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Project in Development and the Environment

USAID/Egypt Environment and Natural Resource Program: A Recommended Strategy

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The objective of the Project in Development and the Environment (PRIDE) is to help the U.S. Agency for International Development (AID) design and implement programs that foster the agency's environmental and natural resources strategy for sustainable economic growth in the Near East and Eastern Europe.

PRIDE provides AID and participating countries with advisory assistance, training, and information services in four program areas: (1) strategic planning, (2) environmental policy analysis, (3) private sector and NGO institutional strengthening, and (4) environmental information, education, and communication.

A consortium selected through open competition in 1991 is implementing the project. Chemonics International is the prime contractor; the subcontractors are RCG/Hagler, Bailly, Inc.; Science Applications International Corporation; Capital Systems Group, Inc.; Environomics, Inc.; Industrial Economics, Inc.; Lincoln University; and Resource Management International, Inc. In addition, AID has entered into a cooperative agreement with the World Environment Center to support the implementation of PRIDE.

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USAID/Egypt Environment and Natural Resource Program: A Recommended Strategy

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SECTION I

A RECOMMENDED STRATEGY STATEMENT

EXECUTIVE SUMMARY

The PRIDE environmental strategy team conducted a two-part environmental and natural resource strategy exercise with the USAID/Egypt Mission from February 6 through March 5, 1992. The purpose of the exercise was to:

- Help the mission formulate a strategy for implementing its program in accordance with USAID's environmental initiative,

- Recommend an action plan to help the Government of Egypt (GOE) improve its environmental management program, consistent with sustained development principles.

In the first phase of the strategy exercise, the team prepared a background analysis (Section II) to assess the current status of Egypt's environmental management program and lay the foundations for recommending a mission environmental strategy. The team reviewed Egypt's macroeconomic setting, natural resource base, and cultural heritage—all of which significantly influence the country's current environmental program.

The team also assessed the quality of Egypt's environmental management by conducting an extensive analysis of the country's policy framework, institutional setting, environmental monitoring, risk assessment, technology acquisition, environmental education, and private sector initiatives. The team used this assessment to analyze the mission's competitive advantage in environmental program assistance and identify areas of opportunity. These areas constitute the program themes of a comprehensive environmental and natural resource strategy.

In the second phase of the exercise, the team recommended a program strategy statement for the mission as part of its comprehensive approach to helping the GOE improve Egypt's environment and natural resource program (Section I). The team also recommended a strategy that calls for implementation of the following cross-cutting program themes:

- Free flow of information
- Environmental management capability
- Policy reform
- Pivate sector initiatives

The team recommended this approach after concluding that Egypt's serious air and water quality problems have resulted from inappropriate policies, ineffective institutions and private sector impediments. The recommended interventions maximize the mission's strong competitive advantage in the fields of water and wastewater treatment, irrigation, and energy. Finally, the strategy recognizes that the mission faces important limits on its ability to achieve its objective.

The Problem Setting

The background analysis led the team to conclude that Egypt faces serious environmental damage to its natural resource base. Although precise environmental quality and risk assessment data have not been developed, available information indicates that environmental problems ranking from highest to lowest risk are water, air, coastal and marine, and land resources.

Egypt's policy-making ability suffers from the absence of an explicitly analytical framework for assessing the costs and benefits of environmental policy options, the absence of the kinds of information needed to make effective policy decisions, a lack of power among local communities, and inappropriate economic policies.

Several factors make it impossible for the country's institutional framework to support an effective environmental management program. These factors include ineffective legislative and regulatory systems, ineffective organizational structures, weak GOE support for environmental non-governmental organizations (NGO's), and limited support for private sector participation in environmental protection initiatives.

Egypt does not systematically monitor any major pollution problems. Monitoring efforts are stalled by the lack of a comprehensive data collection system, inadequate pollutant analysis, and inadequate dissemination of monitoring results.

In addition, Egypt has no systematic environmental risk assessment program. The most serious risk assessment problems are the absence of a framework for a workable risk assessment system and inadequate dissemination of risk assessment results.

Efforts to improve Egypt's environment also suffer from an inability to acquire needed technology. At the root of this inability is a lack of economic incentive for the private sector to provide environmental services. This lack of incentive manifests itself in the GOE's failure to enforce enacted environmental laws and regulations, excessive market domination by parastatal monopolies, and significant non-tariff barriers against private sector environmental firms.

Technical expertise and public involvement could help drive demand for environmental services, but Egypt lacks the sort of effective education programs that would boost expertise or public interest in the environment. The current environmental education program suffers from the absence of an effective environmental management framework; the absence of comprehensive environmental science training program; and the absence of comprehensive public awareness program.

A Recommended Strategy Framework

After reviewing Egypt's major environment and natural resource problems areas and assessing the mission's competitive advantage and mandate, the team designed a strategic framework around six key issues.

The Strategic Objective. The team recommends that the mission adopt the following as the objective of its environmental strategy: **Improvement of Egypt's environmental quality, consistent with sustained development, with primary focus on water and air.**

Key Limitations. In pursuing this objective, the mission is limited by the critical role of water in causing Egypt to have some of the world's highest population densities. Already serious water shortages are being aggravated by growing agricultural, domestic, and industrial pollution.

In addition, the mission already lacks the resources necessary to staff to a major comprehensive environmental management project, and is probably will suffer staff reductions in the near future. The absence of an Egyptian agency with comprehensive environmental management responsibility that could serve as the mission's key environmental counterpart adds to the pressure on mission environmental staff requirements.

Still another constraint to mission activities is the strong interests and capabilities of many other donors. The mission must avoid duplicating or disrupting these donors' efforts.

Fundamental Constraints. In addition to the limitations the mission faces, Egypt has suffers from fundamental problems that cripple efforts to alleviate environmental degradation.

Most pollution problems in Egypt have resulted from inappropriate policies, ineffective institutions, and private sector impediments. More specifically, the country lacks a framework for analyzing the counterproductive implications of current price controls, subsidies, and weak environmental protection policies. The environmental management institutions suffer from lack of coordination of responsibilities and very weak capabilities in environmental monitoring, risk assessment, and environmental education, information, and communications. Finally, weak economic incentives and barriers to competition prevent the private sector from realizing its great potential to solve many environmental problems.

Program Focus. The team recommends that the mission's environmental program be focused in two phases.

The first phase should be to prioritize environmental problems based on regular assessments of the natural resource base. Currently, water pollution problems appear to present the greatest environmental risk, followed by air pollution problems.

The second phase should focus addressing these natural resource problems through interventions designed to take maximum advantage of the three areas in which the mission has significant program experience: water and wastewater treatment, irrigation, and energy.

Implementation Framework. The team recommends that the mission address water and air quality problems on a priority basis through interventions in current and future programs in water treatment, wastewater treatment, irrigation, and energy. These interventions should focus on encouraging the free flow of information, strengthening environmental management capability, facilitating policy reform, and promoting private sector initiatives. The

interventions should be designed to focus on key cross-cutting problems, support key performance indicators, focus on the early stages of environmental problems, and emphasize long-term sustainability of environmental actions.

Special Mission Environmental Management Initiatives. Fortunately, the mission already has a strong program positioned to address the root causes of water pollution through water and wastewater treatment and irrigation projects, and to address air pollution problems through energy projects. However, the cross-cutting approach recommended here cannot be implemented without special consideration to careful use of the mission's already strained management resources.

For this reason, the team recommends that the mission conduct an initial assessment of its current project portfolio to clarify which activities already support key environmental program performance indicators, and to prioritize environmental problems. Over the longer term, the mission should strengthen environmental program development by designing multi-year environmental plans, strengthening mission management capabilities, exploiting AID-funded support projects, and combining non-environmental and environmental projects to achieve environmental goals.

SECTION I
A RECOMMENDED STRATEGY STATEMENT

A. Strategic Overview

Egypt is entering a period in which environmental problems will demand an increasing share of the country's resources and constrain further economic development. The assimilative capacity of the Egyptian environment is being rapidly depleted, and nearly all phases of the country's environmental management system need adjustment.

We recommend that the mission assume a leadership role by demonstrating to Egyptian counterparts that proper management of environmental resources enhances economic development. As part of this leadership role, the mission's strategic objective should be to improve Egypt's environmental quality, consistent with sustained economic development. We have developed an action plan that the mission can use to accomplish this strategic objective within the joint constraints of limited mission staff resources and deficiencies in Egyptian counterpart organizations.

Environmental issues are inherently multi-media, cross-sectoral, and multi-institutional. To deal with the cross-cutting nature of environmental problems, the mission should: (1) within USAID, develop mechanisms that motivate pro-active attention to environmental issues at the program level, and (2) outside USAID, pursue a systematic multi-tiered approach that encourages needed policy adjustments at the top, and demonstrates the viability of individual program components at lower levels.

The mission should concentrate its environmental activities on water and air. These are the sources of Egypt's most pressing environmental problems, and ongoing project activities in water and wastewater, irrigation, and energy represent significant mission competitive advantages. Minor adjustments in projects emphases in these three areas can result in the achievement of initial environmental objectives. Within each area, project design should focus on four cross-cutting themes and adhere to a set of four programmatic ground rules. Our review suggests use of these guidelines will enable the mission to successfully alleviate the underlying causes of Egypt's environmental management difficulties.

We have identified three categories of possible management initiatives for mission consideration: (1) conducting an initial assessment to clarify what the mission already is doing in this area and establish a comparative ranking of Egyptian environmental problems, (2) undertaking near-term actions by adjusting ongoing activities and project design procedures, and (3) establishing a program development plan to guide mission environmental activities in the mid-1990s.

B. The Problem Setting

The PRIDE team has responded to the mission's terms of reference to develop and recommend an environmental strategy and vision statement for in-house mission consideration.

1. State of Environment in Egypt

Rapid population growth and rising individual expectations have placed increasing stress on Egypt's finite resource base. Lack of understanding and limited information on the processes at work have resulted in continued misallocation of resources and effort. Consequently, Egypt's educational, institutional, and regulatory framework is increasingly unable to deal with the emerging crisis.

2. Dynamics of Environmental Degradation

Lack of attention to environmental degradation is constraining economic development. Solid wastes litter the landscape and clog the waterways; clouds of industrial, vehicle, and dust pollution fill the air; pools of sewage and salt water pollute the land; vegetation and silting clog rivers, canals, lakes, and marine waters to the point of discoloration. These problems are resulting in adverse health effects such as high infant mortality, prevalent and recurring gastro-intestinal disorders, and occasional outbreaks of epidemics.

The river and lake system clearly shows the disastrous results of failure to protect a vital natural resource. Over the past 10 years the water quality of the Nile River's mainstem and branches have declined 50 percent, and certain short reaches below untreated municipal and industrial discharge points violate safe drinking water source standards. In Lake Manzala, wastes of Cairo expressed through agricultural drains reportedly have caused a 90 percent decline in the fish take, and lakeside residents' life expectancies are 33 percent below the national average. Lake Maryut's problems are even worse; it essentially is a wastewater oxidation pond.

This discharge of wastes to the waterways has reduced the amount of available agricultural drainage water, which in turn has caused declines in agricultural output. If this reduction continues, cultivated land area could decline by 10 to 12 percent by the end of the decade. Such a decline could reduce agricultural output by some $720 million or 2 percent of GDP (1989 prices), resulting in the loss of approximately 400,000 jobs in agriculture and supporting industries, and significantly increasing Egypt's trade deficit.

3. Effectiveness of Current Institutional and Regulatory Process

Overlapping, unenforceable laws have resulted in the promulgation of regulations that are uncoordinated among the various ministries or by an over-arching authority such as the Egyptian Environmental Affairs Agency (EEAA).

4. USAID Programs and Projected Impacts

The list of past and present USAID efforts to alleviate pollution is long. One particularly significant project is the Cairo wastewater collection and treatment program. This initiative will capture the six years of wastes from greater Cairo and make them suitable to either discharge to the Nile River or transport through agricultural drains without severely degrading those waters for downstream reuse. If operations at these treatment plants are sustained at high levels of efficiency, the expected rapid decrease of the available water resource will be reversed — in part because Cairo is located at the head of the Nile delta, where the potential for water reuse is greatest.

5. Need for Focused, Coordinated Strategy

The mission strategy must address its actions with respect to the Egyptian government and the public, and the ways its executes those actions.

Following for the mission's consideration is a statement of a proposed mission objective, resource limits that will affect strategy implementation, constraints existing and operating in Egypt, identification of the mission's program focus, and a framework for implementing the adopted strategy within and outside the mission.

A sectoral and thematic cross-cutting approach has been introduced to organize the strategy package in a manageable format and to introduce illustrative projects or actions that fit into the current mission portfolio. Our proposed program focus is structured under two major natural resource categories: water and air. Within these two resource categories, three areas of mission strength and commitment are wastewater and irrigation within the water resource category and energy within the air resources category. Other natural resources, including coastal and marine resources and land, will be dealt with in terms of their effects on water and air resource problems, unless they constitute such serious environmental problems that they merit separate interventions through other mission programs outside the water and air sectors.

One or more of four program themes are identified, as appropriate, with each illustrative sectoral project or program selected because it has components that can contribute to an USAID environmental strategy. The themes are free flow of information, environmental management capacity, policy reform, and private sector initiatives.

Within this strategy document, only a dozen mission projects are highlighted as projects which illustrate those the mission might use to introduce elements of an environmental strategy. Other projects are highlighted in Section II of this report.

C. Mission Environmental Strategy Objective

The mission has an overall goal of enhancing Egypt's role as a regional model of stability, democracy, free markets, and prosperity. This goal is reinforced by subgoals of increased private sector-led economic growth, increased human resource productivity, and

better quality of life. Environmental quality is crucial to continued sustained economic development.

Economic activity in the development process invariably generates by-products that pollute the environment and constrain future development. The mission recognizes the seriousness of Egypt's growing environmental problem, and intends to help the GOE improve environmental quality in ways that recognize mission limitations and facilitate the pursuit of sustained development.

The PRIDE team recommends that the mission adopt the following as the objective of its environmental strategy: **Improvement of Egypt's environmental quality, consistent with sustained development, with primary focus on air and water.**

D. Mission Limits

To accomplish this objective, the mission faces three significant limits to formulating and implementing supporting program and project activities. These limits are operational barriers beyond the mission's immediate control, and relate to Egypt's unique, limited natural resource base, shrinking mission management resources, and other donor initiatives.

1. Limited Natural Resource Base

Egypt depends on the Nile River for virtually all of its fresh water. In addition, the population, while growing at high, unsustainable rates, is crowded on less than 4 percent of the country's land. These resource limitations drive programs and problem solutions, and must influence the mission's strategic planning approach to environmental protection.

2. Limited Mission Management Resources

The mission faces the problem of managing one of USAID's largest programs with a reduced staff — and the current reorganization of USAID's worldwide program signals possible further reductions of current mission strength. Under these circumstances, future program design must provide for more effective and possibly a different management structure, with a smaller staff.

3. Other Donor Initiatives

Other donors, particularly the European Community (EC), have made significant commitments to strengthening Egypt's environmental management program. The mission should ensure that its programs complement rather than duplicate those of the EC and other donors.

E. Key Constraints

Because the environment affects all sectors of the Egyptian economy, implementing effective environmental programs requires a holistic policy analysis capability, institutional coordination, and the ability to provide adequate market signals and incentives to address the root causes of environmental damage. However, three areas of constraint must be considered when environmental protection activities are undertaken. These areas are inappropriate policies, ineffective institutions, and private sector impediments.

1. Inappropriate Policies

Much of the damage to Egypt's environment is caused by serious shortcomings in the policy formulation process.

a. Policy Analysis Framework

Egypt's environmental policy process lacks a comprehensive analytical framework that permits widespread access to relevant information and the subsequent participation by all interested parties needed to evaluate economic tradeoffs inherent in deciding among environmental policy options. This has led to inappropriate pricing of environmental resources, conflicting policy signals across economic sectors, and a lack of coordination among environmental management institutions.

b. Legislation and Regulation

Current legislation is inadequate, unrealistic, and unenforceable. Because it lacks adequate financial support and sufficient institutional capacity for effective monitoring and enforcement, even those who are committed to environmental quality ignore it.

c. Policy-making Process

To formulate effective environmental policies, the decision-making process must resolve conflicts among competing policy interest groups. However, Egypt's fragmented, highly political and crisis-oriented decision-making process misses opportunities for early low-cost environmental solutions, and severely limits or excludes needed participation in the process by interested non-governmental groups and individuals.

d. Organizational Structure

Egypt's government lacks a central focal point for environmental activities; instead, environmental responsibilities are scattered among various ministries and economic management institutions. Consequently, approaches to environmental policy are fragmented and redundant.

e. Local Empowerment

Opportunities for widespread participation in the environmental decision-making process are severely limited. Government agencies routinely fail to disseminate environmental management information, and thus also fail to foster better public understanding of environmental issues; in fact, the agencies actually suppress scientifically documented evidence of environmental damage. Individuals, NGOs, local government units, and private sector businesses with concerns about environmental problems generally do not have an opportunity to influence the GOEs environmental policy process. Without access to the kinds of environmental policy information available to the public in developed countries, Egyptian groups are disenfranchised from the environmental policy process.

2. Ineffective Institutions

Lack of public empowerment and access to environmental policy information have preordained much of Egypt's weak environmental institutional foundations. To make matters worse, existing environmental management institutions generally lack effective environmental monitoring and assessment programs, and are not capable of disseminating relevant information to either the public or decision-makers.

a. Environmental Monitoring

Egypt lacks a systematic and uniform system for monitoring major environmental problems in all areas, particularly air pollution. Time series data collected from an established monitoring network are crucial to identifying critical environmental problems and monitoring their abatement.

b. Analytical Methodology

Egypt's environmental management institutions lack a comprehensive methodological approach (e.g., risk assessment) to identifying and prioritizing points at which to take effective preventive and remedial actions. Instead, institutions wait until crises occur — and the actions needed to resolve such crises often are more expensive than proactive solutions would have been.

c. Environmental Information, Education and Communication

All levels of Egyptian society, including decision-makers, interest groups, and the general public, generally lack awareness of environmental issues and tradeoffs.

3. Private Sector Impediments

The private sector can be one of Egypt's most important sources of innovation in environmental protection; however, there currently is little demand for its services.

a. Lack of Economic Incentives

Historically, subsidies, over-regulation, and market domination by parastatal monopolies have prevented the development of the economic incentives that would encourage individuals, firms, and private sector environmental service firms to develop innovative solutions to environmental problems. In the past, excessive use of subsidized fertilizers and pesticides have caused agricultural pollution; current subsidized petroleum and energy prices discourage conservation measures that could significantly reduce air pollution problems.

b. Barriers to Competition

Massive economic restrictions in effect since the Nasser government have stifled the economic competition necessary to stimulate private sector creativity and subsequent low-cost solutions to environmental problems. Parastatals continue to operate as monopolies in many markets by holding large market shares and limiting private access to international markets.

c. Trade Barriers

Access to needed chemicals and spare parts for environmental programs is limited, and new products and processes cannot enter the market. Recent relaxation of restrictive procedures for letters of credit and removal of many items from the banned importation list have greatly improved private sector access to attractive international goods, services, and technologies.

F. Recommended Program Focus

The PRIDE team recommends that the mission address environmental problems through a program that focuses on the natural resources which cause environmental damage and the mission's program strengths in the respective natural resource areas.

1. Natural Resource Orientation

Because natural resource media inflict environmental damage, the mission should design environmental interventions based on a priority ranking of environmental problems and the level of damage inflicted by each resource. This approach allows the mission to design interventions that not only address the technical nature of the environmental problem, but also develop solutions that complement or evolve from existing programs and projects focused on the respective natural resource sector.

a. Priority Ranking of Environmental Problems

Available evidence indicates that environmental damage is most serious in the water sector, and less serious, in descending order, in the air, coastal and marine, and land sectors.

Water. Agricultural chemicals, industrial waste, raw sewage, and silt from runoff have seriously damaged water intended for farm irrigation, household drinking water, and manufacturing. Because Egypt faces a growing water shortage, water-borne pollution not only damages the water, but also reduces the water supply.

Air. Egypt suffers from widespread airborne particulate and lead pollution, particularly in congested urban areas. Heavy dust and chemical pollution abound in industrial parks. Although no definitive environmental risk assessment has been undertaken, available evidence indicates that air pollution is causing less total environmental damage than water pollution.

Coastal and Marine Resources. Petroleum waste from oil tankers is damaging coral reefs and coastal waters on the Red Sea. Fisheries in the Mediterranean and Red Seas are being damaged by untreated sewage from the coastal development sites, the Nile River, Alexandria, as well as drainage canals and drainage water contaminated with agricultural chemicals. These pollutants are also damaging coastal bird and waterfowl habitats. Above all, the combined effects of all forms of coastal and marine pollution pose a growing threat to tourism. Although most of Egypt's significant tourist-based foreign exchange earnings are from visits to cultural antiquities, growing numbers of tourists are attracted to the country's unspoiled coastal and marine resources.

Land. Land-based solid waste and hazardous waste is a serious environmental problem, but the magnitude of the damage cannot be quantified at this time. Urban solid waste is a major source of pest-related illnesses, and industrial dumping of solid and hazardous waste is a growing problem. The use of sewage treatment sludge in land reclamation projects poses serious environmental hazards because the sludge contains concentrated toxic chemicals.

b. Biodiversity

The scientific basis for protecting biodiversity is well established. However, biodiversity protection is an issue that usually deals with a wide variety of species, and in turn, cuts across water, coastal and marine, and land resources, and the governmental agencies responsible for managing those resources. These complexities, limited mission management resources, and the strong interest and assistance being provided by other donors, make major mission assistance on biodiversity untenable.

Instead, we recommend that the mission develop biodiversity initiatives as opportunities arise during the implementation of environmental interventions in priority natural resource sectors. The extent of biodiversity initiatives must focus on critical needs without straining mission resources or disrupting existing biodiversity programs, particularly those of other donors.

2. Mission Competitive Advantage

The mission has significant program experience and ongoing projects in three areas that together form a strong foundation for addressing the root causes of Egypt's environmental problems.

a. Water and Wastewater Treatment

The mission's extensive water and wastewater treatment program serves as a strong foundation for addressing sewage pollution, drinking water quality, water-borne disease problems, and marine pollution problems.

b. Irrigation

The mission's long irrigation assistance program provides a strategic opportunity for implementing a comprehensive water quality monitoring program, reducing agricultural chemical pollution, and rationalizing the allocation of scarce water resources.

c. Energy

Certain elements of the mission's broad energy development and conservation program provide a strategic platform for addressing air pollution problems through improved energy efficiency and price reform initiatives.

G. Implementation Framework

Egypt has just begun to translate its awareness of environmental consciousness into responsible caretaking. However, more progress in many areas is needed before an effective environmental protection program can be established. Based on assessment of the current Egyptian environmental management structure and areas in which the mission possesses competitive advantage, we recommend that mission efforts focus on four cross-cutting thematic areas and adhere to a set of four programmatic ground rules. By reorienting ongoing mission projects and designing future projects according to these themes and ground rules, the mission can effectively address Egypt's critical but solvable environmental management problems. The recommended ground rules and themes are discussed in the following paragraphs. Illustrative interventions are presented in Annex A.

1. Programmatic Ground Rules

a. Focus on Key Cross-cutting Problems

Environmental issues are inherently multi-media, cross-sectoral, and multi-institutional. They also are an inevitable (although frequently unacknowledged) aspect of any effort affecting the physical world. These characteristics pose a significant management challenge.

Traditional structuring of program responsibilities delineates organizational boundaries in terms of a single medium (air, water, or land) or a single sector (energy, agriculture, industry, etc). Such structures often result in fragmented projects or lack of coordination among institutions addressing different aspects of the same problem. These management difficulties occur inside and outside USAID.

Within USAID, environmental management responsibility tends to be dispersed among program offices where such cross-cutting issues typically receive tertiary priority, at best. This is reflected in the absence of environmental performance measurements in employee performance appraisals.

Outside USAID, Egypt's bureaucratic barriers to inter-institutional coordination pose a major impediment to essential collaborative actions.

The mission should deal with the cross-cutting nature of environmental problems by: (1) developing mechanisms within USAID to motivate pro-active attention to environmental issues at the program level, and (2) outside USAID, pursuing a systematic multi-tiered approach that encourages needed policy adjustments at the upper levels of the Egyptian government, and demonstrates the viability of individual program components at the lower levels.

Because USAID's prioritization structure emphasizes adjustment of management resources, consideration should focus on adaptations that establish a coherent vision of USAID environmental objectives and transmit this vision in a programmatically understandable way. Without such a framework, meaningful progress will prove elusive. Management initiatives are discussed further in Section G below.

A multi-layered approach to motivating needed change in Egypt's environmental management process is necessitated by the near-vacuum of GOE organizational strength at all levels of environmental management. The need for policy reform at upper GOE levels is sufficiently great that this is recommended as one of four thematic areas for mission environmental emphasis. However, top-down initiatives aimed at policy reform will achieve only slow and uneven progress.

Therefore, we also recommend that the mission undertake initiatives to stabilize the environmental system from the bottom up. The bottom-up approach has several benefits: (1) these objectives can be achieved largely through minor reorientations in the mission's existing portfolio of project activities, (2) such projects can demonstrate approaches that can be emulated in other GOE program areas, (3) a foundation for reforming the policy process can be established, and (4) the mission can achieve discernible goals in the environmental area.

b. Tie Interventions to Key Performance Indicators

As noted earlier, if USAID initiatives are to have a lasting effect on Egyptian environmental management, GOE organizational and implementation procedures

must be reformed. In undertaking efforts within the four programmatic themes, the mission should identify a set of key environmental program performance indicators. These indicators should serve as a mechanism for assessing the extent to which individual projects and the overall portfolio motivate needed reforms in GOE environmental activities. For example, performance indicators in the free flow of information area should assess progress in: (1) unrestricted dissemination of scientific data that accurately characterize environmental problems; (2) establishment of institutions that ensure continued assembly of needed environmental data and critical analysis of significant environmental issues; and (3) objective public presentation of information clearly depicting the nature of Egypt's environmental challenges.

c. Focus on Early Stages of Environmental Problems

Environmental problems result from a six-event sequence. The events are, in order: (1) activity performance; (2) pollutant generation; (3) control/release of pollutants generated; (4) pollutant transport; (5) receptor exposure; and (6) environmental problem or effect. At each step along the sequence, the pollutants disperse over a wider area, and efforts to redress the problem must reach further. Consequently, maximum cost-effectiveness almost always results from intervening at the earlier steps in the sequence.

During project design, the mission should account for this sequence, and whenever possible target the earlier steps of the sequence. Interventions at the first causal step seek to modify behavior through measures such as increased mass transit, decreased fertility. Second-step interventions focus on eliminating pollutants at their point of generation by adjusting procedures and modifying processes.

d. Emphasize Long-term Sustainability of Environmental Action

Sustainability is of central importance in Egypt not only because of the country's limited resource base and vulnerable reliance on water, but also because past efforts have not provided adequately for operation and maintenance needs. For these reasons, each project should be structured to ensure achievement of lasting change, and priority should be given to projects that improve the long-term sustainability of the Egyptian environment.

2. Program Themes

To transcend the fundamental barriers to effective environmental management in Egypt, the mission should concentrate its efforts within the four thematic areas discussed in this report. Progress in these four areas will be important indicators of lasting progress in sustaining a healthy and productive Egyptian environment. The four themes are designed to implement aspects of the multi-layered approach discussed in Section F.1.a.

The first three themes are directed at the public sector. The first two — supporting free flow of information and strengthening environmental management capability — are central components of a bottom-up effort. The third theme, motivating policy reform, is the

principal top-down objective. The fourth theme, supporting private sector initiatives, is a parallel bottom-up effort aimed at hastening development of the private sector, which in the long run will be the primary engine driving progress in environmental management.

a. Free Flow of Information

Data collected to characterize the Egyptian environment are distributed only within the governing institution, and are actively suppressed whenever that data might embarrass the GOE. Absence of notable progress over the past decade indicates that the situation will not be easily rectified. Nevertheless, change is essential in this area.

Whenever environmental data are manipulated, restricted, and not subject to critical scrutiny, neither a meaningful overall assessment of the environmental situation nor a precise identification of priority areas is possible. Moreover, bad data obscures good data, and scientific progress is not possible.

The mission should try to improve the free flow of information by undertaking the following three initiatives.

Facilitate Dissemination of Environmental Data. Include a pro-active data and report distribution component in all USAID projects. Fulfillment of this requirement will ensure wide dissemination of information inside and outside Egypt. In situations of extreme GOE sensitivity, overall conclusions could be muted, as long as the basic data are publicized so that other investigators can form their own conclusions.

Strengthen Environmental Data and Information Systems. Support efforts to establish permanent repositories of environmental data so that data emerging under new initiatives are assembled in a form that facilitates critical analysis and review. Support initiatives to develop information systems that provide access to the environmental databases for all scientific investigators. Such databases will lead to an improved data quality and a better grasp of environmental imperatives.

Support Increased Environmental Education. Ultimately, the impetus for continued environmental initiatives in the face of economic tradeoffs must come from the Egyptian public. The agendas of both GOE and the emerging private sector will place environmental considerations in a subsidiary role, no matter how public-spirited these organizations attempt to be. This has been the experience in all countries, including the United States.

For this reason, the Egyptian citizenry must be educated about the vulnerable nature of the Egyptian environment, the components of a sustainable environmental ethic, and the kinds of tradeoffs that are necessary. The mission should support this educational process by: (1) publicizing beneficial environmental results of selected USAID projects; (2) supporting environmental education efforts within university and informal training contexts; and (3) supporting the efforts of NGOs and PVOs to develop well-formulated environmental education materials.

b. Environmental Management Capability

The Egyptian environmental management process suffers from many problems. The mission should concentrate its initial efforts to improve environmental management capabilities on strengthening GOE and private sector risk assessment capabilities, and to develop a strategic plan for achieving specific objectives.

Strengthen Risk Assessment Capability. Risk assessment is the most effective approach to establishing priorities in the environmental area. Risk assessment is an important first step even in situations, such as in Egypt, where available data characterizing the environmental situation are scanty and unreliable. In such situations, the primary benefit of the risk assessment is to systematically organize available data within an appropriate framework and use that data to prioritize problems.

In most cases, prior assessments of the situation based on scientific judgement will have properly identified the most critical problems, e.g., water in Egypt. The initial risk assessment will confirm that emphases are properly placed, identify priorities being given too much or too little attention, and provide a framework for systematic subsequent evaluations as the database improves.

The GOE has never undertaken a comprehensive risk assessment, and is not the data necessary to use risk assessment to set priorities. Consequently, priorities are set on the basis of political influence, a few issues which the public believes are important, and environmental emergencies as they occur.

The mission should use available data to conduct an in-house risk assessment to clarify its understanding of appropriate priorities and to guide discussions with the GOE, and support establishment of a risk assessment framework in specific GOE arenas, starting with assessments focused on water and air. Establishment of meaningful priorities in those areas can be used to motivate risk assessments in other areas.

Strengthen the Strategic Planning Capability. The mission should base its strategic planning on risk assessments of the type such as those in the previous section. Those organizations performing sound risk assessments should be assisted in their strategic planning processes. Where possible, subsequent USAID assistance should provide positive reinforcement to organizations utilizing such planning. Resources should be allocated to those project areas which risk assessment has indicated should be high priority.

c. Policy Reform

In addition to focusing on cross-cutting problems and themes, the mission also should concentrate policy reform efforts on strengthening Egyptian environmental decision-making processes, and developing realistic, enforceable environmental laws and regulations.

The United States is an acknowledged world leader and innovator in both of these areas. Thus, transferring insights gained during U.S. development of these management methods could enable Egypt to avoid making mistakes. However, Egyptian receptivity to such methodology transfers is limited.

Strengthen Decision-making Process. The current environmental problems facing the GOE pose a major opportunity for using policy analysis tools. Generally, the GOE does not use conventional policy analysis tools in formulating economic policy. However, the country's environmental problems are so serious that the current decision- making process cannot identify and implement effective solutions.

As in the case of the economic policy process, Egypt's environmental policy-makers have insufficient knowledge of how to use risk assessments to determine varying levels of environmental damage and associated costs of pollution abatement and control. Environmental policy choices do not highlight tradeoffs and opportunity costs of alternative decisions.

USAID can help the GOE strengthen its environmental policy analysis capability by implementing prototype policy studies within its current water and wastewater treatment, irrigation, and energy portfolios. The studies should be sectoral, and identify broad implications of current problems and the economic impacts of proposed environmental options. In addition, the studies should be consistent with the mission's long-range policy dialogue objectives.

Egypt's environmental decision-makers are also largely unaware that significant environmental damage results from inappropriate pricing policies. The country's past fertilizer and pesticide subsidies prompted farmers to use excessive amounts of these toxic inputs, which damaged surface water and groundwater supplies. The recent reduction and eventual discontinuation of these subsidies has already led to reduced fertilizer and pesticide usage, and a simultaneous decrease in water pollution from these chemicals.

To the extent possible, USAID should pursue price reform objectives through the environmental context of its projects. The price reform measures include lifting price controls, removing subsidies, and recovering irrigation and wastewater treatment costs.

Strengthen Legislative and Regulatory Framework. Egypt has enacted numerous environmental laws and regulations to support a national interest in environmental protection. However, most of these laws have impractical compliance procedures and pollution standards, and unclear delineations of administrative authority over environmental monitoring and enforcement. The procedural difficulties of current laws and regulations reflect Egypt's late entry into environmental protection, and its corresponding lack of experience in developing effective instruments and processes for adversary groups to arrive at least-cost negotiated settlements.

USAID should help the GOE strengthen its environmental legislative and regulatory process by designing projects which analyze sector-specific legislative and regulatory

problems within the context of Egypt's legislative, regulatory, and political experience. These analyses would focus on the processes which help protect the environment, including extended negotiation among involved parties; the roles of lobbying groups in influencing compliance standards and procedures; and collaboration between regulators and those being regulated to achieve workable solutions. The analyses can be particularly useful in identifying legislative and regulatory initiatives that did not succeed in the United States, and indicating the potential pitfalls of adopting similar initiatives in Egypt.

d. Private Sector Initiatives

There currently are very few incentives for pollution control in public sector, where the GOE owns many of the country's worst polluting firms. However, there are major opportunities for private sector solutions to point pollution problems through pollution prevention programs and the development of a strong, competitive private sector environmental service industry.

Promote Private Sector Pollution Prevention Approaches. USAID can effect quick payoffs in pollution reduction by promoting pollution prevention programs in firms with serious pollution problems. This effort should have a two-pronged emphasis: 1) utilize pollution prevention programs, such as the World Environmental Center's PRIDE cooperative agreement, to give plant managers quick hands-on advice; and 2) strengthen the capability of private sector environmental service firms to provide pollution prevention services to firms with pollution problems.

Pollution prevention programs are attractive environmental interventions because pollution reductions of 30 percent are commonly achieved, and plant operating and energy efficiency increase significantly. By eliminating or reducing pollution at or near the production site, these programs are also consistent with the principles of pollution control early in a six-step pollution sequence and reduce environmental damage at a relatively low cost. The USAID ECAP project exemplifies how a project can easily incorporate pollution prevention into a major energy conservation and efficiency program.

This initiative can focus on the private sector as it emerges from privatization reforms, and provide quick assistance to large polluting former parastatals. Over time, the pollution prevention program can help bring new pollution control technology on-stream.

Strengthen Private Sector Environmental Service Industry. Egypt has a substantial foundation of engineering talent. However, many of these engineers work for parastatals that operate in a monopolistic business environment. USAID can strengthen the role of the private sector in environmental services by continuing to pursue a strong privatization program. As the engineering parastatals are privatized, their engineers will have more opportunities to redirect their talents to environmental monitoring and pollution control engineering services. In addition, privatization will improve environmental quality by transferring control of many of the worst polluting firms to the private sector, where economic incentives will be more effective in reducing waste-borne pollution. Moreover, the

GOE will be free of the regulatory conflicts of interest which have hampered enforcement of basic environmental quality standards.

USAID also can use current and future projects to encourage the GOE to contract environmental testing and engineering support services to private firms. The GOE currently supports many environmental laboratories that are under-equipped and undermanned. In addition, Egypt's private medical testing sector already possesses considerable environmental testing expertise. Medical and engineering technicians already trained in basic scientific procedures can be retrained for environmental testing and service occupations without major reallocations of existing educational resources. Finally, USAID should use its water and energy initiatives to discourage further expansion of GOE environmental services.

By encouraging the development of private sector environmental service capability, USAID also would stimulate demand for international trade in cost-effective and innovative environmental equipment, services, and technology. Use of commodity import programs would accelerate introduction of U.S. environmental control technology and strengthen business opportunities for U.S. and Egyptian environmental service firms.

However, efforts to develop private sector environmental service firms should be undertaken with caution. USAID should initially focus on identifying market niches, such as environmental monitoring and solid waste management along canals, to highlight services needed by the government, but currently not widely available in either the public or private sectors.

3. Illustrative Interventions

Annex A provides examples that illustrate possible interventions in areas where the mission now has projects or has a significant competitive advantage. The interventions are grouped within the four suggested thematic areas. Potential linkages to current USAID projects are identified, and representative performance indicators are listed. These interventions provide a range of opportunities from which the mission may wish to select, and offer illustrative guidance for the design of future projects.

H. Special Mission Environmental Management Initiatives

The mission should undertake several management initiatives in the environmental area. The need for such initiatives was discussed briefly in Section F.1.a. The suggested initiatives fall within three categories: (1) conducting an initial assessment to clarify what the mission already does in this area and prioritize Egyptian environmental problems; (2) undertaking near-term actions through adjustments of ongoing activities and project design procedures; and (3) establishing a program development plan to guide mission environmental activities through the mid-1990's.

1. Initial Assessment

The mission should undertake two planning actions in order to establish a sound basis for subsequent program activities.

a. Conduct Environmental Audit of Ongoing USAID Projects

As a first step in planning future activities, a clear picture of the environmental implications of current or finished projects is needed. The mission should conduct a systematic audit of all projects that affect the environment in any way. Many projects will be found to be generating a net environmental benefit; however, some projects may be found to be worsening a current problem, or helping to create a new one.

It is important that the mission be aware of the environmental implications of both types of projects. The outputs of this effort will clearly expose mission environmental activities for program review and planning purposes, and quantify environmental benefits already being achieved through USAID projects.

b. Use Risk Assessment to Target USAID Initiatives

Egypt's paucity of reliable environmental data deters a comprehensive assessment of the current environmental situation. Nevertheless, the mission should conduct a preliminary risk assessment to identify those areas on which USAID environmental efforts should concentrate. As discussed in Section F.2.b., even where data are limited, a preliminary risk assessment systematically organizes available data within a well-structured framework on which to base the most reasonable prioritization of problems possible with that data. The resulting prioritization provides a base from which to check ongoing projects and to design future projects. Additional discussion of risk assessment appears in Section F.2.b.

2. Near-Term Actions

Even within present staff constraints, the mission can achieve several worthwhile environmental objectives by modestly reprogramming current resources. We recommend the following three near-term actions:

a. Use Current Project Portfolio as Foundation for Initiatives

To progress as rapidly as possible, the mission should direct its initial efforts in the project area toward adding environmental components to ongoing activities. To achieve maximum impact, the program themes identified in this report should be used to select projects. Illustrations of representative project opportunities in areas such as energy development, water and wastewater, irrigation, and other areas are described in Annex A.

b. Strengthen Environmental Review Component of New Projects

We recommend that the mission place greater emphasis on environmental considerations when selecting new projects. It should not be enough for projects to be environmentally harmless; projects that provide positive environmental benefits should be given preference over otherwise identical initiatives. In addition, environmental considerations should be taken into consideration at each stage of the project design process.

c. Expand Outreach Activities

To be effective in the environmental area, the mission should expand its efforts to reach key Egyptian environmental actors (governmental and non-governmental) and other foreign participants and donors. Relationships with this relatively small community provide an insightful basis on which to formulate USAID policies in the environmental area. In addition, the mission should build into the Conditions Precedent for each project the intention to publicize the environmental data generated from that project.

3. Program Development

The preceding two types of initiatives represent start-up efforts to provide greater cohesion in the mission's environmental activities. However, over the longer term, the mission should establish an overall framework to guide the design and evaluation of environmental activities and to provide staff with a coherent vision of mission objectives in this area. The need for such programmatic framework was discussed in Section F.1.a. The mission should undertake the following four program development initiatives:

a. Establish Multi-Year Plan for Environmental Activities

When left untended, environmental problems reach a point at which rapid deterioration occurs. Egypt is approaching such a point in several areas. For this reason, the mission should establish a multi-year plan to govern environmental activities in the mid-1990s; to guide implementation, the plan should provide for annual action plans.

b. Strengthen Mission Environmental Management Capabilities

We recommend that the mission designate staff personnel whose full-time responsibilities are to address environmental issues. Such staff are essential to ensure that important cross-cutting issues are properly addressed and that all mission environmental actions receive needed management attention. Moreover, the issues are sufficiently complex that full-time attention is needed.

c. Emphasize Use of USAID Centrally Funded Support Projects

To circumvent current constraints on USAID management activities, the mission should utilize centrally funded resources for initial environmental planning and project activities.

d. Use a Two-pronged Approach to Project Formulation

To formulate projects, the mission should pursue a two-pronged approach of leveraging non-environmental projects with environmental components, and initiating over a period of years several projects that specifically target cross-cutting environmental issues.

ANNEX A
Illustrative Environmental Interventions

A. Program Theme: Free Flow of Information

Program Sub-Theme: Facilitate dissemination of environmental information and data.

Activity: Local publication and exposure of Water Research Center results to ministries, clients and citizens.

Rationale: Data dissemination is currently very limited. This project can demonstrate how to establish a regular and public dissemination system.

Performance Indicator: Number of papers, reports, etc. released to wide audiences; proportion of annual research portfolio released.

Project Linkages: 0132.07 (Water Research Center)

Activity: Add public awareness, education, and institution-building component to selected environmental projects to explain project benefits and gain multiplier effects of project benefits.

Rationale: Present or future projects in urban and rural wastewater treatment, air pollution, solid waste, energy management or alternative energy sources, etc. may derive additional benefits by publicizing environmental value or specific measures needed. In some cases, involving organizational stakeholders can increase chances of adoption and maintenance behaviors.

Performance Indicator: Increased knowledge of innovation, how and when to use, why it is important to protect, etc. Longer-term sustainability because of stakeholder involvement.

Project Linkage: 0132.02 (Renewable Energy) 0152.02 (Technology Transfer) or new project areas. systems.

Program Sub-Theme: Strengthen environmental data and information systems.

Activity: Continue and strengthen data collection, analysis and public dissemination project components to improve sectoral and cross-sectoral environmental decision-making capacity.

Rationale: Mission projects currently place heavy emphasis here, but further strengthening and specific environmental applications could be added at minimum cost and effort. Payoff in terms of linked databases and information availability would be substantial.

Performance Indicator: Databases created that are accessible to public; use of public databases in decision-making and media coverage.

Project Linkages: 0132.04 (Main Systems); 0140.01 (S&T Cooperation); 0176 (W/W Sector Inst. Support); 0140.02 (Schistosomiasis); 0215.04 (Power Sector); 0102 (Cooperative Health); 0144 (Pop. FP); 0123.02 (Renewable Energy).

Program Sub-Theme: Support Increased Environmental Education

Activity: Enhance University Linkages project with specific environmentally-related university programs which support emerging project education priorities.

Rationale: Mission currently has opportunity to support and strengthen emerging environmental programs at major universities to provide needed research and teaching expertise.

Performance Indicator: Establishment of Linkage program; specific exchanges, research, and program development.

Project Linkages: 0211 (University Linkages II)

B. Environmental Management Capacity

Program Sub-Theme: Strengthen capability for strategic planning

Activity: Using current water quality model project as a prototype, the mission might work toward developing similar capabilities for air quality. Could eventually lead establishing National Center for Air Quality Management.

Rationale: Air quality monitoring and regulation is currently done only sporadically and for a limited number of pollutants. Long- term data and analysis capabilities are urgently needed.

Performance Indicator: Strengthening of air quality monitoring data and capabilities, and their use in strategic planning.

Project Linkage: 0132.07 (Water Research Center) for model; 0102 (Technical Cooperation and Feasibility).

C. Policy Reform

Program Sub-Theme: Strengthen Environmental Legislative/Regulatory Process

Activity: Support deregulation activities in areas such as agriculture (subsidies, prices, and land area) and energy through policy dialogue.

Rationale: Artificial subsidies/prices have distorted energy use and agricultural sector chemical and water use. Deregulation would result in more selective use of energy, chemicals, and water. Sectoral and cross-sectoral (inter-ministry) environmental benefits from deregulation

need to be considered.

Performance Indicator: Subsidy reductions, removal of crop quotas, removal of market price controls, energy conservation.

Project Linkage: 0202 G (Ag. production credit policy); 0215G (Power Sector Support)

D. Program Theme: Private Sector Initiatives

Program Sub-Theme: Promote private sector employment of pollution prevention approaches.

Activity: Add environmental audits to current energy efficiency audit processes.

Rationale: For minimal costs, significant pollution prevention and control recommendations for private sector firms can integrated into current energy audit process.

Performance Indicator: Number of pollution prevention audits, feasibility studies done, pollution prevention actions taken.

Project Linkage: 0140.03 (Energy Conservation and Efficiency).

Activity: Development of pollution prevention and control regulations for coastal Mediterranean and Red Sea tourism developments.

Rationale: Projected coastal tourism growth, if not coupled with strict pollution guidelines, will likely result in substantial damage to coral and other marine life. Currently, preventive actions can be developed at manageable cost to protect these resources.

Performance Indicator: Research output concerning alternative designs for waste disposal; integration of design outputs into legislation and regulations for coastal areas.

Project Linkage: 040.01 (S&T Cooperation for Research).

Program Sub-Theme: Strengthen private sector environmental service industry.

Activity: Technical assistance to help set up private sector water and wastewater companies.

Rationale: There currently is great interest in private sector opportunities for water and wastewater treatment to encourage both efficient cost recovery, sustainability and the freeing up of private funds.

Performance Indicator: Feasibility studies performed, privatizations completed, number of trainees.

Project Linkage: 0176G (Water/Wastewater Institutional Support).

SECTION II
BACKGROUND ANALYSIS

This section presents the basic information and analyses that are the foundation for the PRIDE team's recommendations on USAID/Egypt's environmental strategy. Included are summaries on Egypt's economy, natural resource base, and cultural heritage. The analysis assesses the status of environmental management to determine the framework the GOE now uses, and the nature and magnitude of Egypt's environmental quality problem. Also assessed is the mission's competitive advantage in environmental projects and programs to identify the broad problem areas that constitute important opportunities for future mission program and project activities.

A. A Geographic Overview

Egypt's geographic situation relates directly to the environmental quality that will play such a crucial role in the country's future prosperity. Despite scant evidence of precise environmental risks, there is widespread agreement that Egypt is suffering serious environmental damage.

This damage presents a two-fold problem. First, the damage is a direct loss to society that is not identified in the national income accounting system. Second, these losses, if allowed to grow, will halt future economic growth.

The following sub-sections summarize Egypt's economy and demonstrate the linkage of economic policy with the level of environmental quality. Also summarized is the resource base, with particular emphasis placed on the role of water in the economy. Finally, the cultural heritage is reviewed with respect to the environment.

1. The Macroeconomic Setting

Egypt's economy has a long history of inflation, sluggish growth, high unemployment and underemployment, an over-staffed government bureaucracy, and large balance of payments deficits.

a. Historical Background

Modern Egypt's economic history divides into three phases. During 1930-1952, the country embarked upon an aggressive industrialization program. For almost a century prior to this period, a free trade policy had strengthened the cotton, trade, finance, and infrastructural sectors, although relatively little industrialization had occurred. For this reason, the GOE emphasized industrialization to diversify the economy and capture some of the benefits of the strong industrial growth in developed countries. During the industrial phase, the primary policy instruments were import controls and tariffs.

In 1952, Lieutenant Colonel Gamal Abdul Nasser overthrew the constitutional monarchy and began a four-year consolidation of political power. During 1952-1956, economic policies basically did not change from those of the industrialization phase. However, after the Suez crisis in 1956, the Nasser government began a program of massive public investments, public ownership of industry, public monopoly on foreign trade, administered prices, and a rigid program of wage and employment guidelines and controls. A strong pro-industry policy set the stage for massive economic distortions that are still being felt today.

After Nasser consolidated political power and established an interventionist economic policy, he instituted a planning phase that continued from 1960 through his death in 1970, and ended with the October 1973 war with Israel. During this period, prices over much of the economy were administered by the GOE. Consumption was allowed to grow at moderate rates, and long-range investment programs were emphasized.

Following the 1973 war, President Anwar al-Sadat quickly moved to implement an economic program known as the liberalization phase that has been continued by President Hosni Mubarak. During this phase, the GOE has emphasized price decontrol, reduction and elimination of subsidies, and strong ties with the West. More recently, the GOE has begun a large privatization program.

b. Basic Indicators

According to World Bank estimates, Egypt's 1989 population was 51 million. By the end of the first quarter of 1992 the population will be an estimated 54.5 million, assuming a compound annual growth rate of 2.7 percent since 1989. The 1989 life expectancy at birth was estimated at 60 years.

Between 1965 and 1989, the crude birth rate (per 1,000 population) fell from 43 to 32, while the crude death rate fell from 19 to 10. The population grew at an annual rate of 2.1 percent between 1965 and 1980, and 2.7 percent between 1980 and 1989; the rate is expected to fall to 1.8 percent between 1989 and 2000.

The expected slowing of population growth is based partially on steady improvements in health and nutrition. Between 1965 and 1984, the population per physician fell from 2,300 to 770. Between 1965 and 1988, daily calorie supply per capita increased from 2,336 to 3,213. These changes, along with stable income growth, have contributed to a steady decline in fertility that should exert downward pressure on the overall population growth rate during the next decade. The total fertility rate (number of births per female during her childbearing years) fell from 6.8 in 1965 to 5.9 in 1989, and is forecast to fall to 3.1 by the year 2000.

In 1989, gross national product (GNP) per capita was US$640. Between 1965 and 1989, the share of gross domestic product (GDP) claimed by private consumption rose from 67 percent to 80 percent, while the government share fell from 19 percent to 13 percent, and

gross domestic savings fell from 14 percent to 7 percent. Inflation grew at an annual rate of 6.4 percent between 1965 and 1980, and 11 percent between 1980 and 1989.

c. Aggregate Structure and Performance

Between 1965 and 1989, the economy underwent sharp structural changes. Gross domestic product (GDP) increased seven-fold, from $4.5 billion to $31.6 billion. The agricultural sector's share of GDP fell from 29 percent to 19 percent, while the industrial and service sector shares increased from 27 to 30 percent, and 44 to 51 percent, respectively.

Between 1970 and 1989, Egypt's agricultural GDP increased three-fold, from $1.9 billion to $5.8 billion, but overall food security deteriorated. During 1974-1989, cereal imports increased from 3.9 million metric tons (MMT) to 8.5 MMT, with no offsetting gain in exports. As a result of the growing domestic grain shortage, food aid in cereals increased from 610,000 MT in 1974 to 1.4 MMT in 1989.

d. Government Revenues and Expenditures

The GOE's fiscal situation continues to deteriorate. Government offices are overstaffed but lack the money to effectively implement mandated programs. During 1987-1990, the budget deficit rose from LE 4.9 billion to LE 8.7 billion.

The critical state of the GOE's fiscal situation is underlined in the deficit trends. About LE 4.3 billion was annually covered with investment financing, resulting in an increase of the annual net deficit from LE 680 million to LE 3.8 billion.

e. Trade

Between 1987 and 1989, exports remained steady at about $3.2 billion; however, imports rose from $9.8 billion to $10.8 billion, pushing the trade deficit from $6.6 billion to $7.6 billion. After accounting for services and transfers, the current account deficit increased from $545 million to $1.2 billion. Tourism, one of Egypt's most important sources of economic growth, had receipts rise from $886 million to $1.1 billion.

f. Exchange Rate Policy

The long-term deterioration of Egypt's balance of payments position indicates that the Egyptian pound has been consistently overvalued. A recent World Bank study found that, on an annual basis over the 1960-1985 period, the pound was overvalued by an average of about 22 percent (Dethier, 1989). However, the GOE has taken several significant important actions to reform its exchange rate policy.

Prior to May 1987, a three-tiered exchange rate structure was maintained. The Central Bank rate, which had been fixed at LE 0.7/US$ since 1979, was used for most government and public sector transactions; the commercial bank rate had been devalued

gradually to about LE 1.36/US$. A third rate, loosely defined as the "free market" rate, fluctuated at around LE 2/US$ during 1987.

In May 1987, the commercial bank rate and the free market rate were merged into a new free rate. Up to half of all foreign exchange transactions continued to be handled through the Central Bank at the same fixed rate. The Central Bank rate was devalued in August 1989, and again in July 1990, when it was set at LE 2/US$.

A Central Bank committee regularly adjusted the new free rate, in line with perceived demand for and supply of foreign currencies. The free rate was set at LE 2.16/US$ in May 1987, and gradually devalued to about LE 2.7/US$ in late 1990. By February 1991, the free rate had fallen to LE 2.85/US$. During this period, the government did not officially intervene in the foreign exchange market, but maintained tight controls on demand through letters of credit, import licensing, and credit controls.

In October 1991, the Central Bank rate was eliminated completely and a single free rate was established. Since then, the rate has gradually fallen to about LE 3.3/US$. Although the unified rate is defined as a "free" rate, there is no doubt that the GOE is managing the downward float, although with more attention to open market rates than before 1987. Even with a managed float, the conversion of the exchange rate system into a unified rate is an extraordinary reform that suggests a surprising new GOE resolve to align the domestic economy with world prices.

2. The Natural Resource Base

Two major components of the resource base, water and land, are described to provide a framework against which environmental conditions and impact trends in Egypt may be assessed. The quantifications and characterizations support the formulation of strategies USAID may pursue to help Egypt promote continuing sustainable economic growth through sound environmental policies and practices.

In addition to the two natural resources introduced above, the impacts of water upon the scenic and cultural resources that support the very important tourism industry are identified.

a. Water

Ninety-five percent of Egypt's water resource originates in the flow of the Nile River. Ten percent comes from groundwater, half of which is integrated with the Nile, and half developed from the Nubian sandstone aquifer underlying the western desert oases and the aquifer underlying the Sinai-Red Sea areas.

Precipitation is limited to a narrow belt (about 15 kilometers wide) along the Mediterranean Sea in the lower delta and North Sinai areas. Even in this zone, rainfall totals only 50 to 200 mm annually, and is not agriculturally significant.

The Nile River. The Nile River rises in and flows through nine countries, but only Egypt, Sudan, and Ethiopia can control and exploit virtually all of the water[1]. The key features of the Nile River system determine current use of Nile water and will influence future availability of water to Egypt.

The White Nile River, from its source, Lake Victoria, carries only 10 percent of Nile River total annual flood season flow. However, the White Nile carries some 80 percent of the low season flow. This occurs because the six large natural and manmade lakes and the Sudd marshland in Southern Sudan, above the confluence of the White and the Blue Nile rivers, regulate flow.

Agreements. Although discussions have been held among the nine riparians under the auspices of the United Nations, no agreement on water sharing has been concluded or even proposed. There is a 1959 agreement between Sudan and Egypt to share water impounded in Lake Nasser: 55.5 milliard m^3 annually to Egypt and 18.5 milliard m^3 annually to Sudan. Further, once the first phase of the Jonglei Project to express water through the Sudd marsh is completed, some 4.0 milliard m^3 of water that now evaporates will flow down the Nile River and be shared between Egypt and Sudan equally. Thus Egypt's annual draw at Aswan can be 57.5 milliard m^3.

Potential South Nile Developments Beyond Aswan. Sudan one day plans to build a large dam on the Nile River between Khartoum and the Egyptian border to produce hydropower. Generally, once such a project is undertaken, an irrigation component is added. Thus, there will be drawdown of the Nile resource due to evaporation, reservoir seepage, and diversions for irrigation. Although there currently is no understanding between Egypt and Sudan regarding such developments, it is vital that they be anticipated and addressed.

Since 90 percent of flood runoff to the Nile River is from Blue Nile River in the highlands of Ethiopia — and that country will have to develop storage and irrigation systems if it is to feed its burgeoning population — Egypt and Ethiopia must reach some agreement regarding future water sharing.

The Nile Canal and Drain System In Egypt. The Nile River flows northward 952 kilometers (km) from Aswan to the Mohammed Ali Barrages (Delta Barrages), 22 km downstream from Cairo. Offtaking canals service lands and habitations of the valley, which is 18 to 25 km. At the Delta Barrages the valley spreads into a fan which is divided into eastern, middle, and western delta canal service areas. These areas are served by a dendritic system of canals with Imailia Canal running to the east toward Suez, the Damietta Branch serving the east and middle, and the Rosetta Branch serving the middle and the west. Drains of the delta lie in an opposing semi-dendritic pattern. They collect water across the delta and terminate at the lakes which occupy the area immediately inland along the Mediterranean coast.

[1] The Nile basin countries are: Burundi, Egypt, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, Uganda, and Zaire.

Pumps at strategic intervals lift water from the drains into the canals for reuse. Reused water comprises a sizeable component of the total supply of water for agricultural, domestic, and industrial use. The flow of some drains, such as Bahr El Baqar, goes directly to the lakes without reuse because industrial, household, and agricultural wastes are mixed and extremely polluted. The high level of pollution in the drain water has polluted the water of the receiving lakes, particularly Lake Manzala, so severely that unsubstantiated reports indicate that the lake's fish have cancers and the life expectancy of lakeside inhabitants is only some 45 years compared to 60 years reported by the World Bank (Annual Report, 1991) for Egypt.

Groundwater. Associated with the surface water regime are three groundwater sources of importance to domestic users and to agriculture: the deep wells of the delta, Cairo, and the valley. The 1984 division of groundwater for irrigation and drinking is shown in Exhibits 1 and 2. Hand pumps provided 375 million cubic meters (MCM) per year of a total pumpage of 1180 MCM per year or 32 percent of the groundwater used for drinking purposes in the Nile system.

Exhibit 1. Groundwater Pumping, 1984, Million Cubic Meters

Area	Drinking Water	Irrigation Water	Total
Nile Delta	620.0	300.0	920.0
Nile Valley	260.0	500.0	760.0
Cairo	300.0	0.0	300.0
Deserts	9.5	470.5	480.0
Total	1,189.5	1,270 5	2,460.0

Source: Water Research Center, Research Institute on Groundwater

Exhibit 2. Drinking Water Produced, 1984, Million Cubic Meters

Area	Ground Water Deep	Handpumps Total	Ground Water Handpumps	Total Ground Water	Total Less Handpumps
Nile Delta	345.0	275.0	620.0	695.0	1040.0
Nile Valley	160.0	100.0	260.0	280.0	440.0
Cairo	300.0	0.0	300.0	620.0	920.0
Deserts	9.5	0.0	9.5	10.5	20.0
Total	814.5	375.0	1,189.5	1,605.5	2,420.0

Source: Water Research Center, Research Institute on Groundwater

While the deep groundwater is extracted from aquifers partially protected by a clay aquitard some 30 meters thick, and thus often meets drinking water standards without treatment, the water extracted by hand wells is from the upper 5 to 25 meters of the soil profile and therefore generally is contaminated by human wastes; agricultural fertilizers, pesticides and herbicides; and industrial wastes.

Nile System Water Balance. An actual water balance for the Nile River system in 1989-1990 was calculated by Dr. Abdel Hadi of WRC in 1990. The environmental master planning team of the Egyptian Environmental Affairs Agency (EEAA) has estimated a current 1990 water balance, a water balance for year 2000 under three scenarios of water availability, and a water balance for year 2025, along with demands for each period (Exhibit 3).

Clearly the water in the Nile system is being utilized fully, but inefficiently. Future scenarios anticipate increased flows from the Jonglei Project; more reuse of irrigation, municipal, and industrial water; capture and reuse of water released for navigation during the winter canal closure period; and greater exploitation of groundwater. If all of these savings are realized and upstream inflows indeed increase, irrigation can be extended to new lands. Potential new irrigated lands vary from 0.86 million feddans under present day conditions to two million or more feddans under each future scenario presented by the multi-disciplinary technical committee for water resources planning of MPWWR.

It is critical that future scenarios also account for potential developments in upstream riparian states, particularly those that will create drafts on basin water supply and those that will reduce basin water losses. Water conservation potentials at Lake Nasser also must be pursued to the extent they are practicable. Any significant planned diversions of water from Aswan to the Red Sea area or to the New Valley must be assessed with respect to reductions of potential for water reuse and the environmental impacts of basin withdrawals on the future water balance.

b. Land

Egypt has a total land area of about one million km^2, but the population is concentrated on only about 4 percent of this land, or 39,000 km^2. Based on a 1989 population of 51 million, the population density on the habitable land was about 1,300 persons per km^2, one of the world's highest densities. However, for the 46 percent of the population living in urban areas, the density is even higher.

About 7.5 million feddans[2] were under cultivation in 1989. Since 1970, 1.5 million feddans were reclaimed on the fringes of Nile valley and delta lands, but low farm

[2] One feddan = 1.038 acres = 0.42 hectares.

Exhibit 3: Water Available for Agricultural Use (milliard m^3/year)

SOURCE	1990	2000[2]	2000[3]	2000[4]	2025
Nile River[5]	55.5	57.5	57.5	57.5	57.5
Drafts, non-agricultural:					
Municipal	(3.1)	(3.1)			
Industrial		(4.6)	(6.1)		
Combined M&I			(4.6)	(6.1)	
Navigation and Regulation	(1.8)	(0.3)	(0.3)	(0.3)	(0.3)
Agricultural drainage water, re-use:	4.7	7.0	4.7	8.0	5.0
Treated municipal wastewater, reuse	0.2	1.1	1.5	2.5	2.0
Groundwater, Nile Valley and Delta	2.6	4.9	2.6	4.9	3.6
Groundwater, desert	0.5	2.5	3.5	3.5	3.5
Available for agriculture	54.0	63.5	59.9	61.5	60.5
Agricultural demand, present area	(49.7)	(59.9)	(43.5)	(49.7)	(46.6)
Available to irrigate new land	4.3	4.6	16.4	11.8	13.9
Area that could be served (million feddans)	0.86	2.9	1.95	0.0	2.38

[2]Scenario 1

[3]Scenario 2

[4]Scenario 3

[5]Present from Aswan, including salvage Jonglei, first stage.

productivity caused 300,000 feddans of fertile valley and delta lands to be taken out of agricultural production for more valuable village, urban and industrial use. About 70 percent of the cultivable area is planted in both winter and summer, with 10 percent of the area supporting a third season crop in late summer (Nili). The area planted in 1990, included multiple cropping, was about 14 million feddans (Samie, UNEP, p. 35, 1992).

3. Cultural Heritage

The history and culture of Egypt are inextricably tied to the Nile River basin, that narrow band of fertile land which is the agricultural and cultural base of the country, and which has provided the setting for a civilization that has flourished for thousands of years. The Nile is much more than a source of water: together with the plants and animals found there, it forms the core of Egyptians' image of their country, and permeates historical political and religious traditions. Consequently, Egyptians have long been interested in protecting this treasured resource.

In the past, Egyptians relied on the annual flooding of the Nile to cleanse accumulated wastes from the basin and provide nutrition for crops. However, the completion of the Aswan Dam, an urban population increase of more than 1 million per year in Cairo alone, and significant growth in industry have rendered long-standing cultural and historical solutions to the country's environmental problems insufficient. New practices and traditions must be sought. Since 1980, GOE and donor assessments and activities have focused on how to deal with these problems.

To make matters worse, increased agricultural development, tourism, and urban growth have threatened other historically important and biologically valuable areas of the country, including wetlands with their bird, animal, and plant populations; the coastline with its coral reefs and fish; and high mountain areas.

B. Current Status of Environmental Quality Management

Egypt began to develop its environmental management system in earnest only a decade ago. However, its short experience can expand quickly if it exploits the knowledge gained by the developed countries' environmental managers over the past two decades.

All of the world's developed nations have created complex systems for managing environmental quality. These systems evolved through a series of institutional trials and errors to build the legislative, regulatory, and technical foundations for wise management of natural resources and sustained economic growth. This section of the analysis describes Egypt's environmental quality management system in terms of the policy, institutional, monitoring, risk assessment, technical and educational factors found to be crucial to effective environmental management programs in developed countries. The section also assesses the problems that require urgent attention if Egypt's economic development is to be sustained.

1. A Geographic Perspective on Environmental Issues

Most of Egypt's environmental problems are best understood by placing them within a geographic context that is defined by three key economic sectors: agriculture, industry, and households. Within each of these sectors are unique interrelationships between urbanization and the types of economic activity that influence pollution. These distinctions are important in determining not only the nature and magnitude of environmental damage, but also the nature and magnitude of efforts to control and abate the damage. This section's brief review of the agricultural, industrial, and sectors household provides a background for analyzing Egypt's key environmental management problems.

a. Agriculture

Agriculture is supported entirely by irrigation, and agricultural lands are confined to the Nile valley and Delta except for some oases of the New Valley Governate and some 300,000 feddans dedicated to rainfed agriculture or rangeland along the Mediterranean coast west of Alexandria.

Output of crops is determined by both the area of cultivable lands in service and production determinants such as water quantity and quality, fertilizers and their types, drainage of lands, and protection of crops with pesticides and herbicides. The reclaimed lands were developed at considerable expense, and fertility levels were increased through application of soil conditioners that included domestic sewage sludge, chemical fertilizers, and animal manures. Each of these conditioners contaminated surface water and groundwater systems.

Sewage sludge caused heavy metal pollution, while chemical fertilizers caused nitrate pollution. Pesticides and herbicides also added pollutants to the water, as documented in the discussion of water quality that follows. However, this pollution is viewed as a threat to the public and not to agriculture.

Both horizontal (tile) and vertical (well) drainage has been provided, particularly for delta lands, for 40 years. Drainage has not yet been provided to the lands most in need: those lands across the entire lower delta which border the Mediterranean Sea and lakes from Alexandria to the Suez Canal (Samie, UNEP, 1992, p. 53).

b. Industry

Industry currently is highly concentrated in the urban areas. The greater Cairo region encompasses 64 percent of industrial units and the Alexandria area accounts for 19 percent.

In greater Cairo, industry is concentrated in two areas: Helwan and Maadi in the southern part of the city; and Shoubra El Kheima, Mustorod, and Abu-Zaabal in the north. The Helwan industrial district and surrounding areas include cement, iron and steel

(including foundries and smelters), chemical (including fertilizers and coke), textiles, wood products, automotive, and electric power installations. The Shoubra El Kheima industrial district and surrounding areas include iron, non-ferrous metals, chemicals (plastics and fertilizers), textiles, and clay products (bricks) installations. The central Cairo/Giza area includes facilities for limestone, foundries, and electric power. The Alexandria area (including Wadi El Kamar) includes cement, petroleum refining, iron and steel (including foundries and smelters), chemicals (including fertilizers), limestone, textiles, clay products (bricks), and electric power installations. Other industrial sites in Egypt include Suez, Assiut, Mansoura/Talkha, Kafr Elzayat/Kafr Eldawar, Tanta, Aswan, Naga Hammadi, and Sharkia.

Sixty to seventy-five percent of the industrial output of Egypt is produced in facilities falling within the public sector. The other 25 to 40 percent of industrial output comes from firms in the private sector.

Although accounting for the lesser share of production volume, the private sector encompasses a greater number of firms, estimated to be at least 730. In comparison, only about 330 firms account for the public share of output, valued at LE 16 billion in 1989/90.

On average, the output from public firms is more than three times that from private sector firms. Seventy-five percent of the public firms fall under the jurisdiction of the Ministry of Industry (MOI), and the remainder are governed by the Ministries of Petroleum and Minerals, Housing and Utilities, Health, Agriculture and Land Reclamation, Defense, and Electricity and Energy. The 330 public sector firms include 119 in the food industry, 75 in textiles, 53 in chemicals, 39 in engineering, 33 in mining, and 11 in metals and metallurgy. An initial effort to provide an overview of the industry sector in terms of types of firms, output share, and pollutant generation is Industrial Environmental Map Progress Report, a 1991 publication by the Friedrich Ebert Stiftung Foundation.

c. Households

More than 90 percent of the Egyptian population lives on less than 4 percent of the land area, and the greatest concentration is in cities along the Nile. The population density along the Nile is 3,370 people per square mile, a density that is exceeded on a country-wide basis only by Singapore. Greater Cairo alone accounts for 18 percent of Egypt's total population, and Alexandria accounts for another 5 percent of the total.

The high concentration of people in Cairo and Alexandria, in conjunction with an even higher concentration of industry, subjects the populace in these areas to a wide variety of environmental risks. The principal origins of the more dangerous pollutants are the nearby industrial facilities and their discharges; the uncontrolled emissions released by the 1.2 million vehicles operating in those areas; and the domestic sewage produced by a rapidly growing population.

2. Policy Framework

Most of Egypt's environmental problems result directly from inappropriate economic policies. More specifically, the lack of a comprehensive framework for formulating and implementing economic policy has been a major factor behind the GOE's inability to develop an effective environmental policy. This section assesses the current environmental policy framework to determine the basic structure of the policy process and indicate major opportunities for policy reform.

a. Current Policy Objectives

The GOE lacks a concise statement of its environmental policy objectives. Despite strong support for improving environmental quality, no GOE agency specifies the specific role of environmental quality in meeting national development goals. Although there is agreement that the country suffers from widespread pollution, particularly water pollution, there is no consensus on how to balance pollution abatement with economic imperatives.

b. Key Policy Actors

Of the many organizations with environmental policy interests, virtually all are in the public sector. At this time, NGO's and private sector trade and professional associations have no significant influence on environmental policy. Eight public organizations dominate current environmental policy formulation. The Peoples' Assembly legislates the policies that evolve from deliberations across all ministries and levels of local governments.

The Ministry of Cabinet Affairs is the primary coordinating agency for policy implementation through its Environmental Affairs Agency (EEAA). However, the EEAA lacks sufficient political authority or money to be more than a weak advisor to the line ministries that serve the economic interests of the agricultural and business communities.

The Ministry of Public Works and Water Resources (MPWWR), as the GOE agency responsible for irrigation, has primary responsibility for water resource management under Law 48. The MPWWR has an extensive water research and water quality monitoring program, but focuses on supporting irrigation users rather than the consumers who use water directly and purchase food produced with irrigation water.

The Ministry of Tourism and Civil Aviation, through its Tourism Development Unit (TDU), is responsible for most GOE efforts to earn foreign exchange through tourism. The TDU is primarily an advocate of major tourism development projects. Although it aggressively promotes tourism, the TDU is beginning to recognize the environmental costs of tourism and coastal development. Consequently, the TDU is pressing for moderation in coastal developments, such as petroleum exploration and production, that reduce tourist

demand. Within the tourism industry, the TDU is becoming more aware of how the large water and sewage requirements of tourists impair the environment.

The MOI manages most of the parastatal heavy industries that are the most serious polluters. The MOI has shown little support for enforcing environmental laws and regulations, and there is very little pressure by other GOE agencies to reduce parastatals' pollution. The MOI is one of the country's most powerful ministries and therefore well insulated from outside criticism of its role as a polluter. If these parastatals are not privatized, the GOE, through the MOI will continue to be the nation's worst industrial polluter.

The Ministry of Health's (MOH) record in monitoring environmental quality and taking legal action against egregious polluters is remarkably weak. The MOH has been slow to apply risk assessment methods to environmental problems and has not disseminated data on health problems associated with environmental damage.

The Ministry of Agriculture and Land Reclamation is the major player in formulating agricultural policy, including product and input prices. Until recently, the Ministry's Principal Bank for Agricultural Development and Credit was responsible for all agricultural imports, including fertilizer and pesticides. However, import controls have been relaxed and private firms are beginning to import directly.

The Ministry largely determined large fertilizer and pesticide subsidies in the past; however, the GOE recently began to phase out the subsidies. Fertilizer subsidies were abolished in late 1991; pesticide subsidies, which were paid only for cotton, will be abolished by mid-1992. These withdrawals are associated with reductions in fertilizer and pesticide usage. It is not clear how much of the decline in utilization was due to withdrawal of subsidies, but available evidence suggests a strong direct correlation. Therefore, we believe that the reduction and eventual elimination of fertilizer and pesticide subsidies ultimately will lead to a significant reduction in the pollution of canal and groundwater supplies by agricultural activities. The Ministry also monitors pesticide contamination of water supplies, but testing is performed irregularly.

The Ministry of Petroleum is responsible for petroleum exploration, production, and processing, which collectively represent one of the nation's potentially great pollution problems. However, the petroleum industry appears to be strongly influenced by the environmental awareness of foreign oil companies and has made a major effort to prevent oil-related pollution. The ministry has a major role in determining energy pricing policy and would be an important interest group in any decision to decontrol all petroleum-based energy prices.

c. Key Policy Instruments

Because Egypt's overall environmental program is very new and weak, the country lacks effective environmental policy instruments. Most of the regulatory process is based on pollution discharge sanctions. Point polluters are held responsible for keeping

pollution discharges below a standard which generally refers to international pollution standards. However, this approach is not effective because the standards generally do not allow the flexibility necessary for the polluter and the GOE regulatory agency to negotiate a quick agreement on a compliance schedule.

Instead, Egyptian regulators concentrate on informing the polluter of a violation — but there are no provisions for phasing in compliance measures after the violation has been announced. To make matters worse, this regulatory process is ineffective because the regulatory agencies lack the authority and resources to enforce current laws and regulations. If the enforcement was effective, the fines paid by polluters could finance the repair of past environmental damage and development of new pollution control technology.

The GOE could reduce much of the current pollution problem simply by decontrolling product and resource prices. As controls were removed, prices would move towards levels that match international prices, minus transportation costs between Egypt and the referenced international price. Because Egypt's prices generally are held below world prices, consumption exceeds free-price levels, or has been controlled by rationing or natural market shortages.

For example, petroleum prices generally have been set at one-fourth to one-third of the international price. The result has been that fuel consumption has been greater and energy efficiency has been far less than in countries with higher prices. The increases in consumption also increase pollution problems.

Similarly, irrigation water is a critical resource, but farmers pay very little of the total cost of supply. Again, the extraordinarily low price has led to irrigation water overuse, which has, in turn, caused waterlogging and salinity problems. Underpriced water also aggravates water-borne pollution problems by removing most incentives for users to conserve water and simultaneously reduce pollution.

Subsidies have been used to alter market prices and reallocate resources according to non-market objectives. The use of fertilizer and cotton pesticide subsidies is a good example of unintended environmental damage caused by a program primarily intended to reduce farmers' production costs and encourage use of high-productivity, agro-chemical technologies. In addition to causing resource misallocations, subsidies also often are costly to government treasuries. Consequently, it is therefore highly doubtful that any subsidy program could induce desired environmental management objectives.

The GOE's current privatization program is an example of an significant new policy instrument that can be an important tool for improving environmental quality. As parastatals are privatized, their monopoly positions in markets are usually weakened or eliminated. In the case of environmental policy, the transfer of ownership and managerial control of parastatals to the private sector removes the GOE from a conflict of interest in enforcing environmental regulations.

Other environmental policy instruments have been implemented in developed countries, but Egypt lacks the administrative and technical support system necessary to ensure success. Discharge taxes, or emission charges, could be assessed in direct proportion to the level of damage associated with a particular level of pollutant discharged by a firm. This approach would require both detailed knowledge about the relationship between the level of pollution and environmental damage, and a convenient method of measuring the level of pollution discharge.

As an alternative to discharge taxes, a polluting firm's product could be taxed to capture the environmental costs associated with the manufacture of the product. Discharge and product taxes could be used as a weak alternative to direct pollution control sanctions.

Transferrable emission permits have been particularly important policy instruments in the US air pollution control program. However, this program also requires a sophisticated administrative and technical support system that is not available in Egypt.

d. Analytical Framework

The failure to price water at its approximate social cost has led to severe water overuse which, in turn, has aggravated much of Egypt's water-based environmental damage. This problem is well known throughout Egypt, but there has been no concerted effort to analyze the problem in terms balancing the costs of eliminating water overuse with the resulting benefits or savings from forestalled environmental damage. Beyond the pricing issue, the absence of an analytical framework has meant that basic economic analysis is not being used to evaluate tradeoffs between the costs and benefits of environmental policy options.

More generally, the analytical framework requires translation of physical damage caused by pollution into a monetary cost, which is then compared with the monetary cost of removing or reducing the pollution source.

Exhibit 4 demonstrates the essential economic relationships required to apply these analyses to a comprehensive environmental quality management program. This framework is an economic version of the risk assessment model explained in a later subsection. Panel (a) assesses the relationship between observable levels of pollution and physical damage to the environment; in Egypt, virtually no effort has been devoted to this issue. At best, sporadic information has been assembled on levels of pollution, with most comprehensive environmental monitoring program being managed by the MPWWR's Water Research Center. Physical damage, such as incidence of disease, agricultural production losses, and manufacturing losses, have not been systematically related to alternative levels of water and air pollution.

Panel (b) determines the costs of estimated physical damage estimated in the first panel in terms of medical expenses, income lost from health problems, losses in agricultural and industrial productivity, and damages to property. Again, Egypt is not studying this relationship in terms of solving any major pollution problem.

Panel (c) links Panels (a) and (b) to produce a total pollution damage cost function, where the total cost of pollution damage relates to respective levels of observed pollution. These costs should vary directly according to the level of pollution.

Panel (d) estimates the cost of abating or controlling pollution for alternative levels of pollution. This very difficult task often is abandoned in favor of a few lumpy approximations of the smooth curve of an infinity of abatement costs at respective levels of pollution.

Panel (e) determines the optimum level of pollution or environmental quality. The total cost of both pollution damage and abatement is minimized by combining panels (c) and (d) and summing the damage and abatement cost functions. These relationships show that at a relatively high level of pollution (low level of environmental quality), the total cost to society is high, and due almost entirely to the cost of damage caused by the pollutant. In contrast, at low levels of pollution (high environmental quality) total cost is high, and attributable almost entirely to the cost of abatement. Between these two extremes, the total cost of the combined damage and abatement costs reaches a minimum, which can be described as the optimum level of pollution or environmental quality.

3. Institutional Context

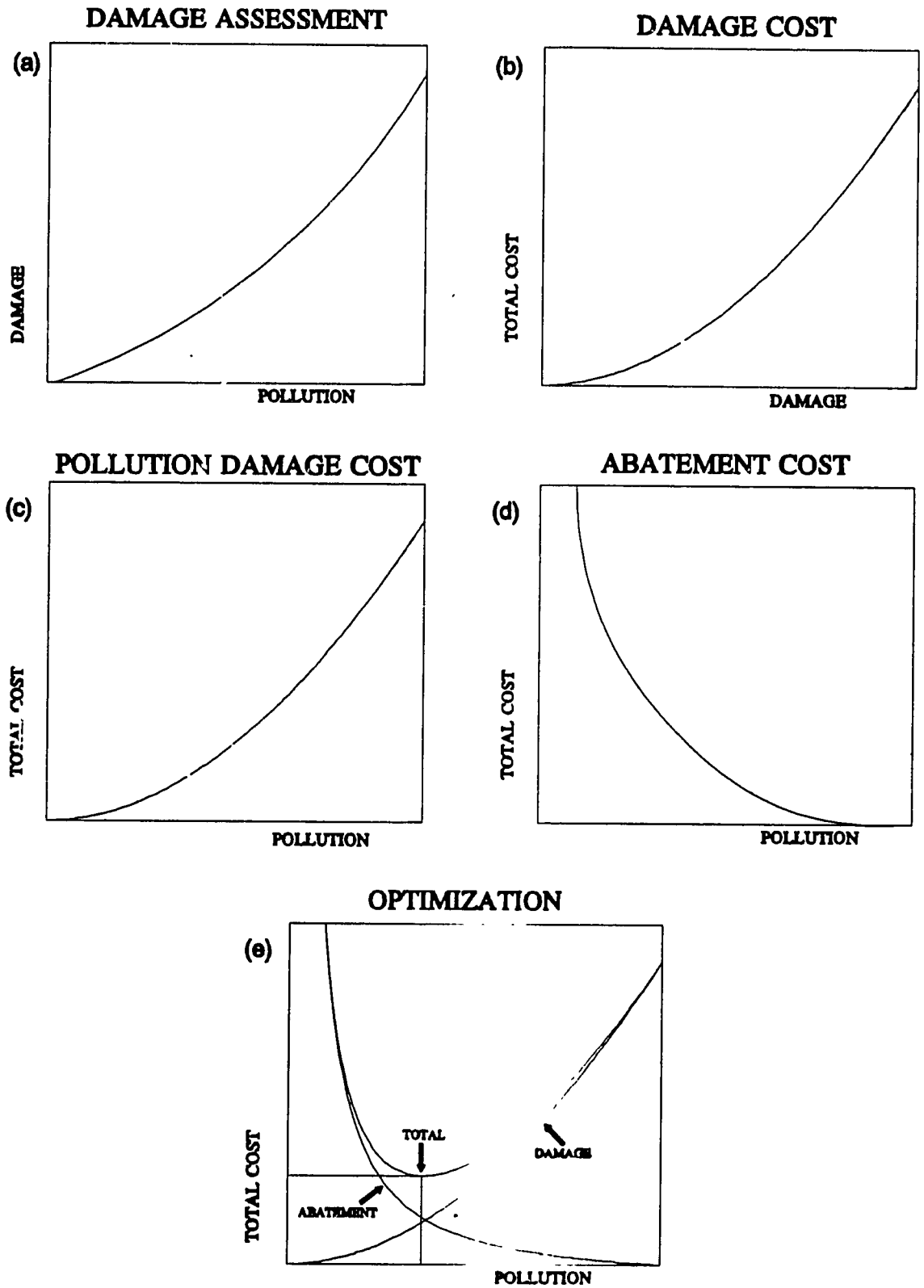
The institutional framework for environmental programs in Egypt is diffused and disjointed, resulting in weak capabilities among environmental institutions. Currently no strong institutional leadership exists in public, parastatal, or private environmental institutions, or among NGO's. Because of relatively short experience with environmental issues and lack of a strong central agency, the GOE currently exercises little coordination among donor agency assistance in this field. To date, the GOE has provided little financial and other resources to government and/or non-governmental agencies to implement strong environmental programs.

There appear to be no effective mechanisms for inter-ministerial cooperation on environmental programs. For example, Law 48 specifies that the Ministry of Health is to monitor water quality; the Ministry of Public Works and Water Resources (MPWWR) is to enforce the law; the Ministry of Reconstruction, Housing, and Development is to control water quality; and the Ministry of Industry is to work with private sector agencies to support the law.

What actually happens is that the MPWWR Water Research Center (WRC) collects and analyzes water samples without the help of the Ministry of Health (which had been involved earlier). The four ministries apparently do not cooperate on any aspect of the water quality program. Efforts to address solid waste, industrial waste, off-shore pollution, food contamination, and other environmental problem areas appear to be similarly fragmented and weak.

EXHIBIT 4

MANAGEMENT OF ENVIRONMENTAL QUALITY



Many organizations, especially nongovernmental, claim to be addressing Egypt's environmental problems, but most appear to be "paper tigers." Their actual involvement is insignificant.

a. Legislation

Legislation in Egypt takes the form of laws, presidential decrees, prime ministerial decrees, and ministerial decrees. In the environmental area, 17 ministries administer 81 laws with environmental components, eight ministries are mandated by 34 presidential decrees concerning environmental activities, three ministries carry out 17 environmental decrees issued by the prime minister, and 11 ministries have issued a total of 287 environmental decrees. Frequently, decrees following a law will indicate which ministries will be empowered to enforce it, or will specify how a law is to be implemented.

Key ministries involved are Health, with 21 laws and 108 decrees; Supplies, with 4 laws and 66 decrees; Housing, with 12 laws and 21 decrees; Agriculture, with six laws and 27 decrees; and Industry, with one law and 26 decrees. Interestingly, Water Resources, which plays a major role in irrigation and water issues, has only two laws and four decrees. Other involved ministries include Cabinet, Reconstruction, Petroleum and Mineral Wealth, Social Security, Culture, Interior, Tourism, Electricity, Transport, Commerce and Trade, and Manpower.

A summary of legislation by type of environmental problem is shown in Annex A. Key pieces of legislation include the Presidential Decree 631 (1982) which established the Egyptian Environmental Affairs Agency (EEAA), Law 48 (1982) which is the basic law protecting the Nile River and its waterways, and Law 102 (1983) which made possible the establishment of Natural Reserves.

In addition to national legislation, Egypt has ratified 34 international conventions and protocols dealing with the environment. These include agreements concerning protection of wetlands for migratory birds, fishing regulations, oil pollution damage, endangered species, pollution of the Mediterranean, and conservation of the Red Sea. These also are presented in Annex A.

There is wide agreement that passage of this legislation alone has not led to significant environmental improvements. There are several reasons for this.

First, Egyptian policy-makers lack a deep understanding of environmental problems. They normally do not make connections between actions taken in one area and environmental consequences of those actions in another area. Available information tends to be fragmented, guarded by ministerial stakeholders, and sometimes distorted to suit political ends.

Second, there is little general public understanding of environmental issues, and only limited activity by environmental interest groups. This dilutes political pressure for change unless an environmental crisis occurs.

Third, the legislation itself does not spring from a careful consideration of proper standards for Egypt, and often is not specific enough to be enforceable. For example, a law concerning air pollution states that no heavy smoke should emerge from the exhaust of motor vehicles. Another says that wastes dumped at sea should not be harmful to marine life.

Finally, ministries, institutes, and other agencies often do not have the resources necessary to carry out enforcement and monitoring activities. Consequently, polluters often are not penalized unless a crisis occurs.

The GOE currently is considering a new law which would provide sweeping new powers to the EEAA. The proposed law would conflict directly with other laws, decrees and ordinances. Other governmental units certainly will fight enactment, and nongovernmental interests probably will oppose it as well.

b. Institutional Groupings

Environmental programs are complex because they involve a variety of national institutions — governmental and nongovernmental — and in the case of Egypt, several donor agency programs and projects. To illustrate the complexity, Annex B contains a matrix of the agencies which are involved, or claim to be involved, in Egyptian environmental issues.

The purpose of this list is to provide an overview. From this list, the key institutions should be selected for further analysis and determination as to whether they should be involved in specific projects funded by USAID.

Public Sector. Many GOE agencies are involved in various aspects of the environmental program. However, these agencies often compete with each other for funds and power. The result is ineffective monitoring of the environmental situation and enforcement of existing legislation.

The roles, functions, and responsibilities have not been thought out for the various agencies. Consequently, there is no logical plan to fund GOE environmental programs. For example, policy-makers in many other countries recognize that line ministries, such as agriculture or industry, cannot effectively enforce environmental legislation because of the inherent conflicts of interest with their traditional clientele, who represent producers and business interests. No such recognition appears to exist in Egypt.

Parastatals. The large number of parastatals in Egypt is particularly burdensome to efforts to address environmental problems. In addition to using monopoly practices to severely distort much of the nation's economy, they are the nation's worst polluters. Parastatals have little incentive to be environmentally conscious and the GOE does not have the will to force compliance with environmental rules and regulations.

NGOs. Up to 80 NGOs in Egypt reportedly are interested in environmental issues. There are two categories of NGOs: registered and non-registered.

The registered NGOs have governmental representatives on their boards, and the GOE monitors their activities closely. Consequently, the registered NGOs tend to be cautious to the point of ineffectiveness in order to avoid government sanctions.

Non-registered NGOs often try to be activist, but face potentially more serious sanctions from the GOE because of their non-registered status.

We found no more than a handful of NGOs that are active in specific environmental causes. Many of the others are professional societies that treat the environment only indirectly.

Private Sector. The private sector in Egypt is small, but it is growing rapidly and causing environmental problems. The exact degree of the problems it is causing is unclear because the GOE does little monitoring or enforcement.

A fledgling environmental services industry is emerging within the private sector. This industry presents a strong opportunity for donors interested in simultaneously strengthening the private sector and Egypt's environmental management capability.

Donor Programs and Projects. In Egypt, donors have considerable influence on the country's institutional structure, focus, and capabilities. However, too often, donor projects concentrate on strengthening one agency even though several agencies share responsibility for overall program focus. This is the chief cause of project failure.

More information is needed about donor support in the environmental field. Such information should be gathered through the new informal Donor Environmental Coordination Group and used by USAID to develop its future environmental portfolio.

c. Institutional Functions

Most environmental analyses done to date, including the World Bank-supported Master Plan, have not addressed the institutional framework adequately. Where institutional analyses have been performed, analysts have been preoccupied with policy, monitoring, and regulatory functions. Although these functions are important, they do not constitute a sustainable environmental program, which must also include education and communication, environmental services, and other functions. Consequently, donors currently take a piecemeal approach which results in further program fragmentation, continued duplication of functions among competing agencies, and continued gaps in other critical functions required for a successful environmental program.

The following functions are the most critical to sustaining a comprehensive environmental program:

Policy, Legislative, Planning, and Coordination. This function involves institutions responsible for preparing and helping process legislation and governmental policies; carrying out planning of overall environmental programs (not specific programs or activities); and

ensuring that there is coordination between organizations involved in implementing various environmental programs/projects.

Lobbying. This function involves groups which encourage GOE officials and political leaders to enact new environmental laws, enforce existing laws, and represent environmental related interests.

Environmental Program Monitoring. This function involves agencies that collect of samples, conduct analyses and report the findings.

Regulation and Enforcement. This function involves agencies that promote compliance of environmental laws, levy fines for non-compliance, and oversee arrests where needed.

Research, Technology Development, and Technology Transfer. This function involves organizations that conduct research to develop environmental related technology and, when appropriate, transfer the technology to others.

Information, Mass Media, and Public Awareness. This function involves agencies engaged in a information transfer activities directed towards policy-makers, technical specialists, intermediary groups (such as mass media, NGOs, schools, private sector associations), and the general public.

Training, Non-Formal Education and Human Resources Development. This function involves organizations that train various groups including political leaders, opinion leaders, technical specialists, and school teachers how to deal with environmental problems.

Formal Environmental Education. This function involves higher education institutions which conduct degree programs in environmental related fields and include environmental subjects in other degree programs such as engineering, agriculture, education, and business administration.

Funding Sources for Environmental Programs. This function involves agencies which (not including international donor agencies) provide funds to public, private, NGO, and/or parastatals for environmental activities. This could include governmental agencies, banks, foundations, NGOs from inside and outside the recipient country.

Operating Environmental Restoration and Treatment Programs. This function involves organizations—governmental and nongovernmental—which operate environmental programs that result in the pollution prevention, treatment, or cleanup.

Environmental Services Industry. This function involves private sector agencies or parastatals which provide services and/or supplies for a fee to other organizations which prevent pollution, support the treatment of pollution, or are involved in pollution clean-up.

d. Egyptian Environmental Affairs Agency

EEAA currently is a weak organization, and in the past has received little funding or attention from the GOE. However, this appears to be changing. The new chairman is dynamic and aggressive. The United Nations Development Program, with World Bank encouragement, has helped create within EEAA an International Cooperation Unit (ICU) responsible for relations with international donors and the development of environmental projects. EEAA/ICU is developing an environmental master plan in cooperation with the World Bank, and with major assistance from Denmark. The twelve-part plan, to be completed by April 1992, is the coordination mechanism for proposing many projects which would draw upon traditional types of donor support and debt-for-swap funding.

Presently, USAID has contact with EEAA and the ICU, but has not pledged assistance to either the EEAA or any part of the environmental master plan. If the legislation currently being considered is enacted, EEAA will become the focal point in Egypt for environmental programs. Other donors, including the United Nations Development Program (UNDP), World Bank, Germany, United Kingdom, Denmark, and Sweden, apparently are committing significant assistance to the EEAA. However, it is too early to determine whether the EEAA will gain the authority necessary to wrest control of Egypt's environmental management program away from the line ministries.

The master plan specifies that EEAA will provide leadership in at least the following environmental fields: legislation and policy, program coordination, monitoring activities, information and education, and regulatory enforcement. Most of the plan's strategy assumes that a new omnibus environmental law will be enacted shortly. This law would give the EEAA regulatory and enforcement authority over all pollution matters, including the authority to arrest persons and organizations who violate pollution regulations.

Line ministries would continue to implement environmental programs, but the EEAA would have clear authority over these programs. All GOE environmental monitoring and analysis laboratories would continue to operate under the current respective ministries, but the EEAA would contract with the laboratories for all national environmental quality monitoring.

Although the draft law has been circulated for review in the Peoples' Assembly, enactment in its present form is far from certain. Until the law is enacted, EEAA's future role in environmental management is very uncertain.

4. Environmental Monitoring

Measuring environmental quality is the first step in the developing an environmental management program. This subsection assesses Egypt's record in collecting and analyzing environmental data and monitoring pollution.

a. Data Collection

Water. Measurement of flow in the Nile River and canal system has been carried out systematically basinwide for many years. Measurement of water quality parameters has been confined to the ionic constituent concentrations which are important to design of and reclamation of irrigated agricultural projects. Only since 1975 have the water quality parameters of the Nile River been measured irregularly over different segments of the river.

The WRC is working with the Canadian International Development Agency (CIDA) to implement a systematic monitoring program for the Nile River. The WRC also is working with a PRIDE team to develop a preliminary water quality assessment for the country's surface water and groundwater resources. Following the assessment, the team will prepare a water management plan to be used to muster support for coordinated water management action at all levels of government including the Peoples' Assembly. However, considerable work still is needed to strengthen water quality monitoring programs, including:

- Assuring that drinking water meets health standards.
- Measuring the quality of effluent from wastewater treatment plants.
- Measuring the quality of post-treatment industrial effluent for discharge for land application, discharge to a drain, or pretreatment for discharge to a municipal wastewater system.
- Measuring the quality of canal water and any drain water pumped into the canal system to assure that the water is suitable for agriculture and for treatment for drinking water if the canal provides both supplies.

Air. The MOH has established more than 50 monitoring stations in Cairo, Alexandria, Tanta, and other cities. Species monitored include sulphur oxides, total suspended particles (TSP), and smoke. The Ministry also has equipment to monitor nitrogen oxides, carbon monoxide, and photochemical oxidants; unfortunately, the latter equipment lacks the parts necessary to fully function. The National Research Center will provide funds to operationalize this equipment and then lead an analysis of the implications of the monitoring results.

Land. Generation and disposition of municipal solid waste are not monitored on a systematic basis, but data have been collected to provide estimates of total quantities from urban and rural areas and to indicate the general composition of this waste.

Currently, no system has been established to monitor the generation and disposition of industrial hazardous wastes, nor have more limited data been found to characterize the hazardous waste practices of specific Egyptian manufacturing sectors or facilities.

b. Data Analysis

Water. There is a considerable water quality data and water quality indicators, but it is largely unpublished and generally appears within report only in summarized form. Although monitoring has been carried out for limited periods and over limited geographical areas for selected parameters, no established national networks continually and fully monitor water quality for use in efficient, environmentally sound, systematic water management planning and operations.

To support development of an environmental strategy, and to illustrate the value of risk analysis to environmental programming, water quality in several components of the Nile River system is characterized below. Water quality standards for discharges and water uses are presented to facilitate comparisons with observed water quality parameters and estimation of environmental damages.

Groundwater Quality. Egypt's current drinking water standards for total dissolved solids (TSD), nitrates (NO_3), DDT, and malathion are as follows:

Exhibit 5: Drinking Water Quality Standards

CONSTITUENTS	STANDARD	AUTHORITY
TDS	1500 mg/l	Egypt
Nitrate, NO_3	45 mg/l	Egypt
DDT(total isomers)	1 ug/l	WHO
Malathion	0.2 mg/kg body weight	WHO

FAO irrigation water guidelines for NO_3 and sodium absorption ration (SAR) concentrations which affect crops are:

Exhibit 6: FAO Irrigation Water Guidelines

RESTRICTIONS ON WATER USE	NITRATE, NO_3	SODIUM ABSORPTION RATIO (SAR)
None	< 20	< 6
Some	20-130	6-9
Severe	> 130	> 9

IWACO Consultants and the WRC Research Institute for Groundwater reported on a development and management study of groundwater in the Nile area in 1990 (IWACO/ RIGW, 1990). Samples were taken from wells to test drinking water quality and agricultural

suitability. Detailed sample analyses are reported in the appendices of the report and are summarized below for SAR, NO_3, DDT+DDD, malathion, and TSD in very abbreviated form.

Exhibit 7: Detailed Sample Analyses

CONSTITUENT	SHALLOW	DEEP	MINIMUM	MAXIMUM
SAR (calc.)	0.0	0.0	0.17	3.98
NO_3	6-110	10-25	1.9	252.3
DDT+DDD	0.4-5.7	0.3-10.9	undetected	10.4
Malathion	0.0	0.0	undetected	6.11 ug/l
TDS	0.0	0.0	357.0	2,392

With respect to agriculture, the groundwater does not threaten sodium (SAR) levels. However, with respect to nitrates (NO_3), yields for some sensitive crops could drop, and blue baby syndrome is threatened. Although DDT has not been widely used for several years, organo-chloro pesticides still threaten some groundwater, both shallow and deep. This persistence undoubtedly is due to the fact that the normal half life of four years for these compounds is not operable in the underground environment; there, decay is negligible.

With respect to TDS, all waters were within the guidelines except for the one sample of 2392 parts per million (ppm) which perhaps is an outlier influenced by a nearby drain. An alternative view is that 8 percent of all drinking water drawn from the ground will affect the health of the people who are sensitive to high quantities of salt.

Surface Water Quality. A network was established by the High Aswan Dam Side Effects Research Institute and the Ministry of Health for water quality monitoring along the Nile River in 1976, and extended along the Rosetta and Damietta branches in 1987. Several sampling campaigns have been carried out in recent years, but no permanent program with specific frequencies of monitoring at given locations for specified parameters exists. Through cooperation with CIDA, and through the River Nile Protection and Development Project (RNDP), MPWRR established the Water Quality Management and Pollution Control Division. One element of this division's charter is to establish a permanent water quality monitoring program for the Nile River. The program's objectives are to:

- Provide a general reference for water quality conditions in the river.
- Detect stream standards violations and maintain effluent standards.
- Determine seasonal variations of river and point source water quality.

Several measurement campaigns conducted over the past 15 years show increasing levels of untreated industrial and agricultural discharges are harming river quality.

Measurements have been taken at discharges from 79 agricultural drains and 69 points of discharge of industrial effluent, power stations, and domestic wastes. Also measured was the flow of the river upstream and downstream of the effluent points.

Sherbini and El-Moattassem summarized the situation in 1989 in their discussion of the Nile River's water quality index. The water quality index is a composite of ratios of measured to standard parameter values; the higher the value, the purer the water. In 1977, the index ranged generally between 20 and 50 percent; however, by 1986 the purity had declined to an index that ranged between 5 and 25 percent, and sometimes dipped below zero just downstream from industrial outfalls and agricultural drains. Factors of the water quality index were temperature, pH, dissolved oxygen, suspended matter, phosphates, nitrates, ammonia, and fecal coliform.

Abou-Elela of the National Research Center (NRC) led a team in 1991 in a study of water quality of a 5-km reach of the Rosetta Branch of the Nile River downstream from Kafr El-Zayat. This very comprehensive study measured and characterized the water's physico-chemical character and the phytoplanktonic structure of the water monthly for seven months. By doing so, the team was able to compare the general health of the stream and its planktonic communities with the instantaneous biological and chemical constituents contributed by industrial and agricultural discharges. Key findings were:

- The discharges of two industrial plants (one salt & soda and one superphosphate) affected water quality for a distance of a few hundred meters before mixing led to dilution and apparent recovery.

- The high diversity of phytoplankton indicated that the river is relatively oligotropic, not eutrophic or in a deteriorated condition;

- Coliform counts increased one to two orders of magnitude at the point of industrial discharges, but a check of the counts indicated they were not fecal.

- Concentrations of organic pesticides and PCB's, already high in the Rosetta Branch, increase at the point of inflow of the Tala Drain. The high background level of pesticides in the Rosetta Branch is attributable upstream drain discharges and the high concentrations in the groundwater, which is reported to contribute 50 percent of the flow of the Rosetta Branch (Abou-Elela, p 17, 1991).

- The high pesticide levels probably adversely affected the quality of the water diverted just downstream from the industrial sites through to the Monofer water treatment plant intake site.

The investigators concluded that in this reach of the Nile River water is of high quality, except immediately below industrial outfalls, and with the possible exception of pesticides. El-Gohary et al. found in 1982 and Sheta and Badr found in 1985 that the discharges of industrial waters at Helwan severely affected algal counts and water quality o

the Nile River with recovery only by the time flows reached Cairo. The adverse impact on phytoplankton diversity was attributable to significantly lower dilution.

Extrapolation of the experience along these two reaches of the river indicates that continued growth of Egypt's industrial establishment will result in severe near-term degradation of the mainstem Nile's water quality. Subsequently, public health and agriculture will suffer — as is the case now along smaller canals and in the lake regions at the lower end of the system. In these areas, dilution no longer alleviates pollution. The river's assimilative capacity was overwhelmed long ago by very large, direct discharges of highly polluted waste streams.

Pollution of canals results from the discharge of industrial and domestic wastes from bankside habitations and the estimated 12 milliard m^3 of drain water pumped annually into the canals for reuse. MOI studies indicated that about 85 percent of drain water is reused. This water comprises about one-third of the irrigation water supply. Drain water quality may be summarized in brief as follows:

Exhibit 8: Drain Water Quality

Drains	NO_3,mg/1	**BOD,mg/1**	**Coliform MNP**
Eastern Delta (4 drains)	31-45	50-160	$11\text{-}24 \times 10^6$
Middle Delta (5 drains)	11-30	50	24×10^6
Western Delta (7 drains)	11-32	30-85	$15\text{-}43 \times 10^6$

Basin Salt Balance. About 16 milliard m^3 of drainage is discharged annually to the lakes and the Mediterranean Sea. The TDS concentration of the drainage water reportedly averages 1,400 ppm, which should be adequate to maintain the basin balance between salt entering the basin largely at Aswan and that being discharged (ESG,1989,p69).

Lakes. Egypt's eight major lakes are important habitats for fish, birds and migratory waterfowl. The lakes are at risk from various degrees of pollution from surface runoff from nearby areas, untreated wastewater, and irrigation drainage. However, no comprehensive water quality estimates are available for the lakes.

The largest lake in the Delta, Lake Manzala, located between the Nile River Damietta branch and the Suez Canal, receives wastewater discharged from the Bahr El Baqar, El Sirw, and Hadous drains. The high nutrient content of the wastewater discharges has led to the disappearance of several species of fish. However the surviving fish species constitute a strong commercial fishery. Runoff from nearby land reclamation projects has reduced the area of the lake by about 50 percent over the past two decades.

Lake Maryut, located south of Alexandria, is biologically dead as a result of heavy discharge of Alexandria industrial and sewage wastewater, and agricultural drainage water

from the western bank of the Nile. Most of the natural fish population has been killed. Large fish kills have been reported in areas pesticide concentrations are heavy.

Lake Idku, situated east of Alexandria, is an important commercial shrimp fishery and bird habitat. The fishery is sustained by brackish water from the adjoining Abu Qir Bay. Although the lake is a highly productive fishery, it is being damaged by agricultural drainage water and industrial wastes dumped into Abu Qir Bay.

Lake Burullus, the last of the delta lakes, is located midway between the Damietta (east) and Rosetta (west) Branches of the Nile. Its shallow and brackish waters are an important winter sanctuary for birds.

Lake Qarum, located in Fayoum in the western desert, is used mainly as a reservoir for drainage water from the Nile. The water is very saline, but still supports a few fish species. The lake is a major habitat for water birds.

Lake Nasser, behind the Aswan Dam, is one of the world's largest artificial lakes. It provides flood protection for the lower Nile, irrigation water for all of Egypt's agriculture, and about one-third of the country's electricity. The lake covers about 5,000 km^2 and supports an important commercial fishery.

In northern Sinai, Lake El Malaha borders the Suez Canal and Lake Bardawil is located west of Al Arish. Both lakes are very saline and shallow, but support commercial fishing. El Malaha is an important habitat for local and migrating aquatic birds, while Bardawil is becoming a popular bird hunting site.

Air. Several site studies have been conducted in which air quality was assessed for specific locales. For example, lead content at various locations in the greater Cairo area has been determined periodically and compared with international guidelines. For example, a 1979 study measured 3-hour concentrations at the street level ranging between 2.8 and 12.5 ug/m^3, compared with a World Health Organization (WHO)-recommended maximum of 8 ug/m^3. A 1983 study determined annual lead concentrations in Cairo at the roof level to range between 2 and 5 ug/m^3; the U.S. standard is 1.5 ug/m^3. Similar studies have been carried out for smoke, TSP, carbon monoxide, sulphur dioxide, nitrogen dioxide, photochemical oxidants, and dust fall. Exhibit 9, on the following page, summarizes the findings of these studies.

The notable aspect of the data in this table is that the air quality in Greater Cairo falls significantly below established health standards for each pollutant, and total suspended particles in Alexandria are much worse than WHO standards.

These air quality data merely indicate the nature of the problem. Monitoring data have not been collected systematically for any pollutants. The intense concentration of industry in the greater Cairo and Alexandria areas, compounded by the large number of motor vehicles in these cities, suggests that the air quality data presented almost certainly

Exhibit 9: Air Quality Results; Annual, ug/m³, 1988, unless specified

LOCATION	SMOKE	TSP	DUST (g/m²/mo)	SO_2 (ppm)	PHOTO (ppm/hr)
Cairo/ctr.	139	704	54(83)	.01(79)	.14(90)
Cairo/res.	70	602	–	.04	.21(90)
Cairo/res., commercial	130	591	–	–	–
Helwan Industrial	61	838	100	.04	.10(90)
Sh. Elkemia Industrial	123	–	57	.06	.18(90)
Alexandria: res./comm.	33	446	–	–	–
Alex: Wadi Elkamar Industrial	25	1,061	–	–	–
WHO std.	40	90	–	.02	.06
Egyptian std.	–	–	7(r)14(ind)	–	–

understate the existing problem, and that the problem will worsen significantly as additional development occurs.

Land. The Egyptian environmental master plan includes an overview of the types of hazardous waste generated by Egyptian industries. Because no waste generation and management data are available, the investigators could only identify those wastes generated in facilities similar to those of other countries, and the analysis was descriptive, not quantitative. The overview is a useful, if rudimentary, first effort, to summarize problems that may exist. The authors indicate that no waste management programs have been undertaken.

5. Risk Assessment

The following subsections analyze the above environmental monitoring to determine the relative potential environmental damage from major types of pollution. This analysis demonstrates the need for a risk assessment framework to realistically prioritize pollution control interventions. It also shows that although pollution control is critical to any environmental management program, other elements such as monitoring, legislative and regulatory analysis, education, and appropriate environmental policy instruments are equally important to any national environmental strategy.

a. The Risk Assessment Framework

The environmental risk assessment framework that has evolved from

U.S. experience over the last two decades has become a critical tool in any effective environmental management program. This framework involves applications of risk ranking and risk assessment methodologies to demonstrate physical and economic costs of environmental damage, and prioritize alternative pollution abatement options. The following sub-sections summarize these methodologies and demonstrate to employ them to improve Egyptian environmental management.

Risk Ranking. To effectively allocate scarce resources (money, personnel, time) toward alleviation of significant environmental problems, it is necessary to rank those problems according to the nature and magnitude of their detrimental effects. This ranking process is risk analysis.

Three types of risks must be considered: human health risks, ecological risks, and social and economic effects.

Human health risks involve actual or estimated cases of human disease or injury caused by anthropogenic environmental problems. Ecological risks involve actual, estimated, or anticipated damages to the structure and function of natural ecosystems and their components. Social and economic effects address losses in the social and economic quality of human life caused by environmental problems, such as increased maintenance cost of paint and reduced recreational use of water bodies.

Risk analysis involves four steps: identify all significant environmental problems; characterize each problem in terms of the detrimental effects; estimate the magnitude of damages associated with each environmental effect; and rank the environmental problems on the basis of the damage estimates.

In the first step, it is important to identify both existing environmental problems and potential future problems. The second step involves identifying the environmental effects associated with each problem, such as cancers and related deaths, pulmonary-related illnesses and deaths, and trees blighted.

In the third step, quantitative damages are estimated for the magnitude and associated costs of each environmental effect identified in Step 2. Examples would be number of cancers and associated cancers, number of pulmonary-related illnesses and deaths, number of trees blighted, increase in health care costs, lost wages, value of lost timber or tourism.

The fourth step requires the ranking of environmental problems according to the damage estimates established in Step 3. This step typically involves judgmental decisions because different types of costs often are involved, e.g., are 10 cancer-related deaths equivalent to one million blighted trees? For this reason, the ranking process may be limited to assigning the problems to risk-level groups, such as high, medium, and low risk.

Risk analysis in developing countries such as Egypt usually more limited than analyses conducted in the United States. This occurs because data of sufficient quality are seldom available for characterizing the environmental problems. Consequently, estimates

must be made by extrapolating from data for comparable situations in the United States or other developed countries.

Egypt lacks continuous, systematic monitoring data; however, the country's scientific community has made a useful first effort to use available data to estimate environmental damage for the Egyptian environmental master plan. Because the plan will be used to solicit aid from donor countries, risks have not been ranked. However, the Egyptians' damage estimates provide a useful context for assessing the significance of projects USAID may consider undertaking.

Risk Sequence. When selecting among projects to address existing or potential environmental problems, it is important to consider the risk sequence associated with each problem. Each environmental problem can be viewed as the outcome of the six-step sequence depicted in Exhibit 10. Viewing the problem within the context of the risk sequence is important because the appropriate remedy changes at each point of the sequence.

Ideally, projects should focus on the step in the risk sequence at which greatest payoff can be achieved for the least cost. In nearly all cases, cost efficiency decreases as one moves long the risk sequence.

In addition, the mission may prefer to undertake some types of projects and to refrain from undertaking others. In this case, the risk sequence can help determine at which step such projects will be most useful.

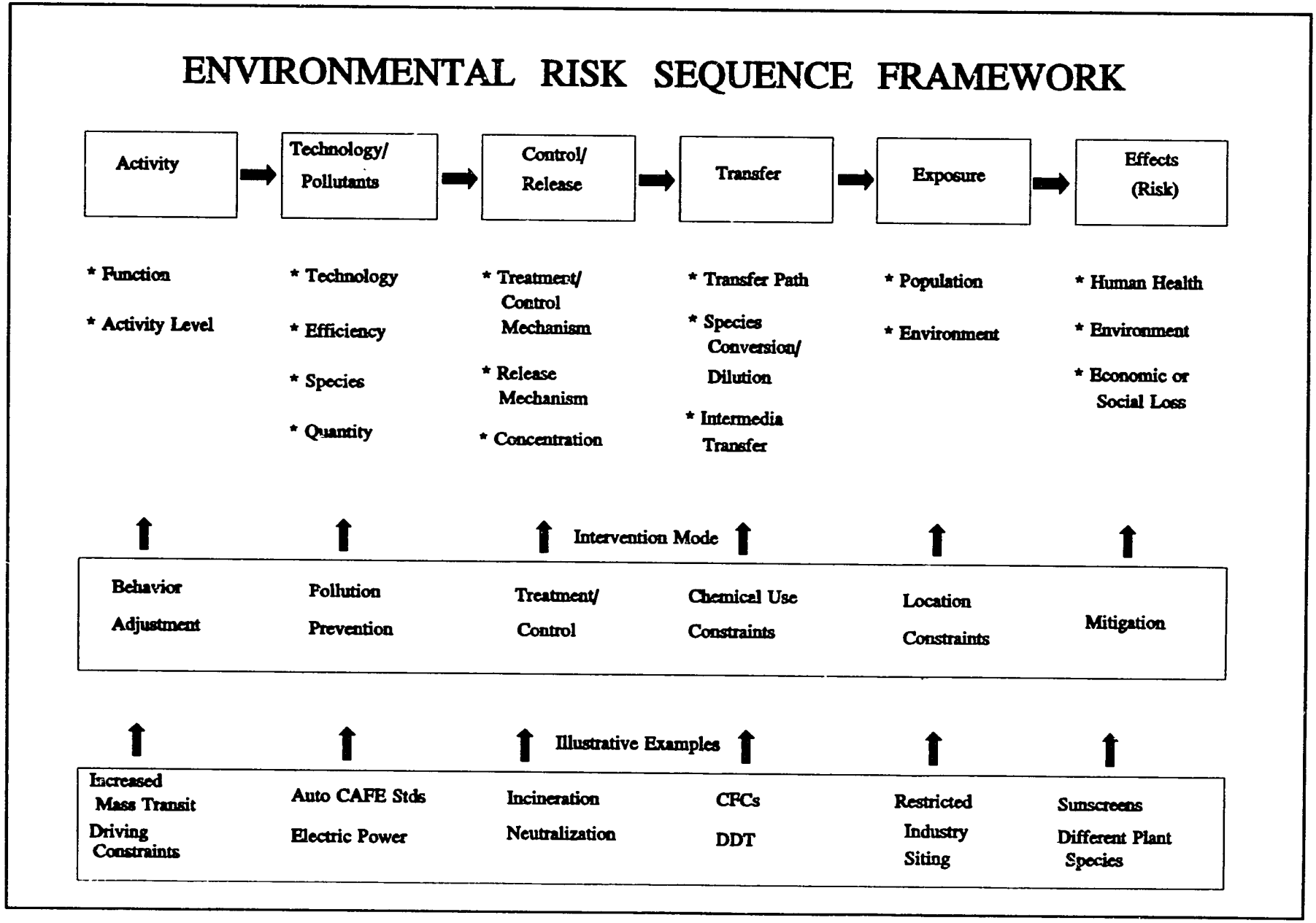
The activity of transporting people can be used to illustrate the six steps of the risk sequence (Exhibit 11).

The first step in the risk sequence (Step 1) is the activity being undertaken, which in this case is people transport. The activity level is measured in people-kilometers. The activity mode can be individual or mass transport via land, air, or water. The choice of activity mode is important. For example, comparing mass transit using buses with private automobile transit, the former achieves more people-kilometers with less pollution than the latter because of the equipment characteristics, even though the two may employ the same technology.

Several technologies can be employed (Step 2), including automobiles, buses, rail, or water transport. In each case, the engine used to provide motive power can vary. Alternatives include internal combustion engines using gasoline, diesel fuel, natural gas, or LPG as fuel; electric power; coal boilers; or sail. The pollutants generated vary by species and quantity with the technology and fuel used and with the efficiency at which the technology is applied. Efficiency varies with the intrinsic characteristics of the technology, quality of equipment, and level of maintenance.

Once the pollutants have been generated, the goal becomes to capture, treat, and dispose of them before they are released (Step 3). In the internal combustion engine case, treatment can be accomplished by use of catalytic convertors, which convert fuel components

EXHIBIT 10


ENVIRONMENTAL RISK SEQUENCE FRAMEWORK
Activity
Technology/ Pollutants
Control/ Release
Transfer
Exposure
Effects (Risk)
* Function
* Activity Level
* Technology
* Efficiency
* Species
* Quantity
* Treatment/ Control Mechanism
* Release Mechanism
* Concentration
* Transfer Path
* Species Conversion/ Dilution
* Intermedia Transfer
* Population
* Environment
* Human Health
* Environment
* Economic or Social Loss
Intervention Mode
Behavior Adjustment
Pollution Prevention
Treatment/ Control
Chemical Use Constraints
Location Constraints
Mitigation
Illustrative Examples
Increased Mass Transit
Driving Constraints
Auto CAFE Stds
Electric Power
Incineration
Neutralization
CFCs
DDT
Restricted Industry Siting
Sunscreens
Different Plant Species

in engine exhaust. In the case of chemical plants, treatment includes waste water treatment, neutralization of acidic waste streams, incineration of organic wastes, and other technologies.

Once the pollutants are released, they are transferred through the environment (Step 4) until they reach their final repository. In the case of air releases, pollutants are chemically converted over time, deposited on land, added to the atmospheric level of that material (*e.g.*, carbon dioxide), or they migrate to the stratosphere (chlorofluorocarbons). Emissions from vehicles include nitrogen oxides that contribute to ozone formation, volatile organic compounds (VOCs) that contribute to smog formation, and lead that is land deposited. The transfer path for air releases is affected by terrain and meteorological conditions.

During the transfer process, people and the environment may be exposed to the released pollutants or their conversion products (Step 5). In the case of airborne vehicle pollutants, the extent of exposure depends upon population location and density and the location of sensitive ecosystems.

Finally, the amount of damage (Step 6) attributable to this exposure depends upon the pollutant species characteristics, intensity and extent of exposure, and characteristics of the receptor, i.e., child, elderly, pregnant, or fragile ecosystem.

The risks associated with a given sequence result from the behavioral characteristics defined in the preceding steps. Thus, in the automobile exhaust example, the effects (damages) depend not only on the receptor characteristics (Step 6), but also on population and sensitive ecosystem locations (Step 5); transfer path characteristics (Step 4); whether a catalytic converter was employed as a control mechanism (Step 3); the type and efficiency of the engine and the type of fuel employed (Step 2); and the extent to which mass transit or private vehicles are employed (Step 1).

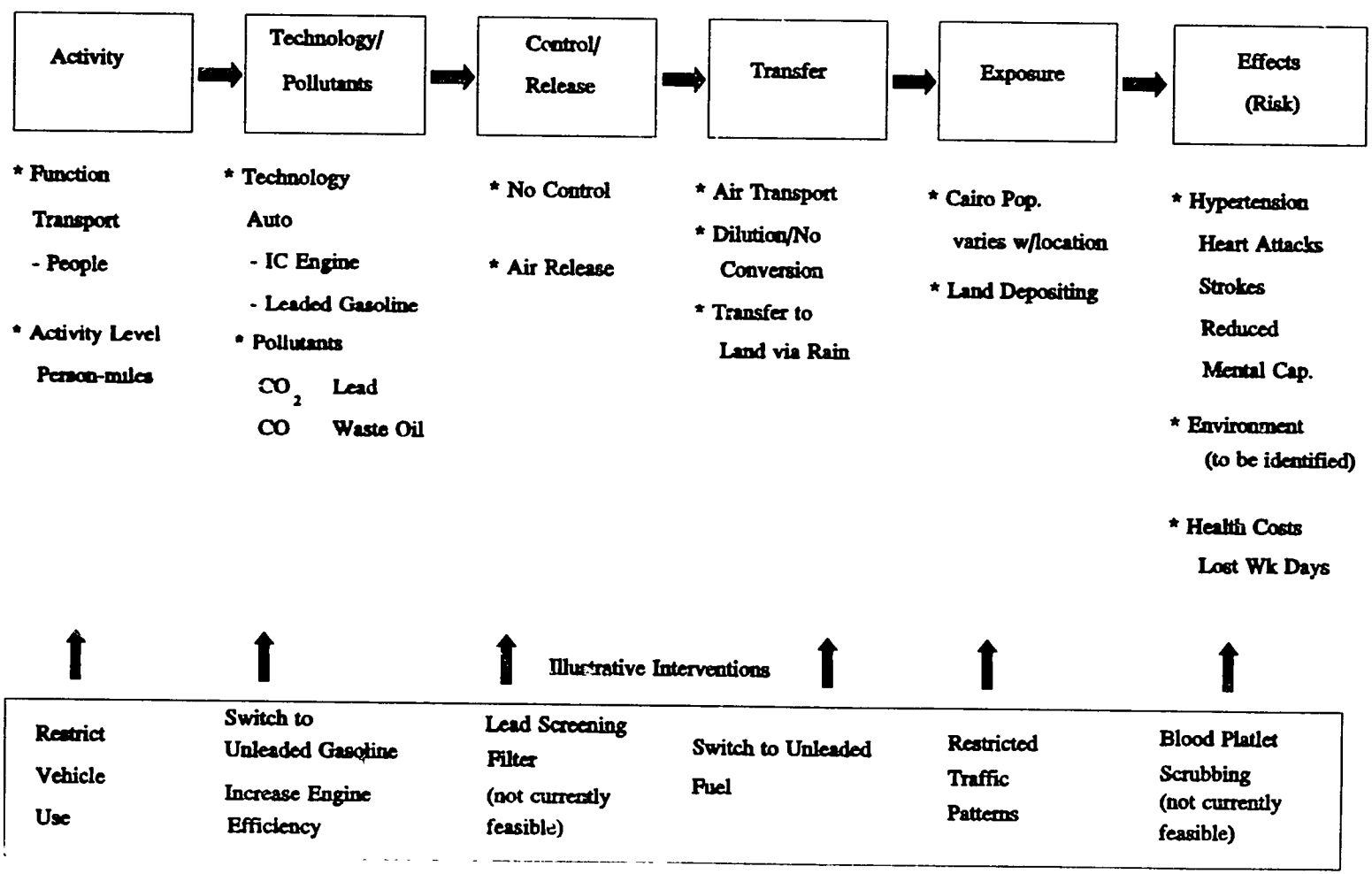
In nearly all cases it is less costly to address environmental problems at the earlier steps of the risk sequence (Exhibit 10). Activity modes can be adjusted by behavior modification, e.g., increasing the use of mass transit. Technology can be dealt with by pollution prevention actions, which include source reduction and recycling, recovery, and reuse. Source reduction means elimination of pollution at the source, i.e., before it is generated. In the people transport case, significant source reduction could be achieved by switching to electric power, using natural gas fuel, using unleaded fuel, or adequately maintaining the vehicle fleet.

Once the pollutants are generated, they can be controlled to some extent in the gasoline engine example by use of catalytic converters. However, such an approach does not deal with lead compounds, nitrogen oxides, or carbon dioxide generation. In dealing with a given level of pollutant release, transfer path and exposure can be affected by locating the road system away from population centers (or vice versa).

EXHIBIT 11

RISK SEQUENCE: ILLUSTRATIVE EXAMPLE

(LEAD EMMISSIONS IN CAIRO ASSOCIATED WITH VEHICULAR TRAFFIC)



Once exposure occurs, it is possible only to mitigate the potential effects. For example, sensitive populations can be kept indoors during high ozone concentration periods (although this has been found to be of limited benefit).

Based upon the foregoing description of the sequence, USAID can be most cost-effective by focusing on the first two steps of the process. The third step of the sequence is a less cost-effective alternative. This is because control methods, often termed end-of-the-pipe treatment, inevitably cost money, while pollution prevention actions often pay for themselves or even return a profit. This attribute is especially valuable in situations where limited pricing flexibility is available, as is the case in much of Egypt's public industry sector.

The latter three risk steps are difficult to affect, and generally fall within the province of Egypt's internal planning process. USAID might, however, provide expertise to strengthen the Egyptian planning process.

Subsequent subsections use the risk sequence perspective as a framework for assessing the current availability of environmental risk information and identifying USAID environmental project opportunities in Egypt.

b. Damage Assessment

Water. Documentation of damages to and by water in the agricultural, public health, and natural resources areas is quantitative, qualitative, and inferred. Specific damages may be summarized as follows:

- Groundwater of the Nile Valley and in the Delta presents both a health hazard and could be somewhat detrimental to agriculture.

- Eight percent of the deep groundwater is too saline for application to crops and could adversely affect the health of those drinking it.

- DDT+DDD exceeds the guideline value of 1 mg/l in three of eight deep wells monitored during the IWACO/RIGW groundwater monitoring campaign.

- Nitrate levels in shallow groundwater pumped for drinking in rural areas averages above the guideline value of 45 mg/l. This groundwater is the source for one-third of Egypt's rural populace. The shallow groundwater also is subject to human and other agricultural pollutants. There is little doubt that infant mortality results from this pollution; in addition, some adult diseases also result from nitrate pollution of drinking water.

- Pesticide levels significantly exceed guideline values for drinking water in the two branches of the Nile river downstream from the Nile Barrages, but the health consequences are not known.

- Some 8 milliard m^3 of drain water could be reused for irrigation and still maintain a favorable basin salt balance. However, Samie (UNEP, 1992, p. 94) reports that an average of only 3.4 milliard m^3 of drain water was reused in recent years. The failure to use the additional 4 to 5 milliard m^3 of agricultural water means a 10 to 12 percent loss of irrigated agricultural lands irrigated.

Air. Estimates of the damages attributable to air quality contaminants were made as part of the ongoing development of an Egyptian environmental master plan. The National Research Center study estimated human health damage that may result from excess concentrations of sulphur dioxide and particulates.

The analysis indicated that nearly 30 percent of the population of Helwan and Shoubra near Cairo have incurred illnesses related to these two pollutants; the resulting number of respiratory patients is 66,746 in Helwan and 84,666 in Shoubra. In addition, 28 air-pollution-induced deaths are believed to have occurred in the Helwan/Maadi area.

Comparable calculations were not carried out regarding the damages associated with the other pollutants, but the types of damages associated with each pollutant were identified. In addition, the types of air-pollution-related damages to soil and vegetation and to materials and buildings were described.

Land. Damages that could result from mismanagement of Egyptian municipal solid waste were descriptively characterized. Related diseases identified include diarrhea, typhoid, paratyphoid, poliomyelitis, and infectious hepatitis.

Reliable data have not been gathered to determine whether Egyptian municipal solid waste handling and disposal has caused the transmission of these diseases. The investigators posit that at present levels of activity only waste management personnel and their families would be affected. The investigators also conclude that the present municipal waste management system has not adversely affected Egyptian tourism.

Because of an almost total lack of data on industrial hazardous waste generation and management, damage assessments have not been conducted.

c. Economic Costs

Water. If Egypt experiences a 12 percent loss of agricultural output because drainage water is contaminated by industrial and untreated municipal wastewater, the economic loss is two-fold: a GDP loss of US$ 720 million (1989), and a 25 percent addition to the balance of payments deficit. The latter is attributable to increased agricultural imports because Egypt imports about half of its food and agricultural supply.

The fishery in Lake Maryut has disappeared for commercial purposes; production fell 80 percent in the past 10 years. DDT, DDD, and Lindane have been measured in high concentrations in the lake. Other coastal and inland lakes have not suffered as fully as has Lake Maryut, but declines reportedly are occurring.

Estimates of national economic costs of health losses from water pollution are not available. However, the income loss factor is known and could be applied if health-related labor losses from water pollution were known.

If each citizen is assumed to earn the 1989 per capita income (GNP) of $640, one person-year of water pollution-related illness or loss of expected life is worth $640 (plus the medical costs associated with illness). Waterborne illnesses such as diarrhea, hepatitis, and typhoid currently pose a serious health threat. Estimates of the person-years of non-productive time lost due to these illnesses could then be costed at $640 per person-year.

Air. Two types of health-related economic costs have been estimated with air pollution damages: the costs of morbidity, and the costs of mortality.

The economic costs of morbidity include medical treatment costs, and loss of wages and production. Medical treatment costs were estimated for three groups. Residents in Helwan incurred LE 56 million in costs; residents in Shoubra incurred LE 71 million; and policemen and drivers in Greater Cairo incurred LE 13 million. Thus, the total medical costs for these three groups is LE 140 million. The loss of wages and of production for the three groups are estimated to be: LE 5.9 million, 7.4 million, and 4.1 million. The total for the three groups is 17.4 million.

The cost of air pollution deaths in the Helwan/Maadi area is estimated to be LE 4.4 million. The total of all these costs is LE 161.8 million, mainly due to increased medical costs.

In addition, air pollution incurs economic costs attributable to material damages. In greater Cairo, the economic losses are an estimated LE 795 million annually, plus the losses in antiques, monuments, and the number of tourist nights. Thus, material costs are largest among the costs estimated, which altogether total LE 956 million.

These costs are very approximate and apply to only a few geographic areas, albeit significantly polluted areas.

Land. Damages that could result from mismanagement of Egyptian municipal solid waste were descriptively characterized. Identified diseases include: diarrhea, typhoid, paratyphoid, poliomyelitis, and infectious hepatitis. Reliable data have not yet been gathered to determine whether municipal solid waste handling and disposal has resulted in transmission of these diseases. The investigators posit that at present levels of activity only waste management personnel and their families would be affected, and also conclude that the present system has not adversely affected Egyptian tourism.

Because of an almost total lack of data on industrial hazardous waste generation and management, damage assessments have not been conducted.

d. Risk Analysis

Water. A crude value of risk or damage costs can be derived by assigning a probability that, for example, increments of the drain water now being reused for irrigation will be degraded beyond reuse at a rate of perhaps 1 milliard m^3/ decade in the absence of effective wastewater and industrial effluent treatment programs. The probability is multiplied by the damage value (lost agricultural production for each decade) increment and summed.

Conversely, as municipal wastewater plants come on-line in Cairo, and if the effluent is discharged separately from agricultural drains or can be returned safely to the river or to irrigation canals, the risk/damage cost is reduced.

For the public health aspect, loss can be derived as lives or productive capacity lost; if necessary, a monetary value can be assigned.

Estimates of damages attributable to water misuse and pollution of receiving indicate that the benefits of polluting, i.e. discharge of untreated industrial and domestic wastes to streams, are far less than the costs of either treating or eliminating present pollution and preventing and controlling future potential pollution.

Air. Although an initial start has been made at estimating the damages and economic costs of air pollution, available data fall far short of characterizing the present level or future extent of air pollution as further development takes place. For this reason, it is not possible to establish more than an approximate ranking of risks. Although even this semi-quantitative analysis would be valuable, the necessary data have not been assembled. The work done as part of the Egyptian environmental master plan process merely illustrates the type of analysis needed, and the authors have used their own experience to identify what they judge (with reasonable justification) to be the highest priority areas.

Land. The almost total lack of data on hazardous waste generation and management in Egypt prevents risk analyses from being conducted.

6. The Overall Environmental Threat to Egypt's Natural Resource Base

Any effort to strengthen Egypt's environmental management program should begin with an assessment of the natural resource base to prioritize the magnitude of environmental risks. The following sections give special consideration to coastal and marine resource and biodiversity issues. Finally, the PRIDE team has ranked natural resources according to its perceptions of environmental risks.

a. The Importance of Coastal and Marine Resources

The above analysis has concentrated on environmental damage to water, air, and land resources. Coastal and marine resources were not addressed because most of the population is more directly affected by water, air, and (habitable) land resource

pollution problems. However, coastal and marine resources also have important environmental problems.

The coastal fisheries are an important source of income and employment, and the coastal areas and coral reefs are growing sources of tourist income. Increased pollution of marine and coastal resources by untreated waste water and irrigation drainage clearly poses a growing threat to fisheries and coral reefs. Moreover, rapid tourism development along the coastal areas poses a growing threat from untreated sewage and runoff from land development.

Although the environmental threat to coastal and marine resources is clearly suggested by the increased pollution of the Nile and the growing coastal tourist industry, the levels of pollution and the associated physical and economic damage are far more difficult to assess.

b. Monitoring Critical Biodiversity Thresholds in the Environment

Because protection of biodiversity is a complex issue that cuts across all other natural resource bases, the implications of biodiversity for USAID's environmental strategy are presented in the section below, rather than with the above analysis of environmental quality across water, air, and land resources.

Development activities and projects in Egypt in this century—particularly over the past 30 years—have resulted in the extinction or endangerment of a number of plants, birds, animals and other species. In many cases, declines in populations of native plants and animals can be traced directly to human interventions relating to land, air and water. For example, the construction of the Aswan High Dam led to changes in such drastic changes in wildlife ecology that studies are still being conducted to identify them.

USAID, as a partner in development in agriculture, industry, and tourism, plays a major role in Egyptian projects affecting environmental quality. Although the need to document the biodiversity of Egypt and its evolution over time is important, it is a long-term activity that requires substantial training and resources. However, because the mission engages in activities which directly affect the environment, it at least must consider how it affects critical areas of biodiversity such as endangered birds and animals, and vanishing plant species. These requirements are clearly set forward in USAID Environmental Procedures.

Because the United States is a world leader in the area of understanding and preventing loss of protected species and biota, it can contribute in at least four ways to protecting biodiversity through its project activities. The first two areas represent current requirements carried out for each project. The second two represent areas of opportunity to enhance the beneficial impacts of the first two areas at minimal cost. The four areas are:

- Considering potential effects on endangered species and critical biota of proposed project activities;

- Studying both direct and indirect effects of project activities on those endangered species and biota;

- Using public awareness experience gained from other projects to increase knowledge of and protection for endangered species.

- Helping Egyptian public and private sector organizations to consider critical and endangered aspects of environmental activities.

Each of the four areas will now be discussed briefly.

Considering Potential Effects. Egypt does not have the database necessary to make detailed quantitative assessments of project impacts. However, sufficient data do exist to identify a number of areas of critical need. This includes a list of endangered birds and wildlife, and identification of certain types of disappearing ecosystems.

Available information can be used to make approximate but vital assessments. These assessments may concern negative and positive impacts of project activities. For example, a well-run wastewater treatment plant may legitimately claim that it helps to protect the wildlife that depend on downstream water. The requirement to consider these effects is presently a part of every project which could potentially affect the environment.

Studying Direct and Indirect Impacts. Lessons learned in the United States show that considering only the direct impacts of proposed project activities is not sufficient. For example, limiting evaluation of a pesticide to its immediate impact on the crop sprayed is inadequate. For this reason, current environmental guidelines mandate that effects of pesticides be considered in terms of threats to applicators plus short-term and long-term dangers to the immediate and surrounding environment.

However, even after this assessment, additional unintended effects often emerge after completion of a project. For example, an unintended effect of the construction of wastewater treatment plants in arid areas of Egypt has been that they attract storks and other wildlife. These birds, weakened from their long migratory flight, have landed in the treatment lagoons and at times have been unable to escape from them. Thus, a subsequent activity of designing methods of discouraging these birds from landing in the settlement ponds was necessary.

Solid waste landfills located in desert areas have attracted a variety of wildlife which then become entrapped in plastics or poisoned by wastes.

Public Awareness Activities. In a country where environmental awareness of endangered species is very limited, even at the decision-making levels, designing a project which protects or enhances survival opportunities is not enough. Along with the enhancement or protecting activities must come sufficient public awareness of what is being protected or preserved to alter traditional destructive tendencies. For example, a lake cleanup project which cleans water to the point at which it could support an endangered bird is of little value if hunters then kill the birds.

Thus, where possible, there would be value in implementing specific awareness and behaviorally-oriented public communication campaigns to complement the specific protection objectives of projects. Such efforts already have succeeded in Egypt.

The cattle egret once was extensively hunted and its tree roosts destroyed. However, following an educational campaign identifying the egret as the "farmer's friend" and listing the beneficial activities of this bird, tree roosts have been saved and the egret population has increased.

Crucial to the success of such programs is the coupling of beneficial project outcomes with opportunities for creative media approaches. NGOs often can help utilize media channels effectively to promote wildlife.

Institutional Capabilities. This is another area in which a small investment in institution-building can result in a significant beneficial and long-term impact on endangered species.

To preserve and enhance Egypt's endangered species over the long term, the institutional awareness and capability by Egypt's public, private, and NGO institutions must be strengthened.

Success lies not in wholesale importation of U.S. procedures to Egypt, but in finding local solutions to these problems. Nevertheless, these projects often offer opportunities for training and institution-building.

During the project development stage, consideration should be given to linking with NGOs, governmental, or private industry groups that have a stake in the environment. For example, fishermen have a stake in a cleaner lake, and can be expected to not only support a cleanup project but serve as an interest group to protect the lake later. The tourism industry has an increasing stake in protection of endangered wildlife and critical habitat such as the coral reefs on the Red Sea. District Societies for Development Policy, elected groups which supervise solid waste disposal activities, have a stake in improving the environment and managing solid waste resources. By educating these groups about likely environmental impacts and recruiting them as stakeholders, project effects are likely to be more positive, more recognized publicly, and long term in benefits.

One way to strengthen NGOs and other organizations is by bringing in U.S. equivalent organizations (tourism organizations, wildlife protection groups, etc.). A second method is to recruit university researchers and teachers for study of endangered species in the affected areas, thus ensuring their interest in subsequent developments in the area.

A Recommended Role for Biodiversity in the USAID Program. These recommendations build upon the letter and spirit of current USAID requirements concerning the area of biodiversity. They focus on the area of most critical need: endangered species and critical habitat. They also increase public awareness and recognition, and enhance the ability of local stakeholders to maintain benefits generated by project activities.

The specific public awareness activities and institution-building recommended here could be introduced into a project in a variety of ways. If the mission portfolio contains a public awareness project related to the environment or an institutional strengthening project, biodiversity specialists could help coordinate and implement these activities. Outside NGOs and consultants could also be useful, following the model of WEC, which is called in to help individual industries develop environmentally safe procedures.

As protection of endangered species is viewed less as a mandatory requirement and more as an opportunity to enhance the environment, more specific outcome assessment measurements can be designed. Public awareness of specific wildlife benefits and methods of protection can be assessed, as can activities of stakeholders in supporting environmentally sound activities during and after the project.

c. Priority Ranking

The analysis of the available information on environmental risks across Egypt's four major natural resource sectors suggests that environmental damage is occurring in the following order of decreasing importance: water, air, coastal and marine resources, and land.

7. Technology Acquisition

Technology often plays a major but secondary role in key economic and social sectors in a developing country. This appears to be the case with the relationship between technology and the environment in Egypt. The development, protection, and use of environmental resources in Egypt is mostly under government control; however, environmental needs often lose out to expediency or the perceived need to acquiesce to progress or development. Environmental damage resulting from development or resource exploitation is considered acceptable or reversible by the application of appropriate technology.

In Egypt, the actual consideration and use of technology to prevent, mitigate, or reverse environmental impacts of development actions is in its infancy. There are some basic local and national pollution prevention and control programs, but this approach is not widespread throughout the economy or political systems. For example, approximately 4,000 villages have no wastewater collection or treatment. Although there are major initiatives to introduce and expand the coverage of large municipal sewerage systems, such services are not available to over 50 percent of Egypt's population.

Although until now there appears to have been neither sufficient will nor interest to consider or use environmentally appropriate technologies in any meaningful way in the past, real opportunities exist to establish an environmental consciousness and programs to redress past bad practices and prevent future problems.

The base for an environmental services sector in Egypt has already been created. A substantial construction industry and a growing scientific and engineering consulting practice, both private and public, as well as training and public awareness capabilities are available in many forms. Research and development efforts targeted at technology alteration have been successful in many industries in the past. Although little such adaption currently is underway in environmental technology area, funding, support, and demand could prompt the economy and institutions to contribute to technology adoption and transfer.

The foundation to research, study, adapt, design, procure, install, operate and maintain environmentally appropriate technologies exists. What is needed is a major upgrading of and additions to the existing capability in some areas. If the existing foundation is to become a viable environmental services and equipment supply industry, there must be a sustainable and growing market for the services.

a. Egypt's Industrial and Commercial Base for Technology Supply

Egypt has an established industrial base which includes iron, steel, aluminum, heavy engineering, cement, and yarn (cotton) production. Almost all of this is owned by the public sector; approximately 70 percent of the value added by industry is from 200 public sector firms.

There are over 250,000 private sector firms, more than 97 percent of which employ less than 50 people. Garment, food products, leather products, cosmetics, wooden furniture and fabricated metal products are the major areas of private sector manufacturing.

About 75 percent of private firms are located in Cairo and Alexandria while large public sector firms are more evenly distributed around the country.

The level of technology in the society varies widely, but labor is still a major element of value added. Egypt is slowly finding ways to introduce new technology and substitute technology for labor.

Public sector industry generally uses using older, less productive, and less efficient technology. However, parts of the small but emerging private sector are making major strides in technology use and adaptation. A major government initiative to privatize selected public sector industries should lead to technology enhancement in these industries as well.

The privatization initiative also has targeted several major government-owned architectural and engineering consulting firms. The government is altering its currency exchange and import policies and practices to encourage this transition to privatization and technology modernization in the economy. Local industry, though temporarily stymied by the lack of local capital, leads the way in the use, introduction and adaption of advanced and modern technology.

In addition to privatization, Egypt's private sector is growing under its own power. There are many agents, representatives and even joint-venture companies. Pollution control

equipment apparently are available to handle air, land and water pollution problems through importation and assembly. Two principal limitations to expansion of this sector are the small size of the current market for services and equipment and a short supply of local financing for expanding existing or creating new ventures and arrangements.

In some cases potential markets of substantial magnitude already exist for environmental services and equipment. In tourism development projects and the creation of major industrial cities (10th of Ramadan, 6th of October and 10 other cities) there could be a major demand for a wide range of environmental services and equipment. A number of actions by government, the private sector and donors must take place to convert this potential to a real market. However, this conversion is under way, and the timing of these necessary actions will determine how rapidly the market is created.

Much remains to be done before the country has access to and widely employs modern and appropriate pollution prevention and control technology. The government is beginning to realize that Egypt's current environmental exploitation cannot continue. However, without permitting, monitoring, and enforcement this realization will not be translated into pollution prevention and control and environmentally sensitive development.

A combination of planning, monitoring, enforcement, and appropriate technology application is being considered as an alternative to unrestrained exploitation of the country's resources. This beginning, together with the existence of potentially large markets, provide a unique opportunity to establish the infrastructure and incentives necessary for the widespread development and use of locally assembled and manufactured pollution prevention, treatment, and disposal technologies.

b. Pollution Control Technology

Environmentally appropriate, pollution controlling or preventing and waste disposal technology is not manufactured or assembled in Egypt, except for a few selected applications. There are financial, institutional, business\market, and legal barriers to the creation of the necessary demand to interest both local and foreign manufacturers and suppliers.

National and local governments exercise little regulatory authority to prevent environmental resource misuse or pollution. Import and duty restrictions and fees usually make import for individual applications difficult and uneconomical. Industrial development and labor pool skill levels do not appear to prevent the full manufacture of most of the technology processes and specific equipment required to identify, prevent, control or dispose of environmental contaminants.

These barriers are not unique to environmental and pollution control manufacturing. Many have already been addressed and overcome in order to stimulate the supply and manufacture of technologies for use in other areas.

The supply and use of pollution prevention and treatment technology in Egypt is in a very early stage. USAID has been active in funding end-of-pipe treatment for municipal sewage and some industrial waste, municipal solid waste collection equipment for major cities, studies of aquatic problems and marine wastes, and industrial energy conservation demonstration on a project-by- project basis. USAID has also addressed many municipal service and environmental pollution problems at the local level as a part of the LD-II Project.

Although a substantial amount of effort and money has gone into all of these projects and programs over the years there is still no consolidated or coordinated environmental policy or program for the country. Because of this, technology policy has not been a necessity or priority.

There is little regulatory or economic incentive to manufacture, supply, or apply pollution control processes in Egypt. Municipal waste treatment, where it is practiced (only in the major cities in Egypt) is presently primary treatment involving skimming, sedimentation and sludge drying, and land application. While this prevents entry of a significant amount of pollution into surface waters of the country, direct transfer of non-organic sludge components to land, crops, and groundwater can result.

Municipal sludge currently is used as land fill, soil builder, or land reclamation material for desert land conversion to agricultural uses. Garbage and industrial solid waste handling and disposal is in its infancy. There is almost no hazardous waste management, except in some of the most forward thinking or most visibly polluting industries; air pollution from mobile and stationary sources goes unmeasured and uninterrupted. A lack of knowledge, leadership, enforcement, and incentives coupled with the existence of many other critical short-term social and economic problems make pollution control a low priority.

c. The Technology Problem

As stated throughout this document, environmental awareness and protection is in its infancy in Egypt. There are some appropriate and inventive pollution control and environmental protection projects and programs underway, as well as a growing public, private, and governmental awareness that more must be done. In addition, there are some small pollution control equipment assembly and manufacturing companies.

In the technology area there is only the beginning of awareness and action in Egypt, mostly in municipal wastewater treatment using partial end-of-pipe solutions. However, other approaches to environmental protection and pollution control can be applied. Imported or locally assembled and ultimately manufactured technology appropriate to local strategies is also available.

d. Key Technology Issues for Private Sector Development

The existing industrial and technology supply base, though limited in private sector extent and capability, could provide the environmental protection and pollution control technology Egypt requires. Technology availability, supply infrastructure or

consulting, and educational support are not major causes of the existing environmental problems or reasons for the lack of solutions. Although there are some technological problems—and action needed to ensure that technology can be obtained quickly and economically—Egypt's environmental crises suffer from several more fundamental causes.

Decisions about which approaches and thus technologies are appropriate for Egypt have not been made. Many opportunities still exist to influence the selection, supply, and application of technology to prevent and alleviate the country's pollution problems. However, national leadership, policy, strategy, testing and certification, enforcement, and environmental quality must come before technological decisions are made. The same is true for persuading the public and private sector to commit themselves to joint achievement of environmental goals.

8. Environmental Education

One of the most critical weaknesses of Egypt's environmental management program is the lack of a strong environmental education program. This section discusses the role of public awareness and information and communications programs in an effective environmental education program.

a. Citizens' Awareness

With a few notable exceptions, Egypt is a country with relatively low public awareness of environmental problems. This has occurred because:

- Institutions are not gathering, synthesizing and reporting such information.
- Media are not conducting major investigations of their own concerning environmental problems and solutions (with several exceptions), and few organizations feed the media usable information on this topic.
- Citizens receive little education relating to the environment, and thus are not aware of many environmental problems that affect their health or their environment.

USAID experience with public health campaigns has demonstrated that the media—TV, radio and printed materials—can be used to increase knowledge and change behavior. The cattle egret, once killed, now is considered "the farmer's friend" because of an extensive media campaign pointing out its useful behavior.

b. Capacity for Environmental Information, Education and Communication

Formal Education. Egypt's primary and secondary education system contains a systematic environmental education component only for grades 1-3 (developed as a part of USAID's Basic Education project). Although educators at Ain Shams University

have developed innovative curricula containing environmental concepts for grades 7-9, the Ministry of Education has not approved their use in all school systems.

A second constraint is that most teachers focus their activities on concepts that are included in the semi-annual comprehensive national competence exams. When environmental concepts are presented, teachers often tell students to skip over them because they are not included on the examinations.

A third problem has been coordination between textbook writers and curriculum developers. Material pertaining to the environment that appears in textbooks often has a very different orientation than that intended by curriculum developers. The result has been confusion.

At the university level, no core courses are offered. Specialized coursework in post-graduate environmental studies exists at Ain Shams University and environmental coursework in environmental concepts is integrated into other courses in biology and other areas. A list of public universities offering educational programs or research in environmental areas is presented as part of Annex B.

Non-Formal Education. Several Egyptian universities offer non-credit training courses to retool employees for different work or to improve skills for existing jobs. Ain Shams trains 100 post- graduate students per year in one-year certificate programs and another 600 per year in short-term training courses. Other universities such as Assuit, Cairo, American University/Cairo, and Alexandria University also offer short courses and some academic work in the environmental area.

Technical Information. Several ministries, organizations and universities collect data on the environment, from water quality monitoring over time to episodic studies focusing on a specific area or problem. Although considerable information is collected, it often is not shared outside the collecting organization, or at least is not released to the public. Thus, it is not available as a base for public discussion of environmental issues.

Public Communication. Mass media are widely available in Egypt, and are an important source of information. With the arrival of television and radio, most Egyptians now have access to some media source. Television reaches more than two-thirds of the population, and radio is nearly universal. However, access to print media are limited by relatively high illiteracy rates, especially among women.

Although the amount of environmental information available from the media has been increasing, most of the information provided consists of announcements or features, rather than analytical articles concerning pressing environmental policy problems.

Several USAID studies of Egyptian media campaigns have shown that media can impart specific health and agricultural information and encourage behavioral changes. However, because the media tend to respond to crises and new developments, they cannot work alone to improve public understanding of environmental issues and health concerns.

c. Possible Activities to Increase Environmental Information, Education and Communication Capacity

Focused programs or projects are needed to improve environmental education in Egypt. These activities are classified in terms of formal and non-formal education, public communication, and environmental information databases.

Formal Education and Training. Specialized curricula are needed to strengthen university disciplinary capacities in areas of critical need, such as chemical engineering flow systems, and multidisciplinary approaches which enable cross-sectoral problems to be addressed, such as the effect of industrial and agricultural pollution on human health, or the effects of agricultural deregulation on water and chemical pollution.

General curricula are needed to support development and introduction of environmental principles in courses in the primary, secondary, and university levels. This would include assistance in the design of environmental questions to be used on national assessment exams.

Non-Formal Education and Training. Short courses are needed to support audiences as varied as engineers and religious leaders who need short-term training and upgrading in environmental knowledge and skills. Several Egyptian educational institutions with which USAID has ties are well-positioned to enhance their non-formal educational offerings. Two such institutions are Ain Shams Environmental Studies Institute and the continuing education program at American University/Cairo.

Working through such organizations as EEAA's information unit of EEAA, data-gathering and synthesizing activities can be focused to help policy-makers and decision-makers obtain the best possible picture of the environmental situation and action alternatives.

Public Communication. Segmented approaches are needed to help design environmental alert systems for affected geographic or demographic groups. An example would be a communication system warning when copper sulphates are to be used to clear canal weeds, or a warning system for new mothers who live in high nitrate water areas).

General approaches are needed for communication campaigns such as Egyptian cattle egret campaign, family planning, oral rehydration therapy when local research indicates that an information campaign can have a significant impact. Also needed are efforts to strengthen institutions that provide information to the public concerning the state of the environment (PVOs, NGOs, government information units, etc.), and train media practitioners in basic environmental principles and sources of information.

Information Database Construction and Management. The development of environmental database management systems should consider the following options:

- Improving the quality of data collected on the environment by training personnel in collection, analysis, and data storage procedures.

- Supporting the sharing of data across ministerial and organizational lines for use by interested groups.

- Training in how to access and utilize local and international environmental databases.

9. Perceived Problems

It is clear that environmental pollution is damaging Egypt's natural resource base, and posing serious constraints to future development. Although comprehensive environmental quality monitoring data and risk assessment analyses are not yet available, the spotty evidence available indicates that national pollution problems are, in descending order of priority, associated with the following natural resource media:

- Water
- Air
- Coastal/marine
- Land (solid and hazardous waste)

If USAID/Egypt is to succeed in helping the GOE to improve its environmental management capability, the environmental project or program interventions must reflect a clear linkage between problems and solutions. The choice of environmental problems to be addressed must reflect fundamental constraints that can be solved by USAID assistance. The problems selected as the most critical constraints to improved environmental quality are:

- Significant constraints to Egypt's development,

- Constraints critical to sustainable development which directly impact prospects for economic development or affect the quality of human life, including health impacts and effects on ecological integrity and stability,

- The most urgent environmental problems and constraints to development, where failure to take immediate action will likely result in irreversible damage to the natural resource base and the economy, and

- Problems that the GOE has identified as priorities, and is capable of and committed to addressing.

The environmental problem selection process also must encompass the broad range of issues that extend well beyond the physical conditions surrounding a specific pollution problem. Therefore, in addition to identifying pollution problems according to natural resource media priorities above, critical problems have also been selected according to seven key components of a comprehensive environmental management program: the policy framework; the institutional framework; the environmental monitoring system; the risk assessment system; the environmental technology system; the environmental education system; and private sector environmental problem prevention and solution initiatives.

a. Policy Framework

The GOE's framework for making environmental policy decisions is similar to but far less developed than its economic policy framework. The most critical environmental policy problems are:

Lack of Policy Analysis Framework. Neither the EEAA nor any other GOE agency follows a systematic analytical procedure to evaluate the social costs of current environmental problems and determine the mix of environmental abatement programs that are consistent with sustained economic development.

Lack of Decision-making Information. Even if a policy framework were available, little useful analysis could be performed because Egypt lacks the basic environmental data necessary to support the development of decision-making information. Environmental quality data monitoring is sketchy, and there is no comprehensive survey of environmental quality and risk assessment that is easily accessible to environmental specialists and interested citizens.

Weak Local Empowerment. The current environmental management decision-making process suffers from a lack of constructive citizen contributions to the identification of problems and the development of solutions. The continued exclusion of citizen input to the policy process limits the GOE's capacity to wisely assess environmental policy tradeoffs while promoting sustained national development.

Inappropriate Economic Policies. Despite recent economic reforms, much of Egypt's environmental damage and subsequent economic development losses are attributable to GOE policies that keep prices below market levels, limit market access, and support inefficient parastatals.

b. Institutional Framework

Egypt's environmental institutional setting is heavily biased toward the public sector, where agencies usually have inadequate budgets, insufficiently trained staff, and overlapping and contradictory lines of authority and responsibility for environmental management issues. The most critical institutional problems are:

Ineffective Legislation. Many of Egypt's environmental laws do not allow the administrative flexibility necessary to deal with complex technical issues. Consequently, there is little opportunity for regulatory agencies to develop compliance procedures that satisfy the intent of the laws, yet allow pollution violators to work with the GOE to solve a specific pollution problem.

Ineffective Regulatory System. The general lack of enforcement of most environmental laws has eroded public confidence in the GOE's ability to protect the environment. Equally important, the lack of regulatory enforcement has eliminated the most important source of demand for environmental monitoring and pollution control services.

Ineffective Organizational Structure. The GOE agencies responsible for environmental management generally have organizational structures that do not match required functions with the necessary job descriptions and personnel. Instead, the organizational charts often are designed around the available staff, who usually are not qualified for the required work functions and job descriptions.

Weak GOE Support for Environmental NGOs. Environmental NGOs have made important contributions to improved environmental programs in LDC s around the world by enabling citizens to help governments improve environmental quality. However, GOE registration requirements constitute a major impediment to the utilization of both local and international environmental NGOs.

Limited and Weak Private Sector Participation and Investment in Environmental Protection Services. The existing public manufacturing sector, much of which is targeted for privatization, presently does not give serious attention to pollution prevention and treatment issues. However, Egypt's private sector is in no position to take up the slack.

The country does have the beginnings of a small private sector environmental service industry—primarily architectural and engineering consulting and civil works construction—and some environmental technology adoption, assembly, and importation capability. A program to remove barriers to technology transfer and imports, create incentives, reduce government involvement, and create an aggressive environmental monitoring and enforcement framework will help build a major market for private sector environmental services and equipment.

c. Environmental Monitoring

If Egypt is to develop a systematic approach to incorporating risk analysis into its environmental policy formulation and analysis program, a comprehensive monitoring system will be required. At this time, considerable environmental quality data are collected, but the samples are not drawn to effectively measure all important and changing pollution problems. The more serious monitoring problems are:

Lack of A Comprehensive Data Collection System. Egypt's most comprehensive environmental monitoring system is devoted to water quality. However, even this system does not provide for regular sampling over all critical water pollution points. The MPWWR Water Research Center has the most comprehensive sampling program, but its coverage is biased in favor of irrigation water quality issues. Air, coastal/marine, and solid waste monitoring is far less systematic than the water program.

Inadequate Analysis of Pollutants. Even if sampling plans provided regular coverage of all critical pollution points, there is not enough manpower in the respective laboratories to perform all the analyses necessary for an accurate estimate of the magnitude and nature of a particular pollutant. For example, agricultural pesticides pose a major threat to rural drinking water supplies, but no systematic pesticide analysis is performed on rural water samples.

Inadequate Dissemination of Monitoring Results. The results of the existing monitoring program are not routinely disseminated outside the respective monitoring laboratories. This low level of dissemination has led to two serious environmental management problems. First, many Egyptian scientists consider the quality of current monitoring to be inadequate for performing risk assessments. In addition, because the data are not disseminated widely, independent experts cannot advise the laboratories on improved sampling and analysis procedures. The absence of peer review and public oversight of environmental monitoring erodes professionalism and dedication to scientific excellence.

Second, the routine failure of laboratories to publish and disseminate environmental monitoring results has left all environmental policy interest groups without the benefit of even inadequate pollution estimates. Without this crucial set of data for a particular pollution problem, risk assessment methods cannot be used to estimate environmental damage and social costs, and correlate these damages and costs with alternative pollution abatement and control methods. The public debate on environmental policy then increasingly relies on subjective opinions, not objective description of the true magnitude and nature of a particular environmental problem.

d. Risk Assessment

Over the last two decades, environmental specialists in the United States and Western Europe have refined procedures for relating observed levels of a particular pollutant to physical and economic measures of environmental damage. As the quality of the monitoring data and associated economic and physical damage data improve, the precision of the risk estimates can be refined considerably.

Although such highly refined methods are not needed to develop reasonable estimates of pollution risks, or cost/benefit estimates of pollution control methods, risk assessment nevertheless is one of the most important environmental management tools Egypt can use. The most important risk assessment problems facing Egypt are discussed below.

Lack of a Framework for a Workable Risk Assessment System. No Egyptian environmental management agency routinely employs risk assessment systems. Without the benefit of this analytical tool, the GOE cannot rank pollution problems or establish physical and economic rankings of the costs and benefits of alternative pollution control interventions.

Inadequate Dissemination of Risk Assessment Results. To the extent that isolated risk assessments have been conducted in Egypt, the results have not been disseminated to relevant environmental policy interest groups.

e. Technology Acquisition

The generation and transfer of environmental monitoring and control technology is a critical problem in the development of Egypt's environmental management capability.

Inadequate Regulatory Incentives for New Environmental Technology. Failure to enforce current environmental regulations has greatly weakened private sector incentives to supply environmental monitoring and control technology.

Excessive Domination of Market by Parastatal Monopolies. Continued domination of the market by parastatals exercising monopoly denies most private sector environmental service firms the cost and pricing advantages enjoyed by the parastatals.

Non-Tariff Barriers Against Private Sector Firms. As long as parastatals remain to compete with any private sector firms in environmental service market niches, the private sector firms will suffer considerable disadvantage when attempting to import environmental equipment and technology. The parastatals now dominating much of the market use non-tariff tactics to block and divert business away from private sector firms.

f. Environmental Education

Within Egypt, there is a widespread lack of understanding of the nature and magnitude of environmental problems and solutions. The absence of environmental education is a major constraint with respect to three key areas.

Lack of Understanding of the Environmental Management Framework. There is a general lack of understanding of the basic ingredients and structure of an effective environmental management framework among all levels of all environmental interest groups.

Lack of a Comprehensive Environmental Science Training Program. Although there is a significant foundation of technical manpower in Egypt, most of these scientists and engineers would need substantial training in a comprehensive environmental science program to become effective environmental scientists. There is very little environmental science training capacity in the country's universities. If present environmental laws and regulations were fully enforced, the fledgling environmental science training programs would not be able to respond quickly to a subsequent demand for trained personnel.

Lack of a Comprehensive Public Awareness Program. The public is generally unaware not only of the magnitude of environmental damage already inflicted, but the roles and responsibilities of GOE environmental agencies to prevent and alleviate such damage. No GOE agency has provided leadership in environmental public awareness programs, in part because the government tends to suppress or deflect any public indication of serious environmental problems.

g. Private Sector Environmental Problem Prevention and Solution Initiatives

The private sector can be a major source of cost-effective environmental services, but it suffers from the high risk associated with infant industries.

Lack of a Capability to Encourage and Help Polluters Identify and Solve Environmental Pollution Problems. Because the private sector is weak, and there is very little demand for environmental monitoring and control services, the few engineering and consulting firms interested in environmental services have little access to environmental service technical and marketing information.

Lack of Positive and Successful Examples of Appropriate Pollution Prevention and Control Projects. The infant private sector environmental services industry lacks dynamic role models of successful, sustainable pollution prevention and control projects. Without such role models, there is little confidence to take risks and develop innovative marketing techniques.

Lack of a Robust Private Sector Environment Service Technology Transfer and Manufacturing Sector. The lack of effective enforcement of existing pollution control standards and domination of the private sector by parastatals has reduced the market potential for private sector firms to offer cost-effective transfer and development of appropriate environmental technology.

C. Mission's Competitive Advantage

1. Current Environmental Focus

Although the mission lacks an environmental Division or Office, the Program Development and Support Office has an Environmental Officer. There are approximately seventy-two major grant and loan projects currently underway (as summarized in the 31 December 1991 Quarterly Implementation, PVO and MIS Reports volume Numerical Index to All Projects).

Of these projects, up to 26 percent make significant contributions to preventing deterioration and sustaining or improving environmental quality in Egypt. The direct environmental benefits from these major project activities include:

- Urban and rural pollution elimination and control,
- Strengthening of national and provincial environmental and pollution control institutions,
- Environmental information dissemination and training,
- Development of environmental policy and strategy,
- Installation of energy-efficient and pollution-limiting practices and equipment in private and public sector industries,
- Incorporation of environmental considerations in major economic development initiatives, and
- Decontrolling agricultural prices and privatizing agricultural parastatals.

These benefits have resulted without the existence of a single major mission environmental project.

Clearly, then, the mission project portfolio makes a major beneficial environmental contribution to the country. Individual projects which can be identified as making specific contributions are listed below by Division and Office:

Agricultural Resources Division
- Office of Agriculture Credit and Economics
  - 0202 Agriculture Production and Credit
- Office of Irrigation and Land Development
  - 0132 Irrigation Development Systems
    - R&D funding
    - TA
    - Training
    - Policy and strategy

Development Resources Division
- Office of Engineering
  - 0101.10 Industrial production sub-activities
- Office of Local Administration and Development
  - 0182 LD II Program
- Office of Urban Administration and Development
  - 0100 Alexandria Wastewater Expansion
  - 0161.03 Provincial Cities Development
  - 0173 Cairo Sewerage II
  - 0174 Canal Cities Water & Wastewater II
  - 0176 Water/Wastewater Sector Institutional Support
  - 0193 Cairo Water II
  - 0215 Power Sector Support

Human Resources & Development Cooperation Division
- Office of Education and Training
  - 0118 University Linkages Project
  - 0139 Basic Education (integrated environmental studies textbook, grades 1-3)
- Office of Science & Technology
  - 0140 Science and Technology for Development
  - 0140.01 Science and Technology for Cooperation
  - 0140.02 Schistosomiasis Research
  - 0140.03 Energy Conservation and Efficiency

Trade and Investment Division
- Office of Commodity Management & Trade
  - 0201.01 Private Enterprise Credit
- Office of Finance and Investment
  - 0102.01 Partnership in Development
  - 0201.03 Private Enterprise Credit - Credit Guarantee

There are several other types of contributions and areas related to the environment upon which the mission could focus. The major possible areas which currently receive no substantial attention include:

- Health impacts of environmental use and pollution
- Environmental regulation and enforcement
- Strengthening environmental institutions
- Environmental public awareness
- Environmental business creation and support
- Environmental technology certification
- Environmentally sustainable tourism
- Air pollution prevention
- Hazardous waste management
- Biodiversity and ecosystem management
- Preservation of antiquities

2. Other Donor Resources

Several of the above areas and others which are similar to those being contributed to by USAID are also covered by other donors. The World Bank, African Development Bank, UNDP, various EC donors, Canada, Finland, and Japan are just some of the donors who support Egyptian environmental initiatives.

3. Key Constraints

Egypt's environmental problems are due to three fundamental causes: inappropriate policies, ineffective institutions, and private sector impediments. These problems constrain chances for achievement of the mission's overall environmental objectives.

a. Inappropriate Policies

Egypt's environmental policy process suffers from five major shortcomings:

- The environmental policy process lacks a comprehensive analytical framework that permits widespread access to relevant information, and the consequent participation by all interested parties, for evaluation of economic tradeoffs inherent within environmental policy options.

- Current environmental legislation and regulation is considered inadequate, unrealistic, and unenforceable.

- The policy-making process is fragmented, crisis-oriented, and closed to many interested NGOs and individuals.

- The organizational structure cannot focus on working with many environmental management institutions to solve problems.

- There is insufficient local empowerment to allow widespread participation in the environmental policy formulation and decision-making process.

b. Ineffective Institutions

The primary environmental management institutions have three major shortcomings:

- There is a lack of a systematic and uniform monitoring system for major environmental problems.

- There is no comprehensive methodological approach, such as risk assessment, for identifying problems and establishing priorities for effective preventive and remedial environmental actions.

- There is a low level of awareness of environmental issues and tradeoffs at all levels of society, including decision-makers, directly affected groups, and the public.

c. Private Sector Impediments

The private sector has great potential for solving many of Egypt's environmental problems, but it will not be effective until three important problems are addressed.

- Subsidies, over-regulation, and lack of enforcement of current environmental laws and regulations has stifled economic incentives for private sector contributions to environmental protection.

- Market domination by parastatals operating as monopolies has posed a severe barrier to competition from private sector manufacturing and environmental service firms.

- Government restrictions continue to pose significant international trade barriers for private firms who want to import energy-saving and pollution reduction equipment and technology.

4. Constraints

The mission faces three constraints to achieving any environmental program objective: a severely limited natural resource base, finite mission management resources, and competing offerings from other donors.

a. Limited Natural Resource Base

The country's critical dependence on the Nile River for its water supply has resulted in one of the world's highest population densities. As growing population needs threaten to exceed the fixed available fresh water supply, environmental policies will be constrained.

b. Limited Mission Management Resources

The mission operates one of the largest USAID programs with a proportionally smaller staff. The current reorganization of USAID increases the likelihood that the mission will face future staff reductions without a concurrent reduction in program responsibilities.

c. Other Donor Initiatives

Other donors, particularly the European Community, want to share their strong environmental management capabilities with Egypt. Consequently, the mission must avoid duplication and disruption of other donors' programs when it designs new environmental initiatives of its own.

5. Significant Opportunities

The mission has significant opportunities to improve Egypt's environmental quality by increasing the free flow of environmental management information, strengthening the country's environmental management capacity, promoting policy reform, and facilitating private sector initiatives.

a. Free Flow of Information

The mission can strengthen the foundations for environmental management capacity and policy reform by:

- Strengthening environmental data and information systems;
- Supporting increased environmental education; and
- Facilitating dissemination of environmental data.

b. Environmental Management Capacity

The mission can strengthen the environmental management capacity of key government and non-government institutions by:

- Strengthening the capability for risk analysis and priority setting; and
- Strengthening the capability for strategic planning.

c. Policy Reform

The mission can strengthen the policy foundations for improved environmental programs by helping the GOE to:

- Strengthen the environmental decision-making process;
- Strengthen the environmental legislative and regulatory process;
- Decontrol prices, including the removal of subsidies; and
- Recover the full cost of user-specific public services.

d. Private Sector Initiatives

The mission can help the GOE to exploit private sector contributions to environmental management by:

- Promoting private sector employment of pollution prevention approaches; and
- Strengthening the private sector environmental service industry.

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ANNEX A
LEGISLATION AND INTERNATIONAL AGREEMENTS CONCERNING THE ENVIRONMENT

A. Legislation

1. Water

	Level of Legislation	No & Date	Title
1.	Law	27/1978	Control of potable water sources
2.	Law	93/1962	Drainage of waste waters
3.	Law	48/1982	Protection of River Nile from pollution
4.	Law	12/1984	Irrigation and Drainage
5.	Law	57/1978	Treatment of ponds and marshes
6.	Law	72/1968	Prevention of oil pollution of sea water
7.	Pres. Decree	2703/1966	High committee for water created
8.	Pres. Decree	961/1972	Permanent committee/sea water pollution control
9.	Pres. Decree	421/1962	Ratifying Marpol Convention
10.	Minis. Decree	331/1970	Executive committee of water created
11.	Minis. Decree	7/1979	Specifications for potable water
12.	Minis. Decree	8/1983	Implementing Law 48/1982
13.	Minis. Decree	170/1982	Established High Committee for the Nile
14.	Minis. Decree	43/1985	Regulation of drainage and waterways
15.	Minis. Decree	380/1982	Technology and pollution
16.	Prime Min. Decree	1476/1985	Exec. Committee for Nile Industrial Drainage

2. Air

	Level of Legislation	No & Date	Title
1.	Pres. Decree	64/1969	Establishes Committee for Air Pollution Control
2.	M. of Health Dec.	470/1971	Max. limits of air pollutants
3.	M. of Health Dec.	240/1979	Add level max. for S02 in ambient air
4.	Law	106/1967	Regulates building activities
5.	M. of Housing Dec.	380/1975	Specs. for industrial and commerical buildings
6.	M. of Housing Dec.	126/1958	Specs. for plant oil processing
7.	M. of Housing Dec.	58/1972	Animal farms
8.	M. of Housing Dec.	994/1959	Rubber work places
9.	M. of Housing Dec.	63/1972	Paper and paper pulp workplaces
10.	M. of Housing Dec.	65/1972	Metal welding
11.	Law	371/1956	Public shops
12.	Law	372/1956	Recreational places
13.	Law	3/1982	Urban planning
14.	Law	148/1959	Civil Defense

15.	M. of Housing	600/1982	Implementation of Law 3/1982
16.	Law	66/1973	Traffic
17.	M. of Interior	291/1974	Implementation of Law 66/1973
18.	Law	137/1981	Labor
19.	M. of Manpower	55/1983	Safety and Health in the Workplace
20.	Law	27/1981	Mines and quarries
21.	M. of Soc. Affairs	193/1959	Occupational safety in mines and quarries
22.	Law	52/1981	Protection against smoking
23.	M. of Health Dec.	1/1982	Implementation of Law 52/1981
24.	M. of Health Dec.	444/1972	Use of ionizing radiation
25.	M. of Industry	380/1982	Technology of Pollution

3. Natural Reserve

Level of Legislation		No & Date	Title
1.	Law	102/1983	Natural Reserves permitted
2.	Prim. Min. Decree	1067/1983	Implementation of Law 102/1983
3.	Prim. Min. Decree	1068/1983	Natural Reserve Est. in Ras Mohamed
4.	Prim. Min. Decree	1429/1985	Natural Reserve Est. in Bardawil Lake
5.	Prim. Min. Decree	671/1986	Natural Reserve Est. in Omaid
6.	Prim. Min. Decree	928/1986	Natural Reserve Est. in Saluga and Gazal Islands
7.	Prim. Min. Decree	450/1986	Natural Reserve Est. in Elba
8.	Prim. Min. Decree	1186/1986	Natural Reserve Est. in Ashtom
9.	Prim. Min. Decree	459/1988	Natural Reserve Est. in St. Catherine Mtn.
10.	Prim. Min. Decree	613/1988	Natural Reserve Est. in Fossilized Forest
11.	Prim. Min. Decree	944/1989	Natural Reserve Est. in Wadi Alagi
12.	Prim. Min. Decree	945/1989	Natural Reserve Est. in Kobbat Alhasana
13.	Prim. Min. Decree	946/1989	Natural Reserve Est. in Wadi Alassuity
14.	Prim. Min. Decree	982/1989	Natural Reserve Est. in Wadi Alrayan

4. Food Safety

Level of Legislation		No & Date	Title
1.	Law	48/1941	Control fraud in foodstuffs
2.	Law	10/1966	Food control and its amendments
3.	Law	132/1950	Milk and milk products
4.	Law	2/1953	Meat and meat products
5.	Law	684/1954	Bread handling
6.	Law	257/1956	Ice and ice cream
7.	Law	____/1953	Food preservatives
8.	Pres. Decree	880/1960	Transport of fresh fish
9.	Pres. Decree	1604/1967	Meat marketing
10.	Pres. Decree	100/1975	Organization and mandate of Ministry of Supplies
11.	Pres. Decree	1770/1971	General authority of import and export control
12.	Law	53/1966	Agriculture
13.	Law	21/1958	Industry

14.	Law	2/1975	Egyptian Authority for Quality Control
15.	Prim. Min. Decree	291/1966	Imported food control
16.	M. of Health		More than 100 decrees on food specifications
17.	M. of Supplies		More than 40 decrees on imported food controls

5. Noise

Level of Legislation		No & Date	Title
1.	Law	45/1949	Use of loudspeakers
2.	Law	66/1973	Traffic
3.	Law	137/1981	Labor
4.	M./Manpower Dec.	55/1983	Exposure time to noise

B. International Environmental Conventions Ratified by Egypt

1. 1987, Montreal Protocol on Substances that Deplete the Ozone Layer
2. 1986, Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, Vienna
3. 1985, Vienna Convention for the Protection of the Ozone Layer
4. 1983, International Tropical Timber Agreement, Geneva
5. 1983, Convention Relative to the Preservation of Fauna and Flora in Their Natural State, London London
6. 1982, United Nations Convention on the Law of the Sea, Montego Bay
7. 1982, Protocol Concerning Regional Cooperation in Combating Pollution by Oil and Other Harmful Substances in Case of Emergency, Jeddah
8. 1982, Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment, Jeddah
9. 1982, Protocol Concerning Mediterranean Specially Protected Areas, Geneva
10. 1980, Protocol for the Protection of the Mediterranean Sea Against Pollution from Land-Based Sources, Athens
11. 1979, Convention on the Conservation of Migratory Species of Wild Animals, Bonn
12. 1978, Protocol of 1978 Relating to the International Convention for the Prevention of Pollution from Ships, London
13. 1977, Convention Concerning the Protection of Workers Against Occupational Hazards in the Working Environment Due to Air Pollution, Noise and Vibration, Geneva
14. 1976, Convention on the Protection of Military or Any Other Hostile Use of Environmental Modification Techniques
15. 1976, Protocol Concerning Cooperation in Combatting Pollution of the Mediterranean Sea by Oil and Other Harmful Substances in Cases of Emergency, Barcelona
16. 1976, Protocol for the Prevention of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft, Barcelona
17. 1976, Convention for the Protection of the Mediterranean Sea Against Pollution, Barcelona
18. No Date Convention Concerning Prevention and Control of Occupational Hazards Caused by Carcinogenic Substances and Agents

19. 1973, Convention on International Trade in Endangered Species of Wild Fauna and Flora, Washington D.C.
20. 1973, Protocol Relating to intervention on the High Seas in Cases of Marine Pollution by Substances Other than Oil, London
21. 1973, International Convention Relating to Intervention on the High Seas in Cases of Marine Pollution by Oil, Brussels
22. 1972, Convention Concerning the Protection of the World Cultural and Natural Heritage, Paris
23. 1971, Convention on Wetlands of International Importance Especially as Waterfowl Habitat, Ramsar
24. 1969, International Convention on Civil Liability for Oil Pollution Damage (as amended), Brussels
25. 1968, African Convention on the Conservation of Nature and Natural Resources, Algiers
26. 1967, Phytosanitary Convention for Africa, Kinshasa
27. 1967, Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space Including the Moon and Other Celestial Bodies, London, Moscow, Washington D.C.
28. 1965, Agreement for the Establishment of Commission for Controlling the Desert Locust in the Near East (as amended), Rome
29. 1963, Vienna Convention on Civil Liability for Nuclear Damage, Vienna
30. 1960, Convention Concerning the Protection of Workers Against Ionizing Radiation, Geneva
31. 1954, International Convention for the Protection of Pollution of the Sea by Oil, London (amended on 11 April 1962 and 21 Oct. 1969)
32. 1951, International Plant Protection Convention, Rome
33. 1949, Agreement for the Establishment of a General Fisheries Council for the Mediterranean (as amended), Rome
34. 1946, International Convention for the Regulation of Whaling (amended), Washington D.C.

ANNEX B
DESCRIPTION OF EGYPTIAN ENVIRONMENTAL ORGANIZATIONS—PUBLIC SECTOR

National Level

This summary provides information on national level ministries and their subunits which play a significant role in the environment. The following section is a matrix of organizational functions carried out by key national level organizations and NGOs.

Ministry of Cabinet Affairs: Minister: Dr. Atif Obeid

* Egyptian Environmental Affairs Agency (EEAA)
  Director: Mr. Salah Hafez.

—Main environmental agency in Egypt; largely a coordinating and advisory organization, but has direct management responsibility for protected areas; proposed new law would greatly enhance agency's power and give it financial and regulatory power; perceives itself as becoming the main financial supporting agency for environmental projects in Egypt; operates International Cooperation Unit, a semi-independent strategy and project development unit supported for four years by UNDP funding to assist in development of Master Plan for the environment. Current budget includes 50 percent of a 10 percent tax on airline travel (other half goes to Min. of Tourism). Sponsors and participates in environmental studies, such as the Industrial Environmental Map Progress Report issued in 1991 (with Friedrich Ebert Foundation, the National Research Center, the General Organization for Industry and universities).

* Agouza Center Building for Training: General Mohamed Hussein, first undersecretary, is in charge of approving all requests for non-project training for USAID projects. (This, at present time, includes environmental training.

Ministry of Public Works and Water Resources (MPWWR)

Responsible for development of water resources and the construction and maintenance of irrigation and drainage. It is also concerned with maintaining water quality, allocates water for newly reclaimed areas, decides upon the division of water supply between areas, and administers the rotational system for irrigation during wet and dry periods. In charge of protecting Nile River and waterways from pollution; regulates discharge of wastewater and reuse of drainage water (see also Ministry of Health). Note: Ministry of Interior is responsible for police enforcement of wastewater pollution. Operates Water Research Center (main research arm and data providing unit for this ministry) with 11 research institutes (pays LE10 million each year for institutes):

*Water Research Center

—11 institutes including:

1. Water distribution and irrigation system research institute
2. Drainage research institute
3. Hydraulics and sediment research institute

4. Water resources development research institute
5. Weed control and channel maintenance research institute
6. Groundwater research institute
7. High Aswan Dam side effects research institute
8. Mechanical and electrical research institute
9. Survey research institute
10. Soil mechanics and foundations research institute
11. Coastal protection research institute

*Minister heads the Supreme Committee of the Nile to coordinate water utilization activities under various ministries and organizations

Ministry of Tourism and Civil Aviation

Develops tourism for Egypt; oversees Tourism Development Authority (TDA), a semi-independent unit supported by World Bank and other donors. Licenses tourist developments. Gets half of the 10 percent tax on airline travel. Also promotes tourism. Has under-secretary in charge of environment. Looks at existing tourist developments to see that they comply with environmental regulations. Also regulates sewage from Nile cruise boats and proposed new tourism developments on Red Sea coast.

*Tourism Development Unit

— Is responsible for environmental assessments for all new tourist projects in Egypt; surveyed Red Sea coast for oil pollution damage and coastal development possibilities for tourism; also surveying western desert for safari tourism, etc.

Ministry of Industry

Subset General Organization for Industrialization (GOFI) sets rules and requirements for industrial production; set regulations for use of toxic chemicals by industry. Provide funds for pollution abatement in some cases. Carries out planning and enforcement for most industrial solid waste (exceptions are noted under other ministries).

*General Organization for Industrialization (GOFI)

—general administrative responsibility for environmental protection; has field projects in water protection, air protection, solid waste, toxic substances, etc. Does training, and is involved in planning process for pollution treatment. Assembled working team to help produce Industrial Environmental Map Progress Report in 1991 (with Friedrich Ebert Foundation, the National Research Center, and universities). Contains an Environmental Studies and Research Department, an Environmental Safety Department, an Air Pollution Department, and a General Department for Environmental Protection.

Ministry of Housing, Public Utilities and New Communities

Responsible for potable water and sewage treatment through five organizations and authorities. Sets policy for water and wastewater; delegates most policy analysis responsibilities to NOPWASD, GOSD and AGOSD. Major role in provision of drinking water and wastewater disposal systems. Has a desert institute and a research organization investigating resources necessary to create desert cities. This ministry is also in charge of implementation of the main law (Law 31 of 1976) relating to solid waste disposal. However, actual disposal activities are carried out by municipalities (in Cairo the Cairo Cleaning and

Beautification Authority and the Giza Cleaning and Beautification Authority). For industrial solid waste, this ministry supervises cement solid waste disposal.

*National Organization for Potable Water and Sanitary Drainage (NOPWASD), General Organization for Sewage and Sanitary Drainage (GOSD), and Alexandria General Organization for Sewage and Sanitary Drainage (AGOSD). Oversees water and wastewater systems for three major areas of the country. GOSD supervises the greater Cairo area, AGOSD for Alexandria, and NOPWASD for a number of major cities and areas outside the other two.

Ministry of Health

Responsible for monitoring air, water and soil through the Environmental and Occupational Health Center. Focuses on human protection and monitoring aspects of environmental monitoring.

*Environmental Occupational Health Center

—Environmental monitoring of air, water and soil; trains technical cadres, research on local problems; establishes standards for environmental pollutants; operates 10 stations for water pollution monitoring.

Ministry of Local Administration

Administers USAID and other donor funds which pay a portion of costs of village/small city wastewater treatment plants.

Ministry of Agriculture and Land Reclamation

Largest ministry in the country: responsible for agriculture, land reclamation, fisheries, veterinary medicine, and wildlife conservation. Operates fourteen institutes, three central labs, and thirty-two agricultural experiment stations. Institutes of most immediate relevance to the environment are the soil and water research institute, and the central laboratory for agricultural pesticides. Under the Veterinary Administration Organization, there is an undersecretary in charge of the five zoos and the Egyptian Wildlife Service. In charge of sites with on-site conservation value, such as natural history section of museums and a botanical garden. Reach large rural audiences through extension service concerning fertilizer and chemical recommendations. Semi-autonomous Executive Authority for Land Reclamation is involved in amelioration of deteriorated soils through drainage. Note: no laws yet exist concerning agricultural solid and hazardous wastes.

*Central Laboratory for Agricultural Pesticides.

—Conducts periodic assessments of pesticide residues and other effects. Has advocated doing routine pesticide monitoring, but is not currently doing so.

*Egyptian Wildlife Service

—Organization created with assistance from U.S. Fish and Wildlife Service; funded through PL-480 in first years; funding declining now. Recommended legislation and survey work. Has done some environmental monitoring, referring to police for enforcement. Made initial recommendations for protected areas. Has helped to drafting decrees concerning protection of wildlife. Egyptian contact organization for Sites, Bonn and Ramsar conventions. Gives out import/export permits for wild animals. Runs a conservation/educational center at the Giza Zoo.

Ministry of Scientific Research

Operates the Academy of Scientific Research and Technology; operates the National Research Center. An important source of research information on topics including the environment.

*Academy of Scientific Research and Technology

—Eight institutes, a research organization, and clearinghouse for research information. Organizes committees to focus on specific research topics. Important institutes include Environmental Research Council, Institute of Fisheries and Oceanography, Remote Sensing Unit and Theodore Belharz Research Institute. Also operates ESTINET, an information database and clearinghouse for information on science and technology.

*National Research Center

—Operates fifteen disciplinary branches, including an Environmental Research Branch. That branch has three laboratories:

a. Water Pollution Laboratory: determines levels of water pollution in drinking water and industrial waste water, and studies sources and control methods of pollution sources.
b. Air Pollution Laboratory: determines level of air pollution in industrial cities, sources and control methods. Air pollution lab, headed by Dr. Mahmoud Mohammed Nasralla, played a key role in producing data for the 1991 Industrial Environmental Map Progress Report (with Friedrich Ebert Foundation, GOFI, and universities). Has been critical of air pollution monitoring methods for sulfur dioxide taken in the Helwan area.
c. Occupational Safety Laboratory: determines health occupational risks.

Ministry of Finance

Accountants from this ministry monitor financial activities of NOPWASD, GOSD, and other water and wastewater treatment organizations in other ministries.

Ministry of Education

Several universities have programs which deal with environmental issues. By decree, each university now has designated a vice president for the environment. However, interviews have shown that these individuals have received no specific guidelines as to what they should be doing, and to date they have not done much. University disciplines tend to be very strong, and there is little core or cross-cutting activity that would make it possible for students to learn about the environment. The Ministry recently approved the inclusion of an environmental unit in curricula for grades 1-3. Universities with major programs include:

*Alexandria University

High Institute of Public Health — monitoring and research on pollution, water and air; awards degrees, applied research emphasis; participated in Industrial Environmental Map Progress Report in 1991 (with Friedrich Ebert Foundation, GOFI, National Research Center; provided data on industrial pollution in Alexandria).

Marine Health Research Center — marine pollution and Lake Maryut studies;

Fisheries and Oceanography Institute — research

Post-graduate institute — industrial pollution studies

*Cairo University

Environmental Engineering Program—postgraduate 2-year program under engineering;

African Research and Studies Institute — offers Ph.D. in some environmental areas

*Al Azhar University

Zoology Department has several professors who have done ecological research with graduate students

*Ain Shams University

Environmental Studies and Research Institute — non-degree training, M.S. Ph.D. in a number of different disciplinary areas; multidisciplinary focus; graduate students must have multidisciplinary committees.

*Assuit University — Aswan

Wadi Allaqi Project — research on Lake Nasser, flora, fauna and sustainable development. Field research emphasis. Students work on this as a part of coursework. Issues reports.

*Suez Canal University

Under Veterinary Department, has Wildlife Management program.
Marine Biology and Fisheries Dept. Operates a field school at Sharm El-Sheikh, South Sinai (coral reefs, etc.).
Biology Department has ecology courses and a field station at St. Katherine's.

Ministry of Planning, Ministry of International Cooperation

Involved in approval of projects and mobilization of international financing for environmental and other projects.

Ministry of Petroleum and Mineral Wealth

Responsible for disposal of petroleum-based solid waste.

Ministry of Interior

Responsible for police enforcement of Law 48 relating to water and wastewater pollution. (Ministry of Public Works has overall monitoring responsibility)

Ports and Lighthouses Administration

Chairs Permanent Committee for the Prevention of Marine Pollution with Oil. Members include: EEAA, National Research Center, Navy, Air Force, Academy of Scientific Research and Technology, Egyptian General Petroleum Corporation, Arab Maritime Transport Authority, State Council (legal), and Ports Authorities. (Committee was established in 1972.

* Permanent Committee for the Prevention of Marine Pollution with Oil.
Deals with marine pollution: carries out research studies; studies international research conventions, prepares research programs with help of specialized agencies and institutes. Communicates with international organizations concerning prevention of marine pollution by oil.

ANNEX C
FUNCTIONS OF EGYPTIAN ENVIRONMENTAL ORGANIZATIONS

EGYPTIAN ENVIRONMENTAL ORGANIZATIONS—PUBLIC SECTOR

FUNCTIONS:

EM = Environmental Management—Policy, Legislative, Planning, & Coordination
EL = Environmental Lobbying
EM = Environmental Monitoring—Data Collection, Processing & Dissemination
RE = Regulation & Enforcement
RT = Research/Technology Development & Transfer
IM = Information/Mass Media/Public Awareness
TN = Training/Non-Formal Education/Human Resources Development
FE = Formal Environmental Education
FS = Financial Sources for Environmental Programs
OE = Operating Environmental Restoration/Treatment Programs
ES = Environmental Services Industry—Services (Including Legal) & Supplies

ORGANIZATIONS	EM	EL	EM	RE	RT	IM	TN	FE	FS	OE	ES	COMMENTS
NATIONAL LEVEL:												
Ministry of Cabinet Affairs	X											
– Egyptian Environmental Affairs Agency (EEAA)	X		X	X		X	X		X	X		See Description
– Agouza Center Building for Training							X					See Description
Ministry of Public Works and Water Resources	X		X	X								See Description
– Water Research Center	X		X	X	X	X						See Description
– Supreme Committee of the Nile	X											See Description
Ministry of Tourism	X		X	X		X						
– Tourism Development Unit			X	X	X							See Description
Ministry of Industry	X											
– General Organization for Industrialization (GOFI)	X		X	X	X	X	X					See Description
Ministry of Housing, Utilities and New Communities	X		X	X	X							
– National Organization for Potable Water and Sanitary Drainage (NOPWASD)	X		X	X	X		X					See Description
– General Organization for Sewage and Sanitary Drainage (GOSD) (for Cairo area)	X		X	X	X		X					See Description
–Alexandria General Organization for Sewage and Sanitary Drainage (AGOSD)	X		X	X	X		X					See Description
Ministry of Health (MOH)	X											
– MOH Center for Environmental & Occupational Health	X		X	X	X		X					See Description
Ministry of Local Administration									X			See Description

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ORGANIZATIONS	EM	EL	EM	RE	RT	IM	TN	FE	FS	OE	ES	COMMENTS
Ministry of Agriculture and Land Reclamation	X		X	X	X	X	X					See Description
—14 Institutes and 3 central labs, including the Central Laboratory for Agricultural Pesticides			X		X	X						See Description
—Egyptian Wildlife Service	X	X	X	X	X	X						See Description
Ministry of Science and Technology	X				X	X						See Description
—Academy of Scientific Research and Technology					X	X						See Description
—National Research Center			X		X	X						See Description
Ministry of Finance				X								Audit Function; See Description
Ministry of Education	X	X			X	X	X					
—Alexandria University High Institute of Public Health			X		X		X					See Description
—Alexandria University Marine Health Research Center					X				X			
—Alexandria University Fisheries and Oceanography Institute					X							
—Alexandria University Post Graduate Institute					X		X					Industrial Pollution
—Cairo University Environmental Engineering Program					X		X					Postgraduate
—Cairo University African Research and Studies Institute					X		X					Offers Ph.D.
—Al Azhar University					X		X					Zoology
—Ain Shams University Environmental Studies and Research Institute					X		X					Postgraduate and non-formal training
—Assuit University-Aswan-Wadi Allaqi Project					X	X	X					Field Research
—Suez Canal University Wildlife Management Program, Marine Biology and Fisheries Dept. with coral reefs field school, Biology Dept. with field station on St. Katherine's Mtn.					X		X					

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ORGANIZATIONS	EM	EL	EM	RE	RT	IM	TN	FE	FS	OE	ES	COMMENTS
Ministry of Planning	X								X			See Description
Ministry of International Cooperation	X								X			See Description
Ministry of Petroleum And Mineral Wealth	X			X								See Description
Ministry of Interior	X			X								Law Enforcement
Ports and Lighthouses Administration	X											
Permanent Committee for the Prevention of Marine Pollution with Oil	X											See Description
Ministry of Defense	X											Uninhabited Desert Lands

EGYPTIAN ENVIRONMENTAL ORGANIZATIONS—PRIVATE SECTOR

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ORGANIZATIONS	EM	EL	EM	RE	RT	IM	TN	FE	FS	OE	ES	COMMENTS
Zeballeen Refuse Collectors											X	Traditional Trash Haulers and Recyclers
American University Cairo - Desert Research Center					X		X					

EGYPTIAN ENVIRONMENTAL ORGANIZATIONS—NGOs

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ORGANIZATIONS	EM	EL	EM	RE	RT	IM	TN	FE	FS	OE	ES	COMMENTS
EGYPTIAN NGOs												
Arab Office for Youth & Environment (AOYE)		X				X	X			X		Regional focus
Society for the Tree Lovers		X				X	X			X		Has successfully blocked several developments to save trees
Egyptian Wildlife Society		X				X						Holds meetings; has magazine
Egyptian Society for the Conservation of Natural Resources						X						Conferences and occasional publications
Zoological Society						X						
Friends of the Zoo							X					Boy Scout type organization
Cairo Aquatic Association Fans (CAAF)						X						Aquarium Fish
Egyptian Geographical Society												
Egyptian Society for Medicine and Law/Society for Environmental Legislation		X				X						Annual Seminar
The Green Party —Political Party Advocating a Clean Environment		X				X						Dr. B.H. Bahri, Cairo Univ., is a member
Society for the Protection of Natural Beauty						X						
Egyptian Ornithological Society		X	X		X	X	X					Mindy Baha El-Din
Baladi Association						X				X		
Cairo Divers						X				X		Unregistered Org.
Central Society for Environmental Protection	X					X						
Friends of the Environment		X				X						Alexandria

EGYPTIAN ENVIRONMENTAL ORGANIZATIONS—NGOs

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ORGANIZATIONS	EM	EL	EM	RE	RT	IM	TN	FE	FS	OE	ES	COMMENTS
INTERNATIONAL NGOs												
International Union for the Conservation of Nature & Natural Resources (IUCN), Gland, Switzerland					X	X			X			
International Council for Bird Preservation (ICBP), London		X	X		X	X	X		X			
World Wildlife Fund (U.S.A.)					X				X			
World Wildlife Fund (Italy)		X				X						
Ford Foundation		X							X			Recycling
Holy Land Conservation Fund		X				X						Not Active Now
International Waterfowl Research Bureau		X			X	X	X					
Centre for Environment and Development for the Arab Region and Europe (CEDARE) est. 1992; supported by Arab Fund for Economic and Social Development, GOE and UNDP	X		X		X				X			

EGYPTIAN ENVIRONMENTAL ORGANIZATIONS—INT'L AGENCIES/DONORS

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PROJECTS/PROGRAMS	EM	EL	EM	RE	RT	IM	TN	FE	FS	OE	ES	COMMENTS
USAID Irrigation Management Systems Project												
USAID High Dam Rehabilitation Project												
USAID Combined Cycle Units at Talkha & Cairo South												
USAID Gas Turbines at Talkha & Helwan												
USAID Conversion of Cairo West												
USAID Urban Water & Wastewater												
USAID Energy Conservation												
USAID Renewable Energy Field Testing												
USAID Energy Policy Planning												
USAID University Linkages												
USAID Provincial Water & Wastewater												
USAID IPP Environment Sub-Activity-Industrial Pollution Control												
USAID Mahalla Textile Project												
USAID Population Program												
USAID Environment Health Program-Schistosomiasis Research Project												
US Fish & Wildlife Assistance to MOA Egypt Wildlife Service												
World Bank (IBRD)	X											Assistance to Master Plan Preparation
Friedrich Ebert Stiftung (FES)	X		X		X	X	X	X	X			Long Assistance to EEAA
United Nations Development Programme (UNDP)	X											Assistance to EEAA Int'l Coop. Unit (ICU)

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PROJECTS/PROGRAMS	EM	EL	EM	RE	RT	IM	TN	FE	FS	OE	ES	COMMENTS
Denmark	X				X							
Canada			X									
England									X			
Germany											X	Filters for Cement Companies

ANNEX D
ENVIRONMENTAL PROJECT ACCOUNTING SYSTEM

As USAID establishes a more explicit environmental emphasis to its project selection process, an Environmental Project Accounting System (EPAS) becomes desirable. EPAS both furnishes organized management information for project oversight and reporting purposes, and provides the data needed to assess new projects in terms of their consistency with ongoing USAID activities. An EPAS should contain the following information for each project: geographic region affected; economic sector; environmental media involved; pollutant generation being affected; types of environmental impact occurring; estimated magnitude and costs of these impacts; remediation approach being employed (designated by risk sequence step); and overview comments on the project. An illustrative printout of EPAS data is given in the exhibit on the next page for the people transportation case discussed in the preceding risk assessment subsection.

Assembly of an EPAS for USAID/Cairo is a manageable endeavor. It involves a systemic review of all USAID projects from an environmental perspective. All projects have environmental implications if viewed broadly enough. While identifying these implications may seem an academic exercise in many cases, in other cases this analysis will provide valuable insights.

Most projects probably will be found to be generating a net environmental benefit. In some cases, however, projects may be found to be exacerbating an existing environmental problem or contributing to the potential emergence of a new problem. The mission must be aware of the environmental implications of the latter type of projects. Once EPAS is assembled, the mission will be able to provide a well founded summary of the environmental implications of all its project activities.

One of the highest priorities of EEAA is to establish a central environmental information center which would serve as a source of information for policy-makers, environmental education agencies and public awareness programs. Since the World Bank does not appear to be interested in environmental education and information, the information center could be an excellent opportunity for USAID, in a field where the United States enjoys a unique comparative advantage.

ENVIRONMENTAL PROJECT ACCOUNTING SYSTEM (EPAS) FRAMEWORK

Region	Sector	Medium	Pollutant	Types of Impact	Estimated Magnitude	Remedial Approach	Comment
Egypt	Trans-porta-tion	Air	Lead	Hyper-tension	X Cases/Yr	Switch to Unleaded Fuel	Can Draw Upon U.S. Experience in Switching to Unleaded Fuel
	People			Stroke	Y Cases/Yr		
				Heart Attacks	Z Cases/Yr		
				Reduced Mental Capacity	Avg. IQ Declines		
				Health Costs	$/Yr		
				Lost Work Days	No. Days/Yr, $/Yr		
				Reduced Effective-ness	Reduced Productivity		