Task Order No. 832
USAID Contract No. PCE-I-00-96-00002-00

Egyptian Environmental Policy Program
Program Support Unit

WORK ASSIGNMENT REPORT
Tranche 2, Policy Measure 6.2

Potential Sources of Hazards
Mohamed Rashed
January 2002

PSU-66

for
U.S. Agency for International Development
Cairo

by
Environmental Policy & Institutional Strengthening
Indefinite Quantity Contract (EPIQ)

A USAID-funded project consortium led by International Resources Group, Ltd.

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Fact Sheet

USAID Contract No.:	PCE-I-00-96-00002-00 Task Order No. 832
Contract Purpose:	Provide core management and analytical technical services to the Egyptian Environmental Policy Program (EEPP) through a Program Support Unit (PSU)
USAID/Egypt's Cognizant Technical Officer:	Holly Ferrette
Contractor Name:	International Resources Group, Ltd.
Primary Beneficiary:	Egyptian Environmental Affairs Agency (EEAA)
EEAA Counterpart:	Mohamed A. Borhan Director General, Coastal Zone Management General Directorate, and National Oil Spill Contingency Plan Coordinator
EEPP Policy Objective:	Increased GoE capacity to conduct long-term strategic planning, policy formulation, analysis, and coordination
EEPP Policy Measure:	EEAA develops and adopts a strategic National Environmental Disaster Contingency Management Plan
Work Assignment Title:	Provide assistance regarding national environmental disaster contingency management planning
Work Assignment Author:	Mohamed Rashed
Work Assignment Supervisor:	Will Owen
Work Assignment Period:	September – December 2001

Preface

Through competitive bidding, the U.S. Agency for International Development (USAID) awarded a multi-year contract to a team managed by International Resources Group, Ltd. (IRG) to support the development and implementation of environmentally sound strategic planning, and strengthening of environmental policies and institutions, in countries where USAID is active. Under this contract, termed the Environmental Policy and Institutional Strengthening Indefinite Quantity Contract (EPIQ), IRG is assisting USAID/Egypt with implementing a large part of the Egyptian Environmental Policy Program (EEPP).

This program was agreed-to following negotiations between the Government of the United States, acting through USAID, and the Arab Republic of Egypt, acting through the Egyptian Environmental Affairs Agency (EEAA) of the Ministry of State for Environmental Affairs, the Ministry of Petroleum's Organization for Energy Planning, and the Ministry of Tourism's Tourism Development Authority. These negotiations culminated with the signing of a Memorandum of Understanding in 1999, whereby the Government of Egypt would seek to implement a set of environmental policy measures, using technical support and other assistance provided by USAID. The Egyptian Environmental Policy Program is a multi-year activity to support policy, institutional, and regulatory reforms in the environmental sector, focusing on economic and institutional constraints, cleaner and more efficient energy use, reduced air pollution, improved solid waste management, and natural resources managed for environmental sustainability.

USAID has engaged the EPIQ contractor to provide Program Support Unit (PSU) services to EEPP. The PSU has key responsibilities of providing overall coordination of EEPP technical assistance, limited crosscutting expertise and technical assistance to the three Egyptian agencies, and most of the technical assistance that EEAA may seek when achieving its policy measures.

The EPIQ team includes the following organizations:

- Prime Contractor: International Resources Group
- Partner Organization:
  - Winrock International
- Core Group:
  - Management Systems International, Inc.
  - PADCO
  - Development Alternatives, Inc.
- Collaborating Organizations:
  - The Tellus Institute
  - KBN Engineering & Applied Sciences, Inc.
  - Keller-Bliesner Engineering
  - Conservation International
  - Resource Management International, Inc.
  - World Resources Institute's Center For International Development Management
  - The Urban Institute
  - The CNA Corporation.

For additional information regarding EPIQ and the EEPP-PSU, contact the following:

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Abbreviations, Acronyms, and Glossary

A	Acute
ATF	Agency Task Force
B	Both acute and chronic
C	Chronic
CAPMAS	Central Agency for Public Mobilization and Statistics
CD	Civil Defense
CEO	Chief Executive Officer (of EEAA)
COP	Chief of Party
CTO	Cognizant Technical Officer. This is the USAID person responsible for supervising a technical assistance contractor.
EDMU	Environmental Disaster Management Unit (of EEAA)
EEAA	Egyptian Environmental Affairs Agency
EEPP	Egyptian Environmental Policy Program (a USAID-funded program aimed at achieving a series of environmental policy reform performance objectives)
EEPP-PSU	Egyptian Environmental Policy Program, Program Support Unit
EPIQ	Environmental Policy and Institutional Strengthening Indefinite Quantity Contract. This is a contract issued by USAID's Global Bureau that enables environmental policy services to be provided to USAID missions worldwide.
G	Governorate
GoE	Government of Egypt
H	High
IC	Industrial cities
IRG	International Resources Group, Ltd. (a Washington DC-based consulting firm that is prime contractor for USAID's EPIQ contract)
km^2	Square kilometers
L	Low
Loc	Local
M	Medium
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MoV	Means of Verification
MSEA	(Egyptian) Ministry of State for Environmental Affairs
MVE	Monitoring, Verification, & Evaluation (MVE is a the USAID-funded unit established to monitor, verify and evaluate progress of EEPP. It is being implemented by the US-based company Chemonics International)
N	National
NEDCMP	National Environmental Disaster Contingency Management Plan
OEP	(Egyptian) Organization for Energy Planning (attached to the Ministry of Petroleum)
PSU	Program Support Unit (the name of the USAID-funded contract that is to provide overall coordination for the EEPP, as well as provide technical assistance to EEAA under the EEPP)
SK	Shoubra El-Kheima
TDA	(Egyptian) Tourism Development Authority (attached to the Ministry of Tourism)
ToR	terms of reference
US EPA	United States Environmental Protection Agency
USAID	U.S. Agency for International Development

1. Introduction

This report aims to identify sources of hazards on a geographical basis. This approach includes identifying activities that have a potential for producing hazards, screening of each category of activities to identify the sites/facilities that may produce significant hazards, and a geographical survey to identify specific sites and facilities that are potential sources of the concerned hazards.

The sources of information for this report are interviews conducted at the Civil Defense Authority, Cairo, in April 1997. Moreover, data was acquired from the Central Agency for Public Mobilization and Statistics (CAPMAS) Annual Statistics Book, 1998.

2. Potentially Hazardous Activities

The identified hazards for this phase of contingency planning include accidental releases of chemical, genetic, biological, and radioactive substances, in addition to fires and explosions that are known to produce hazardous emissions and/or wastes.

The main potential sources for the identified hazards fall within these categories:

1. **Industrial**—Plants that manufacture, or use large quantities of hazardous materials and facilities that, in their processes, produce large amounts of hazardous wastes or by-products.

2. **Transportation**—Aviation facilities, roads and highways, pipelines, railways, and water transportation.

3. **Storage facilities**—Large storage facilities for chemicals, fuels, and other hazardous materials, especially at airports, within or on the outskirts of cities, and in off-shore structures.

4. **Facilities using radioactive materials**—Nuclear reactors, hospitals, and research centers.

5. **Landfills**—Dumps near big cities and sludge dump sites.

6. **Facilities using biological/genetic materials**—Research facilities and hospitals.

7. **Wastewater treatment facilities**—Especially those serving large cities.

8. **Sources of hazardous waste**—Hospitals, wastewater treatment units, and industry.

2.1 Screening of Potential Activities

Each of the categories of activities mentioned above will be screened and evaluated to identify specific potential sources for environmental disasters.

Potential Industry Sources

Various types of hazardous materials are used in Egyptian industry, such as organic solvents, acids, alkalis, hazardous chemicals used in pesticide preparation, and heavy metal ions. The fugitive releases that occur during industrial processes could be responsible for adverse impacts. However, it is the accidental releases that may occur at the storage areas that are the potential causes for environmental disasters.

Screening Criteria

The concept of ranking hazards used by United States Environmental Protection Agency (US EPA), is here modified to identify industries with the potential for environmental disasters in Egypt. The original model is used for ranking facilities in terms of potential threat according to the following:

- Containment of hazardous substances
- Route of releases
- Amount of hazardous substances
- Likely human and environmental targets.

This model evaluates the potential harm to humans or environmental migration and exposure pathways of a hazardous substance into groundwater, surface water, soil, and air.

In the present work, potential hazards were not quantified. Rather, ranking of industries was based on best professional judgment, considering the above mentioned parameters, according to the following procedures:

1. Identify raw materials, products, by-products and waste.
2. In the worst case, identify the involved potential hazards, if any – e.g. releases, fire, or explosions.
3. For each hazard specify the predicted level of spreading of the anticipated impact. Three levels are considered; Low (L), Medium (M), and High (H).
4. Specify the category of the anticipated impact: Acute (A), Chronic (C), or both (AC).
5. Identify the anticipated level of resource mobilization: Local (Loc), Governorate (G), or National (N).

The results of this exercise are shown in Table 1, Potential Industrial Sources of Disasters, (pages 4–6).

According to the above criteria, industries that have worst-case scenarios that involve high spreading levels (H) acute effects (A) and mobilization at the national level (N) are identified as potential sources for national environmental disasters. The findings of the ranking process are summarized in Table 2, Survey of Transportation Sector (pages 7–8).

Potential Transportation Sources

Environmental disasters may occur due to the accidental release of hazardous materials during the process of transportation from one location to another. The major means of transportation of hazardous materials are through:

- Air cargo
- Sea freight
- Railways
- Pipelines
- Highways.

The potential for accidents during transportation may be determined utilizing the same methodology used throughout this report. The aggregate evaluation of the degree of spreading of hazard material, the anticipated effects of the spread of hazardous material, and the degree of mobilization needed to confront the anticipated hazard will be estimated for each type of transportation in various situations. In all the above, the worst-case scenario is used as the basis of evaluation.

Table 1 Potential Industrial Sources of Disasters

Industrial Sector	Sub-sector	Materials of Concern	Potential Hazard "Accidental Releases"	Spreading (L-Low M-Medium H-High)	Anticipated Impacts (A-Acute C-Chronic)	Degree of Mobilization (L-Local G-Gov. N-National)	Aggregate Evaluation
Oil and natural gas	Oil and natural gas	• Liquefied natural gas	• Release of gas, explosion of reservoirs, fires, and release of toxic gases	H	AC	G	H/AC/G
		• Oil and oil products	• Oil spills	H	A	N	H/A/N
Mining	Mining of ferrous and non-ferrous metals	• Metal oxides, metal compounds, traces of radioactive substances	• Accidental collapse of mines leading to releases of particulates of toxic solids into the air	L	AC	G	L/AC/G
Other mining activities	Stone, sand, chemical compounds, natural fertilizers, and other substances	• Sand, chemical compounds, traces of radioactive substances	• Accidental collapse of mines leading to releases of particulates of toxic solids into the air	L	AC	G	L/AC/G
Food, beverages, and tobacco	Distillation and refining of spirits	• Alcohol	• Release of alcoholic mixtures	M	A	G	M/A/G
	Slaughtering, poultry	• Blood, organic matter, oils, fats	• Release of organic matter in wastewater and waterways	L	A	G	L/A/G
	Canning and food preservation	• Blood, organic matter, oils, fats	• Release of organic matter in wastewater and waterways	L	A	G	L/A/G
	Animal and vegetable oils/fats, animal feed	• Blood, organic matter, oils, fats	• Release of organic matter in wastewater and waterways	L	A	G	L/A/G
	Sugar refining	• Blood, organic matter, oils, fats	• Release of organic matter in wastewater and waterways	L	A	G	L/A/G
	Cacao, sweet products	• Blood, organic matter, oils, fats	• Release of organic matter in wastewater and waterways	L	A	G	L/A/G
	Grain milling, baked goods	• Fine grains suspended in air	• Explosion	L	A	G	L/A/G
	Tobacco products	• Chemicals in tobacco	• Fire – release of hazardous gases	M	AC	G	M/AC/G

Industrial Sector	**Sub-sector**	**Materials of Concern**	**Potential Hazard** **"Accidental Releases"**	**Spreading** (L-Low M-Medium H-High)	**Anticipated Impacts** (A-Acute C-Chronic)	**Degree of Mobilization** (L-Local G-Gov. N-National)	**Aggregate Evaluation**
Spinning, weaving, and dying	Tanning	• Chromium	• Release of chromium ions in wastewater and water ways	M	AC	G	M/AC/G
	Leather products	• Leather	• Fire – release of hazardous gases	M	A	G	M/A/G
	Spinning and weaving	• Fibers	• Fire – release of hazardous gases	M	AC	G	M/AC/G
Wood and wood products	Woodworking, non-metallic furniture	• Wood	• Fire – release of particulates and hazardous gases	M	AC	G	M/AC/G
Paper products, print shops, and publishing	Pulp, paper, and cardboard	• Black liquor	• Release of liquor	L	AC	L	L/AC/L
	Print shops, publishing, and related industries	• Ink	• Release of chromium ions and other heavy metals	L	AC	G	L/AC/G
		• Paper and products	• Fire – release of particulates and hazardous gases	M	AC	G	M/AC/G
Chemicals, chemical products, petrochemicals, rubber, coal, and plastics	Fertilizers and repellents	• Ammonia and other toxic gases	• Release of NH_3 and other gases	H	AC	N	H/AC/N
	Pharmaceuticals and other chemical products	• Biochemicals and chemicals	• Release of biochemicals, chemicals	H	AC	N	H/AC/N
	Soaps, detergents, cosmetics, and perfumes	• Oleum SO_3 and NaOH	• Release of toxins	H	AC	N	H/AC/N
	Oil refining	• Toxins, solvents, etc.	• Release of chemicals and hydrocarbons	H	AC	N	H/AC/N
	Tires and inner tubes	• Sulfur and rubber	• Release of vapors and toxic gases	H	AC	N	H/AC/N

Industrial Sector	**Sub-sector**	**Materials of Concern**	**Potential Hazard** **"Accidental Releases"**	**Spreading** (L-Low M-Medium H-High)	**Anticipated Impacts** (A-Acute C-Chronic)	**Degree of Mobilization** (L-Local G-Gov. N-National)	**Aggregate Evaluation**
Chemicals, chemical products, petrochemicals, rubber, coal, and plastics (continued)	Basic industrial chemicals other than fertilizers	• Chemicals and gases	• Release of toxic substances	H	AC	N	H/AC/N
	Plastic products	• Plastic	• Fire – Release of toxic gases	H	AC	N	H/AC/N
	Petrochemicals and coal products	• Chemicals and gases	• Release of chemicals and toxic gases	H	AC	N	H/AC/N
Ceramic materials and minerals	Cement and plaster	• Cement dust	• Explosion	L	AC	G	L/AC/G
	Ceramic, porcelain, clay, and glass products	• Dust	• Explosion	L	AC	G	L/AC/G
Basic metallurgical industries	Iron and steel	• Iron oxides	• Explosion	M	A	G	M/A/G
	Non-ferrous metals	• Oxides (lead)	• Release of lead	L	C	G	L/C/G
Metallic products and machinery	Metal products, metal forming	• Solvents, heavy metals, feron	• Release of chemicals (solvents and paints) and gases (hydrocarbons)	L	AC	G	L/AC/G
	Motors, machinery, and equipment	• Solvents, heavy metals, feron	• Release of chemicals (solvents and paints) and gases (hydrocarbons)	L	AC	G	L/AC/G
	Electric appliances and computers	• Solvents, heavy metals, feron	• Release of chemicals (solvents and paints) and gases (hydrocarbons)	L	AC	G	L/AC/G
	Trains, shipbuilding, and automobiles	• Solvents, heavy metals, feron	• Release of chemicals (solvents and paints) and gases (hydrocarbons)	L	AC	G	L/AC/G
	Photographic industry	• Heavy metals (silver)	• Release of chemicals	L	C	L	L/C/L
Other processes	Jewelry, musical instruments		• Release of dust and heavy metals	L	C	L	L/C/L

Table 2 Survey of Transportation Sector

Aviation	Statistics show that most aviation accidents occur either during take-off or during landing. Due to the special nature of land use in Egypt, airports are not far from the population mass. In the worst-case scenario, a shipment of a full load of several tons of hazardous material was on board of an airplane that crashed during take off or landing. The force of crash and the subsequent fire caused a huge explosion that released large amounts of toxic vapors in the air. That vapor could spread over a large section of the northeastern part of Cairo causing immediate and long-term adverse effects on the population, fauna, flora, and surface and groundwater, in addition to the buildings and landmarks. The extent of damage may demand mobilization of rescue and mitigation efforts at the national level. Therefore, aviation accidents can rise to the level of environmental disasters.
Sea & Waterways	Most Egyptian ports are heavily populated. In the worst-case scenario, a cargo ship carrying a full load of tens of thousands of tons of hazardous materials collided with another ship in the Port of Alexandria. The collision resulted in a fire and a series of explosions occurred and released the hazardous cargo in the form of liquid into the sea and as a large cloud of toxic vapors, that engulfed the western part of the city. The degree of spreading is high, and the adverse effects of the toxic releases are severe, both acute and chronic, and they require the full mobilization of rescue and mitigation efforts at the national level. The releases are going to adversely impact marine life, city population, flora, and fauna. Therefore, transportation in waterways accidents can rise to the level of environmental disasters.
Railways	The railway network covers the Nile Valley, branches through the Delta, and connects the remote areas of Sinai and the Western Coast to the Valley. It is used extensively in the transportation of fuel. The railroad usually runs through cities, passing through heavily populated areas. In the worst-case scenario, a cargo train carrying a full load of a few thousand tons of hazardous materials collided with a passenger train in a crowded station. The collision resulted in a fire and a series of explosions that released hazardous liquids and fumes. The toxic cloud spread over a large section of the city, causing severe damage to the population, fauna, and flora, and destroying the quality of air, and surface and ground water. Its anticipated effect is both acute and chronic, and it requires mobilization of rescue teams at the national level. Therefore, if hazardous materials are transported by railway and there is an accident, it could rise to the level of an environmental disaster.

Highways and Road Transportation	According to official statistics, in 1998 there were 512,540 trucks and 56,790 trailers in Egypt carrying goods and materials, solids and liquids, through and between the cities and towns of Egypt. In the worst-case scenario, a truck carrying a full load of hazardous chemicals collided with a bus in the middle of a city. The collision caused an explosion that released a cloud of toxic chemicals in the atmosphere. The degree of spreading was high, and the released material will have an adverse impact on the environment and the population. However, the mobilization of rescue and mitigation teams in this case is not expected to go higher than the governorate level because of the limited amount of chemicals that a truck could carry. Therefore, this type of accident could rise to the level of an environmental disaster on the regional level.

Screening Criteria

The criteria for determining transportation accidents that may cause environmental disasters include the potential for hazards to spread, the time frame of the anticipated effects, and the expected level of mobilization needed to confront and mitigate such a disaster's impact, e.g. local, regional, or national. The heavy railway and highway transport of hazardous materials are a potential source for environmental disasters. Table 3 shows the various types of potential transportation accidents, while table 4 shows the most likely source for such disasters.

Table 3 Potential Transportation Accidents (Estimated Significance)

Transportation Category	**Spreading** L = Low M = Medium H = High	**Anticipated Effects** A = Acute C = Chronic	**Mobilization** L = Local G = Governorate N = National	**Aggregate Evaluation**
Local and international aviation	H	AC	N	H/AC/N
Sea and waterways	H	AC	N	H/AC/N
Trains between cities and express trains	H	AC	N	H/AC/N
Highways and roads	H	A	G	H/A/G

Table 4 Major Sources of Potential Transportation-linked Environmental Disasters

Transport Link	**Routes Where Disasters Might Begin**
Alexandria–Cairo	Railways and desert and agricultural highways
Suez–Cairo	Railways and highway/roads
Aswan–Cairo	Railways and highway/roads

Potential Storage Sources

Strategic fuel tanks at the outskirts of cities, and chemical and petrochemical storage facilities in large seaports, such as Alexandria, are by their nature potential sources of hazards. Locations of strategic tanks are shown in table 5, that follows:

Table 5 Location of Strategic Fuel and Chemical Tank Storage Facilities

City	Location
Cairo	Sawah, on the Ismailia Canal
Alexandria	Max, seashore
Kafr el-Dawar	On the Cairo–Alexandria Highway
Tanta	East of Tanta City
Assiut	East on the railroad
Sohag	East on the Nile
Suez	South in Zayteia

Due to the strategic nature of these facilities and their direct connection with national security, it is recommended that a detailed study should be carried out under the umbrella of the National Security Council.

Potential Sources Using Radioactive Materials

Radioactive materials are used in industry, hospitals, and medical research facilities, and atomic and nuclear research centers.

During a year, about 80 shipments of various radioactive materials came into Egypt through Cairo International Airport, to be used in various industrial and medical activities. The most frequently received radioactive material was Iridium 192, followed by Cesium137, with some uses for Cobalt 60, Strontium 90, Americium 241, Californium 252, and Krypton 85. The most common use for radioactive materials in industry is detection of cracks in tanks and underground pipes. Cobalt 60 is used in hospitals for treatment of malignant tumors. No information is available about the quantities and radioactive materials used in Egypt's nuclear reactor.

Discussions with officials in Civil Defense (CD) and the Authority for Atomic Energy revealed that during the past 25 years, there have been no major accidents due to transportation, handling, or use of radioactive materials in industry or hospitals in Egypt. This could be due to the small quantities and low intensity of radiation in use and to the strict implementation of regulations regarding safe use of radioactive materials.

Due to the sensitive nature of the subject and its relationship to national security, information regarding quantities and use of radioactive materials were not available for this report. However, the information available shed some light on the use of radioactive materials in industrial facilities and hospitals.

Landfills as Potential Hazard Sources

Between 1947 and 1994, a set of laws and regulations was developed in order to cope with the increasing need to control and manage solid wastes, with special focus on municipal garbage, especially in Cairo, Giza, and Alexandria. Law 4/1994 and its executive regulations focus on management of hazardous waste.

It is estimated that Egypt generates 35,000 tons of domestic garbage every day, 75 percent of which comes from urban areas. There are three systems for collection and transportation of

municipal waste: municipal services, contracts with private companies, or informal collection performed by the *zaballeen*—Egypt's community of garbage collectors.

Average composition of the waste is 60 percent food, 13 percent paper, 3 percent metals, 2.5 percent each glass, plastics, and textiles, and the rest is demolition and construction waste. Table 6 shows the sources of solid waste in Egypt.

Table 6 Sources of Solid Waste in Egypt

Sources	Percent
Household	60
Facilities	15
Street litter	15
Other (construction and demolition)	10

All the cities and towns of Egypt are surrounded by garbage. There are no figures regarding the exact amount of garbage that goes to dumps around the cities. Table 7 shows the estimated daily garbage production of major cities of Egypt.

Table 7 Estimated Garbage Produced by Egyptian Cities (tons per day)

City	Daily Production of Garbage
Cairo	6,000
Giza	1,200
Alexandria	1,260
Tanta	900
Zagazig	600
Mansoura	600
Dammietta	300
Port Said	300
Ismailia	350
Beni-Suef	600
El-Minya	900
Assiut	700
Sohag	780
Qena	800
Aswan	300

Dumps as Potential Hazard Sources

Dumping sites can become a source of disasters for the surrounding population. Drainage and seepage can contaminate ground and nearby surface waters, and the natural beauty of the environment is inevitably destroyed when a garbage dump begins to grow.

Screening Criteria

Table 8 Dump/Landfill Hazard Criteria

Criteria	Factors
Timeframe of the hazardous effects	Acute—epidemic diseases, destruction of natural beauty Chronic—other types of disasters, contamination of waters
Degree of hazard spread	Localized
Degree of mobilization	Governorate

Most of the solid waste produced in Egypt has a high moisture content (40 percent). This keeps the possibility of fire low, and when a fire does occur, it can be localized. Table 8, above, shows that in worst-case scenarios, the highest level of mobilization needed in cases of fires at dumps or landfills would be on the regional level. This level of mobilization would be needed only during the spread of an epidemic disease.

Facilities Using Biological or Genetic Materials as Potential Hazard Sources

It is well known that genetic and biological materials are hazardous, and must be handled according to regulations. The Ministry of Health regulates handling of these materials in Egyptian hospitals and research laboratories, and the possibility of having an accidental release inside these facilities is low. This is based on the fact that during the past 30 years there is not a single recorded environmental disaster, either locally or internationally, in which the main hazard is of genetic or biological nature accidentally released inside the facility. However, once they leave such a facility as waste, they represent a greater hazard to the public and the environment because they are frequently mixed with municipal garbage or disposed of in the Nile.

Municipal/Industrial Wastewater Treatment Facilities as Potential Hazard Sources

Any damage or inability to operate that occurred to wastewater treatment facilities in Egypt's large cities might cause an environmental disaster.

Alexandria has two modern municipal/industrial wastewater treatment facilities. Following primary treatment, the water is discharged in the sea. It is estimated that 500,000 cubic meters of treated wastewater are discharged every day. In the worst-case scenario, the eastern and western stations are sabotaged and consequently inoperable. Hundreds of thousands of tons of untreated sewage would be dumped directly into the Mediterranean close to the coast, contaminating the water, killing marine life, destroying the natural beauty of the area, and preventing people from fishing or using the beaches for recreation. In addition, the area would be a probable source of infectious diseases that might reach epidemic proportions. Therefore, wastewater treatment facilities for Alexandria should be considered as a hazard source. A similar conclusion could be drawn for the Greater Cairo wastewater systems.

Hazardous Solid Waste as a Source of Potential Hazard

Hazardous solid waste represents a real problem in Egypt. Hazardous hospital wastes are mixed with non-hazardous municipal waste, representing a danger to garbage collectors. There have been some attempts to install incinerators in large hospitals.

Hazardous municipal sludge would be no real problem if laws and regulations were strictly applied. Such sludge now may contain high concentrations of heavy metals from untreated industrial effluents, which minimizes their use, after composting, as fertilizers or land conditioners. Industrial hazardous sludge is being generated in greater quantities due to the increased pace of building on-site pretreatment units.

It is estimated that industrial hazardous wastes are generated at the rate of about 50,000 tons per year, with that figure constantly growing due to the increasing trend of industrialization. For large companies in Helwan, such wastes are disposed of in assigned disposal sites. These are not hazardous waste sites and the wastes are mixed without discriminating between what is hazardous and what is non-hazardous. For the new industrial cities, no policy is enforced and no hazardous waste disposal sites have been established.

Efforts have been made by EEAA in hazardous waste management. Several donor projects are looking at hazardous wastes, i.e., FINNIDA, DANIDA, USAID (EEPP), and the EU project in the 6th of October City.

The major environmental disaster in the U.S., the Love Canal disaster, was caused by hazardous industrial waste. Egypt's National Environmental Disaster Contingency Plan will deal with planning for anticipated hazards, and it includes a recommendation that hazardous wastes be included as a potential source of environmental disasters.