

DANIDA

# Air Quality Monitoring Programme

Annual Summary Report 1997



NILU : OR 2/98  
REFERENCE : O-96013  
DATE : JANUARY 1998  
ISBN : 82-425-0946-8

**DANIDA;**  
**Air Quality Monitoring**  
**Programme**  
**Annual Summary Report 1997**

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## 1 Missions

Three expatriate missions were conducted in Phase 2. In addition a one week visit to Cairo was paid by the Team Leader in September during the Danida Mission visit to Egypt. The expatriate staff for Phase 2 included the Task Manager, Bjarne Sivertsen and Monitoring expert Leif Marsteen. The missions are listed below, where "AQ" stands for Air Quality.

**Mission AQ5** 4 April-27 May 1997. Bjarne Sivertsen, Task Manager, repeated the siting studies for Cairo, Alexandria, Delta and Canal area due to change of Monitoring Institutions.

**Mission AQ6** 23 May- 6 July 1997. Leif Marsteen, Monitoring Specialist participated in some of the siting studies and started preparing instruments for installations and Standard Operation Procedures (SOP) for the first monitoring stations.

**Mission AQ7** 1 September-9 December 1997. Leif Marsteen and Bjarne Sivertsen (from 15 October). L Marsteen prepared and started the first installations together with the Team Leader counterpart Dr M Nassar. The first air quality monitoring station at Tabbin Institute was opened by the Minister for Environmental Affairs on 27 October 1997. The siting studies in Upper Egypt was finalised. Time schedules and preparation for further installations and plans for Phase 3 were developed.

### 1.1 Mission summaries

#### 1.1.1 Mission AQ5

The visit in April- May 1997 included more siting studies. Some of the sites selected in 1996 had to be changed due to the change of Air Quality Monitoring institution. Also new additional sites were selected, visited and described. The objectives of this visit included the following tasks referring to the work programme activities:

- A.1.2 Finalise job descriptions for Air Quality Monitoring Laboratory (AQML) personnel, and support the development of contracts,
- B.2.1 and B.2.2 Select representative monitoring sites for A.Q measure-

- ments adding to previous selected, improve the quality of sites selected in Cairo and Alexandria, and define site characteristics.
- C.1.3 Discuss and assist in supporting equipment and tasks for the reference laboratory; air pollution part.
- C.2.2 Prepare instruments for installation.
- E.2.1 Prepare training programmes.
- F.1.1 Appoint QA officer and other new experts for the AQML.
- G.2.2 Prepare monitoring programme procedures.
- G.3.1 Prepare for the first installation in field, establish calibration programme at Reference Laboratory.

### 1.1.2 Mission AQ6

The visit in May - June 1997 included some siting studies and visits to Tabbin Institute (station and storage room), Cairo University (Monitoring Laboratory facilities) and Chemical and Technical Services (CTS). The monitors purchased by Cairo University were studied. The visit also initiated the work on the QA/QC documentation. The visit was originally scheduled from March to July but was delayed because the instruments did not arrive in Egypt until June. The objectives of Mission 6 included the following tasks referring to the work programme activities:

- C.2.2 Prepare instruments for installation.
- F.2.1 Specify instrument calibration procedures.
- G.2.3 Start monitoring programme and data retrieval.
- H.1.1 Installation of monitors at Reference laboratory.
- H.1.2 Calibration of monitors initiated.

### 1.1.3 Mission AQ7

The work undertaken during the Autumn of 1997 included siting studies in Upper Egypt, the establishment and start up of monitors seminars, workshops and on-the-job training. Monitors and samplers are being checked and installed, additional sites were selected, visited and described. The Air Quality Monitoring Team consisted of B Sivertsen, Mohamed Nassar and Leif Marsteen. The following tasks were undertaken, referring to the work programme activities:

- B.1.1 Select sites in Upper Egypt and modify some sites selected for greater Cairo area.
- C.2.2 Prepare instruments for installation.
- D.1.3 Specify data quality check and control procedures.
- D.2.2 Establish local database for monitoring data at Monitoring Laboratory.
- E.2.1 Prepare training programmes and give seminar and work shops.
- E.2.2 Prepare training programme for instrument operation and maintenance.
- E.2.3 On-the-job training at Reference Laboratory and Monitoring Laboratory.
- E.2.4 Support training at Reference Laboratory.

- F.2.1 Specify instrument calibration procedures/standard operational procedures (SOP).
- F.2.2 Design QA/QC procedures at Monitoring Laboratory.
- F.2.3 Establish SOPs as part of on-the-job training.
- G.2.3 Start monitoring programme and data retrieval.
- G.3.2 Establish first monitors in Cairo.
- G.4.1 Data evaluation at the Monitoring Laboratory.
- H.1.1 Installation of monitors at Reference Laboratory.
- H.1.2 Calibration of monitors installed.
- H.2.1 Train Reference Laboratory personnel in use of monitors and calibration



## 2 Institutions

### 2.1 Cairo University EHMC

Cairo University Centre for Environmental Hazard Mitigation (EHMC) had been selected Monitoring Laboratory for the Air Quality Monitoring Programme. This selection took place in January 1997, after all the plans have been based upon the assumption that the programme would be monitored by the Embaba Laboratory.

The Centre moved to the new Chemistry building in 1997. It was stressed that the centre would have to be considered a consultant part of the University, and that they were used to carry out projects on contracts.

Very limited space was available for the EIMP/EEAA Air Quality Monitoring Laboratory (AQML). One storage room (5.5×2.5 m) should originally be used for monitor maintenance, repair and calibrations. Three persons would have to be located in this room. A new laboratory was thus set a side for the instrument calibrations, maintenance and repair. An office for the AQML Programme Manager had been made available, but it was at the end of Phase 2 not fully clear how the EIMP programme will be organised, when rooms at EHMC were concerned. Dean of the faculty Dr Sharkawi promised during meetings in 1996 to see that adequate space would be made available. Concerning computer data retrieval and data handling this would be part of the computer room. However, this was again changed in Phase 2. The data retrieval (computer centre) had not been finally organised at the end of Phase 2.

The wet chemistry laboratory seems adequate to take care of all the chemical analyses of samples collected in the Air Quality sampling programme, including filters from High Volume samplers.

The EHMC centre experience in air pollution studies was related to a study of lead in the Cairo air reported in 1996. Samples were collected with Andersen and Sierra samplers. Four filters were collected at each of 12 sites in Cairo. All filters were analysed at Washington State University USA. The co-operation with USA will continue.

EHMC installed their own air quality monitoring station at the University as part of the EIMP monitoring programme. The location and installation was

supported by EIMP. The station has been calibrated and prepared with the same QC/QA as introduced to the rest of the network.

## **2.2 IGSR, University of Alexandria**

The Institute of Graduates Studies and Research (IGSR) in Alexandria had been selected a second monitoring institution with the objective of taking care of the monitoring and sampling stations in Alexandria and in the delta.

The IGSR department addresses issues of natural resources, energy and pollution. The facilities include laboratories for remote sensing, air pollution monitoring, GIS, meteorological measurements and modelling.

Personnel from IGSR has participated in seminars and work shops as part of the EIMP training programme. The monitoring station at IGSR in Alexandria will be installed in the beginning of Phase 3, and will include on-the-job training.

## **2.3 National Institute for Standardisation (NIS).**

NIS had been selected the Reference Laboratory for Air under the EIMP programme. The main objectives of the Reference Laboratory are to contribute to the assurance of the quality of measurements and analyses performed at the monitoring institutions. This has been the main objectives agreed upon by all components of the EIMP programme.

In accordance to most of the tasks described in the Contract with the Reference Laboratory it was assumed that the Reference Laboratory at NIS should carry out the following activities:

- Assist in evaluating measurement methods,
- assist in preparing data quality requirements,
- participate in drafting and evaluating new standard measurement methods,
- support calibration of air flows in various types of samplers,
- calibrate balances and check weighing room climates,
- train the monitoring personnel in general quality assurance procedures,
- serve as a link between different air pollution laboratories in Egypt,
- provide a link to internationally recognised air pollution laboratories for international reference purposes,
- perform audits of the sampling and monitoring activities at the Monitoring Laboratory,

Repairs of instruments in the air pollution network will be undertaken by the Monitoring Laboratory. The experience from several years of field measurements at NILU indicate that the practical troubleshooting and repair of instruments in field operations can best be performed by the field operating personnel themselves.

## 2.4 Meteorological Authority

The Meteorological Authority is operating an Air Quality Monitoring station at the roof of the buildings in Abbasiya Cairo. We visited the institute on 12 November 1997, and met with Dr Abdel Moneim A. Ibrahim, Chairman of the Board of Directors. We also discussed possible co-ordination with Darwish M. Ahmed, Abdel Raof, Director of Research, and Hesham Helmy El-Sayed.

All monitors were at present inside the laboratory for repair and calibration. The instruments were delivered by ThermoEnvironment / ETS. SO<sub>2</sub> and NO<sub>x</sub> monitors were delivered in 1993 and ozone in 1995. Tropospheric ozone is measured also in Hurghada and at Sedi Barrana (north western Mediterranean coast). At the institute in Cairo they also measure TSP by a German made (Strohlen) High Volume sampler with flow rate 30 m<sup>3</sup>/h.

Dr. A.M.A.Ibrahim together with the air pollution responsible personnel were all very interested in a co-operation with EIMP/EEAA for air quality and meteorological measurements. We suggested that the air quality measurements were updated and modernised with data loggers and data transfer systems, and that the meteorological mast with more sensitive sensors, like the one used by EIMP, is placed at the roof next to the air quality monitors. In this way the Meteorological Authority location will act as one of the measurement stations in the EEAA/EIMP network.

## 2.5 Chemical and Technical Services (CTS)

Amr ElSoueini of Chemical and Technical Services (CTS) invited Leif Marsteen and Mohammed Nassar to CTS in Garden City to inspect the monitors designed for University of Cairo. These instruments were in May 1997 still not installed at their station in Giza. The monitors are the same type as the instruments procured for the EIMP project.

During three days (22 - 24 June) Aly Hamed of CTS demonstrated the O<sub>3</sub> monitor, SO<sub>2</sub> monitor, NO<sub>x</sub> monitor and the multi gas calibrator. We were allowed to operate the instruments and to assure that the instruments were according to our requirements.

Aly Hamed provided information concerning other types of instruments such as DOAS and LasIR instruments from Thermo Environmental. CTS will be the local supplier of instruments to the EIMP programme, and will thus have the local responsibility for participating in the installations, the first calibrations and in some basic training.

### 3 Outlook for Phase 3

Considering the changes that have been undertaken concerning the Monitoring Institution at the end of 1996 and in the beginning of 1997, the originally assigned resources needed for training and development of the ambient air quality monitoring programme at the Monitoring Laboratory and at the Reference Laboratory Air are insufficient. Some extra equipment have been ordered for the second delivery, and it is foreseen that some double work, particularly concerning training, has to be undertaken.

Site studies had to be performed again. The support of the Task Manager's counterpart, Dr. Nassar, has been very positive. During Mission 5 and Mission 7 we managed to finalise most of the siting studies, due to the fact that some of these were already prepared by Dr Nassar.

A larger problem has been the delay in selecting the final Monitoring Laboratory and the Reference Laboratory Air. The adequate combination of expertise has not been available, and new persons had to be found. This fact delayed the start-up of measurements in phase 2.

However, after NIS was selected a new more detailed description of tasks was developed. The monitors and calibration equipment was installed in the Reference Laboratory at NIS at the end of November 1997. All monitors were calibrated in the beginning of December 1997. Training will continue in Phase 3.

## **4 Tasks undertaken in 1997**

### **4.1 A. Institutional support and co-ordination**

#### **A.1.1 Assist in preparing TOR for A.Q. monitoring working groups**

The first working group meeting was held in October 1996. The objectives and functions of the working group was described. The members were appointed from the institutions involved in air pollution related tasks.

The participants in the working group will have to be changed as a result of alterations in the air quality monitoring programme including changes in monitoring institutions. Further working group meetings may be held, when the instruments have been installed in Cairo and Alexandria. There is at the end of Mission 7 no need for input from the Working Group.

#### **A.2.1 Assist in preparing technical input to contract with Monitoring Laboratory**

Contracts were drafted drawing on experience with similar contracts from other countries to suggest alternatives from which the combination best suited to the situation in Egypt can be chosen.

Detailed draft contracts were finalised for the Monitoring Laboratory at EHMC and for the monitoring institution ISGR selected at Alexandria University. The contracts were signed in August 1997.

#### **A.2.2 Assist in preparing job descriptions for A.Q. monitoring personnel**

Job descriptions for the air quality monitoring personnel has been prepared. An updated description was developed as part of the contract negotiations with the "new" Monitoring Laboratory at Cairo University, EHMC.

New personnel was necessary to take the responsibility for undertaking the future air quality monitoring system. They will have to undergo training. As soon as instruments were available and installed the on-the-job training started in Egypt.

## **4.2 B. Design Air Quality (AQ) Monitoring Programme**

### **B.1.1 Evaluate existing Air Quality data**

The quality of the measurements in Cairo has been evaluated and reported in the siting reports. (Appendix to Mission 2 and Mission 3 report). Together with institutions responsible for the collection of existing air quality data, these data have also been used to evaluate possible representative sites for the future national monitoring programme.

The main conclusion from the evaluation was that the quality of air quality data collected in Egypt up to now has not reached an international standard adequate to include in the EEAA data base. However, further analyses will be undertaken to identify some historical data for evaluation of long term changes in air quality.

### **B.2.1 Select representative monitoring sites for A.Q. measurements on all scales**

The monitoring sites for the future national AQ monitoring programme has been selected based upon available information on:

- monitoring objectives,
- meteorological conditions, prevailing winds,
- existing AQ data,
- major air pollution sources ( from emission data base project).

The measurement sites cover different scales of pollution, as stated in the international requirements for AQ monitoring. The different air pollution indicators selected at each site is given in the siting reports.

Simple field studies using inexpensive passive samplers have been performed to evaluate the representativeness of the different monitoring sites and to compare the concentration distributions with those obtained from the present measurement programme in Cairo. The last study of this kind was undertaken in the northern part of Cairo in September 1997, and is reported in Mission Report 7.

The final version of the total air quality monitoring and sampling programme including installation time schedules can be found in Mission Report 7. This also includes a simplified integrated sampling programme to evaluate the average air quality situation at selected Historical Monuments in Egypt.

### **B.2.2 Define site characteristics**

For each monitoring site the surrounding area, local sources and possible impacts have been described in the siting reports. The site has been characterised according to standard reporting procedures.

The sites descriptions has been supported with local maps, co-ordinate specifications and photos where available. The site description reports are available in the Mission Reports 2, 3, 4, 5 and 7.

### **B.2.5 Select sites for meteorological measurements at some of the A.Q. sites**

Meteorological data on an hourly bases will be needed to explain the Air Quality. Wind speeds, wind directions and atmospheric turbulence ( stability) are the most important parameters.

Most of the meteorological sites were selected in Phase 2. However, some details have to be evaluated also in Phase 3 of the programme.

### **B.2.6 Specify meteorological data**

Typical parameters to be included in the meteorological measurement programme are

- ♦ wind speed and wind direction,
- ♦ temperature at different level along a 10 m mast,
- ♦ stability measured as the vertical temperature difference, or estimated from temperatures and wind speeds,
- ♦ relative humidity.

Other parameters can also be included with limited extra costs, such as UV radiation, precipitation, pressure etc.. Each of the meteorological station includes a 10 m tower and the equipment for mounting the sensors.

### **B.2.7 Specify use of existing equipment**

Some of the instruments available in Egypt, such as at Cairo University, at Meteorological Authority and at Atomic Energy Authority (AEA) could be part of the system. However, at Meteorological Authority and at AEA agreements and clarifications have to be made.

There is also a large number of high volume samplers available in Egypt. Even if many of these are out of operation, some could be made available for this project.

### **B.2.8 Establish agreements with monitoring site owners**

At some of the monitoring sites it may be necessary to establish agreements with the site owners. This work will start during Phase 3 and is the responsibility of Dr. Nassar. Most of the sites are Governmental Building, and it will be discussed whether any written agreements are necessary at all.

### **B.2.9 Input to future activities**

Descriptions of the third phase work plan including revised framework matrixes, was established during the visit to Egypt in October-December 1997.

Discussions concerning the result of the Danida Mission were included as part of the premises for the next Phase work. However, no final decisions had been taken at the end of Mission 7. We also assumed that the data base for both the emission inventory component and the ambient air component would be AirQUIS.

### **4.3 C. Procurement of equipment, hardware and software**

#### **C.1.1 Evaluate existing equipment**

The possible use of existing equipment is based upon a quality control and quality assurance evaluation.

Available monitors for SO<sub>2</sub>, NO<sub>x</sub>, and ozone measurements have been evaluated so far, and most of this equipment is old fashioned and can not be used in the future programme.

The only existing equipment that could be part of the programme, is available at Meteorological Authority, at the Atomic Energy Authority and at Cairo University. The instruments that were purchased by Cairo University were installed and calibrated as part of the EIMP programme in October 1997. Discussions and agreements of co-operation with the other institutions will decide the possible use of this equipment.

#### **C.1.2 Prepare list of equipment**

A total list of equipment necessary for the EIMP/EEAA air quality monitoring and sampling programme has been prepared as part of the procurement. The list can be found in Mission Report 7.

The list contain all equipment procured in Phase 2 and to be procured in Phase 3 such as. Air quality monitors, for real time continuous monitoring and storing in data loggers with automatic data transfer, Automatic weather stations (AWS), Data loggers and data acquisition equipment, modems and data transfer equipment, PCs and central lab. equipment for data retrieval, storage and QA/QC, laboratory calibration units, reference gases, laboratory monitors for checking field monitors, spare parts and extras.

The list also contains Air quality samplers (typically for 24 h average sampling and analyses), passive samplers and transportation means. (one car and scooters).

Arrangements for installation, training, service, quality controls etc. has been requested as part of the procurement procedures. Most of the equipment was delivered in 1997. A second and third delivery is anticipated in 1998.

#### **C.1.3 Assist in supporting equipment for the reference laboratory**

Input concerning equipment relevant for the Reference Laboratory Air was specified, and installed in the Reference Laboratory in November 1997.. Some



of the laboratory equipment needed was duplicated at the Monitoring Laboratory and at the Reference Laboratory.

### **C.2.1 Procure instruments and equipment**

Procurement has been undertaken by the project Procurement Officer, based upon the technical input given by the Air Monitoring component. Detailed specifications for procurement of air quality monitors and equipment was developed.

The equipment imported to Egypt in the beginning of 1997 was delayed almost 6 months due to import regulation discussions and matters that had to be clarified with the Customs Authorities.

### **C.2.2 Prepare instruments for installation**

All instruments and equipment are being checked and calibrated upon arrival in Egypt. Most of the checking is undertaken at the storage area at Tabbin Institute. Calibrations will from 1998 be undertaken at the Reference Laboratory Air.

## **4.4 D. Data management**

### **D.1.1 Specify data collection and data transfer**

Different types of data will be collected by the monitoring programme. The data collection from the automatic monitoring programme will mainly be undertaken by the data retrieval system including the System manager delivered by the instrument supplier. Hourly average data will be transferred as raw data via modem and telephone lines to the central computer unit every day.

In some cases the data will be retrieved on diskettes. After installation of the first monitoring station at Tabbin Institute the first air quality data were retrieved on diskette to evaluate the quality of the data and to perform the first presentation of results from the monitoring programme. The first week of data was presented in Mission Report 7.

The first specification of the data retrieval programme was presented in Phase 2. Further specifications will be developed as part of the SOP development in Phase 3. A list of the SOPs to be developed for the EIMP programme can be found in Appendix E4 of Mission Report 7.

### **D.1.2 Specify data retrieval and local data base at Monitoring Laboratory**

Monitoring data will be retrieved via telephone lines every day at the Monitoring Laboratory. Specifications of data scaling, data storage, data quality controls will be established based upon the possibilities given by the System Manager installed at the Monitoring Laboratory Computer Centre at EHMC.

Training of expert personnel for this operation started at the end of 1997 and will continue in 1998. The data retrieved will be stored preliminary in the local data base supported by the System Manager.

### **D.1.3 Specify data quality check and control procedures**

The Monitoring Laboratory will be equipped with calibrators, reference gases, graphical and statistical software to perform daily controls. All this will be supported by quality control descriptions, manuals and reporting procedures. The deliveries (specified in the procurement documents) included most of the material necessary to operate the various monitors and instruments.

Historical log books will have to be established for each instrument. The development of detailed Standard Operational Procedures and Manuals started after installation of the first site at Tabbin. This work will continue into Phase 3 and Phase 4.

Reporting procedures for collected samples analysed in the analytical lab will be developed. This work will also start through on-the-job training and will be supported by the EIMP analytical specialist in September-October 1998. Training and development of analytical procedures will also be supported by the team at the Reference Laboratory.

### **D.1.4 Identify sources for supplementary data**

Historical air quality data have been produced by various laboratories and universities. Most of the data have been collected during short term air pollution studies as part of Theses reports produced at Universities.

Some data could be used for trend analyses and historical development assessment. However, most of these data were collected occasionally on contract for or by industries and local authorities. By studying some of the data and reports made available, it was concluded that very few of these data sets can thus be used as references to the future air quality reports and as part of the EEAA data bases.

### **D.2.1 Prepare database for manual analysed data from sequential and High Volume samplers**

A laboratory data base for samples that are being prepared for chemical analyses including data quality controls may be needed at the Monitoring Laboratory.

Preliminary data (raw data) will be entered into the data base for automatic control. The data may be stored preliminary while the responsible experts are checking the data against other information available. Final data approvals have to be issued before the data are entered into the main AQ data base.

The establishment of a Laboratory data base for manually collected samples following chemical analyses, will be considered when the training and start up of the sampling programme will be initiated at the end of Phase 3.

### **D.2.2 Establish local data base for monitoring data**

The local data base for all monitoring data retrieved by the System manager at the monitoring laboratory will be based upon the system delivered by the supplier.

It remains to define the length of the time series to be stored at this preliminary data base. At present we have assumed that every 3 months, parallel to the development of quarterly reports AscII formatted files including all data will be stored on a CD for future storage and for transfer to EEAA. Details in these procedures have to be developed, when more information is available concerning the System manager.

## **4.5 E. Training**

### **E.1.1 Perform training needs assessment**

Training needs was identified in Phase 1 and Phase 2 of the programme. Results of these evaluations was a counterpart training programme, a seminar and a work shop. On-the-job training needs were also assessed.

The Team Leader counterpart training included the participation in site studies, considering whether a site was representative, taking into account predominant wind directions compared to possible emission sources in the area. A visit to NILU for training purposes was planned, designed and accomplished in August 1997. A introductory seminar and a work shop was planned and designed. The seminar was held on 27 October 1997 the work shop on 28-30 October 1997.

### **E.2.1 Prepare on-the-job training**

An on-the-job training programme will be developed for the Monitoring Laboratory personnel, to the monitoring institution's personnel, to selected Reference Laboratory experts and to key personnel at the EEAA, who in the final Phase will receive the data for further application.

### **E.2.2 Training programme for instrument maintenance, calibration and data collection**

Training is an essential part of the installations, calibrations and operations of the air quality monitoring programme. An important part of the training programme will be based upon on-the-job training. It is essential that the personnel at the Monitoring Laboratory, who will have the responsibility for the future monitoring system, are aware of their tasks and responsibilities before this training starts.

As a first on-the-job training effort the Monitoring Institution personnel will learn to operate the first monitoring sites at Tabbin and at Cairo University during December 1997 and January 1998. Training under guidance will be resumed after Ramadan at the beginning of February 1998.

Concerning the sampling equipment included in the programme, training in chemical analyses and use of laboratory equipment was originally assumed to be given by experts at the Reference Laboratory to personnel at the Monitoring Laboratory. Local experts for specific instruments such as Atomic Absorption Spectrometer and Ion Chromatography may be used for special training. When the instruments are ready to collect and transfer data the following task will be included in the training programme:

### **E.2.3 On-the-job training at the Reference Laboratory and at the Monitoring Laboratory**

An on-the-job training programme will be undertaken for daily instrument checks, calibration and maintenance. Training will be conducted at the Monitoring Laboratory after a similar introduction has been undertaken for selected experts at the Reference Laboratory. Similar training will also be performed for selected experts from the sub-contracted monitoring institutions. This training will take place with installed instruments in Cairo, and be continued at the main monitoring site in Alexandria.

### **E.4.1 Prepare and perform seminar and workshop on introduction to A.Q. monitoring programmes**

An introductory seminar has been prepared for the EIMP air pollution monitoring staff. This seminar was to be held at the beginning of the measurement phase. The seminar was set for 27 October 1997 at Tabbin Institute, and was opened by H.E. Minister of State for Environmental Affairs, Mrs. Nadia Makram Ebeid.

The seminar represented an introduction to the air quality monitoring for Egypt. As part of the seminar the first monitoring station in the air quality monitoring system for Egypt was opened by the Minister. The event drew attention from the media, the press and national TV stations. A 20 minute programme on air pollution and the EIMP monitoring programme was presented on one of the channels. About 100 persons participated in the seminar, which was held over one day.

Following the seminar was a 3 day work shop on air pollution monitoring held at Tabbin Institute on 28 to 30 October 1997. The work shop was intended to give an introduction to modern air pollution monitoring and information systems. All personnel that will be involved in the EIMP air pollution monitoring programme was invited to attend the seminar. (The programme and participants presented in Appendix H of Mission Report 7)

Among the 20 persons participating in the seminar were personnel from Cairo University, Alexandria University (IGSR), the Reference Laboratory at GIS. Also a few invited persons from the EIMP programme and from Meteorological Institute participated in parts of the work shop.

## **4.6 F. QA/QC**

### **F.2.1 Specify instrument calibration routines , in field and in laboratory**

Instrument calibration routines will be undertaken at several different levels in the air quality data retrieval and data storage process. The technical tools will be supported by quality control descriptions , manuals and reporting procedures. Log books will be established for each instrument at each station. The laboratory routine data monitoring, retrieval, storage and quality control will start as soon as the data systems are up and operating and when the instruments are installed, calibrated and operated.

### **F.2.2 Design quality control and quality assurance procedures at the Monitoring Laboratory**

Good descriptions of day by day analytical routines, included data quality controls, are essential for generating reproducible results. The QA/QC programme will be prepared for all types of data retrieval methods. The main tool for undertaking these tasks for on-line monitoring data at the Monitoring Laboratory will be the System Manager delivered as part of the data retrieval system.

Audits will be undertaken from the Reference Laboratory on an annual basis. The part of the programme that reports to the WHO/AMIS global monitoring programme (see mission Report Ch.13) may also be subject to international audits. This may also be suggested to other parts of the programme in the future.

### **F.2.3 Establish Standard Operational Procedures**

A complete list of Standard Operational Procedures Manuals to be developed as part of the EIMP programme is presented in Appendix E4 of Mission Report 7 . Some of the calibration procedures were developed during 1997. The training in Phase 3 will include all participating air quality data collecting institutions as on-the job training.

Manuals and reporting procedures for collected samples analysed in the analytical lab will be developed. This development will take place at the end of 1998. This work will also be done as an on-the-job training effort. As part of the quality controls proficiency tests will be prepared by the Reference Laboratory.

### **F.3.1 Quality controls and calibration routines as part of the on-the-job training**

An important part of the on-the-job training performed as in the field installations, calibrations and operations will be linked to the total QA/QC programme.

The only way of obtaining good quality air pollution data is to assure that the daily field checks and calibrations and the daily data controls at the data retrieval point is undertaken properly. The use of history log books for the

recording of events at all stations including maintenance and calibrations will be part the on-the-job training.

The log books, including the contents and SOP was developed at the end of Phase 2.

## **4.7 G. Monitoring**

### **G.2.1 Specify sampling programme procedures**

The sampling programme consists of integrated (sequential or individual) samplers, from which samples have to be collected and brought to the laboratory for analyses. A list of parameters including sampling times and frequencies was presented in Phase 1. The Egyptian Air Quality Standards already indicate some of the averaging times requested for reporting the air quality in Egypt. These specifications have also been applied in the design procedures.

### **G.2.2 Specify monitoring programme procedures**

A complete monitoring programme for Egypt was designed at the end of Phase 2. Sites, parameters, instruments and installation schedules were indicated. The sites selected and the procedures developed for the operation of the monitoring programme meet the QA/QC requirements. Both the programme and the time schedules can be found in Mission report 7.

### **G.2.3 Start monitoring programme and data retrieval**

The first monitoring stations were installed and started in 1997 at Tabbin Institute and at Cairo University.

The measurements at Tabbin Institute started on 27 October 1997, after the opening of the station by the Minister for Environmental Affairs. Data were collected on diskettes and evaluated. An example of one week of data is shown in the Mission report 7, Appendix O.

The station manager was used to identify that there were problems in the reading of PM<sub>10</sub> concentrations. The problems seemed to be a combination of mechanical problems and calibration procedures.

A third site at Gemoroya street has been prepared and calibrated, and will be in operation at the end of 1997/beginnin of 1998.

An important part of this phase of the monitoring programme is to train the operational personnel at Cairo University (Monitoring Laboratory) to participate in and to undertake installations and calibrations of the different type of monitors. Also personnel at the monitoring institution in Alexandria (ISGR) will participate in the installation work. A schedule for installation in 1998 has been established and is presented in Mission report 7.

### **G.3.1 Establish monitoring station infrastructure**

During Phase 1 a list of construction work, repair, maintenance, cleaning etc. at the selected monitoring sites was specified. During the site inspections and site visits all these tasks were described in details. The EIMP counterpart, Dr Nassar, has taken the responsibility for undertaking all these preparations. He will also be responsible for agreements, communication lines, shelters and all kind of infrastructure at the sites.

At most of the sites no telephone lines have been available. No on-line data will be possible until telephone line are installed. Discussions with the Communication Authorities started in 1997, as mentioned in Activity D.5.1.

Most of the sites have 220 V electrical power sockets. The possibility of using this has to be verified through the agreements established with the site owners.

### **G.3.2 Install monitors in Cairo and Alexandria**

The installation of monitors in Cairo started in 1997. The installation programme will continue according to a well defined schedule also in the third phase of the programme in 1998.

Training in installation, calibration and maintenance will be an integrated part of the installation programme.

At the end of 1998 the monitoring personnel will have to share time between operation, installation, calibration and maintenance. A considerable work load may be placed on this personnel.

### **G.4.1 Maintenance and calibrations at the monitoring stations**

As soon as the measurement sites are installed and in operation there will be a continuous need for maintenance and calibration. Weekly visits will be paid to all monitoring sites from the Monitoring Institutions. ISGR in Alexandria will have the responsibility for the sites in Alexandria and in the Delta. EHMC at Cairo University will have the responsibility for the rest of the stations in Egypt.

The first SOPs and description of calibration routines were developed in 1997. A seminar for introduction to the operation of air quality monitors was planned by ElSoueini to take place on 10 December 1997.

### **G.5.1 Data retrieval and data evaluation**

The first set of data were retrieved on diskettes from the Tabbin station in October and November 1997. Some simple tests were run to present the data and to demonstrate the relationship between air quality, emissions from industrial sources and meteorology. This work will continue at the System Manager at CEHM in 1998.

Time plots of the data will be produced, first of all at the Monitoring Laboratory at Cairo University but also later at IGSR in Alexandria, to evaluate the diurnal, weekly and spatial variation in concentrations.

Training in the judgement of concentration levels and units will be undertaken during 1998.

### **G.5.2 Data presentation**

After the first air quality data have been evaluated, and the QA/QC procedures have been undertaken and verified, the first data presentation will be prepared. The first report was originally assigned for the end of phase 2. However, very few data were available and the report will have to be delayed till the beginning of 1998.

A brief report will be written describing the background, data availability, data quality and the data itself. A validation/discussion of the results will follow the data presentations.

## **4.8 H. Reference Laboratory**

### **H.1.1 Installation of monitors at the Reference Laboratory**

The installation of monitors at the Reference Laboratory started on 23 November. Calibrations were undertaken into the first week of December 1997. At the beginning of Phase 3 the Reference Laboratory personnel will receive training and will have to start calibrations of new monitors.

### **H.1.2 Calibration of monitors**

The first monitors in the programme were calibrated at the storage room at Tabbin. The monitors at the Reference Laboratory were calibrated in the beginning of December 1997.

The calibration of monitors for field use will start in January 1998.

### **Activity H.2.1 Training of Reference Laboratory personnel**

Training will be undertaken for the Reference Laboratory Air personnel as part of the introduction and on-the-job training for the Monitoring institutions. Selected experts has been invited to participate in the training in operation, calibration and maintenance of monitors.

These activities will start at the end of Phase 2 and will continue into Phase 3.





## **Appendix A**

### **Updated revised logical framework matrix 1998**



## Updated revised logical framework matrix 1998

The LFA matrix for the air pollution monitoring component is presented below as Exhibit A.1.

*Exhibit A.1 - Revised LFA for air pollution monitoring*

Outputs for air pollution monitoring component, Phase 3:		
Project Document	Extended Description	Verifiable Indicators
4	<p>Training of EEAA staff in interpretation of monitoring finalised</p> <p><b>A. Institutional support</b>            A.1 Working group meetings held            A.2 Contract between EEAA and monitoring institution continued            A.3 Counterpart trained</p>	
3	<p>Monitoring programme adjusted based on evaluation</p> <p><b>B. Design of monitoring programme</b>            B.1 Existing monitoring stations and data evaluated            B.2 Monitoring programme designed</p>	
	<p><b>C. Procurement of equipment, hardware and software</b>            C.1 Equipment, hardware and software specified            C.2 Monitoring equipment procured and installed</p>	
	<p><b>D. Data management</b>            D.1 Data management system designed            D.2 Local data bases at Monitoring Laboratory            D.3 EEAA data base installed</p>	

Exhibit A.1 - Revised LFA for air pollution monitoring (continued)

Training courses	<b>E. Training</b> E.1 Training needs assessed for Phase 3 E.2 Programme prepared E.5 Data base training E.6 Chemical analyses training	
5 Preliminary QA/QC introduced at monitoring institutions	<b>F QA/QC</b> F.2 Standard operations procedures (SOPs) and QA/QC manuals prepared F.3 On the job QC/QA training procedures F.4 QA input from Reference laboratory	
2. Permanent sites and first cycle of monitoring sites are monitored  1. First preliminary yearly report on the state of ambient air quality	<b>G. Monitoring</b> G.1 Plans for 1999 G.2 Monitoring programme G.3 Monitoring stations installed G.4 Air Quality Monitoring G.5 Data evaluation G.6 Chemical analyses G.7 Reporting	
	<b>H. Reference Laboratory</b> H.2 Support training for Reference Laboratory. Personnel H.3. Audits and controls	
	<b>I. Component Co-ordination</b> I.1 Planning I.2 Management I.3 Reporting	

Exhibit A.1 - Revised LFA for air pollution monitoring (continued)

Activities for air pollution monitoring component, Phase 2		
Project Document	Extended Description	Verifiable Indicators
1.2 Training of EEAA staff on interpretation and reporting of data	<b>A. Institutional support</b> A.1.1 Air pollution monitoring working group (APMWG) A.2.2 Assist in describing work functions for new experts A.3.1 Counterpart trained during development of the programme	<ul style="list-style-type: none"> <li>• Minutes of meeting</li> <li>•</li> <li>• On the job training and reporting</li> </ul>
3. Revision of monitoring schedule	<b>B. Design of monitoring programme</b> B.1.1 Evaluate existing measurement sites B.2.1 Select representative monitoring sites for air quality measurements, work continued . B.2.2 Define site characteristics B.2.5 Select sites for meteorological measurements at some of the AQ sites B.2.8 Establish agreements with monitoring site owners	<ul style="list-style-type: none"> <li>• Site description report</li> <li>• Site description report</li> <li>• Monitoring programme report</li> <li>• Agreements available</li> </ul>
	<b>C. Procurement of equipment, hardware and software</b> C.1.1 Evaluate existing equipment C.2.1 Procure instruments and equipment C.2.2. Prepare instruments for installation	<ul style="list-style-type: none"> <li>• Instruments available</li> </ul>
	<b>D. Data Management</b> D.1.1 Specify data collection and data transfer D.1.2 Specify data retrieval and local data base at Monitoring Laboratory D.1.3 Specify data quality check and control procedures D.1.4 Identify sources for supplementary data D.1.5 Telecommunication established	<ul style="list-style-type: none"> <li>• Specification report</li> <li>• Report and manuals</li> <li>• Manuals Mission Report</li> <li>•</li> </ul>

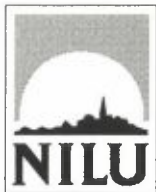
Exhibit A.1 - Revised LFA for air pollution monitoring (continued)

	<p><b>D. Data Management</b></p> <p>D.2.1 Prepare database for manual analysed data from sequential and hivol samplers</p> <p>D.2.2. Establish local databases for monitors at Monitoring Laboratory</p> <p>D.3.1 EEAA data base , AirQUIS installed</p>	<ul style="list-style-type: none"> <li>• Data base at Monitoring Laboratory</li> <li>• Local database available</li> </ul>
4. Training of EEAA staff in reporting and interpretation	<p><b>E. Training</b></p> <p>E.1.1 Assess training needs for Phase 3</p> <p>E.2.1 Prepare on-the-job training</p> <p>E.2.2 Prepare training programme for instrument maintenance, calibration and data collection</p> <p>E.2.3 On-the-job training at Reference Laboratory and on Monitoring Laboratory</p> <p>E.2.4 Support training to Reference Laboratory</p> <p>E.5.1 Use of data base at System Manager</p> <p>E.5.2 Training in use of EEAA data base</p> <p>E.6.1 Sample preparations</p> <p>E.6.2 Chemical analyses of various filter samples</p>	<ul style="list-style-type: none"> <li>• Training plan</li> <li>• Training programmes and preliminary schedules described.</li> <li>• Training on its way</li> <li>• Quarterly reports</li> <li>• Filters analysed</li> </ul>
5 Introducing preliminary QA/QC procedures	<p><b>F QA/QC</b></p> <p>F.2.1 Specify instrument calibration procedures</p> <p>F.2.2 Design quality control and quality assurance procedures at Monitoring Laboratory</p> <p>F.2.3 Establish Standard Operational Procedures (SOP) as part of QA/QC</p> <p>F.3.1 QC and calibration routines as part of on-the-job training</p> <p>F.4.1 Input QA from Reference Laboratory Air</p>	<ul style="list-style-type: none"> <li>• Manuals</li> <li>• Manuals</li> <li>• Written SOPs</li> <li>• Quality check schemes developed and used</li> </ul>

Exhibit A.1 - Revised LFA for air pollution monitoring (continued)

<p>2 Monitoring permanent sites and first cycle</p> <p>1.1 Writing of report based on monitoring results from phase 2 combined with "old" material</p>	<p><b>G. Monitoring</b></p> <p>G.1.1 Prepare work plan for 1999 activities</p> <p>G.2.1 Specify sampling programme procedures</p> <p>G.2.2 Specify monitoring programme procedures</p> <p>G.2.3 Start monitoring programme and data retrieval</p> <p>G.3.1 Update monitoring station infrastructures in Cairo and Alex</p> <p>G.3.2 Install monitors in Cairo and Alexandria</p> <p>G.3.3 Start monitoring in Delta and Upper Egypt</p> <p>G.4.1 Maintenance and calibration</p> <p>G.4.2 Service and repair</p> <p>G.5.1 Data retrieval and data evaluation</p> <p>G.5.2 Data presentation</p> <p>G.6.1 Sample preparation</p> <p>G.6.2 Chemical analyses</p> <p>G.7.1 Quarterly reports</p> <p>G.7.2 Annual reports</p>	<ul style="list-style-type: none"> <li>• Report with work plan for 1999</li> <li>• Monitoring programme</li> <li>• First data collected, evaluated and reported</li> <li>• Monitoring stations prepared</li> <li>• Field reports</li> <li>• First data report</li> <li>• Quarterly reports</li> <li>• Annual reports</li> </ul>
	<p><b>H. Reference Laboratory</b></p> <p>H.2.1 Training of Reference Laboratory personnel in use of monitors and calibration</p> <p>H.3.1 Check field monitors</p> <p>H.3.2 Audit programme</p>	<ul style="list-style-type: none"> <li>• Calibration certificates</li> <li>• Reference Laboratory experts trained</li> </ul>
	<p><b>I Component Co-ordination</b></p> <p>I.1.1 Annual plan 1999</p> <p>I.2.1 Follow up, meetings and administration</p> <p>I.3.1. Annual report</p>	





## Norwegian Institute for Air Research (NILU)

P.O. Box 100, N-2007 Kjeller – Norway

REPORT SERIES OPPDRAGSRAPPORT	REPORT NO. OR 2/98	ISBN 82-425-0946-8 ISSN 0807-7207	
DATE 28. - 98	SIGN. <i>Bj</i>	NO. OF PAGES 31	PRICE NOK 60,-
TITLE DANIDA; Air Quality Monitoring Programme Annual Summary Report 1997		PROJECT LEADER Bjarne Sivertsen	
		NILU PROJECT NO. O-96013	
AUTHOR(S) Bjarne Sivertsen		CLASSIFICATION * A	
		CONTRACT REF.	
REPORT PREPARED FOR: COWI/EIMP EEAA Building, 30 Misr Helwan Street Maadi, Cairo, Egypt			
ABSTRACT  The Annual Report 1997 summarizes the tasks undertaken in 1997, phase 2 of the EIMP/EEAA project, to prepare and establish an air pollution monitoring programme for the Egypt Environmental Affairs Agency (EEAA).			
NORWEGIAN TITLE Overvåkingsprogram for luftkvalitet i Egypt			
KEYWORDS Air Quality	Monitoring	Siting	
ABSTRACT (in Norwegian)			

\* Classification  
 A Unclassified (can be ordered from NILU)  
 B Restricted distribution  
 C Classified (not to be distributed)