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

Egyptian Environmental Policy Program
Program Support Unit

Tranche 1, Objective 4

Cairo Air Quality Crisis Management

Dr. Aref Rashad

April 2001

PSU-69

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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About the Author

Dr. Aref Rashad brings a unique background of crisis management, strategic and business planning to the field of environmental management. He earned advanced degrees in Aeronautical and Mechanical Engineering from Cairo University, and Operations Research training at the Egyptian Military Technical College and the American Naval Postgraduate School. His post-doctoral business studies were completed in the United States at the University of Southern California. He specializes in information systems, operations research, decision support systems, and project management and evaluation. In addition to teaching at military and academic institutions in Egypt, Dr. Rashad has authored papers in a wide-range of fields. He's been recognized by Egyptian President Hosni Mubarak for his work with the military and by the Egyptian Syndicate of Engineers for his contributions to information systems and operations research.

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:	Eng. Dahlia Lotayef
Work Assignment Author:	Dr. Aref Rashad
Work Assignment Supervisor:	Harold Van Kempen
Work Assignment Period:	April 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:

United States of America:
EPIQ Prime Contractor
International Resources Group, Ltd
1211 Connecticut Ave, NW
Suite #700
Washington, DC 20036
Telephone: (1-202) 289-0100
Facsimile: (1-202) 289-7601
Contact: Douglas Clark
Vice President

Egypt:
EEPP-PSU
International Resources Group, Ltd
21 Misr Helwan Agricultural Road
Office 62, 6th Floor
Maadi, Cairo 11431
Telephone: (20-2) 380-5150
Facsimile: (20-2) 380-5180
Contact: Dr. Jan Laarman
Chief of Party

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Acronyms and Abbreviations

AQCMIS	Air Quality Crisis Management Information System
AQMS	Air Quality Monitoring Section
AQS	Air Quality Sector
CA	Competent Authority
CAIP	Cairo Air Improvement Project
CDA	Community Development Association
CIDA	Canadian International Development Agency
CIP	Commodity Import Program
CNG	Compressed National Gas
DANIDA	Danish International Development Assistance
DFID	Department for International Development
EDMC	Environmental Disaster Management Committee
EDMU	Environmental Disaster Management Unit
EEAA	Egyptian Environmental Affairs Agency
EEIF	Egyptian Environmental Initiatives Fund
EEPP	Egyptian Environmental Policy Program
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EIMP	Environmental Information and Monitoring Program
EMA	Egyptian Meteorological Authority
EMS	Environmental Management Systems
EMTF	Episode Management Task Force
EPF	Environmental Protection Fund
EU	European Union
FEI	Federation of Egyptian Industry
FINNIDA	Finnish International Development Assistance
GEAP	Governorate Environmental Action Plan
GTZ	German Technical Cooperation
HW	Hazardous Waste
IBRD	International Bank for Reconstruction and Development
IT	Information Technology
JICA	Japan International Cooperation Agency
KFW	Kreditstanstalt Fur Weideraufbau
MSEA	Ministry of State for Environmental Affairs
MSW	Municipal Solid Waste
NCCM	National Committee for Crisis Management
NEAP	National Environmental Action Plan
NGO	Non-Governmental Organization
O&M	Operation and Management
PSU	Program Support Unit
SME	Small and Medium Sized Enterprises
UNDP	United Nation Development Program
UNEP	United Nations Environmental Program
UNIDO	United Nations International Development Organization
USAID	United States Aid for International Development
VET	Vehicle Emissions Testing
WHO	World Health Organization

Foreword

After completing a competitive bidding process, the United States Agency for International Development (USAID) awarded a multi-year contract to a team managed by International Resources Group, Ltd. (IRG). The contract calls for the development and implementation of environmentally sound strategic planning and the strengthening of environmental policies and institutions in countries where USAID is active. Under the conditions of the contract, the Environmental Policy and Institutional Strengthening Indefinite Quantity Contract (EPIQ), IRG has been charged with assisting USAID/Egypt in the implementation of a sizeable portion of the Egyptian Environmental Policy Program (EEPP).

In 1999, successful negotiations between branches of the governments of the United States and the Arab Republic of Egypt culminated in the signing of a Memorandum of Understanding. The Government of Egypt (GOE) agreed to implement a set of environmental policy measures with technical support and further assistance provided by the United States/ USAID. Negotiations were handled for the United States Government by USAID. On behalf of the Arab Republic of Egypt, representatives from 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 participated.

EEPP is a multi-year program created to support policy and institutional and regulatory reforms in the environmental sector with a focus targeted towards working within economic and institutional constraints, cleaner and more efficient energy usage, reduced air pollution, improved solid waste management, and the administration of natural resources for environmental sustainability.

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

In the preparation of this study, the assistance and support provided by the Egyptian Environmental Affairs Agency (EEAA) was invaluable. Special recognition is due Dr. Ahmed Gamal Abdel-Rehiem, head of the Air Quality sector of EEAA. He graciously provided critical data, thoughtful suggestions, feedback and comments. In addition, I would like to thank Dr. Michael Colby, EEPP/PSU's Senior Environmental Policy Advisor for his valuable advice and expertise.

Executive Summary

In response to the severe air pollution found in Cairo in October of 1999, a committee was formed by Her Excellency, Nadia Makram Ebeid, the then Minister for Environmental Affairs, to investigate and to study the source of this phenomena and to develop a management system to deal with future crises before and/or after they occur. The objective of this study is to define the crisis management concept, work policies, to develop an organizational structure to implement the management process, and to create operational procedures.

Due to the complexity of Air quality crisis types, in order to efficiently and effectively manage them, the crisis management concept sought to create standards and organizational procedures that would be utilized to coordinate the efforts of each agency involved. Crisis management focuses upon implementing different measures to prevent the crisis and/or to effectively implement proper measures during the crisis to minimize possible hazards.

The goal of the organizations is to create a cooperative management system to coordinate deployment efforts between:

- **The National Committee for Crisis Management (NCCM).** NCCM was created by the Cabinet of Ministers and three Egyptian Environmental Affairs Agency (EEAA) units[1]. These include:
  - The Environmental Disaster Management Committee (EDMC)
  - Air Quality Sector (AQS)
  - Environmental Disaster Management Unit (EDMU)
- The monitoring of daily changes in Cairo air quality is the responsibility of **Air Quality Monitoring Section (AQMS)** within the Air Quality Sector. AQMS units include:
  - Supervision group
  - Air Quality group
  - Meteorological group
  - Information group.
- Managing an air quality crisis during its occurrence shall be the responsibility of EDMU.

The Standard Operations Procedure has been formulated based upon the categorization of the phases of the crisis management process. This categorization includes six stages:

1. **Forecasting stage**: Operations are carried out to monitor and predict air quality changes
2. **Attention stage**: Operations are carried out to focus the department's attention when air quality reaches attention-specified limits.
3. **Alert stage**: Operations are carried out when the air quality reaches alert specified limits.
4. **Warning stage**: Operations are carried out when the air quality reaches warning-specified limits.

[1] AQS and EDMU are newly formed within EEAA.

5. **Emergency stage**: Operations are carried out when the air quality reaches emergency-specified limits.

6. **Post-crisis stage**: Operations are carried out to analyze and assess the crisis after its occurrence

Operations in forecasting and attention stages are carried out within EEAA organizational units. Operations for other stages are created in cooperation with pertinent authorities.

The information system supporting the management of the air quality crisis has to be considered as a subsystem of the integrated Crisis/Disaster management system developed by the EEAA Information System Central Department operated within the framework of the EDMU during the occurrence of a disaster. The system includes different databases:

- Geographic
- Entities
- Personnel
- Air Quality Specifications
- Resources and Capabilities
- Environmental disaster sources
- Past Environmental disaster cases
- Disaster Management Rules and Regulations

The major computer software programs required to help in managing the crisis include those that will:

- Record and monitor air quality indicators
- Evaluate air quality
- Select experts and consultants
- Predict air pollution rates of evolution
- Develop air pollution crisis scenarios
- Specify Standard Operating Procedures
- Define disaster recovery procedures
- Map environmental effects
- Record and update data
- Retrieve crisis data
- Prepare reports and statistics.

1. Introduction

Air quality depends upon pollution. Air pollution is anything that contaminates the air or affects its composition. Polluted air can contain dust and chemicals such as smoke from chimney's, carbon monoxide and nitrogen monoxide. Because both plants and animals depend on air to breathe, when the air is not clean, the entire environment is affected. Breathing unclean air causes health problems in humans. Over long periods of time, air pollution may damage the ozone layer and affect the global climate because of the greenhouse effect.

Conventional air pollutants include: Sulfur Dioxide, Particulate Matter, Ozone, Nitrogen Dioxide, Lead and Carbon Monoxide. Others include: Volatile organic compounds (VOC's) and Hazardous Air Pollutants (HAP's) such as dioxins, furans, etc.

Sulfur Dioxide is a colorless gas, odorless at low concentrations, but pungent at very high concentrations. It's emitted largely from industrial, institutional, utility, and apartment-house furnaces and boilers, and from petroleum refineries, smelters, paper mills, and chemical plants. It's one of the major pollutants that cause smog. It can also, at high concentrations, affect human health, especially among asthmatics. The pollutants it produces can impair visibility and acidify lakes and streams. Acidity also damages infrastructure, antiquities and other cultural resources made from stone and metal, etc.

Particulate Matter is any microscopic solid material derived from smoke, dust, fly ash, and condensing vapors that can be suspended in the air for long periods of time. Its main sources are: industrial processes, smelters, automobiles, burning industrial fuels, dust from paved and unpaved roads, construction, and agricultural groundbreaking. Like sulfur dioxide, these microscopic particles can affect breathing and respiration. It causes increased respiratory disease and lung damage. Children, the elderly, and people suffering from heart or lung disease (like asthma) are especially at increased risk. It also reduces visibility.

Ozone is a colorless gas. It's the major constituent of photochemical smog at the earth's surface. As a result of chemical reactions between oxygen, volatile organic compounds and nitrogen oxides in the presence of sunlight (especially during hot weather), Ozone is formed in the lower atmosphere. Sources of such harmful pollutants include: vehicles, factories, landfills, industrial solvents, and numerous small sources such as gas stations, farm and lawn equipment. Ozone causes significant health and environmental problems at the earth's surface. It can irritate the respiratory tract; produce impaired lung function such as inability to take a deep breath, cause throat irritation, and chest pain. Smog components may aggravate existing respiratory conditions like asthma. It can also reduce the yield of agricultural crops and injure forests and other vegetation. Ozone is the most injurious pollutant to plant life.

At lower concentrations, **Nitrogen Dioxide** is a light brown gas. In higher concentrations it becomes an important component of unpleasant-looking brown, urban haze. Its source is: fuels burned in utilities, industrial boilers, cars and trucks. It is one of the major pollutants that cause smog and acid rain. When concentrations are sufficiently high, it can harm humans and vegetation. In children, it may cause increased respiratory illnesses such as chest colds and coughing with phlegm. For asthmatics, it can cause increased breathing difficulty.

Lead, through either ingestion of lead-contaminated soil, dust, paint, etc., or direct inhalation, lead and lead compounds can adversely affect human health. The main sources of lead are: transportation vehicles that use lead in their fuels, coal combustion, smelters, car battery plants, and combustion of garbage containing lead products. Elevated lead levels can

adversely affect mental development and performance, kidney function, and blood chemistry. Due to their greater chance of ingesting lead and the increased sensitivity of young tissues and organs to it, young children are particularly at risk.

Carbon Monoxide is an odorless and colorless gas emitted in the exhaust of motor vehicles and other kinds of engines where there is incomplete fossil fuel combustion. Sources of Carbon Monoxide are: automobiles, buses, trucks, small engines, and some industrial processes. High concentrations can be found in confined spaces like parking garages, poorly ventilated tunnels, or along roadsides during periods of heavy traffic.

Because Carbon Monoxide reduces the ability of blood to deliver oxygen to vital tissues, it primarily affects the cardiovascular and nervous systems. Lower concentrations have been shown to adversely affect individuals with heart disease (e.g., angina) and to decrease maximal exercise performance in young, healthy men. Higher concentrations can cause symptoms such of dizziness, headaches and fatigue.

As a result of the phenomenon of the severe pollution of Cairo air experienced in October 1999, the committee formed by Her Excellency the Minister for Environmental Affairs to investigate the source of this phenomena, a management system was developed to control such a crisis before and after its occurrence.

The objective of developing such a system is to manage the crises of Cairo air quality by monitoring, analyzing and assessing the degree of Cairo air pollution, then to utilize management measures to implement crisis stages of alarm, warning and emergency responses to prevent or to minimize the possible harmful impacts during the crisis.

Cairo Air Quality Crisis

Cairo Air Quality

More than 11 million people live in Greater Cairo. The climate is sunny and dry. Rain is rare (about 22 mm annually). Wind speed averages about 5 meters per second. These climate conditions enable particulate matter to be suspended in the air. If there is no rain and the wind speed is relatively low, the pollutants accumulate in higher concentrations. This leads to the smog phenomena. When temperature inversions occur (warm air stays near the ground instead of rising) and winds are calm, smog may stay in place for days' at a time. Traffic and other pollution sources add more pollutants to the air.

This is what happened in Cairo from October 23 until the beginning of November in 1999. Wind speed had decreased to 2 m/s, temperature inversions occurred and relative humidity increased during the night. Pollutant concentrations became considerably higher over the permissible limits defined by the Environment Protection Law No. 4.

Cairo pollution sources include those produced by the burning of fuels and solid wastes. Solid fuels such as coal and rubber are used heavily in small plants. Gasoline, which has a high sulfur percentage (up to 3%), is used in many electric power stations and industrial firms. The number of cars in Cairo had increased from 0.4 million in 1980 to 1.27 million in 1997. This led to the increase of pollutant emissions such as Carbon Monoxide and smoke.

The practice of burning garbage is another source of pollution in Cairo. The amount of solid garbage burned every day is estimated at about 2000 tons. This has led to estimated emissions of 7700 tons of particulate matters every year, and to approximately 1095 ton of sulfur dioxide and 35000 ton of Carbon Monoxide.

Industry is a major source of pollution in Cairo. Environment polluted industries exist in two main zones: Shubra el-Kheima and Helwan. In addition to over 10000 unregistered plants, there are more than 12600 registered plants in Cairo.

Due to the large increase in Cairo's population, the number of used cars and industrial plants, air pollutant concentrations have increased. For example, sulfur dioxide concentration has reached 105 microgram/m^3 in the downtown area. According to Egyptian law, this is higher than the permissible limit (60 microgram/m^3) and the recommended limit set by the International Health Organization (40 microgram/m^3). According to environmental Egyptian law, concentrations of suspended matters also reached more than 6 times the permissible limit.

As these concentrations increase (especially if temperature inversions occur and winds become calm) it is expected that such elevated conditions may lead to an environmental crisis or disaster similar or worse than the one experienced in Cairo during the fall of 1999. When temperature inversions occur, warm air stays near the ground instead of rising and winds are calm.

Crisis Management Concept

The objective in developing a system to manage the crisis of Cairo air quality and to prevent or minimize possible harmful impacts is to ensure continuous monitoring, analysis and assessment while implementing different tasks and related activities. These include: crisis

stages of alarming, warning, emergency preparedness, and coordination/cooperation with relevant government entities

Due to the complexity of the air quality crisis type, to efficiently manage the crisis, management needs to coordinate activities between the agencies involved in a standard and organized way.

The organization scheme is based upon establishing a framework of cooperation among the National Committee for Crisis Management (NCCM) formed by the Cabinet of Ministers and three Egyptian Environmental Affairs Agency (EEAA) units:

- -Environmental Disaster management committee (EDMC)
- -Air Quality Sector (AQS)
- -Environmental Disaster Management Unit (EDMU).

Functions

The main functions of the proposed system is to:

- Anticipate possible pollution crises in Cairo, prepare suitable plans for confrontation and to monitor the execution of these plans
- Assess the status of the crisis and define the proper method s for handling it
- Monitor crisis progress indicators and notifying EEAA about their status
- In accordance with the framework of the National Contingency Plan for Environmental Disasters, and in cooperation with the relevant state entities beneath the umbrella of the Disaster Management Higher Committee of the Ministers Cabinet, manage the crisis during it occurrence
- Continuously follow-up on the impact of the crisis and analyze the lessons learned after each occurrence.
- Collect and update all necessary data and information. Monitor and manage Cairo air quality and support the decision - making process.

Work Policies

The main work policies include:

- The development of a well-defined procedure to reduce air pollution in Cairo while limiting its negative impact.
- To cooperate with EEAA related disaster management entities and the Cabinet of Ministers in an effective way to prevent or minimize the crisis' negative impact.

Crisis Stages

Crisis shall be managed in different stages that can be categorized according to the type of operations to be carried out. These stages are:

- **Attention stage:** It includes operations to be carried out within EEAA to focus its AQS department's attention when air quality reaches attention levels
- **Alert stage:** It includes cooperative operations to be carried out between EEAA and pertinent authorities when the air quality reaches alert specified limits
- **Warning stage: I**t includes operations to be carried out in cooperation between EEAA and pertinent authorities when the air quality reaches limits set for warning

- **Emergency stage:** It includes operations to be carried out in cooperation between EEAA and pertinent authorities when the air quality reaches emergency specified limits
- **Post crisis stage:** It includes operations concerning the analysis and assessment of the crises after their occurrence

Crisis Scenarios

The evolution of all air quality crises depends upon the concentration of pollutes in the air and changes in the climate. A crisis scenario occurrence follows these stages:

- **Attention stage:** Based upon pollutant concentrations, air quality is continuously monitored by HQS. EEAA departments shall be notified if the air concentration or indicators reach the following limits. These limits should be periodically revised according to effects on health, normal concentration levels, local conditions, etc.

Sulphur dioxide concentration	300 Microgram / m^3 (daily average)
Particulate matter measured as smoke	350 Microgram / m^3 (daily average)
Smoke concentration multiplied by so_2	85.000

- **Alert stage**: This is the stage where concentrations reach unhealthy limits, requiring the deployment of alert operations. This stage is reached at the following levels:

Sulphur dioxide concentration	375 Microgram / m^3 (daily average)
Particulate matter measured as smoke	420 Microgram / m^3 (daily average)
Particulate matter concentration multiplied by so_2	120.000
Very small dust (less than a micrometer)	to be defined
Carbon monoxide	to be defined
Ozone	240 Microgram / m^3 (one hour)

- **Warning stage**: This is the stage where pollutants in the air continue to increase over the specified values in alert stage to reach the following limits:

Sulphur dioxide concentration	450 Microgram / m^3 (daily average)
Particulate matter measured as smoke	550 Microgram / m^3 (daily average)
Particulate matter concentration multiplied by so_2	185.000
Very small dust (less than micrometer)	to be defined
Carbon monoxide	to be defined
Ozone	to be defined

- **Emergency stage:** This is the stage where pollutants reach the following limits:

Sulphur dioxide concentration	525 Microgram / m^3 (daily average)
Particulate matter measured as smoke	650 Microgram/ m^3 (daily average
Particulate matter concentration multiplied by so_2	185.000
Very small dust (less than2.5 micrometer)	to be defined
Carbon monoxide	to be defined
Ozone	to be defined

Air pollution crisis levels can be summarized as shown in table 1:

Table 1 Air Pollution Crisis Levels

Pollutants	Attention Stage	Alert Stage	Warning Stage	Emergency Stage
Dust (24 hour)	350	420	550	650
Sulfur Dioxide (24 hour)	300	375	450	525
Dust + So^2	8500	120000	185000	280000
CO				
O^3				

Crisis Management and Organization

Organization Structure

The core entities involved in managing the air quality crises are:

- National Committee for Crisis Management
- EEAA Environmental Disaster Management Committee
- Air Quality Sector
- Environmental Disaster Management Unit

National Committee for Crisis Management (NCCM)

NCCM is a national committee formed by the Cabinet of Ministers. Its main purpose is to control and manage all national crises. The committee includes representatives from all governmental entities including EEAA. During a crisis, the committee assigns one of its members to follow the crisis. The tasks of the assigned committee members is to:

- Provide regular updates to the National Committee of progress made during a crisis incident
- Coordinate and communicate with all pertinent authorities
- Ensure follow-up by the proper administration of crisis management procedures
- Ensure that the pertinent authorities properly carry out their roles
- Facilitate overcoming obstacles and solving problems that arise during the crisis management process

Environmental Disaster Management Committee (EDMC)

The Environmental Disaster Management Committee is headed by the state Minister of Environmental Affairs. It's responsible for managing and monitoring all environmental crises and disasters. The major tasks of the committee is to:

- Assess the crisis situation and to make proper crisis management decisions
- Provide technical monitoring of the crisis management process
- Send specialized task forces to disaster areas to examine the status on-site
- Meet with the Cabinet of Ministers to brief them on the crisis process and its status
- Set communication and media policy for crisis management

The EEAA Environmental Disaster Committee includes:

- Head of Air Quality Sector
- Head of Environment Administration Sector
- Head of Information System Sector
- Environment Protection Fund Manage
- Head of Native Protection Central Department
- Head of Branches Affairs Central Department
- Head of Environmental Disaster Management Unit

In addition, there are consultants from outside EEAA and representatives of pertinent authorities.

Environmental Disaster Management Unit (EDMU)

The Environmental Disaster Management Unit is the organizational unit of EEAA. It's responsible for managing environmental crisis/disasters. The main responsibilities of EDMU are:

- Environmental crises and disaster prediction and the preparation of the appropriate management plans on each crisis level in cooperation with relevant sectors in EEAA
- Monitoring potential crises in order to take proactive precautions before their occurrence
- In cooperation with relevant sectors, to evaluate the crises/disaster situation and to identify appropriate management plans to deal with it.
- To manage the environmental crises or disaster at the time it occurs and to utilize the National Contingency Plan in cooperation with all relevant entities
- To regularly monitor the crises/ disaster impact and to analyze the lessons learned after an occurrence
- To collect and update all necessary data and information and to monitor and manage environmental crises/ disasters to support a decision-making process

EDMU organizational units are:

- EDMU manager
- Research and Studies section
- Coordination and Communication section
- Information System section
- Control and Monitoring section
- Administrative section

Air Quality Sector (AQS)

The Air Quality Sector is a main division within the EEAA organizational structure. AQS should include a section for monitoring air quality changes. The major tasks of this section include:

- Continuous follow-up on air quality status
- To update EDMU with relevant data and information regarding air quality and crisis impact
- To report to the Head of AQS about daily air quality changes
- To participate in defining proper management actions
- To participate in analyzing actions after the crisis

The Air Quality Monitoring Section (AQMS) includes:

- Section Head
- Quality air group
- Meteorological group
- Information group

Crisis Management Workflow

EEAA constantly monitors changes in air quality. As crises evolve, different entities become involved. They include:

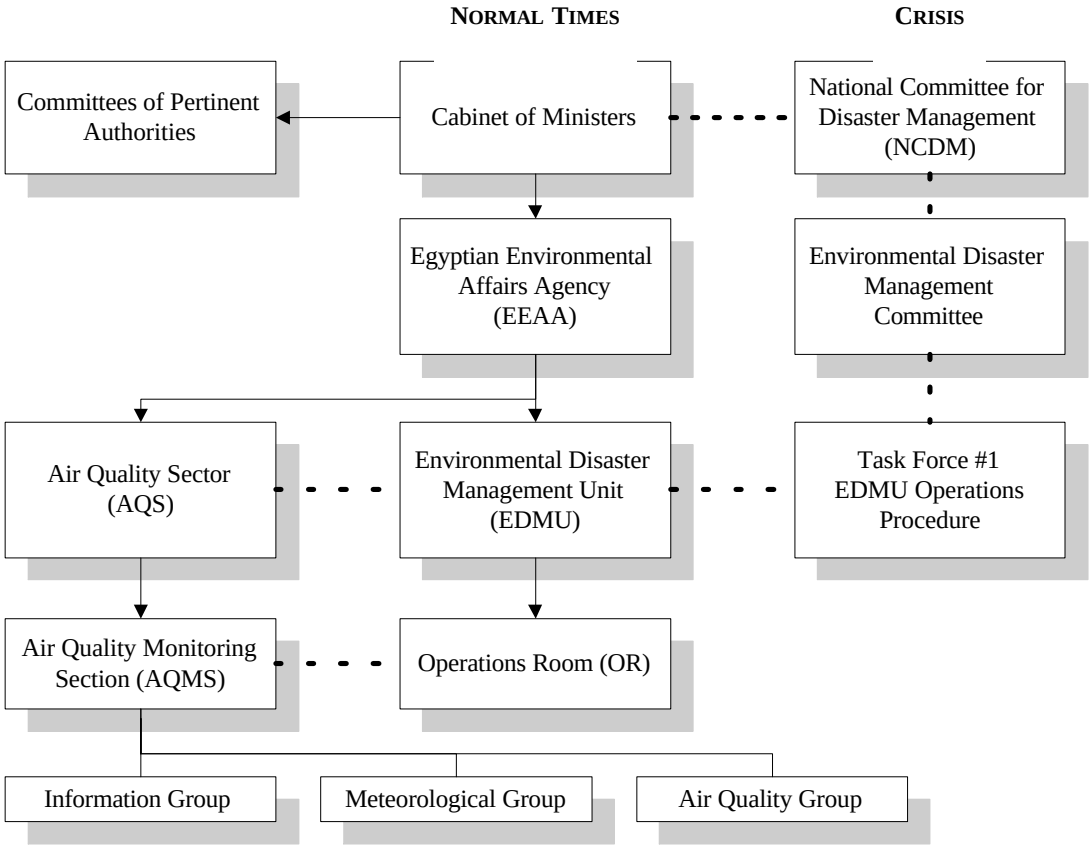
- National Committee for disaster management.
- Pertinent Authorities.
- The Environmental Disaster Management Committee
- Crisis Management task force # 1 (per EDMU operational procedures)

Workflow within the organizational system:

- In cooperation with the Environmental Information and Monitoring Program (EIMP) and Egyptian Meteorological, the AQMS keeps track of daily changes in air quality. The AQMS submits periodic reports to the Head of AQS.
- The head of AQS assesses the situation and keeps the EEAA Chairman current on the status of each crisis stage.
- Upon reaching Attention Stage, the EEAA Chairman instructs the EDMU director to start preparing the Operations Room for possible use. All EEAA departments are notified.
- Upon reaching Alert Stage, the assigned member of the National Committee for Crisis Management is notified by the EDMU Manager. The member begins coordination with pertinent authorities.
- Upon reaching Warning Stage, the State Minister of Environmental Affairs gives instructions to the Environmental Disaster Management Committee to carry out its responsibilities in accordance with the National Environmental Disaster Contingency Plan.
- In accordance with the National Disaster Contingency Plan, upon reaching the Emergency Stage, the National Committee for Crisis Management begins to manage the crisis from the Operations Room. Accordingly, Task Force #1 needs to be created to carry out the tasks specified in the plan.

Figure 1 illustrates the outline of the organizational guidelines for handling the air quality crisis.

Figure 1 Guidelines for an Air Quality Crisis



AQMS Organization

Section Head

The main responsibilities of the Section Head is:

- Planning and follow-up of section activities
- Supervising the implementation of crisis standard procedures
- Presentation of the crisis status to higher authorities to determine the appropriate crisis stage
- Coordination with EDMU to prepare and equip the operation room according to crisis requirements
- Coordinating with the National Committee for Crisis Management
- Coordinating with the EEAA Environmental Disaster Management Committee

Air Quality group

The main responsibilities of the air quality group is to:

- Advise/define/identify the stage of the air quality crisis
- Analyze and assess meteorological and air concentration data as it's received from different sources
- Assess and evaluate the crisis impact on the population
- Participate in specifying air quality limits for different crisis stages and revise criteria periodically according to their affect on health, normal concentration levels, local conditions, etc.

The group personnel include two Air Quality Analysts

Meteorological Group

The main responsibilities of the meteorological group is to:

- Continually follow up on air quality changes
- Coordinate with the Egyptian Meteorological Authority (EMA) to receive and update meteorological data
- Coordinate with Environmental Information and Monitoring Program (EIMP) to receive and update air quality data
- Participate with Air Quality Group in analyzing and assessing the degree of air pollution

The group personnel include two Meteorological Analysts.

Information Group

The main responsibilities of the information group:

- Define information requirements for crisis management
- Provide and update relevant information on a regular basis
- Define computer application requirements to deal with air crisis management.
- Coordinate with the EDMU information section to ensure proper data storage and retrieval.
- Coordinate with the EEAA Central Department for Information to ensure availability of adequate facilities.

The group personnel include two Information Analysts.

AQMS Job Descriptions

Section Head

The main responsibilities of the Section Head is:

- Planning and monitoring implementation of section responsibilities
- Supervises the preparation and evaluation of the crisis management situation
- Supervise and coordinate work of subordinate groups
- Select and assign relevant consultants
- Coordinate with EDMU staff
- Continually update the AQS Head in crisis situations
- Cooperate with the designated contact of the National Committee to ensure proper implementation of the tasks assigned to each pertinent authority

- Coordinate with EEAA departments to facilitate the management process

The prerequisite requirements for the job are:

- A university degree in a relevant field
- At least 5 years experience in Air Quality Management
- Past experience in crisis management
- Good management and leadership skills
- Good communication skills

Air Quality Analyst

The main responsibilities are:

- Participate in analyzing and assessing a crisis situation
- Analyze and predict air quality pollution stages
- Maintain technical documentation about the crisis
- Cooperate with relevant entities
- Coordinate with Meteorological Specialists
- Provide updated information to technical consultants

The prerequisite requirements for the job are:

- A university degree in a relevant field, preferably in Environmental Studies
- At least 3 years experience in air pollution analysis
- Good technical background
- Good analytical capabilities

Meteorological Analyst

The main responsibilities are:

- Participate in analyzing and assessing meteorological status
- Review Early Warning System data
- Cooperate with Meteorological Authority staff to receive and analyze data
- Coordinate with Air Quality Specialist to review available data and information
- Maintain meteorological documentation about the crisis
- Produce meteorological tables and charts
- Provide updated information to the technical consultants

The prerequisite requirements for the job are:

- A university degree in a relevant field, preferably in Meteorological Studies
- At least 3 years experience in meteorological analysis
- Good technical background
- Good analytical capabilities
- Good computer skills.

Information Analyst

The main responsibilities are:

- Receive, store and update relevant data
- Produce required reports
- Ensure data and information updates during different phases of the crisis
- Run computer applications
- Cooperate with other EMTF groups
- Cooperate with EMDU information staff

The prerequisite requirements for the job are:

- A university degree in computers or information systems.
- At least 3 years experience in information system field
- Good technical capabilities
- Good programming skills

Operations Requirements

Administrative Requirements

It is recommended that a specific site be made available for those who are continuously monitoring the status of the air quality during the forecasting stage. This site could be within EDMU premises and near the Early Warning System facilities.

The site should be equipped with:

- Photocopier
- Stationery and printed materials

Technical Requirements

Communication equipment such as:

- Telephones
- Faxes
- Internet access

This equipment should facilitate direct communication with environmental information and monitoring stations in at least four sites in Greater Cairo. These sites are: downtown, residential areas, the Tebin industrial area, and the Shobra Elkhema zone.

The phone numbers dedicated for this purpose are 525-6491, 525-6492, 525-6452 using internal lines number 8846, 8847, 8848, 8850, and the Fax dedicated number is 525-6494.

The site should also include:

- Two computers
- One printer
- One plotter

Training Requirements

Training requirements for handling air quality crises can be divided into two categories: Technical and Managerial.

- **Technical training** includes the following courses. (Some of the topics may be covered in one or a few lectures. Others may be combined into one or two courses lasting a few days.)
  - T001 Air Quality Fundamentals
  - T002 Air Quality Measurements
  - T003 Basics of Meteorological Analysis
  - T004 Meteorological Data Analysis and Assessment
  - T005 Introduction to Information Systems
  - T006 Information Systems Development Methodology
- **Managerial training** is classified as lecture-based training or simulation-based training. **Lecture-based training** includes the following courses:
  - M001 Fundamentals of Crisis Management
  - M002 Decision Making Techniques
  - M003 Environmental Crisis Management
  - M004 Air Quality Crisis management
- **Simulation-based training** is a management game type of training. All the parties involved in the management process participate in managing a hypothetical crisis. It includes two levels:
  - S001 Air Quality Crisis Management Game on EEAA level
  - S002 Air Quality Crisis Management Game on the national level

The parties involved in the training are:

- National Committee for Crisis Management
- EEAA Environmental Disaster Management Committee
- Environmental Disaster Management Unit
- Air Quality Sector Director
- Air Quality Monitoring Section, including its working groups:
  - Section Head (SH)
  - Quality air group (AG)
  - Meteorological group (MG)
  - Information group (IG)

Table 2 shows the training requirements for different parties.

Table 2 Training Requirements

Code	Course Name	NCCM	EDMC	AQS (DR)	EDMU	AQMS (HS)	AQMS (AG)	AQMS (MG)	AQMS (IG)
T001	Air Quality Fundamentals		X	X	X	X	X	X	X
T002	Air Quality Measurements						X		
T003	Basics of Meteorological Analysis					X	X	X	X
T004	Meteorological Data Analysis and Assessment							X	
T005	Introduction to Information Systems.					X			X
T006	Information Systems Development Methodology								X
M001	Fundamentals of Crisis Management		X	X	X	X	X	X	X
M002	Decision Making Techniques			X	X	X			
M003	Environmental Crisis Management			X	X	X			
M004	Air Quality Crisis management			X	X	X	X	X	X
S001	Air Quality Crisis Management Game at EEAA level		X	X	X	X	X	X	X
S002	Air Quality Crisis Management Game on the national level	X	X	X	X	X	X	X	X

Standard Operations Procedures

The Standard Operations Procedure for managing the air quality crisis shall be defined for the different stages of the crisis as:

- Forecasting stage
- Attention stage
- Alert stage

Warning Stage

- Emergency stage
- Post crisis stage

Forecasting Stage

The operations to be carried out by AQMS are as follows, and the responsible is indicated by these abbreviations: IG: Information Group, MG: Meteorological Group, AG: Analysis Group, HS: AQMS Head

1. IG Receives a daily report from EIMP about air quality via Fax and E-mail utilizing an electronic file named "EIMP_Quality_Daily_Report_DD/MM/YY" addressed to: CAIP_CM @caip.com.eg.
2. IG Sends an E-mail and Fax back to EMIP to confirm report receipt
3. IG Receives a daily report about climate data issued from International Cairo Airport through EMA using both Fax and an E-mail file named "EMA_CA_Daily_Report_DD/MM/YY" addressed to: CAIP_CM@ caip.com.eg,
4. IG Sends an E-mail and Fax back to EMA to confirm report receipt
5. IG Receives a daily report about upper air layers from Helwan via EMA using both Fax and an E-mail file named "EMA_HW_Daily Report DD/ MM/YY" that is addressed to: CAIP_CM @caip.com.eg,
6. IG Sends an E-mail and Fax back to EMA to confirm report receipt
7. IG Receives a daily report about weather forecasts from EMA using both Fax and E-mail file named "EMA_FC_Daily Report DD/ MM/YY" addressed to: CAIP_CM @caip.com.eg.
8. IG Sends an E-mail and Fax back to EMA to confirm report receipt
9. IG Receives a daily report about expected changes in weather conditions from Environmental Information and Monitoring Program (EIMP) based upon the Eta Model program using both Fax and E-mail file named "EIMP_Daily_Report_DD/MM/YY" addressed to: CAIP_CM @caip.com.eg,
10. IG Sends an E-mail and Fax back to EMIP to confirm report receipt
11. MG/A Reviews data concerning air quality and expected weather changes
12. AG Implements forecasting tools

13. MG/AG Analyzes and assesses results of implementation of forecasting tool
14. MG/AG REVIEWS Forecasting tool outputs with EIMP
15. AG Discusses and specifies forecast decision
16. AG Formulates daily forecast report
17. HS Sends daily decision report to the head of AQS
18. MG/AG Monitors changes in air quality and weather data
19. HS Informs the head of AQS of any changes
20. AG Prepares monthly follow-up report
21. HS Sends monthly follow-up report to the head of AQS
22. QAS Head Sends monthly follow-up report to EEAA Chairman
23. AG Prepares an annual follow-up report.

QAS Head Sends annual follow-up report to EEAA Chairman

Table 3 shows daily forecasting action schedule and appendix 2 illustrates Daily Forecast Activities Report.

Table 3 Daily Forecasting Action Schedule

Duties Item	Responsible	Time
1-1	IG	Daily at 8: 30
1-2	IG	Daily at 8: 30
1-3	IG	Daily at 8: 30
1-4	IG	Daily at 8: 30
1-5	IG	Daily at 8: 30
1-6	IG	Daily at 8: 30
1-7	IG	Daily at 9: 00
1-8	IG	Daily at 9: 00
1-9	IG	Daily at 9: 00
1-10	IG	Daily at 9: 00
1-11	MG/AG	Daily at 11: 00
1-12	AG	Daily at 11: 30
1-13	MG/AG	Daily at 12: 00
1-14	MG/AG	Daily at 12: 00
1-15	AG	Daily at 12: 30
1-16	AG	Daily at 12: 45
1-17	HS	Daily at 13: 00
1-18	MG/AG	Daily at 14: 00 to 17:00
1-19	HS	Daily at 14: 00 to 17:00
1-20	AG	Monthly on day 30
1-21	HS	Monthly on day 30
1-22	QAS Head	Monthly on day 30
1-23	AG	Yearly in December
1-24	QAS Head	Yearly in December

Attention Stage

The operations to be carried out are as follows:

1. Contact the National Crisis Management committee to designate a committee member who will participate in managing the crisis
2. Add a night shift for the forecasting group to monitor changes in the concentration levels
3. Inform EAA managers and consultants when the attention stage has been reached
4. Activate awareness programs via the media
5. EEAA Chairman or his representative forms a team to start the preparation of the operation room for use in subsequent stages

Alert Stage

1. AQMS continues to monitor the situation and maintains continuous contact with relevant divisions to follow-up upon the execution of procedures. It maintains contact with the weather forecasting organization during the next 24 hours to determine air quality change expectations. In the meantime, relevant information about the status of the crisis is to be shared with the public.
2. A member of the NCCM contacts pertinent authorities to implement necessary actions related to the alert stage within their domain.
3. NCCM member receives follow-up reports from pertinent authorities and sends copies to EDMC.
4. EDMC reviews and assesses the actions taken by different authorities
5. EDMC receives a progress status report from the head of AQS and decides, according to specified concentrations, whether to upgrade the warning stage.
6. EEAA chairman reports crisis status to the Prime Minister
7. Ministry of Interior operations procedures include:
    - Preventing uncovered burning of solid waste.
    - Preventing cars from entering and parking in downtown Cairo
    - Preventing any activities involving the burning of wood, rubber, coal, plastics, etc.
    - Preventing the burning of agricultural wastes
    - Stopping work in all industries using **mazout** as a fuel, especially within inresidential areas
8. Ministry of Local Administration Operations Procedures include:
    - Preventing uncovered burning of solid wastes
    - Stop all burning in slaughter houses and hospitals
    - Stop work at all industries that use mazout as a fuel, especially in residential areas
    - Prevent any activities that involve the burning of wood, rubber, coal ,plastic, etc.
    - Prevent burning of agriculture waste
9. Ministry of Public Enterprise operations procedures include:

- Stop work in all industries that use mazout as fuel, especially in residential areas

10. Ministry of Petroleum operations procedures include:

- Preventing feeding of mazout to all industries in residential areas
- Increase the supply of natural gas to electricity generating stations

11. Ministry of Electricity operations procedures include:

- Increase the supply of natural gas to electricity generating stations

12. Ministry of Health operations procedure includes:

- Stopping burning in hospitals

13. Ministry of Higher Education operations procedure includes :

- Stopping burning in educational medical hospitals

Warning Stage

1. AQMS continues to monitor the situation while maintaining continuous contact with relevant entities who follow-up on the execution of crisis management protocols. To predict air quality changes, for the next 24 hours, AQMS receives updated weather forecasts via the weather forecasting organization. Pertinent information about the status of the crisis is communicated to the public.

2. Within their defined role, members of the NCCM contact appropriate authorities to implement actions related to the warning stage.

3. NCCM receives follow-up reports from pertinent authorities.

4. EDMC reviews and assesses the responses of the authorities involved

5. EDMC receives progress status reports from the Head of AQS and decides, based upon specified concentrations, whether it is approriate to transfer to the warning stage

6. The EEAA chairman reports the crisis status to the Prime Minister.

7. The Ministry of Interior operations procedures include:

- Allow cars to enter greater Cairo only with permission.
- Decrease the number of cars on the street by specifiying which days odd or even license plate numbers are allowed access
- Controlling work suspension in Foundries, lime kilns and crushers within residential areas and 5 km outside Greater Cairo's borders.

8. Ministry of Local Administration operations procedures include:

- Suspend work in foundries, lime kilns and crushers within residential areas up to 5 km outside Greater Cairo's borders
- Suspend work in clay bricks plants
- Suspend work in coal burning sites

9. Ministry of Public Enterprises operations procedures include:

- To allow for the maintenance of equipment and furnaces, using the least energy, control downsizing in industries utilizing chemical, cement, steel, and coal.

10. Ministry of Higher Education operations procedures include:

    - Notify teaching hospitals of the impact of emergency conditions upon heart and lung patients.

11. Ministry of Health operations procedures include:

    - Notify hospitals of the impact of emergency conditions upon heart and lung patients.

Emergency Stage

1. AQMS continues to monitor the situation and maintains continuous contact with relevant entities to ensure that designated procedures are being exececuted. To monitor expected air quality changes, during the next 24 hours it receives weather forecasting from the weather forecasting organization. In the interim, relevant information is shared with the public about the status of the crisis.

2. EDMC reports to the EEAA chairman when the crisis has reached the emergency stage.

3. The EEAA chairman shall:

    - Notify the Minister of State for Environmental Affairs. In turn, he shall notify the Cabinet of Ministers that an accident has caused an environmental disaster.
    - Notify the EDMU manager to begin to manage the crisis from the operations room.
    - Notifies all sections within EEAA

4. The Prime Minister shall declare a state of Environmental Disaster and provide commitments and authorizations at different State administrative levels.

5. According to the rules of the general plan for environmental disaster management, members of the Supreme Council for Disaster Management shall be called to convene a meeting of the Cabinet **Presidency** to form the Management Committee.

6. In cooperation with EDMC,the Management Committee shall convene in the Environmental Central Operations Room to manage the disaster at the strategic level.

7. Members of NCCM shall contact relevant ministries and organizations to begin the implementation of emergency procedure within their domain.

8. NCCM receives follow-up reports from pertinent authorities

9. EDMC reviews and assesses the implementation of procedures by each authority

10. EDMC reports the situation to the NCCM to take appropriate action.

11. Ministry of Interior operations procedures include:

    - Suspend traffic of all cars and buses except for emergency vehicles, physicians and public transfer

12. Ministry of Public Enterprise operations procedures include:

    - Suspend all industries if its equipment willl not be harmed by complete stoppage
    - Utilizing the lowest possible energy, control work in other industries to allow equipment to be maintained in proper working order

13. Ministry of Petroleum operations procedures include:

- Providing all power stations in Greater Cairo with 100% of its fuel as natural gas

14. Ministry of Electricity operations procedure includes:

- Providing all power stations in Greater Cairo with 100% of their fuel as natural gas

15. Ministry of Health operations procedures include:

- Alert all hospitals of emergency conditions

16. Ministry of Higher Education operations procedure includes:

- Alert all teaching hospitals of emergency conditions

Information System Requirements

Information System Characteristics

During a disaster, the information system supporting the management of the air quality crisis needs to be considered as one part of the integrated Crisis/Disaster Management System which was developed by the EEAA Information System Central department. It operates within the framework of the EDMU. The information system aims to:

- In order to manage the crises, provide necessary information to both EDMU and AQS.
- Give appropriate support to decision-making during crisis stages
- Support the presentation of incidents and situations to the crisis management team

The system should also:

- Prepare for and respond to the risks associated with the air pollution crises, promote early warning systems and facilitate the rapid dissemination of information and warnings
- Preserve relevant records for subsequent inquiry into the causes and circumstances of the emergency
- Offer quick analysis and assessment of damages and the amount and kind of relief required
- Provide access to data regarding air quality specifications and standards

The Air Quality Crisis Management Information System (ACMIS) is a collection of data, information and communication measures that would help in analyzing and facilitating a quick solution. Information is regularly updated. In the event of a similar crisis, ACIMS would enable the organization to deal with it and to minimize damage to the environment.

The major information system requirements:

- Compile information concerning sources of potential hazards that might lead to an air quality crisis, including:
  - Industrial facilities producing hazardous wastes
  - Burning areas
  - Electric power stations
  - Quarry areas
  - Large garages and automobiles repair workshops

Give support to decision-making during crisis stages, including:

- Forecasting stage
- Attention stage
- Alert stage
- Warning stage
- Emergency stage
- Post crisis stage

Provide information about resources, including:

- Experts and consultants
- Available capabilities and resources

- Roles and responsibilities of entities at different levels

Provide information related to air quality conditions and specifications

Data Requirements

Required data for the air quality crisis information system should include the following

- Experts and Consultants
  - Personal details
  - Fields of specialization
  - Means of communication
  - Experience and qualifications
  - Previous experience with Egyptian Environmental Affairs Agency (EEAA).
- Available Capabilities and Resources:
  - Contact information for pertinent authorities dealing with the crisis
  - Human resources
  - Equipment and facilities
  - Level of preparedness for crisis confrontation.

These authorities are within the:

  - Ministry of Interior
  - Ministry of Electricity
  - Ministry of Public Enterprises
  - Ministry of Industry
  - Ministry of Local Administration
  - Ministry of Communication
  - Ministry of Higher Education
  - Ministry of Petroleum
  - Ministry of Health
  - Egyptian Meteorological Authority
- Environmental Specifications and Conditions
  - Emission types and concentrations
  - Emission maps
  - Emission maps and air quality
  - Means and locations of pollution measurement
  - Previous and current emission standards for Greater Cairo
  - Critical air concentrations for pollutants.
- Sources of Potential Hazards for air pollution
  - Types and nature of source
  - Available disaster confrontation plans
  - Types of potential disasters and their hazard levels
  - Level of preparedness to confront each type of disaster
  - Means of cooperation with other parties

- Nature of the surrounding environment
- Types and extent of the impact on the surrounding environment
- Applied precautions and safety procedures.

These sources include:

- Industrial locations and facilities
  - Open work places
  - Electrical power stations
  - Motorcycles and vehicles
  - Quarries
  - Large workshops and garages.

Appendix 3 lists air pollution hazards sources in Greater Cairo.

- Standard Operations Procedures for various crisis stages:
  - Forecasting stage
  - Attention stage
  - Alert stage
  - Warning stage
  - Emergency stage
  - Post crisis stage
- Pollution limitation policies:
  - Solid waste management
  - Agricultural waste management
  - Gas emissions reduction
  - Motorcycle emissions reduction
  - Brick factories emissions reduction
  - Air pollution emissions
  - Gas combustion efficiency improvement.
- Previous crisis cases:
  - Cairo air pollution episode phenomenon, October 1998
  - Cairo air smoke pollution episode, October 1999

Data may include:

- Environmental monitoring of concentrations during the phenomena
- Wind speed and directions
- Particulate concentration
- Sulfur dioxide (SO_2) concentration
- Ozone (O_3) concentration.

Main sources for the data needed to establish and implement the air quality information system are:

- Ministry of Interior, Civil Defense Unit
- Ministries, agencies, pertinent authorities

- Universities, scientific and research institutions
- EEAA
- International environmental organizations
- Environment protection organizations in other countries.

Information System Components

The major components that define information system specifications are data bases and computer applications, i.e. programs that utilize data to support decision-making. Proper definitions of these components helps to specify the system structure and physical requirements.

Databases

Data bases in the disaster/crisis management system should be integrated to ensure against data redundancy. Data related to air pollution crisis management can be considered as sub-data bases of integrated ones. However, the required data bases to be used during air quality crisis management should include:

Geographic database: Includes relevant data about Greater Cairo, its geography, demographics, transportation networks, administrative boundaries, main physical sites, etc.

Crisis Management Entities database: Includes data related to agencies and organizations that deal with the crisis. Examples are: name, address, point of contact, roles, responsibilities, etc.

Personnel database: Includes all data related to people who deal with the crisis. Data includes: personal details, specialization, means of communication, overall experience, and their previous interaction with EEAA.

Environmental specifications database: Includes data related to conditions and standard environmental air pollution specifications in Egypt and other countries.

Resources and capabilities database: Includes resources and capabilities inside or outside EEAA available to help in crisis management. Data contains the type of resource, place, specifications, capacity, and availability.

Entity environmental disaster source database: Includes the kinds of entities that might be sources of air pollution. Data includes a resource of existing entities, their crisis management plans, local facilities, potential effect on surrounding areas, etc.

Environmental crisis database: Includes data about past air pollution crises

Rules and regulations database: Includes laws, rules and regulations related to crisis management.

Computer Software

Software required to help in managing air pollution crises includes:

Recording and monitoring air quality indicators: Entering, storing, updating, and retrieving air quality data and the production of periodic status reports

Evaluating air quality: Evaluating air quality status at any time, estimating possible environmental effects and comparing the incident with standard environmental specifications and conditions in order to assess the situation and determine appropriate procedures

Selecting experts and consultants: Recording and updating expert and consultant data and selecting appropriate personnel for dealing with air crisis management

Predicting air pollution rate of evolution: Processing and evaluating incoming data about air quality, predicting possible crisis occurrence and rate of evolution

Developing air pollution crisis scenarios: Analyzing and preparing possible scenarios for air pollution occurrences

Standard operating procedures air pollution crisis: Evaluating and preparing standard operating procedures for different levels of crisis occurrence, facilities for retrieval of the procedures, personnel, and organizations responsible for their implementation

Disaster recovery procedures: Preparing recovery procedures in case of an air pollution disaster occurrence

Mapping environmental effects: Mapping environmental air pollution effects

Recording and updating data: Providing facilities for recording and updating data and information in a simple, user-friendly manner

Retrieving crisis data: Providing facilities for retrieving data and information from databases

Preparing reports and statistics: Providing periodic statistical reports in accordance with EDMU and AQMS requirements

Appendix (1)

Daily Forecast Activities list

Task (time)	Action and Questions Date:
Receive Data (0900)	❑ Check that all EIMP data has been received ❑ Check that all EMA data has been received *Is any data missing? Please explain.* _____ _____ If data has not been received, use an alternate data delivery method such as Fax. If data is missing, follow missing data procedures in the training manual or ask for AQEWS help.
Review Data (1000)	❑ Using the accuracy verification spreadsheet, evaluate yesterdays forecast. *Did the forecast miss by more than one category or 100 ug/m^3 If so, please explain and complete the missed forecast form.* **(insert ? after 100 ug/m)** _____ ❑ To determine general meteorological conditions and forecast trends, obtain and review today's weather observations, forecasts and upper-air observations from Helwan. *Have forecasted weather conditions changed since yesterday? Please explain.* _____ _____ _____ *Are large weather changes expected over the next few days? Please explain.* _____ _____ _____ *Is the inversion strength expected to change? Please explain.*

Task (Time)

Daily Forecast Activities Continued

Run AQEWS

Evaluate Forecast

Distribute Forecast

Action and Question

- Enter the input data
- Run the initial forecast
- Input remarks
- Produce the final AQEWS forecast
- Review the final forecast form

Compare the AQEWS forecast to the weather trend.

Is AQEWS forecasting consistent with the trend? Please explain. If not, reevaluate the input data and forecast trend. Return the AQEWS forecast as needed.

If available, run other forecasting methods.

Do the other methods agree with the AQEWS forecast? Please explain. If so, the forecast is high. If not, reevaluate the input data used in all models and re-run the models as needed. If the forecast still disagrees, then the forecast is lower than when the forecasts agreed.

Appendix (2)

A list of main pollution sources in Greater Cairo

I. Large international zones

1) Helwan Industrial zone

27 Plants, including:

- 3 cement plants
- 1 Iron & steel plant
- 1 Coal plant
- 1 Molding Factory

2) Shobra Elkhema Industrial Zone

1206 plants, including: Delta plant for Iron & Steel and Petroleum refineries

3) Abu Rawash Industries Zone

200 plants

4) 6th of October Industrial Zone

450 plants

5) Abour Industrial zone

50 Plants

6) 10th of Ramadan Industrial Zone

600 Plants

7) Kom Oshem Industrial plant (Fayoum)

10 plants

8) 15th of May Industrial Zone

20 plants

II. Other Industrial Activities

1) Lime stone Furnaces

72 Furnaces, Katameia City Road

2) Brick Fabrication Plants

500 plants in **Giza**:

- Elsaf
- KAF Mesaed
- Badrasheen
- Ayat

3) Molding Factories

700 Factories in Greater Cairo (379 in only 10 districts in Cairo, and 250 factories in Shobra Elkhema)

4) Coal burning sites

500 sites, most of them on Belbis-Abu Zabel Road

5) Crushers

70 Crushers in old Cairo

100 Crushers in Shuk Elteeban

6) Marble workshops

50 in Aldareb Alhamer

200 in shuk Elteeban

III. Open burning zones

1) Sites:

- 15th of May
- Helwan
- Torra
- Menshaat Nasr
- Katameria (Public Zone)
- Abu Almaged (Public Zone)
- Alsalam City (Public Zone)
- Moustarod
- Abou Zaabel
- Elkhosos
- Elbrageel (Giza)
- Ard Moatamadeya (Giza)
- Other minor areas (14 in Giza + 40 in Cairo)

2) Rubber & *Mazot* Burning sites

- Shorabiya
- Nasr city

3) Cable Burning sites

- Boulak
- Sharabya
- Elzawia Elhamra
- Shbra Elhema

IV. Electric Power Stations

- Elwarak Power station
- Shobra Elkema Power station
- Helwan power station

V. Automobiles &Motorcycles

- 450,000 motorcycles
- All Microbuses using Solar as a Fuel
- 4000 Public buses using Solar as a fuel
- Other private cars

VI. Quarry areas

Noise pollution (Explosion by Dynamite) dust pollution in:

- Autostrade (300 feddan limestone quarries)
- Katamieya / Ain Sokhna Road

VII. Mechanical Burners

- Basateen (2 large burning machines)
- El-kharaa 15th of May (3 large burning machines)
- Hospitals (20 burning small machines)

VIII. **Garage &Repair Workshops**

- 10 large garage workshops for public transportation
- 4 garage workshops in Cairo and Giza **Cleaning Authority including workshops**