish this is through active involvement of all parties, the NGOs, the educational establishment, and scientific research centers and institutions, in a focussed education program at all levels of society.

USAID has supported development of an environmental curricula for Grades 1-3 in GOE schools. The great majority of educational facilities in Egypt are government-run, therefore, additional support from the GOE through the involvement of the EEAA is a prime requirement. Also of prime importance is the use of non-formal education, i.e., radio, television, and the press in a widespread public awareness campaign. Once again, since most of the control of these media rests within the central government, the GOE must be a strong participant in these activities. The students of today are the environmental managers of tomorrow, and Egypt has over 10.5 million of them (Table VII-1).

Table VII-1

TARGET GROUPS FOR PUBLIC AWARENESS CAMPAIGNS	
<u>General Education:</u> Primary Education Preparatory Education General Secondary Education	6,155,100 students 3,412,867 students 569,943 students
<u>Technical Secondary Education:</u> Industrial, Agricultural, and Business Education	950,193 students in 1,235 schools
<u>University/Tertiary Education</u>	471,672 students in 12 universities
<u>Non-Formal Education</u> Radio and Television Newspaper and Magazines	40 million viewers 25 million readers

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