

# **Final Report**

**on  
the second steps of an  
Air Quality Management Project  
to strengthen and modernize the Air Quality Management functions  
at the Environmental Management Bureau (EMB)  
in Metro Manila**

## **TA2**

**June 1999 -- August 2002**

**A cooperation between**



**Department of Environment  
and Natural Resources,  
Environmental  
Management Bureau**



**Conexor Sensus AB**

**financed by**



14 August 2002

# Table of Contents

<b>1</b>	<b>EXECUTIVE SUMMARY</b> .....	<b>1</b>
<b>2</b>	<b>THIS FINAL REPORT</b> .....	<b>2</b>
<b>3</b>	<b>THE PROJECT</b> .....	<b>3</b>
3.1	Main objective .....	3
3.2	Estimated outputs after the completion of the first phase of the Project .....	3
3.3	General comments to the accomplishment of the Project.....	4
3.3.1	Fundamental condition for the Project is not fulfilled .....	4
3.3.2	Organization and staff.....	4
3.3.3	Lack of management support.....	5
3.3.4	Lack of customer driven needs for information.....	5
3.3.5	Conclusions and Proposals.....	6
<b>4</b>	<b>THE DIFFERENT PROJECT ACTIVITIES</b> .....	<b>7</b>
4.1	Continued support in the use of the already installed computerized Air Quality Management System (the Airviro System) .....	7
4.1.1	From the Agreement .....	7
4.1.2	Practical results .....	7
4.2	A continued support in the organizational and administrative development in the area of Air Quality Management .....	8
4.2.1	From the Agreement .....	8
4.2.2	Practical results .....	8
4.3	Support in the preparation and evaluation of the credit preparation, technical specifications, bidding documents, etc. for the procurements under the ADB loan and Sida Concessionary Credit to ensure a correct interface to the Airviro System .....	8
4.3.1	From the Agreement .....	8
4.3.2	Practical results .....	8
4.4	Support in the continued building up of the emission database (EDB) over Metro Manila Air Shed .....	9
4.4.1	From the Agreement .....	9
4.4.2	Practical results .....	9
4.5	Support in the continued analyses and reporting of ambient air quality data .....	11
4.5.1	From the Agreement .....	11
4.5.2	Practical results .....	11
4.6	Support in the work to produce basic, but accurate as far as the input allows, “what-if-scenarios” for the simulation of ambient air quality effects of certain actions taken.....	13
4.6.1	From the Agreement .....	13
4.6.2	Practical results .....	13
4.7	Accomplish extensive training of the DENR/EMB staff as a part of the planned enhancement of the general Air Quality Management activities .....	14
4.7.1	From the Agreement .....	14
4.7.2	Practical results .....	15

4.8	Carry out two seminars in the Philippines for the DENR/EMB and other organizations involved in Air Quality Management activities .....	18
4.8.1	From the Agreement .....	18
4.8.2	Practical results .....	18
4.9	Support the DENR/EMB in the following activities, which are parts of the ADB loan and Sida Concessionary Credit financed activities .....	18
4.9.1	From the Agreement .....	18
4.9.2	Practical results .....	19
4.10	Provide the necessary Project management for the implementation of the Project	19
4.10.1	From the Agreement .....	19
4.10.2	Practical results .....	19
<b>5</b>	<b>BUDGET, REPORTING, AND GENERAL FOLLOW UP.....</b>	<b>20</b>
5.1	Budget follow-up .....	20
5.2	Outstanding issues .....	20
5.3	Reporting follow-up.....	21
<b>6</b>	<b>APPENDICES .....</b>	<b>22</b>

## 1 EXECUTIVE SUMMARY

The second phase of the **Air Quality Management Project to strengthen and modernize the Air Quality Management functions at the Environmental Management Bureau (EMB) in Metro Manila, Philippines**, the so-called **TA2**, started rather soon after the conclusion of the first phase, TA1, in early 1999. The Project is financed by the Swedish International Development Co-operation Agency (Sida) and is accomplished as a grant (Technical Assistance, TA). The budget is SEK 4,992,000:- (≈ US\$ 480,000.-).

The main objectives of the Project were in summary

- to train and support the EMB in the **practical use of ambient air quality data** from the network of monitoring stations that was to be established in the Metro Manila Airshed in order to provide regular, on-time and accurate reports as formal reports, Internet based information, media adjusted summaries etc;
- to train and support the EMB to **conduct an emission inventory of point and vehicular sources** in the Metro Manila Airshed and establish an updated database of these sources in the Airviro System; and
- to train and support the EMB staff to **carry out “what-if-scenarios”** regarding ambient air quality based on the monitoring network and the emission inventory to analyze the consequences of corrective measures using simulation methods.

Due to the **much-delayed installation of the ambient air quality monitoring network**, it has unfortunately been practically impossible to accomplish the first objective as planned. However, the Consultant has made **most of the training possible by utilizing data from other projects** (installation) that the Consultant is/has been involved in, mainly from Sweden, Thailand, and Estonia. Practically, the EMB staff has often experienced the training as a “dry run”, but under the conditions this was the best option.

Today, the **Emission Database consists of more than 1,700 point sources** inputted by the EMB AQMS staff. On top of that, the database includes **more than 550 road links with traffic estimates**. The Emission Database in the Airviro System is surely **by far the most structured and updated Emission Database to be found in the Philippines** although the quality of the data is partly uncertain. The work to keep this database “alive” and develop it is practically endless since the sources (emissions) change with time. The EMB staff is capable of doing this.

The EMB staff has been theoretically and practically trained to carry out **“what-if-scenarios”** but the real applications over Metro Manila Airshed have not been possible to carry out.

**Most promising - and partly even impressive - results were achieved by the students (EMB staff) that participated with interest and a high level of attendance.**

The Consultant now **recommends Sida to establish a “wait and see” position** before any more actions and/or commitments are made. The TA1 and TA2 should be evaluated by an independent third party and the ADB financed parts should have created some clearly noticeable results.

There are still unsolved financial issues in the Project regarding the payment by the DENR/EMB of local costs incurred.

## **2 THIS FINAL REPORT**

This Final Report summarizes the activities of the second phase, the so-called TA2, of the Air Quality Management Project cooperation between the Department of Environment and Natural Resources (DENR) / Environmental Management Bureau (EMB) and the Swedish Consultant Conexor Sensus AB financed by the Swedish International Development Co-operation Agency (Sida). This Final Report is following the baselines outlined in Sida's decision to finance the Project dated June 24, 1999 with Sida/INEC reference number INEC-1996-0979.

The report, comments etc are mainly made from a technical and implementation point of view.

### **3 THE PROJECT**

#### **3.1 Main objective**

From the Agreement:

The main objective of the overall Project is to build up a modern Air Quality Management Function within the DENR/EMB.

The main objective is divided into sub-objectives.

The sub-objectives are

- to support the DENR/EMB to establish validated baseline ambient air quality data in strategic points in the Metro Manila Airshed. These points have to be agreed on by the DENR/EMB and are depending on the development and operationalization of a comprehensive ambient air quality network;
- to support the DENR/EMB to conduct an inventory of point and vehicular sources in the Metro Manila Airshed, and to determine the contribution of each type of source and establish an updated database of these sources in the Airviro System;
- to further train the DENR/EMB staff on the operationalization and maintenance of the Airviro System; and
- to establish a training platform for DENR/EMB personnel for determining baseline data and monitoring changes in ambient air quality in Metro Manila Airshed. This will allow the DENR/EMB personnel actual hands-on experience in installing and operating real time air quality monitoring systems and hard-line data with respect to meteorological and environmental conditions prevailing when they were gathered.

The Project will enhance the possibilities for the DENR/EMB to effectively produce the necessary basis for the future work within the Air Quality Management activities, i.e., in summary, reports and analysis for decision-makers in the area of Air Quality Management. The improvements of the capacity to inform the general public, the media etc. also play an important role.

Coordination with other agencies - financing as well as organizations using the Air Quality Management information - will be emphasized during the Project in order to optimize limited resources. The coordination with the ADB loan will be closely monitored and utilized.

#### **3.2 Estimated outputs after the completion of the first phase of the Project**

From the Agreement:

The following main points are the estimated outputs from the Project. The outputs are defined in such a way that it will be possible to verify each one.

After the Project is completed, the EMB should be able to professionally use their organization and technical systems to provide information needed by decision-makers, external experts, the media, the general public etc. in the following areas. The areas are listed in order of priority. The first issue is by far the most important one.

1. Provide regular, on-time and accurate reports on ambient air quality based on the ambient air quality network. The output format can be formal reports, Internet based information, media adjusted summaries etc.
2. Describe and understand the quality requirements for all types of data used in the Air Quality Management System, such as ambient air quality data, emission data, meteorological data etc.
3. Carry out analyses concerning the air pollution situation in Metro Manila with the aid of the installed ambient air quality measurement equipment as well as the traffic and industrial emission information mentioned below.
4. Provide emission information in a systematic way. The information should cover industries as well as road sources. The content of the emission database should also be able to be exported to other Philippine organizations that could make use of the information in their respective work in the field of Air Quality Management. The EMB should also have developed a long-term strategy for the updating and maintenance of the emission database.
5. Determine the air pollution consequences of industrial establishments, traffic routing and planning, city planning, etc. and also to analyze the consequences of corrective measures using simulation methods.

### **3.3 General comments to the accomplishment of the Project**

#### **3.3.1 Fundamental condition for the Project is not fulfilled**

The ambition of the Project was more or less completely based on the condition that an ambient air quality monitoring network (financed by the ADB loan) over Metro Manila would be installed at an early stage of the Project. The ADB loan - and equipment - would soon to be followed by the Sida Soft Loan financing additional equipment and other functions and services.

The problems related to the ADB financed parts of the overall Metro Manila Ambient Air Quality Program have been reported and discussed in various documents and meetings. One significant document is the “ADB Review Mission Report dated 26 November 2001”, which has been sent to Sida.

Since the basic conditions have not been fulfilled due to various reasons, the practical accomplishment of the Project has had to be adjusted to these facts.

The estimated outputs 1 and 3 in paragraph 3.2 above have consequently not been possible to fulfill.

The estimated outputs 2, 4, and 5 in paragraph 3.2 above have been possible to meet to a certain extent. This is described in more detail in paragraph 4 below.

#### **3.3.2 Organization and staff**

The number of staff at the Air Quality Management Section is limited in relation to the number of tasks for the Section. However, the staff has been increased since the start of the ADB financed parts by “Contractual Staff”

The staff is often being assigned by the management to different more or less urgent tasks. This means that most long-term activities like focusing on internal capacity building for high-qualified reporting and analyses of ambient air quality matters, technical skills to service and maintenance monitoring equipment, and exchange of knowledge and experience with domestic and international colleagues, are very limited and seem to be of low priority.

It also means that staff assigned to, well in advance, planned training is often not able to be present. Consequently it is very difficult to provide an effective training to the whole staff since much of the capacity building is based on the fact that each individual has the knowledge from the previous step before he can proceed to the next. With some staff irregular missing, the imbalances in the student group make the training very inefficient.

The Special Orders assigning the staff to the Sida financed activities have not had the practical effect desired. Two Special Orders are found in the Appendices.

The formal and practical qualifications of some of the staff seem to be sufficient for the currently practically accomplished tasks, but is probably not sufficient for enhanced, and more qualified, tasks in the future when it comes to all staff.

**However, it should be mentioned that most promising - and partly even impressive - results were achieved by a limited number of students (EMB staff) that participated with interest and a high level of attendance in the training.**

### **3.3.3 Lack of management support**

The Consultant has often emphasized the lack of practical support from the management during meetings with the DENR/EMB management at different levels. Also the change of individuals at management level has meant that the continuity badly needed for a successful accomplishment of a training program has been partly lacking.

The Consultant has also required a focal person with a good overview of the overall Project activities (including the ADB parts) with mandate to make strategic decisions facilitating and making more effective the daily work in the Project.

### **3.3.4 Lack of customer driven needs for information**

Surprisingly enough, there seems to be a very limited number of customers asking for the information from an ambient air quality network on a regular basis. Such customers are normally

- the Environmental Protection Department (in this case the DENR itself) to follow up e.g. short time episodes and long term trends;
- local authorities that need the information for their regular environmental protection work;
- media to inform the general public about the ambient air quality situation (in this case the doubtlessly most hazardous situations) and to ask the responsible authorities/persons what to do to reduce the pollution levels; and
- NGOs to promote their ideas, etc.

Naturally, the most limited currently available data is used every now and then for different reports and other purposes, but no one seems to ask for Quality Assurance information together with the data.

The Clean Air Act (Republic Act No 8749) clearly establishes several requirements and tasks regarding Ambient Air Quality Monitoring and Reporting, which practically should be carried out by the EMB, but still very few direct actions to practically fulfill these requirements and tasks are seen.

### **3.3.5 Conclusions and Proposals**

The results and achievements from the Project are not as good as planned.

The main reasons have been mentioned several times and are summarized above, but there are also some bright spots.

The Consultant now recommends Sida to establish a “wait-and-see” position before any more actions and/or commitments are made. The TA1 and TA2 should be evaluated by an independent third party and the ADB financed parts should have created some clearly noticeable results.

## **4 THE DIFFERENT PROJECT ACTIVITIES**

The following paragraphs cover each of the main areas of activities in the Project. The first part of each section summarizes the main specification (Terms of Reference) from the Agreement, and the second part describes the practical results. For a more comprehensive and detailed description of each and every activity, references are made to the Status Reports and other documents.

### **4.1 Continued support in the use of the already installed computerized Air Quality Management System (the Airviro System)**

#### **4.1.1 From the Agreement**

The Airviro System will be upgraded to cope with the enhanced ambient air quality network and will include the following functions:

- Data collection from the network of monitoring stations including the meteorological masts planned to be procured under the Sida Concessionary Credit and ADB loan;
- Data handling, reporting and analyzing functions for ambient air quality data;
- Functions for the continued build-up and establishment of an Emission Database (EDB); and
- Dispersion modeling (Gaussian and street canyon models).

The computerized Air Quality Management System will also serve as the technical platform for most of the training.

#### **4.1.2 Practical results**

The Airviro System has been upgraded to handle all the functions mentioned above in paragraph 4.1.1 above. The Airviro System has been utilized to collect data from the meteorological mast at Ateneo University in real time and as the platform for the technical training. (The meteorological mast was installed as a part of TA1.) Since the planned network of on-line ambient air quality monitoring stations has not been accomplished, it has naturally not been possible to provide this function. **However, the on-line connected meteorological stations proves that it is feasible, and practically relatively easy, to set up an on-line monitoring network connected to the EMB provided the monitoring stations are properly specified and designed, and delivered and installed as specified. The data capture from the meteorological mast is almost 100%.**

Some external users, like Ateneo University Environmental Science Education, has been supplied with the meteorological data on a regular basis.

In addition, the Airviro System has also been connected to the installed Local Area Network (LAN) at the EMB. **The latter has meant that it has been possible to access the Airviro System not only from the main computer but also from PCs at various locations at the EMB.**

Please also refer to reports below on the MIS support.

Please also refer to reports below on the use of the meteorological mast at Ateneo University.

## **4.2 A continued support in the organizational and administrative development in the area of Air Quality Management**

### **4.2.1 From the Agreement**

The recently approved “Clean Air Act” is heavily influencing the practical use of Air Quality Management information from this Project.

Support and advice will be given how to make the best possible use of the Sida supported functions. The support and advice will be based on the experience from Sweden as well as other projects in the field of Air Quality Management where Conexor or its subcontracted parties have participated.

### **4.2.2 Practical results**

The Clean Air Act includes several paragraphs (requirements) for which a modern Air Quality Management System is needed to perform the tasks. During the training, these functions have been emphasized and demonstrated how they can be performed using the Airviro System.

Since the practical implementation of the Clean Air Act has been rather slow and not fully accomplished, and the lack of ambient air quality monitoring stations, **it has not been possible to practically demonstrate the functions utilizing “real” data from Metro Manila.**

## **4.3 Support in the preparation and evaluation of the credit preparation, technical specifications, bidding documents, etc. for the procurements under the ADB loan and Sida Concessionary Credit to ensure a correct interface to the Airviro System**

### **4.3.1 From the Agreement**

General advice and support in the preparation and evaluation of the credit preparation, technical specifications, bidding documents, etc. for the procurements under the ADB loan and Sida Concessionary Credit.

Conexor must be given the possibility to review the final specifications for procurement in all areas that are related to the Airviro System functions before they are released. Conexor will provide a written report on the interfaces and also highlight any other areas of concern. The same procedure must take place regarding the evaluation of the bidding from the providers.

### **4.3.2 Practical results**

The Consultant supported the EMB to a larger extend in the preparation of the Terms of Reference (ToR) for the procurement of the ambient air quality monitoring stations under the ADB loan than initially planned. Practically, **the Consultant coordinated and worked as the secretary of the group of technical staff from the EMB that prepared the ToR.** The ToR was later used for the procurement, which started late 2000.

The technical evaluation started early year 2001 but the Consultant was not part of the evaluation in any sense, which meant that the Consultant could not verify if the bids and proposals were in line with the requirements. **The awarding of the contract for the ambient air quality monitoring stations under the ADB loan has still not been done (18 months later).**

Since the specifications of the equipment, functions, and services to be procured under the Sida Soft Loan (a more appropriate term than Sida Concessionary Credit) are heavily depended and integrated with the ADB financed parts of the overall Project, it has not been possible to provide a final ToR for the Sida Soft Loan parts. However, various drafts have been discussed and provided in combination with penetrating questionnaires to the EMB's different types of users to ensure a proper and adequate design of the parts financed by the Sida Soft Loan.

Since the Sida Soft Loan is not yet signed, the status of this part of the Project is unclear.

Some documents produced and used during the process are found in the Appendices.

#### Siting of monitoring stations

The siting of the planned monitoring stations is a very crucial issue. Without a proper siting, representative for the area monitored and fulfilling practical requirements like security and power and telephone supply, the monitoring network cannot be working.

#### **The Sida Consultant carried out substantial work to support the EMB in the finding of good sites for the planned monitoring equipment under the ADB loan as well as the Sida Soft Loan.**

The Sida Consultant has emphasized over and over again that it is most important to provide the potential supplier of the monitoring equipment with the final siting information in order for him to be able to plan properly. So far, no final decision has been made regarding the siting.

In the Appendices, the Sida Consultant work is summarized regarding the finding of suitable sites.

### **4.4 Support in the continued building up of the emission database (EDB) over Metro Manila Air Shed**

#### **4.4.1 From the Agreement**

Support in the continued building up of the emission database (EDB) over Metro Manila Air Shed including the conduct an inventory of point and vehicular sources in the Metro Manila Airshed, and the determination of the contribution of each type of source and the establishment of an updated database of these sources in the Airviro System;

The EDB will form an essential tool in the development of a regulatory framework to control emissions from industries and traffic. The activities under the ADB loan are supporting this development of a regulatory framework.

#### **4.4.2 Practical results**

The development and build-up of the Emission Database (EDB) for Metro Manila is practically an endless task. The work started during TA1 and has been comprehensively continued during TA2.

Data from the industrial sources (point sources) is available to a various extent and quality. One main problem is that the information is scattered among various organizations, not particularly structured (i.e. the information varies from one file to another) and often kept as manual files. The actual quality is doubtful in many cases, since the information is mainly based on the data provided as a part of the application for the initial operation by the industry (Certificate of Operation).

Regarding the line sources Traffic Engineering Center (TEC) has been the main source of information. The TEC carries out more or less continuous counts of vehicles at certain intersections in Metro Manila. The data is used for traffic planning and management, which means that it is not readily applicable to Air Quality Management purposes.

The EMB staff working with the EDB has varied over time. This has meant that the Consultant has spent a lot of time explaining the principles and practical work as well as training the newly assigned staff over and over again. The advantage of this is naturally that a large number of EMB staff has a basic knowledge of EDB work and are capable of continuing the work under competent guidance.

Today, the **EDB consists of more than 1,700 point sources** inputted by the EMB AQMS staff. On top of that, the Airviro System EDB includes **more than 550 road links with traffic counts**. The road database has been partly upgraded with new road types, emission factors, and vehicle flow.

**The EDB in the Airviro System is surely by far the most structured and updated Emission Database to be found in the Philippines.**

The work is, as mentioned above, practically endless since the sources (emissions) change with time. The EMB AQMS staff is technically capable of doing this.

Please also refer to the various Training Programs in the Appendices.

The Final EDB from the TA2 is installed in the Airviro System. It is also found in Excel format (1.6 MB of data) in the Appendices.



The picture shows the current EDB on the Metro Manila map in the Airviro System. The white lines show the line sources (roads). The white squares show the point sources (industries). The numerous point sources placed in Laguna Lake and Manila Bay are point sources not yet adequately located on the map (street location), but the available emission information is stored.

## **4.5 Support in the continued analyses and reporting of ambient air quality data**

### **4.5.1 From the Agreement**

Support in the continued analyses and reporting of ambient air quality data. The planned, extensive, enhancement of the ambient air quality monitoring network over Metro Manila Air Shed will significantly increase the need for an effective tool to handle the data. The activities under the ADB loan and Sida Concessionary Credit are depending on such a tool.

The support will be focusing on the following main areas:

- Understanding of how different types of reports are built up, what the reports show, the required inputs, output formats etc;
- Analyses of the data in relation to Philippine National Ambient Air Quality Guidelines for Criteria Pollutants;
- Analyses of the data to evaluate short and long term trends, specific events or high or low levels of pollution, emission tracking, etc;
- Regular follow-up of data flow and data quality from the enhanced ambient air quality network. This part will particularly be used to evaluate the performance of the suppliers of ambient air quality data under the ADB loan and Sida Concessionary Credit;
- Preparation of reports of different kinds such as regular reports (monthly, annually), specific reports, media adjusted reports, scientifically adjusted reports, decision-maker adjusted reports etc; and
- Preparation of data and reports for the planned Integrated Internet Based Air Quality Information System.

Depending on the development and upcoming needs, the focus might change during the progress of the Project.

### **4.5.2 Practical results**

The activity under this paragraph was specified with the assumption that the ambient air quality monitoring network financed by the ADB - and later also the Sida Soft Loan - would be installed and operational at an early stage of the Project. Since this has not been achieved, the training has been accomplished using data from other projects (installation) that the Consultant is/has been involved in, mainly Göteborg, Sweden; Bangkok, Thailand; and Tallinn, Estonia.

From a theoretical point of view, this has not been a disadvantage; very often on the contrary since different climatological situations have been highlighted. However, practically the EMB staff has often experienced the training as a “dry run”, but under the conditions present this was the best option.

The data from the meteorological mast at Ateneo University has been extensively used for training, but the data sets used do naturally not include any ambient air quality data to evaluate against.

The training has been accomplished in such a way that theoretical sessions have been mixed with practical work utilizing the data mentioned above.

A practical problem has been to handle the training for students (staff) that did not attend more or less continuously since much of the training during a session was based on the skills and knowledge acquired during the previous sessions.

The “exam” was carried out by a comprehensive task to write a formal report based on certain sets of data, which was accomplished successfully by most of the students.

**Most promising - and partly even impressive - results were achieved by the students (EMB staff) that participated with interest and a high level of attendance.**

However, it is a huge difference between performing well under “relaxed” conditions and working with real time data continuously flowing in.

(Just as an example: The estimated data amount per day from the planned network in Metro Manila could be estimated as follows:

15 stations \* 10 parameters \* 24 hours = 3,600 sets of data.

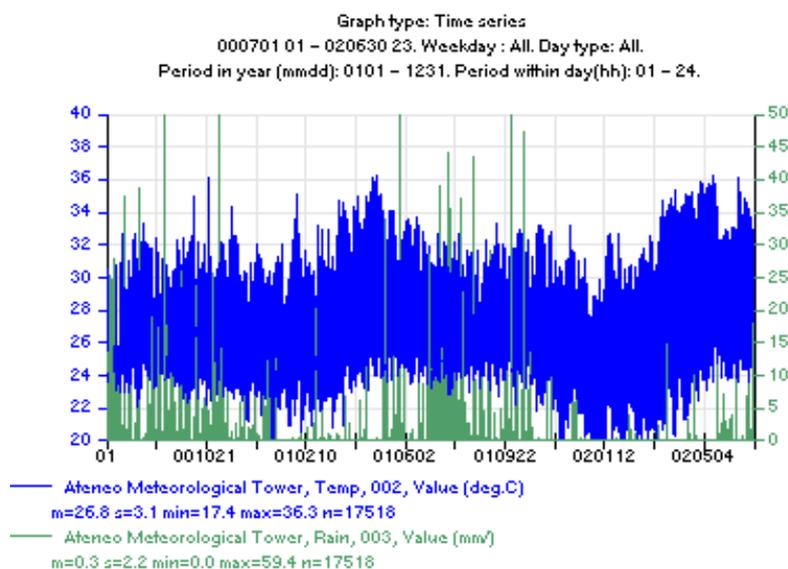
On top of that the meteorological parameters from each stations must be evaluated.

Weekdays as well as holidays...)

**The Consultant does not believe that the EMB staff at this moment is capable of handling and using an on-line monitoring network over Metro Manila and providing reports as outlined in the Clean Air Act. However, with an intensive brush-up training for skilled, dedicated and 100% assigned staff for period of time using the real, on-line, network over Metro Manila, the Consultant believes the EMB could handle the task of making use of a modern network of ambient air quality monitoring stations.**

The activities under this paragraph have been coordinated with the ones under paragraph 4.7 below.

Please also refer to the various Training Programs in the Appendices.



The picture shows the temperature and rainfall at Ateneo University as monitored by the meteorological mast from 1 July 2000 -- 30 June 2002. For the interested reader, it should be noted that the “structure” of the variation of both parameters over time is the same, but the actual levels (values) vary. There are 17,520 hours during the period and the data capture is 17,518.

## **4.6 Support in the work to produce basic, but accurate as far as the input allows, “what-if-scenarios” for the simulation of ambient air quality effects of certain actions taken**

### **4.6.1 From the Agreement**

Support in the work to produce basic, but accurate as far as the input allows, “what-if-scenarios” for the simulation of ambient air quality effects of certain actions taken. The results should be reported to decision-makers at different levels. The activities under the ADB loan are depending on such a tool.

The basic steps were taken under TA1.

### **4.6.2 Practical results**

The lack of ambient air quality monitoring data has again limited the practical possibilities to accomplish this part of the Project in a “real” environment. Also the lack of a high quality Emission Database has limited the accuracy of the simulations carried out. One of the main ideas and challenges when it comes to dispersion modeling - or “what-if-scenarios” - is naturally to be able to compare simulated results of ambient air quality with the measured ones.

The training has been focusing on the theoretical parts of dispersion modeling and applying that on as “practical” situations in Metro Manila as possible.

**Again, as with the ambient air quality monitoring analyses training mentioned above, most promising - and partly even impressive - results were achieved by the students (EMB staff) that participated with interest and a high level of attendance.** The topic is not simple, so students with less interest, theoretical background, and general skills did not perform so well and cannot be considered as capable of working with these issues.

**The Consultant does not believe that the EMB staff at this moment is capable of accomplishing “what-if-scenarios” to such a quality that is required for real planning and evaluation situations as outlined e.g. in the Clean Air Act. However, with intensive additional training for skilled, dedicated and 100% assigned staff for period of time using the real, on-line, network over Metro Manila and an updated Emission Database, the Consultant believes the EMB could handle the task of making “what-if-scenarios” of a reasonable quality.**

The activities under this paragraph have been coordinated with the ones under paragraph 4.7 below.



The picture shows the simulated ambient air quality (in  $\mu\text{g}/\text{m}^3$  over a half-year season) caused by the traffic along North Avenue, Quezon City. The simulation makes use of the Emission Database to evaluate the traffic and emissions, and then uses a wind model and climatological information (from the meteorological mast) and a Gaussian dispersion model to estimate the consequences on ambient air quality.

#### **4.7 Accomplish extensive training of the DENR/EMB staff as a part of the planned enhancement of the general Air Quality Management activities**

##### **4.7.1 From the Agreement**

###### Training in Air Quality Management

Accomplish extensive training of the DENR/EMB staff as a part of the planned enhancement of the general Air Quality Management activities.

The basic technical training program - using the computerized Air Quality Management System - in which theoretical and practical activities are mixed, was accomplished under TA1. The continued training under TA2 will cover all aspects of Air Quality Management needed to understand the overall scope. This will also include the handling of the computerized Air Quality Management System as well as the different software functions installed. The training will be integrated with the more technical aspects of the different activities undertaken.

Based on experience from similar projects, there is always a need for general support during the accomplishment of the Project. Such support cannot normally be labeled as one specific type of training or support, but rather labeled as the understanding of the integrated work that forms modern Air Quality Management.

### On-the-job guidance

Therefore a relatively large part of the Project is called “on-the-job” guidance. Swedish experts in different fields will provide this guidance through more or less full time presence in Manila during various time periods of the implementation of the Project.

### Study visits to Sweden

A limited number of study visits to Sweden are included.

### Conexor's participation in the recruiting process of additional staff

The ADB loan will provide the funds for a significant expansion of the DENR/EMB staff working with Air Quality Management issues. The staff will be a combination of local consultants and contractual DENR/EMB staff. The Sida Project is expected to train this staff in the different Air Quality Management issues mentioned above.

Subject to the requirements from the DENR/EMB, Conexor can participate in the staff recruiting process in all areas that are related to the Airviro System functions and the activities under this Agreement. In such a case, Conexor will provide a written report with recommendations on what staff to recruit.

## **4.7.2 Practical results**

Training in Air Quality Management is a complex issue since it includes so many various parts. Some of the training accomplished has been described above. Unfortunately, the “On-the-job guidance” part has not been possible to carry out as planned due to the lack of “real” monitoring data from Metro Manila. This lack has only been possible to partly compensate through the activities carried out.

The outcome and results of the Air Quality Management training is still considered to be acceptable, but not reaching as far as it could have done. **The understanding of basic Air Quality Management issues has been brought to a good level for some staff that has shown an interest and have been assigned sufficient time to participate in the training provided. Especially issues like data quality, follow-up, and the amount of work needed to run a good Air Quality Management function are being understood.**

Some of the reasons of the outcome are discussed in paragraph 3.3 above.

Some of the Training Programs are found in the Appendices.

### Management Information System (MIS)

**One part of the training in the Project that has been very successful is the support to MIS during their establishment and development as a supportive function in the computerization of the EMB daily work.**

The training and participation in the MIS development was not directly planned from the beginning of TA2, but since it is an integrated part of a more effective Air Quality Management work, the Project Management decided to allocate some of the resources to this part.

The following paragraphs include a rather comprehensive description of the successful work:

In January 2001 the Sida Consultants were asked by the EMB Director to support with the implementation/development of a Management Information System section (MIS). There had been an old, poorly working MIS section with only a few persons and almost no accomplishments. The EMB management saw the need for an improved MIS function and realized its importance for the development of the rest of the EMB.

This training or this work started in January 2001. The MIS was then around 10 relatively newly recruited staff with some experience from work with computers and the proper theoretical background. The Sida Consultant actively participated in meetings with the MIS and the EMB management where some guidelines for the development of the MIS were agreed. After this initial phase we met a few times every week and discussed our mission. We agreed on a strategy and the MIS staff themselves performed very well. In the start we had a few tasks that we solved. After that we began working on a little bit more long-term development of the MIS. The work has been in the form of discussions, advice and a little bit help to solve some technical problems. The MIS staff have listened and used the advice to learn and to develop into a well-working function.

#### From 0 to 100 computers in the Local Area Network (LAN)

When our work with MIS started there were about 50 PCs in EMB but no Local Area Network, no official e-mail function, and a poor webpage. Today after 15 months the EMB LAN consists of around 100 connected computers, the LAN is connected to the Internet with a broadband connection, all key staff persons and sections have official e-mail (name@emb.gov.ph), and there is a new very extensive webpage that already has been updated several times. To manage all this the EMB has invested an estimated PHP 1.5 -- 2 million.

We started with a few small pieces of network equipment that the Sida project supplied for training purposes. As soon as we had 10 computers connected to the LAN the interest within EMB started to grow. A budget for a fixed connection to the Internet was suddenly available and we found a lot of networking equipment that remains after previous aid projects. With almost no resources we managed to expand the network more and more. As soon as the LAN was connected to the Internet there was a demand from all sections to immediately be connected to the LAN/Internet. All sections, where the management understood the advantage of this new technology, requested information on needed investments. About 6 months later, or late 2001, a lot of the needed hardware for the expansion to the size and performance of the EMB LAN today were procured and financed by the EMB.

The fast expansion and development has in a way left the users behind. Despite several training seminars hosted by the MIS there is a big need for more support, training, and guidelines for the use of Information Communication Technology Equipment at EMB.

#### ICT Policy

The last four months of the Sida TA2 we have together with the MIS been developing an Information Communication Technology (ICT) Policy for the EMB. This policy should be seen as a support and help for the users and a tool for the continuing development of the ICT at EMB. The ICT development has mainly been dealing with the EMB central office but has now, through this new ICT policy, been expanded to also include the regional offices. Guidelines for the ICT development in the regions, as well as support and training from the MIS have been included in the ICT policy and the work has started for 4 -- 5 regions. The work with ICT policy will need a lot of more support but has already given the EMB a good basis for continuous development using ICT equipment.

The ICT policy can be found in the Appendices.

### System administration training for networking

The Sida Consultant has conducted training in how to implement and operate a Local Area Network. This work has been very successful and has been an important part of the success of the MIS and the implementation of the EMB LAN.

### System administration training for Air Quality Management System

Training on system administration of the Air Quality Management System started with staff from AQMS. The output from the work was quite poor but there were at that time no other options. With the development of the MIS and the involvement of MIS staff in this training we have started to see much more progress. Unfortunately this part of the training has been successful only the last six months and much more support is needed.

### Turn over operation of AQM server

The Air Quality Management System has been transferred to MIS from AQMS and we have now for the first time in the project experienced that the EMB operates the system on their own. However much more support is needed and the MIS will still not be able to manage any major problems. Normal operation with no special problems will be managed well.

### Database development

The MIS has improved their skills in database development during this time. Several specific databases has been developed and implemented. There is a big need for more hardware and software to continue this development and to operate all these databases.

One positive effect is that data needed to build a Emission Data Base (paragraph 4.4 above) before was only partly available on paper from several different sources will now be included in a main database for industrial permits and export functions to the Airviro EDB module will be developed. This database is now designed and specified but not yet developed.

A list of some of the MIS accomplishments can be found in the Appendices.

### LAN documentation

We have started to provide the documentation regarding the EMB LAN. The Sida Consultant has begun to develop a big spreadsheet with info on all to the LAN connected equipment.

### Future developments

An Intranet Function and an Internal Helpdesk Function to support EMB users to handle the new, technical supporting facilities as effectively as possible are planned.

### Study visits to Sweden

A Study Visit was accomplished to Thailand and Sweden 29 March -- 11 April 2001.

Please also refer to the detailed program in the Appendices.

### Conexor's participation in the recruiting process of additional staff

The Consultant offered to be involved in the recruiting process but he was not invited.

## **4.8 Carry out two seminars in the Philippines for the DENR/EMB and other organizations involved in Air Quality Management activities**

### **4.8.1 From the Agreement**

Carry out two seminars in the Philippines for the DENR/EMB and other organizations involved in Air Quality Management activities. The first seminar (in the beginning of the Project) should present the scope of the Project, the technical activities, the different organizations involved, the estimated outputs etc. The second seminar (by the end of the Project) should present the achieved results and plans for the future.

These seminars should preferably be closely coordinated with other organizations involved in the Project, essentially the ADB.

### **4.8.2 Practical results**

The first seminar (in the form of a workshop) was accomplished **29 -- 30 November 1999** at Villa Escudero. This workshop covered the plans in the beginning of the TA2.

The second seminar (in the form of a workshop) was accomplished **1 February 2002** at Celebrity Club. This workshop covered the accomplishments so far and the plans to optimize the remaining parts of the TA2 support.

The third seminar (in the form of a workshop) is accomplished this day **14 August 2002**. This workshop presents the Final Report and some of the practical accomplishments and practical results achieved.

## **4.9 Support the DENR/EMB in the following activities, which are parts of the ADB loan and Sida Concessionary Credit financed activities**

### **4.9.1 From the Agreement**

#### ADB loan

Support the DENR/EMB in the following activities, which are parts of the ADB loan financed activities:

- The preparation of the ToR, and later the evaluation of the commercial biddings, to refurbish the existing Thermo Environmental stations;
- The preparation of the ToR, and later the evaluation of the commercial biddings, to refurbish the existing DKK stations;
- The preparation of the ToR, and later the evaluation of the commercial biddings, to install new stations; (This part will be technically identical to the content of the Sida Concessionary Credit.); and
- The preparation of the ToR, and later the evaluation of the commercial biddings, for the Operation and Maintenance of the monitoring stations. (The intention of the Operation and Maintenance is to subcontract the work to a supplier, which means that the DENR/EMB will act as a receiver and user of data.)

### Sida Concessionary Credit

The Sida Concessionary Credit will cover

- Ambient air quality monitoring equipment and its operation and maintenance; and
- An Integrated Internet based Air Quality Information System including an Internal Local Area Network (LAN) at the DENR/EMB and its operation and maintenance.

#### **4.9.2 Practical results**

**Practically the activities under this point have been coordinated with the activities under paragraph 4.3 above.**

#### **4.10 Provide the necessary Project management for the implementation of the Project**

##### **4.10.1 From the Agreement**

Provide the necessary Project management for the implementation of the Project, in order to ensure that the coordination aspects of different Air Quality Management activities will be optimized as far as possible and that the appropriate Swedish experts will be involved.

Provide different kinds of Reports outlined in this Agreement. Participate in meetings.

##### **4.10.2 Practical results**

**The Swedish Project Management has provided all necessary work, information, background material etc to accomplish the Project as well as possible under the existing conditions.**

## **5 BUDGET, REPORTING, AND GENERAL FOLLOW UP**

### **5.1 Budget follow-up**

The Project has been spending the available budget over a calendar period longer than the initially planned 36 months.

A slight change between the initially planned and practically spent budgets for the different activities in the Project has been made to adjust to the changed conditions.

A specification of the spending for each invoicing period has been included in the invoices and the Status Reports and a detailed budget follow-up has been sent to Sida.

### **5.2 Outstanding issues**

As of this day, the following invoices, to be paid by Sida, have still not been endorsed by the DENR/EMB:

- Conexor Invoice No 2115 dated 31 May 2002 for the period 1 March -- 31 May 2002.
- Conexor Invoice No 2116 dated 14 August 2002 for the period 1 June -- 14 August 2002.

The following invoice, to be paid by the DENR/EMB has been handed over to the Client:

- Conexor Invoice No 9020 dated 14 August 2002 for the whole duration of the Project for Local Costs incurred under the Agreement to be paid by the DENR/EMB.

A copy of Invoice 9020 has been sent to Sida and the Embassy of Sweden, Manila, Philippines for their information.

The relevant parts of the Agreement are quoted below:

Paragraph 7: Costs

Paragraph 7.1: Principles

#### **The DENR/EMB will cover**

- the costs for internal work by the DENR/EMB;
- the costs for local work done by external Philippine consultants that may be contracted by the DENR/EMB;
- **local cost in terms of transportation, offices, telephone and fax etc.;**
- **local costs for the Swedish experts while in the Philippines, hotel accommodation and per diem; and**
- **the costs for the Philippine Project participants in terms of international travels (from the Philippines to Sweden and return) as well as domestic Philippine travels.**

**The Project under the Agreement is completed from the Consultant's point of view with this Final Report.**

**However, the Client, the DENR/EMB has not fulfilled its obligations under the Agreement before the Invoices 2115 and 2116 are endorsed and Invoice 9020 is paid.**

### **5.3 Reporting follow-up**

Regular “Status Reports” have been furnished in connection to each invoice. The EMB has lately demanded a different format of the reports (matrix format), so the Consultant has provided parallel reports for a period of time.

All formal reports are found in Appendices.

## **6 APPENDICES**

The number of documents, reports, presentations, training programs etc produced in the Project is very high. Some, but far from all, of all these documents etc are found in the Appendices.

In order to save paper, space - and the environment, only one (1) hardcopy of the complete Appendices has been produced. This heavy folder is handed over in connection with the Final Report.

All Appendices are copied to a CD attached on the inside of the back cover page of the Final Report.

The Appendices are organized in the following directories:

- Emission Database (6 files)
- Power Point Presentations (12 files)
- Special Orders (2 files)
- Status Reports (16 files)
- Training (21 files)
- Various Documents (21 files)
- Workshops (3 files)

The naming of the files is normally more or less self-explanatory regarding to the content with a date convention as YYMMDD.