

NILU : OR 18/98  
REFERENCE : O-96100  
DATE : MAI 1998  
ISBN : 82-425-0969-7

# **ENSIS Yantai**

## **Annual Report 1997**

**Bøhler, Trond – NILU**  
**Gao, Zhanjun – YEMC**

# Contents

	Page
<b>Summary</b> .....	<b>2</b>
<b>1. Introduction</b> .....	<b>7</b>
<b>2. Project status</b> .....	<b>7</b>
2.1 Air quality .....	7
2.1.1 Monitoring stations.....	7
2.1.2 Emission inventory .....	8
2.1.3 Dispersion modelling.....	8
2.2 Water quality .....	9
2.2.1 Maps .....	9
2.2.2 User interests .....	9
2.2.3 Monitoring stations.....	9
2.2.4 Monitoring data .....	10
2.2.5 Water flow .....	10
2.2.6 Water Quality Control Procedures.....	10
2.2.7 Water Quality classification.....	11
2.2.8 Other relevant data.....	11
2.2.9 Water Monitoring equipment .....	11
2.3 Information technology .....	12
2.3.1 Data equipment.....	12
2.3.2 Configuration and training in Norway .....	13
2.3.3 Adjustment of "ENSIS version-2.0" to Chinese conditions.....	13
2.3.4 Data handling.....	14
<b>3. Revised project plan for 1998 from the Norwegian side</b> .....	<b>14</b>
3.1 Revised work plan summary .....	15
3.1.1 Phase 1 (November 1996–March 1997) .....	15
3.1.2 Phase 2 (April 1997–December 1998) .....	15
3.1.3 Phase 3 (January 1999–December 1999).....	16
<b>4. Project costs 1997</b> .....	<b>17</b>
4.1 Project costs for the ENSIS group.....	17
4.2 Project cost of Chinese side for phase 1 and 2.....	19
<b>5. Project budget for 1998</b> .....	<b>20</b>
5.1 Budget for the ENSIS group .....	20
5.2 Project budget of YEMC.....	20

## Summary

On November 27, 1996, an agreement was signed in Beijing between the Norwegian Agency for Development Co-operation (NORAD) and The State Science and Technology Commission (SSTC) regarding Environmental Surveillance and Information System for Yantai, China. According to this agreement and the project proposal on the above mentioned project, a start up Workshop was held in Yantai 25-29 November.

The institutions participating in the project are Yantai Municipal Science and Technology Commission (YMSTC), Yantai Environmental Monitoring Centre (YEMC) and Yantai Environmental Protection Bureau (YEPB) from the Chinese side. The ENSIS group consists of the institutions Norwegian Institute for Air Research (NILU), Norwegian Institute for Water research (NIVA) and the NORGIT centre.

This annual report describes the work carried out in 1997 and a revised project plan for 1997.

### **Air quality**

#### ***Monitoring stations***

Five locations for online monitoring have been selected. Preparations and decorations of the monitoring sites have started and the stations will be ready for installation of the monitors in June 1998.

The discussions about selection of monitors have lasted for almost one year. NILU delivered an offer from a Swedish manufacturer in January 1997. A final list of air quality instruments from a Chinese distributor and NILU was signed in the workshop in November 1997. Later, the distributor of the instruments list changed from ATI to T.E. Instruments from T.E. which are considered to have a more reliable quality according to market investigation. NILU will deliver the data acquisition system and data loggers while the Chinese distributor will deliver the monitors. One set of the instruments shall be delivered in Norway for testing and adaptation of the NILU data logger and the automatic data acquisition system (A-DACS). The installation of the air quality monitors is about six months delayed due to these discussions.

#### ***Air Emission inventory***

The ENSIS emission database has been presented and explained to a certain level of detail by the Norwegian group. The "Input data Specifications – AirQUIS 2.0", which describes the forms and formats for entering all data related air emission into the ENSIS data base, has been presented by the Norwegian group.

The emission inventory for different source categories has been started by the YEMC emission inventory group. The collection of emission and energy

consumption data for the different source categories was presented by the Yantai emission inventory group in the workshop in November.

A "Square administrative districts" have been identified, which corresponds to squares of one or two square kilometres, exactly fitting in the co-ordinate system on a detailed map. This map is on the scale 1:50000 and defines the co-ordinate system of the ENSIS application for Yantai.

The Chinese side will write a first emission inventory by the end of February 1998.

### ***Dispersion modelling***

The NILU developed EPISODE model for urban areas has been presented to YEMC. This model contains sub models for calculating concentration contributions from point-, area- and traffic sources. The use of the different sub models and the relations between them have been explained to a limited level of detail. A more detailed and technical presentation will be given during the forthcoming workshops.

### **Water quality**

#### ***Maps***

YEMC has provided maps of land coverage, user interests and administrative codes for the catchment of the River Jia. A map indicating 321 industrial point sources has also been delivered. Discharges and other relevant information from the industrial plants in the catchment area of the river Jia. have also been delivered.

At the November Workshop, YEMC made available a map of the catchment area which codes reflect the information concerning population data for each of the administrative 'towns', listed in the database.

#### ***Monitoring stations***

At the 1997 Yantai Workshop, YEMC made available a map indicating all the different monitoring stations. The Monitoring laboratories in the five districts of Yantai are responsible for the sampling on their respective sections of the catchment area. These Monitoring laboratories report every second month their monitoring results to YEMC.

#### ***Monitoring in the reservoir and rivers***

YEMC has provided a complete data set of reservoir and river monitoring for 1995 as well as a complete set of monitoring results for several years on paper. The hydrological data for the three monitoring stations in the River Jia were submitted during the November Workshop.

### ***Water Quality Control Procedures***

YEMC has submitted a detailed description in English of quality control for both sampling and analysis in laboratory. This description contains the following elements:

*Sampling:* Collection procedures (method and equipment used), field treatment of samples (preservation) and procedures for transport and storage of samples.

*Laboratory:* Comparison of results with other analytical methods, comparison of results with other laboratory, use of certified reference material (for instance to calibrate instruments), and use of ionic balance as a control procedure.

Any special requirements that YEMC might have for quality assurance cannot be implemented in the ENSIS system before phase 3 of the project. However, some standard quality assurance procedures will be part of the ENSIS system that will be demonstrated as part of the workshop to take place in Norway spring/summer 1998.

### ***Water Quality classification***

The ENSIS version to be demonstrated in Norway spring/summer 1998 will contain a functionality to classify water quality data according to the Chinese water quality classification criteria (based on yearly average).

The Menlou Reservoir is classified according to the same principles as Jia River. The reservoir must meet class III criteria according to the Local Regulations.

### ***Water Monitoring equipment***

It has been NIVA's responsibility to find the best equipment for the water quality monitoring of the Jia River, and much effort has been put into the evaluation and selection process. The evaluation process was built on NIVA's extensive experience in instrumentation for water quality assessment and the following guidelines were applied:

Products from the following producers were screened: ABB, GLI, YSI, Fox, Bran & Luebbe, Polymetron, Applicon and ISCO. An in depth evaluation was performed, and the results based on whether the instruments could meet the criteria set.

This evaluation process was completed before the end of February 1997, i.e. before the March 1997 annual meeting between NORAD and SSTC in Beijing. NIVA's recommendations were presented before the said meeting.

As the agreement for the 1997 budgets was signed as late as in September 1997, the ordering process to follow the instrument selection was delayed. However, an instrument list is agreed upon and the ordering process started in late October and some of the instruments were delivered in Yantai in November 1997.

Due to different practice in the two countries regarding purchasing and import of instruments, and the fact that YEMC and the ENSIS group not fully understood each other regarding the Chinese import procedures, tax procedures was not finished in 1997. At present, because the free tax formalities have not been finished, YEMC have paid more than 10,000\$ for delaying apply to custom and storage cost.

### **Information technology**

An important part of the project is to establish a computer platform and adapt and install the ENSIS system in Yantai. This part of the project is NORGIT's responsibility.

NORGIT needs data equipment to modify the ENSIS applications, test the equipment to be sent to China, and for training our Chinese colleagues in Norway.

The hardware list was sent to China for approval in December 1996. Technical discussions between the ENSIS group and YEMC took place. NORGIT also discussed the equipment with various companies.

To fulfil the project plan, NORGIT had to start immediately the work with adaptation of ENSIS to Chinese conditions and handling the data already received from our Chinese partner. Therefore, NORGIT asked Danotec (Norwegian HP-distributor) to lend the equipment to NORGIT without any payment before April 1997. NORGIT sent a contract of the Danotec offer to YEMC for signing.

The contract from Danotec was not signed by YEMC before the deadline of 30. April. In May 1997, NORGIT had to send the equipment back to Danotec. The extra installation of the ENSIS system in NORGIT will have a minimum cost of 40.000 NOK.

To obtain progress and fulfil the time plan in the project, NORGIT has borrowed the necessary hardware. This makes it possible for NORGIT to accomplish both the "Factory acceptance test" (FAT) and part of the "Site acceptance test" (SAT) in Norway.

In November 1997 YEMC and NILU signed a data equipment list based on an offer from a Chinese manufacturer. The server and one client will be sent to NILU for configuration, testing and training of Chinese personnel in Norway.

### ***Configuration and training in Norway***

Education and training of Chinese users is planned to take place in Norway in June 1998. The quality of the training would increase if it can be carried out using Chinese hard-/software.

### ***Adjustment of "ENSIS version-2.0" to Chinese conditions***

To include the Chinese language, it was necessary to develop a Chinese/English multilingual module. NORGIT has made a technical description of the module,

and the development started in April 1997. The module had beta release in July 1997, according to the time plan.

The ENSIS-data model had to be modified to satisfy the Chinese requirements. The analysed data from the Chemical Laboratory had to be entered into the system through a Manual Data Acquisition System (MDACS). This application makes it possible for the user to record data manually. The examples from laboratory data have been used to modify the MDACS according to YEMC 's requirements.

The Automatic Data Acquisition System (ADACS) has been ordered by YEMC for collecting on line data from the monitoring stations to the ENSIS-database. The adaptation to the monitors requested has started and will be finalised during the testing of one set of instruments in Norway.

### **Project costs 1997**

The costs in 1997 were **NOK 460,000**, - lower than the budget. The saved costs for phase 2 in 1997 is transferred to 1998 for finalization of phase 2.

The total cost for the Norwegian side was in the project plan **NOK 10,573,581.-**. During 1997 it was agreed that the Chinese should purchase data equipment, air and water monitors. The total amount to be transferred directly to China in phase two of the project is **NOK 3,875,000,-**. The reduced budget for phase two on the Norwegian side is therefore **NOK 3,711,581.-** of which **NOK 1,516,043.-** was used in 1997.

The cost of YEMC for 1997 is RMB 750,000.-. According to the project plan, the total cost is RMB 2,197,500.-. These funds are mainly obtained from YEPB and YEMC themselves. Yantai financial organ will support to a certain extent.

According to the revised project plan, the project is delayed with about three months. This means that phase 3 of the project is planned to start in January 1999.

# ENSIS Yantai

## Annual Report 1997

### 1. Introduction

On November 27, 1996, an agreement was signed in Beijing between the Norwegian Agency for Development Co-operation (NORAD) and The State Science and Technology Commission (SSTC) regarding Environmental Surveillance and Information System for Yantai, China. According to this agreement and the project proposal on the above mentioned project, a start up Workshop was held in Yantai 25-29 November.

The institutions participating in the project are Yantai Municipal Science and Technology Commission (YMSTC), Yantai Environmental Monitoring Centre (YEMC) and Yantai Environmental Protection Bureau (YEPB) from the Chinese side. The ENSIS group consists of the institutions Norwegian Institute for Air Research (NILU), Norwegian Institute for Water research (NIVA) and the NORGIT centre.

This annual report describes the work carried out in 1997 and a revised project plan for 1998.

### 2. Project status

The project work has been performed at each institution during the whole year and during the two workshops in March and November. A short description of the work performed is described below.

#### 2.1 Air quality

The work performed related to air quality can be divided into three parts; monitoring, emission inventory and dispersion modelling.

##### 2.1.1 *Monitoring stations*

Five locations for online monitoring have been selected. In October, two of the stations have been modified to meet NEPA recommendations. Preparations and decorations of the monitoring sites have started and the stations will be ready for installation of the monitors in February 1998.

The discussions about selection of monitors have lasted for almost one year. NILU delivered an offer from a Swedish manufacturer in January 1997. A final list of air quality instruments from a Chinese distributor and NILU was signed in the workshop in November 1997. The final decision is to purchase the instruments from Tek-Equipment Inc. In the workshop in March 1997, NILU and YEMC together inspected the automatic air monitoring system built in Qingdao, and decided to select the API instruments from Gemini company of Qingdao.



According to the principle of the total cost unchanged, due to a reasonable configuration of instruments, the automatic air monitoring instruments of Yantai project were extended from 2 sets to 5. In addition, in the meeting with the distributor, YEMC strived for another set of spare instruments. So the total amount was increased to 6. In December 1997, according to the principle of "low price, good quality and good service", air instruments were bidden by SSTC. The T.E. Company entered the bid. Under the confirmation of NILU and YEMC two sides, the instruments from T.E. Company were finally selected.

NILU will deliver the data acquisition system and data loggers while the Chinese distributor will deliver the monitors. One set of the instruments shall be delivered in Norway for testing and adaptation of the NILU data logger and the automatic data acquisition system(A-DACS). The installation of the air quality monitors is about six months delayed due to these discussions.

### ***2.1.2 Emission inventory***

The ENSIS emission database has been presented and explained to a certain level of detail. The "Input data Specifications – AirQUIS 2.0", which describes the forms and formats for entering all data related air emission into the ENSIS data base, has been presented by the Norwegian group and given to the emission inventory group.

The YEMC emission inventory group has started the emission inventory for different source categories. The collection of emission and consumption data for the different source categories was presented by the emission inventory group in the workshop in November. Till end of December, materials required have been mostly collected, and several point sources were identified. It was agreed to use the NEPA source classification.

A "Square administrative districts" have been identified, which corresponds to squares of one or two square kilometres, exactly fitting in the co-ordinate system on a detailed map. This map is on the scale 1:50000 and defines the co-ordinate system of the ENSIS application for Yantai.

Area Source Data have been collected as distributed according to the "Square Districts". Since ENSIS easily can calculate emissions from consumption data by using emission factors, consumption data will be collected instead of emission data.

The Chinese side will write a first emission inventory report after data for all sources in the defined modelling area are collected. This will be done by the end of February 1998.

### ***2.1.3 Dispersion modelling***

The NILU developed EPISODE model for urban areas has been presented to YEMC. This model contains sub models for calculating concentration contributions from point-, area- and traffic sources. The use of the different sub models and the relations between them have been explained to a limited level of

detail. A more detailed and technical presentation will be given during the forthcoming workshops.

## **2.2 Water quality**

The status report on the data collection is based on the data requirements agreed at the March 1997 meeting in Yantai. The report from the said meeting indicates that some data collected were not presented to NIVA in time. Actually, the data have been collected completely and translated into English on time after the workshop on March. YEMC prepared to present them on the planning workshop in June. But later, the workshop was postponed to August. Because NORAD and SSTC were revising the agreement, the workshop was postponed once again to November. Following is the data collected.

### **2.2.1 Maps**

YEMC has provided one map, scale 1:50 000, of one part of the catchment of the River Jia and one map, scale 1:75 000, of an other part of the catchment of the River Jia. It is uncertain if the whole catchment of the river Jia is covered as the catchment area itself has, as yet, not been identified.

YEMC made available a map indicating 321 industrial point sources. It is hoped that similar information for the development district and for the Fushan district will be made available shortly.

A map indicating land coverage and administrative codes in the Jia River system catchment area by 1 May 1997 was made available at the workshop in November.

At the 1997 Yantai Workshop, YEMC made available a map of the catchment area which codes reflect the information concerning population data for each of the administrative 'towns', listed in the database.

### **2.2.2 User interests**

At the 1997 Yantai Workshop Y/EPB submitted to NIVA a map with information about the user interests in the Jia River System catchment area. In NIVA's view this map seems to give a good overview of the user interests involved.

YEMC informed that since the river is used for drinking water purposes, fishing and swimming activities are not allowed. Drinking water outside the city of Yantai and in the villages are taken from small wells. This is not indicated on the map. The five drinking water plants supplying water to Yantai city are indicated on the map.

### **2.2.3 Monitoring stations**

At the 1997 Yantai Workshop, YEMC made available a map indicating all the different monitoring stations.

YEMC informed NIVA that the Monitoring laboratories in the five districts of Yantai are responsible for the sampling on their respective sections of the

catchment area. These Monitoring laboratories report every second month their monitoring results to YEMC.

YEMC undertook to provide a list of the names of the sampling points of Jia River drainage. The five said districts are: Qixia, Fushan, Leshan, Muping and Yantai City (monitored by YEMC). In the five districts, the catchment area is divided into 26 administrative 'towns'.

#### **2.2.4 Monitoring data**

##### *Monitoring reservoir and rivers*

Samples are taken at 5 locations in the Menlou Reservoir, at 0,5 m depth-mid-depth and 0,5 m above the bottom of the Menlou Reservoir. There are 6 field trips each year.

YEMC has provided a complete data set from the Foxpro database for the 1995-monitoring year (floppy disk) as well as a complete set on paper of monitoring results for the period 1990-1994 and 1991-96 for the reservoir and rivers, respectively.

#### **2.2.5 Water flow**

At the 1997 Yantai Workshop, YEMC informed NIVA that part of the outlet from the Menlou Reservoir namely the inlet to the Fourth Drinking Water Plant, has a water flow of 1 m<sup>3</sup>/s. The outlet over/through the damming section is not monitored.

The hydrological data for the three monitoring stations in the River Jia were submitted during the November Workshop.

#### **2.2.6 Water Quality Control Procedures**

At the workshop in November, YEMC submitted a detailed description in English of quality control for both sampling and analysis in laboratory. This description contained the following elements:

*Sampling:* Collection procedures, field treatment of samples and procedures for transport and storage of samples.

*Laboratory:* Comparison of results with other analytical methods, comparison of results with other laboratory, use of certified reference and use of ionic balance as a control procedure.

#### **Comments:**

Any special requirements that YEMC might have for quality assurance cannot be implemented in the ENSIS system before phase 3 of the project. However, some standard quality assurance procedures will be part of the ENSIS system that will be demonstrated as part of the workshop to take place in Norway spring/summer 1998.

### **2.2.7 Water Quality classification**

YEMC has been offered the possibility of providing NIVA with a description of special procedures for classifying water quality data in order to include these procedures in the ENSIS system.

#### **Comments:**

The ENSIS version to be demonstrated in Norway spring/summer 1998 will contain a functionality to classify water quality data according to the Chinese water quality classification criteria (based on yearly average). It will also be possible to list parameters which do not meet the local requirements in the Menlou reservoir.

All the 17 and 19 standard water quality parameters analysed are used to determine the final class. The class is not necessarily determined by "the worst parameter ", but there is an assessment of the importance of the parameter. This assessment is made by the YEMC.

The Menlou Reservoir is classified according to the same principles as Jia River. The reservoir must meet class III criteria according to the Local Regulations.

### **2.2.8 Other relevant data**

YEMC has delivered data on the following tasks; discharges from industrial plants, sediment data, domestic waste water, agriculture and deposition data.

### **2.2.9 Water Monitoring equipment**

#### *Instrumentation evaluation and selection process*

It has been NIVA 's responsibility to find the best equipment for the water quality monitoring of the Jia River, and much effort has been put into the evaluation and selection process. The evaluation process was build on NIVA 's extensive experience in instrumentation for water quality assessment and the following guidelines were applied:

*Functional quality:* Selecting instruments that over time produce the most reliable data with minimal operator maintenance.

*Price:* Selecting instruments with a price/quality ratio that satisfies the project.

*Availability and Logistics:* Selecting instruments from manufacturers with an international network and reputation.

Products from the following producers were screened: ABB, GLI, YSI, Fox, Bran & Luebbe, Polymetron, Applicon and ISCO. An in depth evaluation was performed, and the results based on whether the instruments could meet the criteria set.

### *Status*

This evaluation process was completed before the end of February 1997, i.e. before the March 1997 annual meeting between NORAD and SSTC in Beijing. NIVA's recommendations were presented before the said meeting.

As the agreement for the 1997 budgets was signed as late as in September 1997, the ordering process to follow the instrument selection was delayed. However, an instrument list is agreed upon and the ordering process started in late October and some of the instruments were delivered in Yantai in November 1997.

Due to different practice in the two countries regarding purchasing and import of instruments, and the fact that YEMC and the ENSIS group not fully understood each other regarding the Chinese import procedures, tax procedures was not finished in 1997. At present, because the free tax formalities have not been finished, YEMC have paid more than 10,000\$ for delaying apply to custom and storage cost.

## **2.3 Information technology**

An important part of the project is to establish a computer platform and adapt and install the ENSIS system in Yantai. This part of the project is NORGIT's responsibility.

The procedure regarding procurement and import of necessary equipment in the project was unclear in the first phase of the project and these procedures were established one year after the project started. The process started in November 1996 with an agreed project plan signed by NORAD and SSTC. This plan was based on very definite conditions with regard to time schedules and availability of equipment.

### **2.3.1 Data equipment**

NORGIT needs data equipment to modify the ENSIS applications, test the equipment to be sent to China, and for training our Chinese colleagues in Norway.

The hardware list was sent to China for approval in December 1996. Technical discussions between the ENSIS group and YEMC took place. NORGIT also discussed the equipment with various companies. The issues of concern were in particular:

- How to obtain the best maintenance of the computers,
- Discussions of the possible telecommunications solutions available;
- Checking whether the air and emission models from NILU could function on the platform.

NORGIT received offers from Compaq and Hewlett Packard in January 1997 with specific terms of payment in April 1997. NORGIT discussed the offers with our Chinese partner on various faxes.

To fulfil the project plan, NORGIT had to start immediately the work with adaptation of ENSIS to Chinese conditions and handling the data already received from our Chinese partner. Therefore, NORGIT asked Danotec (Norwegian HP-distributor) to lend the equipment to NORGIT without any payment before April 1997. NORGIT sent a contract of the Danotec offer to YEMC for signing.

The contract from Danotec was not signed before the deadline of 30 April. In May 1997, NORGIT had to send the equipment back to Danotec. The extra installation of the ENSIS system in NORGIT will have a minimum cost of 40.000 NOK.

To obtain progress and fulfil the time plan in the project, NORGIT has borrowed the necessary hardware. This makes it possible for NORGIT to accomplish both the "Factory acceptance test" (FAT) and part of the "Site acceptance test" (SAT) in Norway. The installation can easily be compared to the basic ENSIS-system which is an important task in quality assurance of the system. Installation and testing in Norway will also be more efficient since several people with different competence can combine other obligation with the installation and testing of ENSIS. Installation and testing done by different people is also an important task in quality assurance of the system.

In November 1997 YEMC and NILU signed a data equipment list based on an offer from a Chinese manufacturer. The server and one client will be sent to NILU for configuration, testing and training of Chinese personnel in Norway.

### ***2.3.2 Configuration and training in Norway***

Configuration and testing in Norway is the basis for the existing project plan and budget. Installation in China would greatly enhance the project costs considerably and new allocations for this activity would be needed. Also the project plan has to be revised according to the extra time and costs consumption.

Education and training of Chinese users is planned to take place in Norway. If the training can be carried out using Chinese hard-/software, the quality will increase. It will also be more easy for the users to start using "ENSIS" in China when they already are familiar with part of their own system from training in Norway.

### ***2.3.3 Adjustment of "ENSIS version-2.0" to Chinese conditions***

To include the Chinese language, it was necessary to develop a Chinese/English multilingual module. NORGIT has made a technical description of the module, and the development started in April 1997. The module had beta release in July 1997, according to the time plan.

To be able to use Chinese characters/symbols ENSIS had to be adjusted to support UniCode (32.000 characters) instead of ASCII (255 characters per set). Because of this, we also had to switch from ODBC to RDO for communication between the application and the database.

The ENSIS-data model had to be modified to satisfy the Chinese requirements. This has been changed several times according to new information. In addition to

this the analysed data from the Chemical Laboratory had to be entered into the system through a Manual Data Acquisition System (MDACS). This application makes it possible for the user to record data manually. The examples from laboratory data have been used to modify the MDACS according to YEMC's requirements.

The Automatic Data Acquisition System (ADACS) has been ordered by YEMC for collecting on line data from the monitoring stations to the ENSIS-database. The adaptation to the monitors requested has started and will be finalised during the testing of one set of instruments in Norway.

#### **2.3.4 Data handling**

##### *Maps*

NORGIT has adjusted the digital base maps with scale 1:250000 from the various maps we received at the workshop in November 1996. NORGIT has also collected the Digital map of the world from ESRI to fill in missing data. The map was made operational in August 1997. The analogue maps received from YEMC are not for the whole catchment area. The missing geographic data are still missing.

##### *Data*

The location of the stations has been checked. NORGIT has not received the geo-reference of the discharge points and information on the catchment/sub catchments. NORGIT received examples of the statistical data in November 1996. NILU thereafter sent the specification on Input Data Specifications for AirQUIS 2.0. NORGIT has not received any data according to this Specification. We therefore planned to place the MDACS-module in China to fill in the missing data. The system allows modifications of the data directly in the database.

### **3. Revised project plan for 1998 from the Norwegian side**

The project plan is described in detail in the NILU report: 'Environmental Surveillance and Information System for Yantai, P.R. of China. Project Proposal.' dated 14. February 1996. Based on the conclusions described above from the three parallel tasks on air, water and information technology, the installation of measuring instruments is delayed from six months to one year.

The ENSIS group purchased the computer equipment already in February 1997. The development of the ENSIS application for Yantai is therefore approximately only three months delayed if the computers will be bought in the beginning of 1998.

The revised project plan will be as described below. The YEMC and the ENSIS group have planned that the project will only be three months delayed at the end of this year. The third phase is therefore postponed to start from January 1999 instead of October 1998.

### **3.1 Revised work plan summary**

#### ***3.1.1 Phase 1 (November 1996–March 1997)***

The following tasks was carried out during the first phase of the project:

1. Project kick-off seminar to initiate the project in Yantai.
2. Development of a detailed working plan, distribution of tasks, appointment of the participants.
3. Start of emission and discharge data inventory.
4. Collection of other relevant available information on air and water quality.
5. Evaluate existing monitoring network.
6. Collect information on communication network and data handling.
7. Institutional assessment, man power, infrastructures, equipment etc.
8. Evaluation of laboratory equipment.
9. Data model adaptation.

The kick off seminar was held as planned in Yantai at the very start up of the project.

An additional workshop was arranged in Yantai in March 1997 at the end of Phase 1.

The following tasks was discussed during the workshop:

- presentation and discussions of the preliminary emission and discharge inventory;
- presentation and discussion of the improved monitoring system;
- status on ENSIS development by the ENSIS group;
- preparation for the tasks of Phase 2.

#### ***3.1.2 Phase 2 (April 1997–December 1998)***

Phase 2 will represent a continuation of the work started and reported from the Phase 1. In addition, the following tasks will be covered by Phase 2:

1. Functional user requirements and data management routines.
2. Abatement strategy discussions.
3. Selection of air and water monitors.
4. Installation of monitoring stations, data collection network and quality control.
5. Develop dispersion models on air and water.
6. Configuration, testing and installation of first version of the ENSIS system in Yantai.



7. Training by Yantai personnel in Norway and in Yantai.
8. Implementation and use of manual data.

A scientific workshop was held in Yantai 3–7 November. The Yantai personnel presented the air emission inventory and data related to discharges to the Menlou river. The equipment list for computers, air and water monitoring was agreed upon and signed. The minute from the workshop is given in appendix A.

The monitoring stations on air and water will be installed during spring 1998 and on-the-job training will be undertaken by the manufacturers. Data collection will be continuously undertaken.

Workshop containing training on the first version of the ENSIS system is planned to take place in Norway in June 1998. This training depends on the date of arrival in Norway of computers from China. The ENSIS group needs minimum two months for configuration, installation and testing of the system. A revised plan will be prepared dependent on the arrival of computers in Norway.

One more workshop will be arranged during Phase 2:

a) In November 1998 a workshop will be arranged in Yantai to include:

- installation of the first version of the ENSIS system in Yantai
- local training and presentation of the ENSIS system;
- presentation and discussions of the improved emission inventory;
- first model calculations of air and water pollution ;
- discussion on abatement strategies;
- preparation of status reports and phase 3.

In addition to the workshops, the ENSIS group will visit Yantai during October to December for performing project work related to installation, testing, training and abatement discussions.

### ***3.1.3 Phase 3 (January 1999–December 1999)***

This phase contains mainly improvements and finalization of the tasks described in phase 2. A full version of the integrated ENSIS system, containing measurements, quality control, models, statistics and GIS presentations will be installed and adapted to the local environment.. A final training will be performed in Yantai to ensure that the system is fully understood and learned by local personnel.

In addition to work performed by ENSIS personnel in Yantai, a final workshop will be undertaken containing:

- presentation of the ENSIS system;
- discussion on needs for local personnel for further operating and maintenance of the monitoring and data system;
- discussion of further needs for collaboration, if any;
- prepare the content of final report, distribute responsibilities.

The final report should be finalised and sent to NORAD not later than three months after the final workshop.

Table 1: Revised Time schedule.

Phases	1996	1997				1998				1999			
Quarters	4	1	2	3	4	1	2	3	4	1	2	3	4
<b>Phase 1</b>													
Workshop Yantai	■												
Project plan													
Pollution screening													
Emission/discharge inventory													
Network, data handling													
Phase 1 reports			■										
<b>Phase 2</b>													
Workshops Yantai													
Installation monitors													
ENSIS, first version													
Dispersion models													
Training ENSIS, Norway													
Installation of first ENSIS													
Phase 2, reports													
<b>Phase 3</b>													
Installation, full ENSIS													
Testing, adapt ENSIS													
Training Yantai personnel													
Abatement strategy													
Completion workshop													
Final project report													

## 4. Project costs 1997

### 4.1 Project costs for the ENSIS group

The project costs from the Norwegian side are divided into three phases as described in the Project Plan:

Project Phases	Period	Costs
Phase 1	(November 1996 – March 1997)	NOK 1,242,000.-
Phase 2	(April 1997 – September 1998)	NOK 7,586,581.-
Phase 3	(October 1998 – September 1999).	NOK 1,745,000.-

which gives a total cost of **NOK 10,573,581.-** as stated in the Contract. During 1997 it was agreed that the Chinese should purchase data equipment, air and water monitors. The total amount to be transferred directly to China is **NOK 3,875,000.-** of which NOK 2,100,000.-, NOK 1,400,000.- and NOK 375,000.- are allocated for purchasing air, water and data equipment, respectively. The reduced budget for phase two on the Norwegian side is therefore NOK 3,711,581.-.

The costs in 1996 was NOK 229,008.99 lower than the budget The saved costs for phase 1 in 1996 was transferred to 1997 for finalization of phase 1 and the first part of phase 2.

The budget and costs from the Norwegian side for 1997 including savings from 1996 was as described in Table 2.

*Table 2: The ENSIS Group – Project budget and costs for 1997.*

Tasks		Budget	Costs
Revised work plan	NOK	20,000.-	20,000.-
Emission inventory	NOK	40,000.-	40,000.-
User requirements	NOK	100,000.-	80,000.-
Data management routines	NOK	100,000.-	70,000.-
Develop dispersion models	NOK	150,000.-	30,000.-
Abatement strat. disc.	NOK	200,000.-	130,000.-
Manual data implementation	NOK	100,000.-	100,000.-
Monitoring water quality	NOK	1,400,000.- *)	0.-
Monitoring air quality	NOK	2,100,000.- *)	0.-
Server system, hardware	NOK	230,000.- *)	0.-
Server system, software	NOK	255,000.-	255,000.-
Client systems	NOK	145,000.- *)	0.-
Installation water quality instruments	NOK	100,000.-	0.-
Installation technical data system	NOK	50,000.-	70,000.-
Configuration and test	NOK	150,000.-	170,000.-
Training in Yantai	NOK	100,000.-	0.-
ENSIS license	NOK	630,000.-	630,000.-
Subsistence and travels	NOK	330,000.-	235,000.-
Project management	NOK	280,000.-	315,000.-
<b>Total 1997</b>	<b>NOK</b>	<b>6,480,000.-</b>	<b>2,145,000.-</b>

\*) Funds transferred directly from NORAD to SSTC.

The main changes compared to the Project Plan is related to purchasing of data equipment and air and water quality instruments. The Chinese side will purchase this equipment from local distributor, which also will be responsible for installation and maintenance of the equipment.

The total costs for 1998 including the funds directly transferred to China was **NOK 6,020,000.-**. The unused funds of **NOK 460,000.-** for the Norwegian side in 1997 is mainly caused by late delivery of equipment and installation of these. There is also a delay connected to adaptation of ENSIS to the area. There has been extra work in connection to project management due to extended discussions on data equipment and selection of air and water monitors.

The unused funds for 1997 for the Norwegian side will be transferred to 1998.

## 4.2 Project cost of Chinese side for phase 1 and 2

The project costs from the Chinese side are divided into three phases:

- 1996.11-1997.3 RMB 32,234.-
- 1997.4-1998.12 RMB 1,840,500.-
- 1999.1-1999.12 RMB 375,000.-

The costs in phases 1 were RMB 32,234.- as described in Table 3:

*Table 3: YEMC Project Cost for 1996.*

Tasks	Cost
Making and translation of reports	RMB 12,789.-
Communication	RMB 3,000.-
Project management	RMB 3,194.-
Cost for workshop	RMB 13,251.-
<b>Total 1996</b>	<b>RMB 32,234.-</b>

The total budget for phase 2 is RMB 1,840,500.-. The cost in 1997 was RMB 750,000.- which included the extra cost for fine for delaying apply to the Customs and instruments storage. See Table 3. The saving of phase 2 is the budget for 1998.

*Table 4: YEMC Project Budget and Cost for phase 2.*

Tasks	Budget for phase 2	cost in 1997
Investigation of basic data	RMB 56,000.	35,000.
Building of monitoring stations	RMB 806,000.	0.
Attached equipment of monitoring stations	RMB 314,500.	0.
Building and rebuilding of the Centre control room and laboratories	RMB 279,000.	266,000.
Installation and testing of instruments		
Making and translation of reports	RMB 40,000.	40,000.
Advisory from experts	RMB 20,000.	20,000.
Cost for workshops	RMB 10,000.	10,000.
Cost for traffic and transportation	RMB 10,000.	26,000.
Communication	RMB 37,000.	35,000.
Jeep for outdoor work	RMB 8,000.	8,000.
Cost for delaying apply to the Customs and instruments storage	RMB 240,000.	240,000.
	RMB 0.	90,000.
<b>Total</b>	<b>RMB 1,840,500.</b>	<b>750,000.</b>

## 5. Project budget for 1998

### 5.1 Budget for the ENSIS group

The project costs in 1997 for the ENSIS group was **NOK 460,000.-** lower than the budget. The saved costs for phase 2 in 1997 is transferred to 1998 for finalization of phase 2.

The total cost for the Norwegian side was in the project plan **NOK 10,573,581.-**. During 1997 it was agreed that the Chinese should purchase data equipment, air and water monitors. The total amount to be transferred directly to China in phase two of the project is **NOK 3,875,000.-**. The reduced budget for phase two on the Norwegian side is therefore **NOK 3,711,581.-** of which **NOK 1,516,043.-** was used in 1997.

According to the revised project plan, the project is delayed with about three months. This means that phase 3 of the project is planned to start in January 1999.

The budget from the Norwegian side for 1998 including savings from 1997 is described in Table 5.

*Table 5: The ENSIS Group – Project budget for 1998.*

Tasks	Budget
User requirements	NOK 40000
Data management routines	NOK 60000
Develop dispersion models	NOK 170000
Abatement strat. disc.	NOK 150000
Server system, software	NOK 400000
Installation water quality instruments	NOK 100000
Installation technical data system	NOK 75500
Configuration and test	NOK 150000
Training in Yantai	NOK 100000
Training in Norway, Norwegian side	NOK 100000
Training in Norway, Chinese side	NOK 300000
Subsistence and travels	NOK 280000
Project management	NOK 270000
<b>Total budget 1998</b>	<b>NOK 2195500</b>

The budget for 1998 is **NOK 2,195,500.-** including NOK 300,000.- allocated for subsistence of the Chinese personnel during training in Norway.

### 5.2 Project budget of YEMC

ENSIS Yantai -project mainly includes there sub projects: environmental air automatic monitoring and information system, environmental water quality automatic monitoring and information system, environmental monitoring network

and information treatment system. 1998 is a key year of the phase 2 of the project. The major work in 1998 includes: capital construction of monitoring stations; acceptance, installation and testing of instruments; improving databases; installation and testing of the first ENSIS version, etc.

The major work in 1998 of environmental air automatic monitoring and information system includes:

1. Consummate the investigation of air pollutant sources and the collection of relevant data of environmental monitoring. Complete the input into databases and data transfer. Finish the air technology report for 1997.
2. Complete the capital construction of air monitoring stations, meteorology station and control centre. Install power ,communication system and other assistant equipment.
3. Complete the acceptance, installation and first testing of air instruments.
4. The installation, testing and improving of the first version of ENSIS.
5. Training of Yantai personnel in Yantai and in Norway.
6. Two workshops in Yantai.

The major work of environmental water quality and information system in 1998 includes:

1. Complete the investigation of industrial discharge pollutant sources in Fushan and Development Zone. Draw maps and input data into databases. Finish the technology report on water quality work in 1997.
2. Complete the capital construction and indoors decoration of water auto monitoring stations. Install power and communication system and purchase other assistant equipment.
3. Complete the acceptance, installation and first testing of water instruments.
4. Complete the installation, testing and improving of ENSIS system.
5. Training of Yantai personnel in Yantai and in Norway.
6. Two workshops in Yantai.

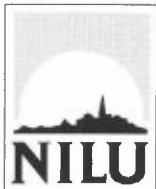
The major work of environmental monitoring network and information treatment system in 1998 includes:

1. Co-operate with the sub projects of air and water to improve databases and transfer data. Investigate information of communication network.
2. Complete the indoors decoration of control centre, such as fire-fighting facilities, air condition, UPS, communication facilities, etc.
3. Co-operate with experts from Norway to complete the installation, testing and improving of ENSIS system.

The cost from Norwegian side for 1998 is NOK 2,195,000.- including the unused funds NOK 460,000.- in 1997. According to the project plan, Chinese side will purchase the air ,water and data equipment. The funds is directly transferred to SSTC is NOK 3,875,000.- of which NOK 2,100,000.-, NOK 1,400,000.- and NOK 375,000.- are allocated for air, water and data equipment, respectively. The total assistant funds from YEMC for ENSIS project is RMB 2,197,500.-. The budget of YEMC for 1998 is RMB 1,090,500.- which is described as following :

*Table 6: Project Budget of YEMC for 1998.*

order	content	unit	quantity	budget (RMB)
I	Complete the data collection and improving 1. Rich and improve the air and water data 2. Complete the input into databases; write, translate and copy the air and water technology reports.			64,500.- 40,000.-
II	Capital construction and assistant equipment 1. Decorate the monitoring stations and houses 2. Purchase and install communication system 3. Purchase and install power system 4. Purchase and install temperature-keeping system 5. Purchase and install fire-fighting system 6. Build air monitoring stations and meteorology station, lay pipes for water monitoring stations.	site	8 9 9 9 9 6	150,000.- 62,000.- 55,000.- 13,000.- 116,000.- 125,000.-
III	Install and test the instruments 1. Install and test the instruments of air and water monitoring stations. 2. Install and test the ENSIS system.			85,000.- 50,000.-
IV	Others 1. Advisory from experts 2. Training of ENSIS application in Yantai 3. Cost for two workshops in Yantai 4. Cost unforeseeable			70,000.- 30,000.- 60,000.- 170,000.-
	Total 1998			1,090,500.-



# Norwegian Institute for Air Research (NILU)

P.O. Box 100, N-2007 Kjeller – Norway

REPORT SERIES SCIENTIFIC REPORT	REPORT NO. OR 18/98	ISBN 82-425-0969-7 ISSN 0807-7207	
DATE 8 May 1998	SIGN. <i>Arstein Hov</i>	NO. OF PAGES 22	PRICE NOK 45.-
TITLE ENSIS Yantai Annual Report 1997		PROJECT LEADER T. Bøhler	
		NILU PROJECT NO. O-96100	
AUTHOR(S) Bøhler, Trond – NILU Gao, Zhanjun – YEMC		CLASSIFICATION * A	
		CONTRACT REF. CHN-014	
REPORT PREPARED FOR: Yantai Municipal Science and Technology Commission, China Yantai Environmental Monitoring Centre, China			
<p>ABSTRACT</p> <p>Norwegian Institute for Air Research (NILU) carries out on behalf of the ENSIS group (NILU, NIVA, Norgit) a project for Yantai Municipal Science and Technology Commission, China, regarding installation of an Environmental Surveillance and Information System (ENSIS). This system consists of modules for air and water monitoring and management. The Norwegian side is funded by NORAD. The project started in November 1996 and will last for three years. This annual report for 1997 describes the project work and the costs for 1997 and a revised plan for 1998.</p>			
<p>NORWEGIAN TITLE</p> <p style="text-align: center;">ENSIS Yantai – Årsrapport 1997</p>			
KEYWORDS Monitoring	Management		
<p>ABSTRACT (in Norwegian)</p> <p>NILU utfører, sammen med ENSIS-gruppen (NILU, NIVA, Norgit), et prosjekt for Yantai Municipal Science and Technology Commission, China, vedr. installasjon av ENSIS-systemet i Yantai, Kina. ENSIS-systemet er et planverktøy for luft- og vannkvalitet som omfatter målinger og spredningsmodeller. Prosjektet startet i november 1996 og har en varighet på tre år. NORAD finansierer den norske siden av prosjektet. Denne rapporten er årsrapport for 1997 med revidert prosjektplan for 1998.</p>			

\* Classification

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