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ENSIS YANTAI

Workshop Report
25–29 November 1996

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Summary

On November 27, 1996, an agreement was signed in Beijing between the Norwegian Agency for Development Cooperation (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.

This report is a summary from the discussions and the work carried out during the workshop. The institutions participating in the workshop were Yantai Municipal Science and Technology Commission (YMSTC), Yantai Environmental Monitoring Center (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 Center.

Air and water quality measurements

On water quality, the Chinese part accepted the planned instrumentation as described in the project plan. Three on-line stations shall be delivered, one fully equipped and two reduced equipped. The first installation will be reduced equipped on all three stations.

On air quality, the Chinese part wanted to add one on-line station. It was agreed to reduce to two sequential stations in addition to the three on-line stations.

A detailed description of the monitoring programme is given in the project plan.

NILU and NIVA shall send specifications of the necessary installations at the monitoring stations before February 1997. The Chinese part shall prepare the monitoring sites according to the specifications given by NILU and NIVA by the end of June 1997. The installation of measuring instruments will take place in October/November 1997.

The instruments shall be ordered by the Chinese side. NILU and NIVA shall send descriptions and prices to the Chinese side as soon as possible and not later than January 1997.

Emissions/discharge inventory

Information on emissions to air and discharges to water have to be collected by local personnel. This information should for air pollution contain data on traffic flow, area distributed consumption of fossil fuels and emissions from industrial point sources. Discharges to water should contain data for both industrial and public sources. NILU and NIVA will in January 1997 send specifications on the parameters needed and in which form the data should be collected and stored. The first version of the inventory should be finished in June 1997.

The ENSIS system

The adaptation of the Environmental Surveillance and Information System (ENSIS) to Yantai city has to start as soon as possible. Norgit will send an offer on computers for approval from the Chinese side in December 1996. After approval, Norgit will order the computers for starting the implementation of the ENSIS system for Yantai.

The first ENSIS installation, containing one of the four PCs will be delivered with the modules for manual input and measurements in September 1997. The complete ENSIS system, containing emission database, statistics, wind field module, dispersion models, exposure module and geographical information system will be developed in 1997 and a training of the Chinese experts will take place in Norway in spring 1998. The final installation in Yantai of the complete ENSIS system is planned to take place in autumn 1998.

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1. Introduction

On November 27, 1996, an agreement was signed in Beijing between the Norwegian Agency for Development Cooperation (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.

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The purpose of the workshop was to sign a contract between YMSTC and NILU, set up the organization plan and discuss revisions of the project plan during the visit. The project participants showed a good co-operative spirit and all meetings and arrangements have been excellent organized.

2. Working group summary

One day of the workshop was reserved for detailed work in three scientific groups; air quality, water quality and information technology. The summary of the discussions is given below.

2.1 Air quality

Present: Mr. Zhao Jing Fuo (YEMC), Mr. Gao Zhan Jun (YEMC), Mr. Zhang Haokui (YEMC), Mr. Wang Wei (YEMC), Mr. Thor Christian Berg (NILU) and Mr. Trond Bøhler (NILU)

Following topics were discussed :

- Air pollution situation in Yantai
- The ENSIS monitoring program in Yantai
- Emission inventory and modelling

2.1.1 Air pollution situation in Yantai

Mr. Gao Zhan Jun described the present air quality situation in Yantai. Before the seminar, YEMC had prepared a detailed description of the air pollution situation in Yantai, which was given to the ENSIS group at the start-up of the seminar. The report: "The introduction to the atmospheric environment" is enclosed in Appendix C. This report describes the development of consumption of coal, pollution sources, the meteorological situation and the air pollution measurements. The measuring program consists of measuring points in the four districts of the city. The measurements where carried out four times yearly over a period of 5 days and four samples per day. The main air pollution problem in Yantai is particles emitted mainly from coal burning for heating and cooking. Annual values of SO_2, NO_x and TSP were typically 0.100 mg/m^3, 0.040 mg/m^3, and 0.250 mg/m^3, respectively.

2.1.2 The ENSIS Monitoring Program

The suggested monitoring program for Yantai as described in the project plan consisted of two on-line stations and 4 sequential stations. Due to new standards in China, this program had to be modified to meet the requests from the Chinese part. It was agreed upon that the monitoring program should consist of three on-line stations measuring NO_x, SO_2 and PM_{10} in addition to two stations with sequential samplers measuring SO_2 and NO_2. These modifications gave an extra cost of about NOK 300.000,-.

Mr. Thor Christian Berg presented the measuring instruments for meteorology and air quality to be delivered to Yantai. The meteorological instruments are Norwegian type, while the on-line sensors are manufactured by Monitor Labs, an American company. The sequential samplers for daily averaged measurements are produced by NILU.

2.1.3 The ENSIS system

The Environmental Surveillance and Information System(ENSIS) developed by the ENSIS group was presented. The system consists of modules for measurements, modelling and presentation of measured and calculated data for both air and water pollution. The different modules were presented for the group with special emphasis on the storage and presentation tool for measurements.

2.1.4 Emission inventory and atmospheric dispersion models

Methods for collecting data on emissions, such as traffic pattern, stack emissions and consumption of fossil fuels were discussed. The quality of the model results strongly depends on how detailed and correct the emission and consumption inventory are. Detailed description of the parameters to be collected and the format for storing the data will be sent to YEMC.

The numerical dispersion model EPISODE was described by Mr. T. Bøhler. This contains source modules for area sources(consumption), line sources(traffic) and point sources (stacks). The model is a part of The ENSIS system and calculate hourly averaged concentrations. The modelling area agreed upon has an extension of approximately 24 km in the east/west direction and 20 km in the north/south

direction with the east side starting from the Menlo river and the in the south edge start approximately 3 km south of the Sheng Li oil field Sanatorium.

The use of the model for calculating personal exposure to air pollution and as a planning tool for evaluation of different measures to reduce air pollution in Yantai was also discussed.

2.1.5 Future work

NILU shall:

- deliver the form for collection of emission data;
- send a table with description and price of the instruments for approval in December;
- start the adaptation of the EPISODE model for the Yantai area;
- install the instruments in October/November 1997.

YEMC shall:

- collect emission data before 1 June;
- prepare the measuring sites as described in the site inspection report before 1 July.

2.2 Water Quality

Present in the Group for Water Quality discussions were:

Chinese side	Norwegian side
Ms. Sun Chengjun	Ms. Bente M. Wathne
Ms. Ma Shangrun	Mr. Finnur Olafsson
Ms. Wang Mingling	Mr. Arne Veidel
Mr. Xu Mingjia	
Ms. Chen Xiaohong	

2.2.1 Water quality measurements

The parameter list for the start-up (reduced) and fully equipped on-line stations presented from NIVA was accepted by the Chinese part. It was noted as an advantage that one monitor could be used for monitoring either COD or TOC. The start-up (reduced) on-line station list has the following parameters:

- pH;
- conductivity;
- turbidity;
- temperature;
- ammonium;
- DO (dissolved oxygen);
- water height when possible/necessary.

The fully equipped on-line station list has the following parameters:

- pH;
- conductivity;
- turbidity:
- temperature;
- orthophosphate;
- nitrate;
- ammonium;
- DO (dissolved oxygen);
- COD/TOC;
- water height when possible/necessary.

Flow measurements are not performed in the river for the moment. To be able to calculate the transport of pollution downstream the river, the need to register the water height after calibration for the flow.

It was underlined by the Norwegian side that the responsibility of the Chinese side is to provide housing for the on-line monitoring equipment, also including necessary pumps for water intake to the instruments, telephone lines, and electricity. The necessary wall space for the instruments are 4 m, as they all will be put up on the wall inside the monitoring house.

The most important water pollution problem as described by the Chinese side, was the extremely high pH values in the drinking water reservoir at Menlou due to algae growth occurring during warm summer periods. As high pH values as approx. 10 have been measured. Also phosphorus pollution from agriculture was a major problem in the drinking water reservoir at Menlou. A description of the water pollution situation is given in the report: "Introduction to the water environment" enclosed in Appendix D.

Information on sales fertilizer and pesticides for the Yantai area is available. Also a monitoring station for agricultural products is situated in Yantai, but they often ask YEMS to do analysis for them.

Permissions for industrial emission and discharge to air and water are given by the Environmental Protection Bureau. The criteria that have to be met is given as concentrations for parameters in 2 classes. No limitation with respect to discharge amount is given for the time being, but the authorities are working to get such restrictions set.

From the Norwegian side information was given on the possibilities for the ENSIS system to do river modelling for abatement strategy planning.

Information was given from the Chinese side that in 1995 a discharge inventory had been performed for 500 industrial plants in Yantai. Information on the industrial discharge investigation, forms used and an executive summary will be made available for the Norwegian group.

It was agreed that the Chinese side should provide:

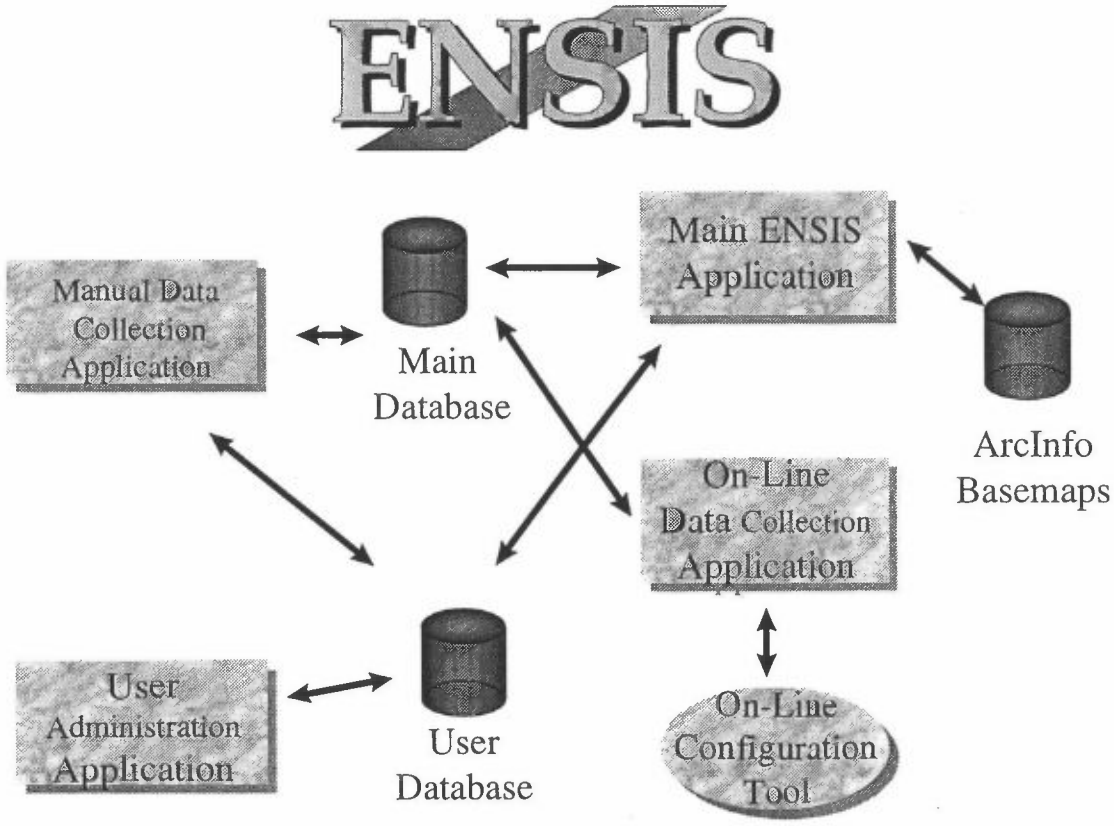
- A list of analytical parameters, methods and instruments used by the YEMS;
- Information on the industrial discharge investigation for 1995, forms used and an executive summary of the investigation if possible;
- Maps (1:50.000) of Yantai giving the position of the measuring points as they have been in the existing monitoring programme, the planned measuring points for the on-line measurements and the discharge points for most important pollution sources;
- The map and water quality results from the last 5 years as given in the 5-year report to the Shandong province;
- The national criteria for the 1. and 2. Class parameters for discharge to water;
- The province criteria for the 1. and 2. Class parameters for discharge to water.

2.3 Information Technology (IT)

Participants: Mr. T. Skancke, NORGIT, Mr. R. Rostad, NORGIT, Mr. Fu Chun, YEMC, Mr. Wang Xiaojun, YEMC.

2.3.1 Description of the ENSIS system

The ENSIS system was described. The Chinese representatives understood the concept and the functionality of the Information Technology required in the system. The purpose of the system and its specific functions were briefly explained. The system overview is described in the figure below.



The ENSIS Software consists of several separate applications;

The User administrator database controls user names, privileges and preferences.

The Manual samples application is an application for entering the information about the manually analyzed samples.

The Automatic sampling application communicates with the Data loggers to retrieve data from the on-line measuring stations. The needs for automatic detection of error conditions and subsequent alarms were noted by the Chinese, and acknowledged by the Norwegian parties.

The main ENSIS application is a tool for administration of existing data, viewing statistics on the measured values, operating models and presentation of results and measurements.

2.3.2 The Information needed

The further discussion clarified the types and quality of data available, and the same data are required to make the project successful. The following items are grouped together by logical relations, and do not necessarily correspond with the order of the actual discussion.

Statistical data

All Statistics must in some way be distributed geographically. The following was agreed upon as a sound foundation for the data sets;

Population for the city of Yantai distributed on the five districts.(We also need population in the whole catchment areas for Jia and Menlou rivers);

Traffic distributed on roads, and with road classification on the geographical road-segments.

Consumption of different energy sources distributed on individual factories and the five districts. District consumption and consumption for the larger area are possibly available, but this must be further investigated.

Geographical data

Digital maps

The Meteorological institute of Beijing has produced a digital map on a scale of 1:250 000. This map is available on DWG format, and will be supplied to the Norwegian party within the week. Other digital maps may become available, but further investigations are necessary. The Norwegian party was impressed by the readily availability of digital maps. The map will have to be translated to English at a later time.

Paper Maps

The Chinese parties have a wide variety of paper maps, and the Norwegian party requested the following:

1:10000 now and 1:50000 with Discharge points, Measurement points, Catchment areas and Districts plotted in as soon as possible, at the latest by January 1997. This information will be digitized by the Norwegian party.

The use of land is categorized as Industrial, inhabited, Agricultural and natural. A map of the distribution of these area categories will be supplied.

Several other maps will be needed for the projects. These include; Roads with traffic flow and Road types, Agricultural and Industrial areas along the river, Topography in more detail than the map from the meteorological institute. The maps will be send to Norway as fast as they are found. These maps will be supplied at the latest in June 1997.

Measurements data

The existing measurement data resides either on Foxbase, FoxPro or Paper. The Norwegian party requested that all information about the data structure would be supplied within the end of the year. The actual data must be supplied to the Norwegian side within the end of May 1997.

The paper based information must be typed by the Chinese party. The typing can be performed with a tool such as Excel, or directly into the ENSIS system when this is delivered. If Excel is used, The Norwegian party must supply information about the data format. When a description of the available data is supplied, the Norwegian party will do this on request.

2.3.3 The Computer solution

Hardware, and systems requirements were discussed. The Norwegian party will supply a complete list of the hardware in the project for approval by the Chinese party within December 24th.

The Communication with the data loggers is based on 2.400 bps, and can use either ordinary telephone lines or cellular phone. The LAN for the ENSIS system will be supplied by the Norwegian party after testing in Norway, and yield at least 10 Mbps. A local Ethernet with 10 Mgb capacity will be included.

The system requires a plotter for the drawing of maps. This plotter should be of A0 size, and not a pen plotter. The brands, prices and availability will be checked by the Chinese party. A HP 1600 Deskjet should also be checked by the Chinese party. The DAT streamer will also be checked, and should be of a 4 mm DDS2 type.

2.3.4 The Work Plan for the Information Sub task

The digital map of 1:250000, and the paper map of 1:10000 will be supplied by the Chinese party within the week.

The description of the computer system will be supplied by the Norwegian party before December 24th.

The description of the Chinese data structure will translated to English and supplied by the Chinese party by January 1 1997.

The Maps on the different themes described will be delivered in June 1997 at the latest.

All the information on measurements should be delivered in May 1997.

All the prices on the hardware that the Chinese part should investigate, should be delivered from the Chinese part at 20 December 1996.

The information will be put into a database on one PC that will be installed in October/November 1997. After a test period of minimum three month the Chinese technical personnel will then come to Norway and installation of the whole ENSIS will be done as short as possible after this visit. This will be approximately April/May 1998. A fully functionally system will be made available at the same time. The installation of the complete ENSIS system in Yantai is planned to take place in autumn 1998.

2.3.5 The man resources needed from YEMC

Technical personnel will have to fill different functions:

ENSIS Super user
ENSIS Systems Engineer
Data Responsible
Mapping Responsible
Manual data Responsible
On line data Responsible
Systems Engineer
We will recommend that this should involve 4-8 man years.

2.3.6 Information received at departure

At departure from Yan Tai, most of the requested information was received by the Norwegian party. The main issues were;

Digital map on DXF format. This map is sufficient, but the separation of information on layers is very poor, and requires some work before it is suitable for ENSIS use. In addition, it is on a different scale from the one described from the Chinese side, and the data is not digitized on the correct scale. There is some work to be done in rectifying the map data.

3. Summary from the site inspections 27.11.96

3.1 Air quality

Participants:

Norwegian side	Chinese side
Trond Bøhler, NILU	Zhao Jing Fuo, YEMC
Thor Christian Berg, NILU	Zhang Peng Lang, YEMC
Torstein Skancke, NORGIT	Wang Wei, YEMC
Rikard Rostad, NORGIT	Zhang Haokui, YEMC

A short summary of the measuring sites is given below. More details of the measuring stations is given in appendix F.

Following 5 sites were visited:

- Laishan Chemical Factory, a residential area with small industry. Sequential samplers for SO_2 and NO_2 will be installed as a new station in the factory building. Contact for 220 volt AC supply(300 watt) must be provided and the temperature in the room must be kept above +5 degrees centigrade.
- Shengli Oil Field Sanatorium, a relatively clean area with an existing measuring station for SO_2, NO_x,TSP and dust fall. At this station on-line monitoring instruments for SO_2, NO/NO_x and PM_{10} will be installed. Air Condition unit must be installed and the 220 volt AC supply must be increased to at least 16 amperes. The NILU monitors need the whole bench and an extra shelf have to be installed. NILU will send a description of place and size for this shelf. A standard public telephone line for data transfer must be provided. The technical description above is required for the three on-line stations.
- Yantai Synthetic Leather Factory, an industrial area with relatively low buildings. An existing measuring station like the one at the Sanatorium is going to be moved to a new place. Like the station at the Sanatorium, on-line monitors for SO_2, NO/NO_x and PM_{10} will be installed. In addition, a possible site near the station for a meteorological tower with instrumentation was discussed. AirCondition unit must be installed and the 220 volt AC supply must be increased to at least 16 amperes in the station. A standard public telephone line must be provided.
- Fushan Environmental protection Bureau, a residential area. Sequential samplers for SO_2 and NO_2 will be installed as a new station in the Bureau building. The temperature in the room where the samplers are installed must be kept above +5 degrees centigrade.
- Yantai Bearing Factory, an industrial area with an existing measuring station for measurement of SO_2, NO_x, TSP and dustfall. At this station on-line monitoring instruments for SO_2, NO/NO_x and PM_{10} will be installed. Air Condition unit must be installed and the 220 volt AC supply must be increased to at least 16 amperes. A standard public telephone line must be provided.

At all 5 stations a dustfall collector is planned to be installed.

3.2 Water quality

3.2.1 Necessary equipment for all the on-line measuring stations

The instruments at each station shall be placed in a housing with specific needs. A pump is necessary for taking river water into the instruments. To prevent sampling water from freezing during winter, the feeding pipeline has to be dug into the ground. The water outlet must be placed downstream the water intake or directly into the sewage system. Heating is needed inside the sampling room during winter time. The room temperature has to be kept between 5 and 40°C. Tap water is necessary for cleaning the instruments. Electricity of 220 V AC must be available for the monitoring instruments and the water pump. To transfer the data, a good telephone line is needed.

3.2.2 Specific comments for the monitoring site at Taokou

Across the river is a rubber dam (rubber piping filled with water). The dam is used for keeping up the water height in the river during periods of low flow. Drinking water is taken from a groundwater well nearby, and the rubber dam is necessary to help the groundwater level during dry periods.

The best position for the pump is 3 m upstream from the river dam. Suitable housing was located approx. 25 m form the river. In the second floor a 6 m^2 room was available for the instruments. The window towards south will have to be closed in such a way that the instruments can be placed on the wall. This location will be equipped as a reduced station.

3.2.3 Specific comments for the monitoring site at Menlou Reservoir

The dam and the outlet for the drinking water to Fushan Drinking Water Plant were inspected. Housing for the instruments were available near the drinking water intake, where the water pipes for the plant started. The room for the instruments need cleaning, and a leakage through the roof must be mended. Also heating is necessary, and insulation for the windows. Tap water was available from a ground floor room. This location will be full equipped station.

3.2.4 Evaluation of a possible monitoring site at Fushan Drinking Water Plant

A visit was also made to the Fushan Drinking Water Plant. The possible measuring point here is situated in the outer Jia River just before the two Jia River branches meet. This point was only representative for the outer Jia River branch, and it was regarded as desirable to have a measuring point representative for both river branches.

3.2.5 Specific comments for the monitoring site at New Jia River Bridge

The monitoring position by the New Jia River Bridge is the very best for measuring the water quality before the river water outlet to the sea. By measuring at this spot we will get the information needed for calculating the total burden of the polluting parameters to the sea. Two possible measuring points were evaluated. The first point was at the river banks using a pumping house as shelter for the instruments. At this spot there seemed to be difficult to provide heating and telephone lines. This point was although situated very close to the river and was

an excellent from that point of view. This location will be equipped as a reduced station.

The second measuring point was situated at distance of 500 m from the river, but had better possibilities for housing with heating possibilities, electricity and telephone. Both Chinese and Norwegian colleagues agreed that an evaluation of the possibilities for the long pipelines and their effects on the measuring equipment should be done, but the first conclusion was the second measuring points could be used.

4. Contract discussions

The ENSIS group had prepared a draft contact which had been sent to the Chinese part before the workshop. The Agreement between NORAD and State Science and Technology Commission (SSTC) was not signed before the start-up of the workshop, due to minor points to be clarified. The discussion was focused on the use of the NORAD grant. A contact with NORAD and the Norwegian Embassy in Beijing stated that the grant should be used for funding the Norwegian side of the project. The cost of the Chinese participants in the project in China will be funded by the Chinese side, while Chinese expenditures in Norway will be covered by the NORAD grant.

The Chinese side wanted to include in the report the following paragraphs :

a) The technique and equipment that are provided by the ENSIS group should have advanced level in the world, so that the Yantai ENSIS project will be a model for China.

b) In order to reflect the real air quality of the Yantai city (5 districts). 7 air monitoring stations is needed. The sampler station should be replaced by on-line stations step by step in the later time.

c) Because of the air pollutants in Yantai are very serious, PAH(s), Pb and O_3 will be considered in the ENSIS project, if it is possible.

d) The noise model should be designed in ENSIS, so Yantai can get a full ENSIS.

e) Some equipment that is included in the Norwegian budget or purchased in China, it may be cheaper in China. If it is sure, the Chinese side want to get the soare money to buy other equipment for the ENSIS project. Of course, we will open an account, which will be audited by the Norwegian side.

f) In the summary from the water quality group, the Norwegian side mentioned that the Chinese side should provide pumps for water intake to the instruments. Pumps are a part of all instruments, so the Norwegian side should provide the pumps.

After clarification of different subjects and receiving the information that SSTC and NORAD had signed the Agreement, the two parts accepted the Contract.

5. Revised project plan

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 from the three parallel workshops on air, water and information technology, only minor changes of the planned activity were needed. The revised project plan will be as described below. A detailed description of the work in 1997 prepared by the Chinese partners is given in Appendix C: "The working plan of the Yantai ENSIS project in 1997".

5.1 Revised work plan summary

5.1.1 Phase 1 (November 1996 – March 1997)

The following tasks will be undertaken 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 will be arranged in Yantai at the end of Phase 1.

The workshop will include:

- 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 of status report for each sub-task;
- preparation for the tasks of Phase 2.

5.1.2 Phase 2 (April 1997 – September 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.
2. Data management routines.
3. Functional design.
4. Abatement strategy discussions.
5. Installation of monitoring stations, data collection network and quality control.
6. Develop dispersion models on air and water.
7. Configuration, testing and installation of first version of the ENSIS system in Yantai.
8. Training by Yantai personnel in Norway and in Yantai.
9. Implementation and use of manual data.

In the beginning of second phase, the new stations on air and water will be installed and on-the-job training will be undertaken. Selected Yantai experts will receive training in operation and maintenance of the instruments by ENSIS personnel. Data collection will be continuously undertaken.

Three workshops will be arranged during Phase 2:

a) Scientific workshop.
After installation of the Unix server and the air and water monitors a scientific follow-up meeting will be held in Yantai. During this workshop, the following terms will be discussed:

- design of management routines for manual and on line data handling;
- data communication and quality control of measurements;
- evaluation and presentation of the measurements
- adaptation of air and river models.

A first version of the ENSIS system, containing storage and presentation of measurements will be installed in connection with this workshop.

b) Midway through the second phase work a training workshop will be arranged in Norway to include:

- 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 report of each sub-task.

c) At the end of the second phase a workshop will be arranged in Yantai. This meeting will include a consideration of the work undertaken so far, and will consider a possible extension of the project if necessary. The following items will also be included:

- presentation and discussion of second phase results;
- preparation of status report;
- preparation of tasks in Phase 3.

5.1.3 Phase 3 (October 1998 – September 1999)

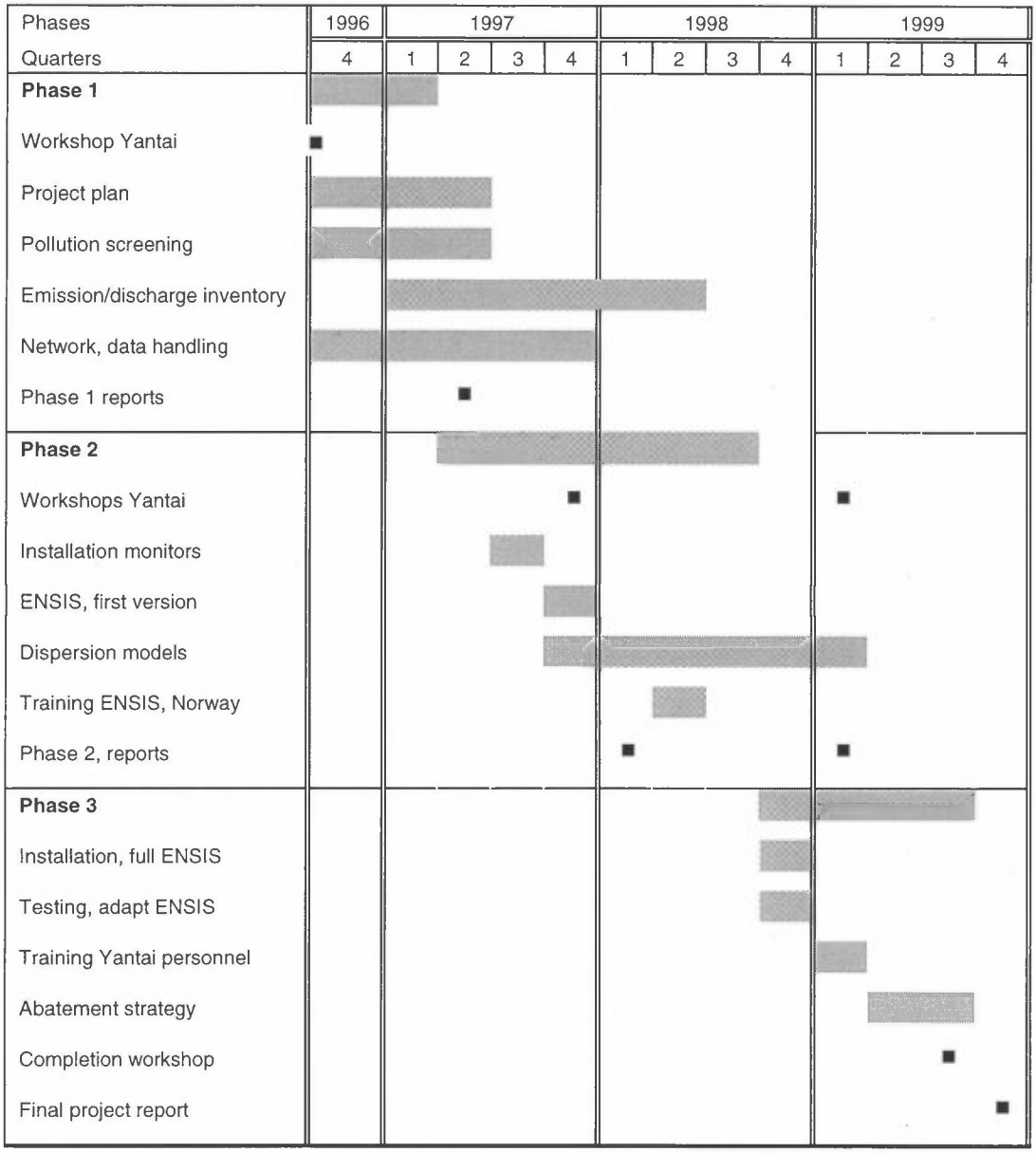
This phase contains mainly improvements and finalization of the tasks described in phase 2. A full version of the integrated ENSIS system, containing measurements, quality control, models, statistics and GIS presentations will be installed and adapted to the local environment. The manual noise data collected by the Chinese part will be entered into the measurement database. 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 finalized and sent to NORAD not later than three months after the final workshop.

Revised Time schedule.



5.2 Measurements

On water quality, the Chinese part accepted the planned instrumentation. Three on-line stations shall be delivered, one fully equipped and two reduced equipped. The first installation will be reduced equipped on all three stations.

On air quality, the Chinese part wanted to add one on-line station. It was agreed to reduce to two sequential stations in addition to the three on-line stations. The extra costs for the on-line is approx. NOK 300.000,- which must be covered from other parts of the budget.

NILU and NIVA shall send specifications of the necessary installations at the monitoring stations before February 1997. The Chinese part shall prepare the monitoring sites according to the specifications given by NILU and NIVA by the

end of June 1997. The installation of measuring instruments will take place in October/November 1997.

The instruments shall be ordered by the Chinese side. NILU and NIVA shall send descriptions and prices to the Chinese side as soon as possible and not later than January 1997.

5.3 Emissions/discharge inventory

Information on emissions to air and discharges to water have to be collected by local personnel. This information should for air pollution contain data on traffic flow, area distributed consumption of fossil fuels and emissions from industrial point sources. Discharges to water should contain data for both industrial and public sources. NILU and NIVA will in January 1997 send specifications on the parameters needed and in which form the data should be collected and stored. The first version of the inventory should be finished in June 1997.

5.4 The ENSIS system

The adaptation of the Environmental Surveillance and Information System (ENSIS) to Yantai city has to start as soon as possible. Norgit will send an offer on computers for approval from the Chinese side in December 1996. After approval, Norgit will order the computers for starting the implementation of the ENSIS system for Yantai.

The first ENSIS installation, containing one of the four PCs will be delivered with the modules for manual input and measurements in September 1997. The complete ENSIS system, containing emission database, statistics, wind field module, dispersion models, exposure module and geographical information system will be developed in 1997 and a training of the Chinese experts will take place in Norway in spring 1998. The final installation in Yantai of the complete ENSIS system is planned to take place in autumn 1998.

Appendix A

Participants in the workshop in Yantai 25-29 November 1996

LIST OF PERSONEL FOR ENSIS WORKSHOP IN YANTAI

1996.11.25 - 1996.11.29

NAME	INSTITUTION	POSITION
Jiang Shufu	YEPB	Director
Che Pingchuan	YEPB	Vice-Director
Zhao Jingguo	YEMC	Director
Gao Zhanjun	YEMC	Vice-Director
Zhang Penglang	YEMC	Section Chief
Xu Mingjia	YEMC	Section Chief
He Xianling	YEMC	Section Chief
Jiang Ziqing	YEMC	Translator
Chen Xiaohong	YEMC	Translator
Wang Wei	YEMC	
Fu Chun	YEMC	
Sun Chengjun	YEMC	
Zhang Haokui	YEMC	
Wang Xiaojun	YEMC	
Ma Shang Run	YEMC	
Wang Minling	YEMC	
Liu Yiqing	YMSTC	Director
Ding Chengyu	YMSTC	Vice-Director
Yan Ming	YMSTC	Section Chief
Trond Bøhler	NILU	Section Chief
Thor C. Berg	NILU	Section Chief
Bente M. Wathne	NIVA	Section Chief
Finnur Olafsson	NIVA	Scientist
Arne Veidel	NIVA	Engineer
Torstein Skanche	NORGIT	Director
Richard Rostad	NORGIT	Programmer

Appendix B

Project organization

Quality Assurance Group

YMSTC: Dir. Liu Yiqing
YEMC: Mr. Yanming
YEMC: Dir. Zhao Jingguo
NILU: Dep.dir. P. Berg
NIVA: Dir. H. Thaulow
NORGIT: Dir. F. Kverneng

Project Leaders

ENSIS: Trond Bøhler
YEMC: Gao Zhanjun
YEMC: Zhang Penglang

Air Quality	Water Quality	Information Tecnology
Task Leaders YEMC Wang Wei ENSIS T. Bøhler	**Task Leaders** YEMC Sun Chengjun ENSIS B. Wathne	**Task Leaders** YEMC Fu Chun ENSIS T. Skancke,
Subtasks **Measurements** T. C. Berg Zhang Haokui N. Ladegard V. Dahl **Emission inventory:** D. Tønnesen A. Riise Wang Wei Zhang Haokui **Modelling:** D. Tønnesen A. Riise Wang Wei **Abatement** T. Bøhler D. Tønnesen A. Riise Wang Wei Zhang Haokui	**Subtasks** **Measurements** A.Veidel M. Wildberg Ma Shangrun Wang Mingling **Emission inventory** S. Borgvang J.F. Olafsson Sun Chengjun Wang Mingling **Modelling** J.F. Olafsson N.R. Sælthun T. Tjomsland Sun Chengjun Ma Shangrun **Abatement** B. Wathne S. Borgvang Sun Chengjun Ma Shangrun	**Subtasks** **Telecommunication:** R. Rostad Wang Xiaojun **Database management:** M. Ørseng Fu Chun **User application:** R .Rostad Wang Xiaojun G. Bakke Nilsen Fu Chun

Appendix C

The introduction to the atmospheric environment

The Materials for the Yantai ENSIS Project

The Introduction to the Atmospheric Environment

Yantai Environmental Monitoring Center

1996.11.25

I The General Introduction to Yantai City

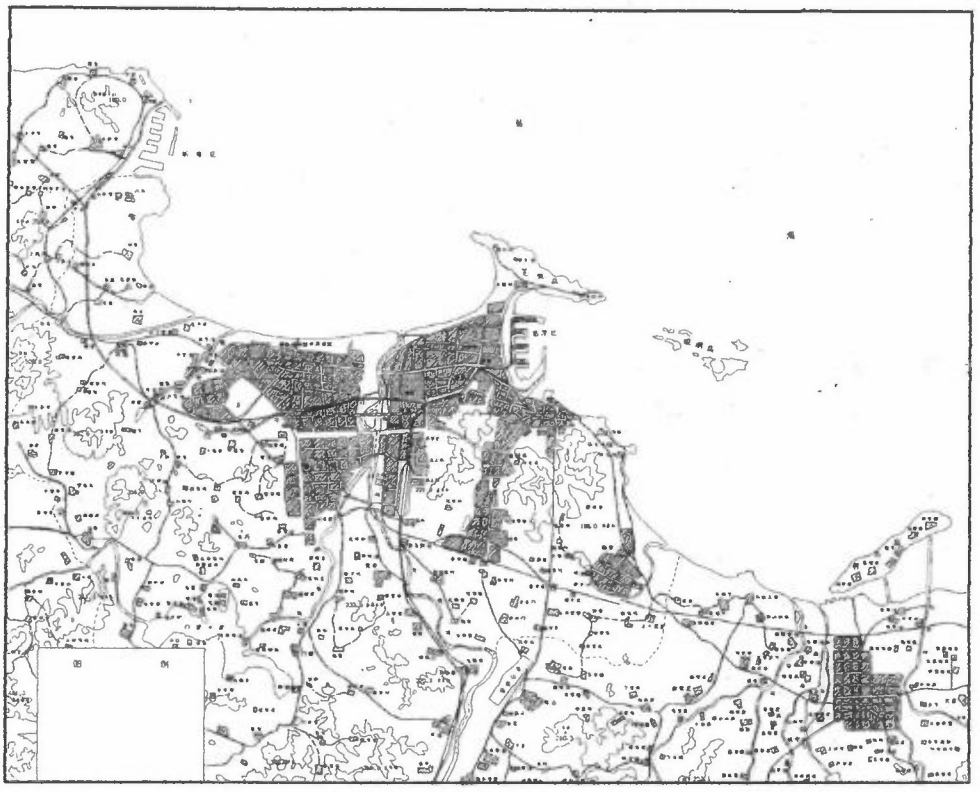


Fig 1.1-1

The region has four administration districts and an economy and technology Development zone under its jurisdiction. These are: Zhifu, Laishan, Fushan, Muping district and Yantai Economy and Technology Development Zone. The region is the center of political economy and culture of Yantai at present and in long-term planning.

1.1 The Characteristics of Meteorology and climate

Tne region is in the middle latitute area and belongs to East Asia temperate continental climate .The continental degree is 53.8 per cent.

In winter.under the high pressure control of Mongolia, N breeze is very strong .The average number of gale days is 9.5.Usually the season precipitation is about 30.0 millimetre.The average air temperature is

-1.3 ℃.

In spring.there are more S.N direction gale and less rainfall. The average precipitation of the season is 92.3 millimetre. The gale days on the average is 13.2 days.

In summer,it's humid,hot and rainful. The season precipitation is about 330 ~ 490 millimetre,covering 60% of the total yearly amount.

The average air temperature of the season is about 23.0 ℃.

In autumn,the air temperature falls down quickly and the rainfall decreases also.

The season precipitation is 119.0 ~ 159.4 millimetre.

The north direction gale days of the season is more than 70 per cent.

The characteristics of the sea and land breeze are: sea breeze(wind) toward north direction and land breeze toward south direction . sea breeze usually occures during the daytime under a certain weather situation.The speed is 2 ~ 3 metres/sec.Land breeze occurs during the night.with a speed of 1 ~ 3 metres/sec. In winter sea breeze usually arises at 10:00 ~ 12:00 and in summer 7:00 ~ 19:00.

1.2 The social and economic situation

1.2.1 Administrative area and population.

There are 190.5 thousand famillies with a population of about 683 thousand in five districts.

1.2.2 National economy situation

In 1995,the gross national product(GNP) is 57.6 billion. Yan RMB. The total industry product is 122.16 billion Yuan. The national product increases at an average rate of 22.1 percent per year.

Tab 1.1 Statistics of Yantai national economy indicators.

Overall indicator	1980	1985	1990	1995	Average yearly increasing rate
Total national product.	**30.95**	**46.78**	**131.36**	***576.00**	**22.1**
National in come.	**27.31**	**41.16**	**118.85**	**414.42**	**22.2**
Total products of industry and agriculture.	**51.84**	**86.91**	**209.23**	**1405.18**	**31.2**
Total industry product.	**32.10**	**63.67**	**180.94**	**1221.58**	**39.6**
Total Agriculture product.	**19.74**	**23.24**	**28.30**	**183.60**	**22.8**

1.2.3 The structure and Location of the Regional Industry

There are 35 industrial sectors in the district. The heavy industry is mainly located in western part,the Light industry in the south , the machinery processing on the Northern Island,and culture and tourism in the east.While diveloping the old district of the city, the Fushan Industrial District,the Economic Developing Zone. In the

northeast, the agricultural machine and fertile industrial area in Muping District in the east, have also set up these years.The industrial land reaches 9. 2 km^2,accounting for one third of the total construction area of the city .

1.2.4 The energy structure and consumption

According to the statistics in 1995,the coal was used as the major energy source in the area,and the coal gas was provided for only 82000 households and some enterprises.In the countryside,the oil liquor was demanded in a large quantity.In 1995, the total coal consumption reached 192800 T,and the coal for industry was 1578000T, with the proportion of 79.61% of the total (see Fig1-2)

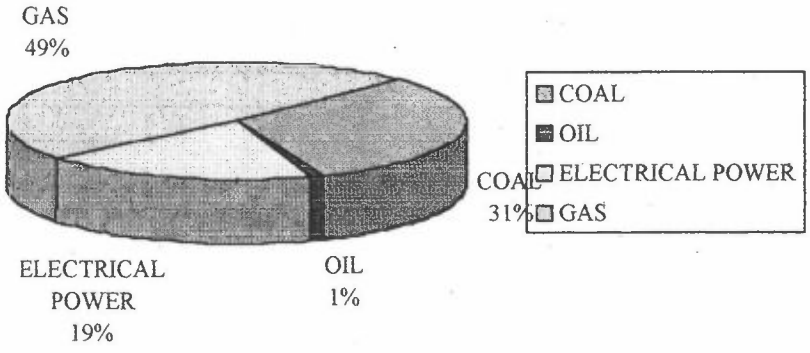


Fig 1-2

The coal consumption for domestic and industrial purpose can be characterized by:

(1) obvious season change. The coal for heating reached 232000 T,accounting for 13.22% of the total consumption .

(2)big consumers in the western industrial district with the coal consumption of 1410000 T as well as 71% of the total

(3)major heating source of citizens and industry. The coal-burning equipment included industrial and domestic boilers and furnaces. According to the statistics in 1995,there are 112 boilers which burn coal over 1000 T in the area.

Fig 1-3 shows the industry value,energy consumption and so_2 emission.

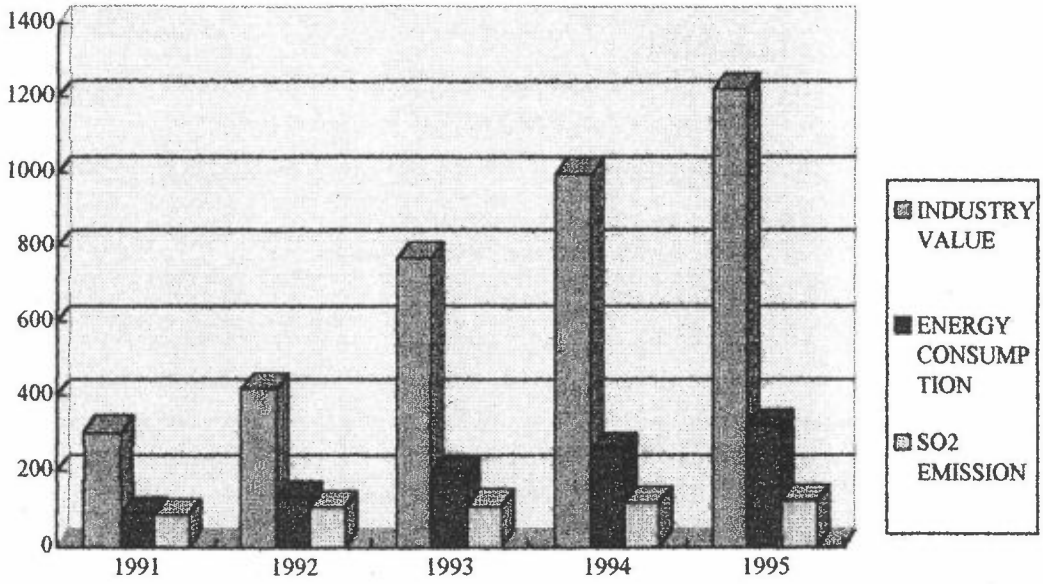


Fig 1-3

The industry value has increased by 22.1%,coal consumption by 22.3% and the so_2 value by 4.99% annually respectively.

II The Pollution Meteorology in the Region

2.1The meteorology in Yantai City

2.1.1 Wind and temperature

A. Temperature

According to the data provided by Yantai Meteorological Station the average annnual temperature is 13.0 ℃,and the highest temperature is 38 .0 ℃.See Fig-2.1

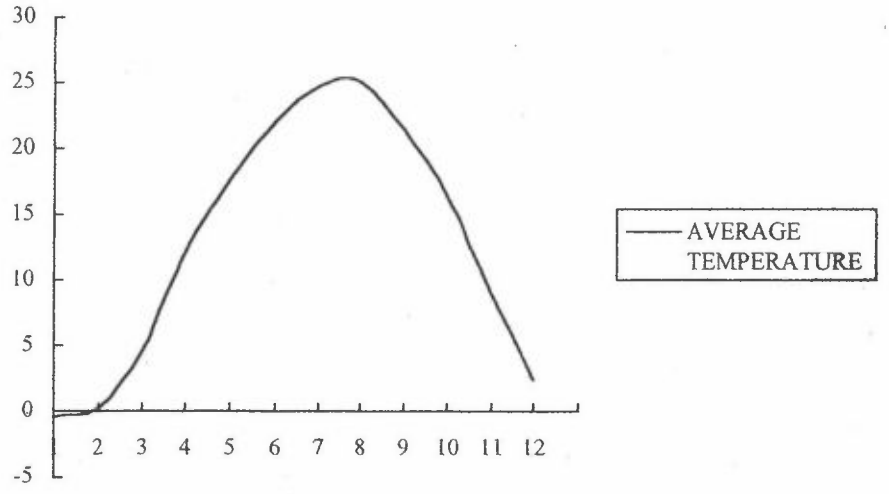
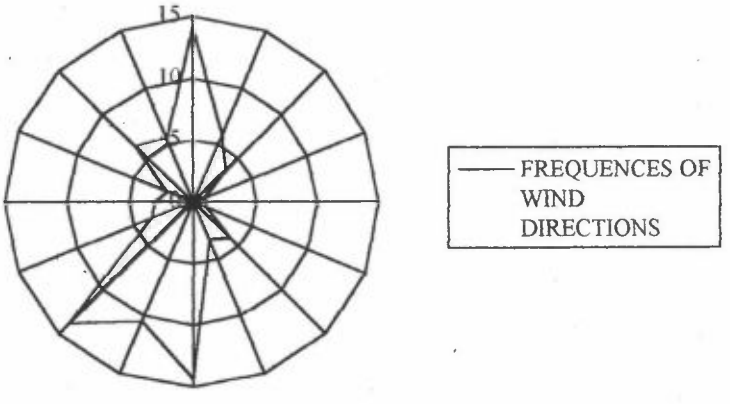


Fig 2.1

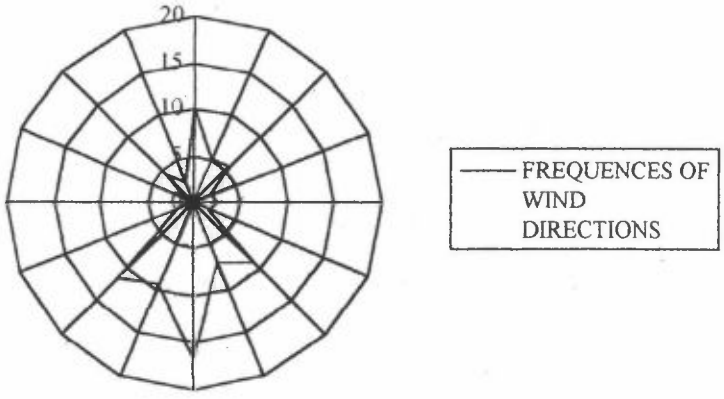
B. Wind direction and velocity

The dominate wind direction is S-SSW-SW with the frepuence of 35.6%, and the less is N- direction wind with the frequence of 12. 66%. The frequence of static wind is 7.57%.The targest wind velocity occurs in the SSW-SW wind,reaching 25m/s.

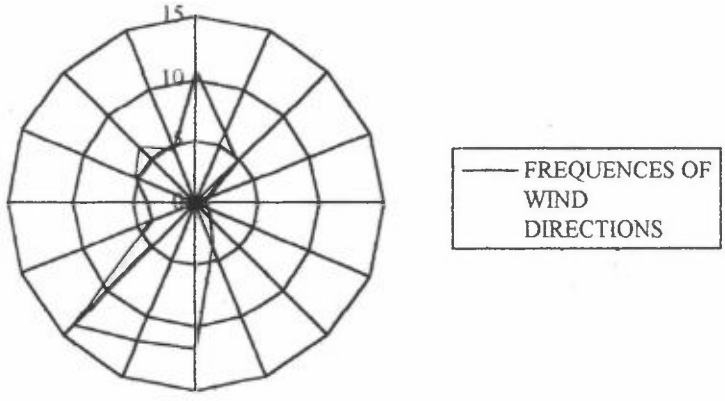
In terms of the daily and seasonal changes,the wind velocity in daytime
is larger than in the night,and in winter larger than in summer.In a day ,the largest wind occurs between 12- 14 o'clock. Fig 2.2 show the frequences of wind directions in spring, summer, autumn and winter,respectively.



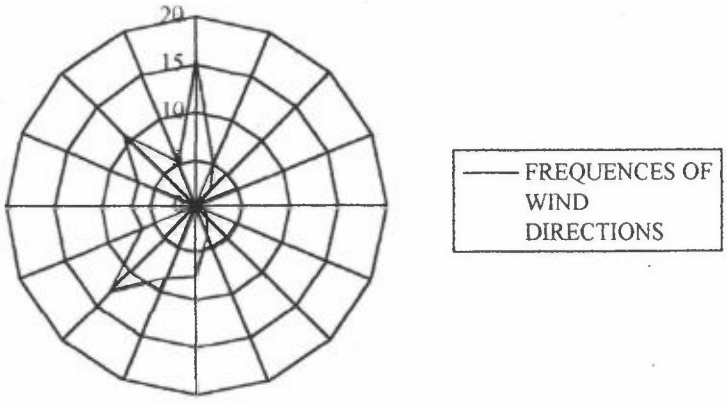
spring



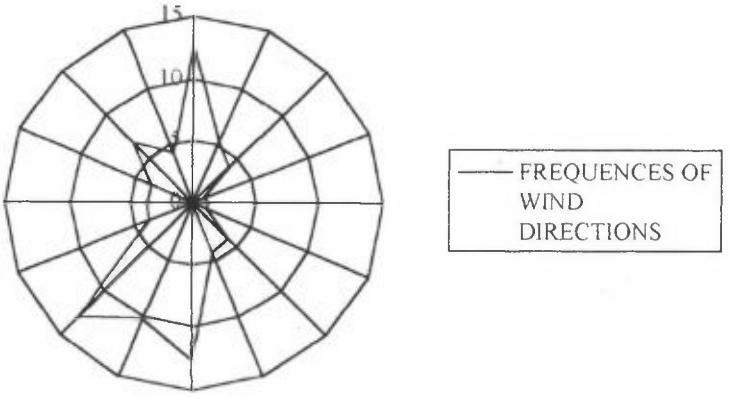
summer



autumn



winter



whole year

Fig 2.2

C.The air stability

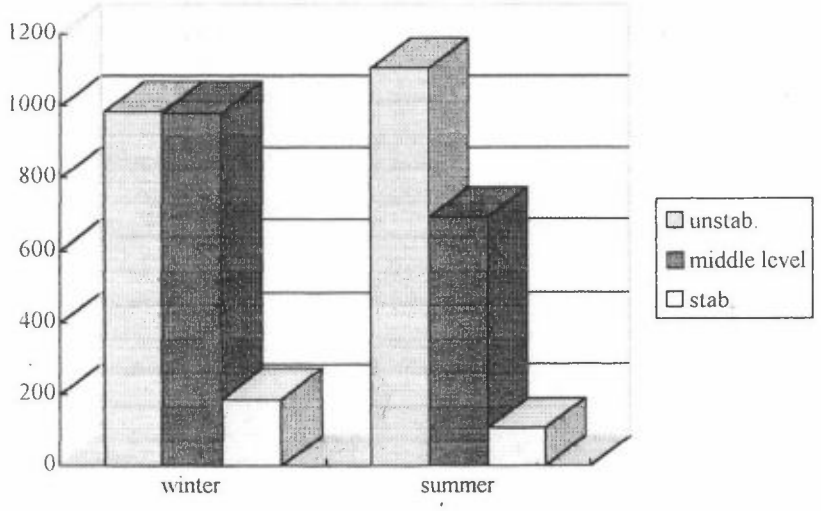
The air stability in Yantai City belongs to middle level(D or F) . The stabilized values of D and F are 37.5% and 17.7%.See Tab 2.2.2

Tab 2.2.2 The air stabilities in Yantai City

stab. / time	A	A-B	B	B-C	C	C-D	D	E	F
winter	**0.0**	**0.7**	**10.6**	**0.3**	**5.9**	**0.1**	**44.5**	**24.0**	**13.9**
summer	**0.0**	**18.2**	**8.4**	**4.8**	**1.6**	**2.0**	**30.1**	**15.1**	**19.7**
whole year	**0.0**	**9.0**	**12.4**	**2.8**	**3.8**	**1.1**	**37.5**	**17.7**	**15.7**

D. The thickness of mixed layer

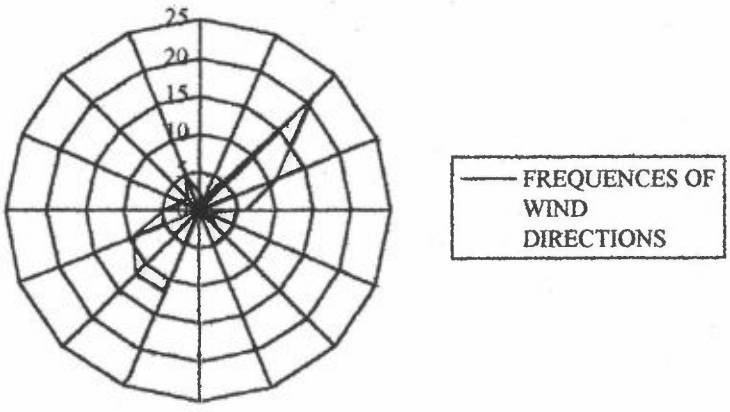
See Fig2.3



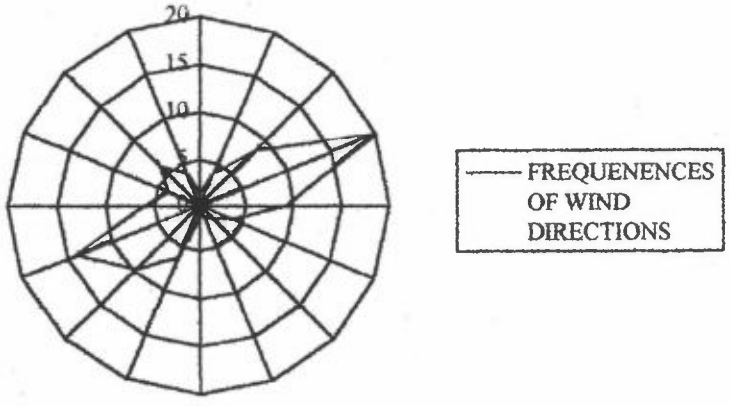
2.2.2 The atmospheric field

The low atmospheric field is dominated by southern wind at various levels ,and its daily change is characterized by: the largest velocity in daytime,in winter,or during 12-14 o'clock in a day.

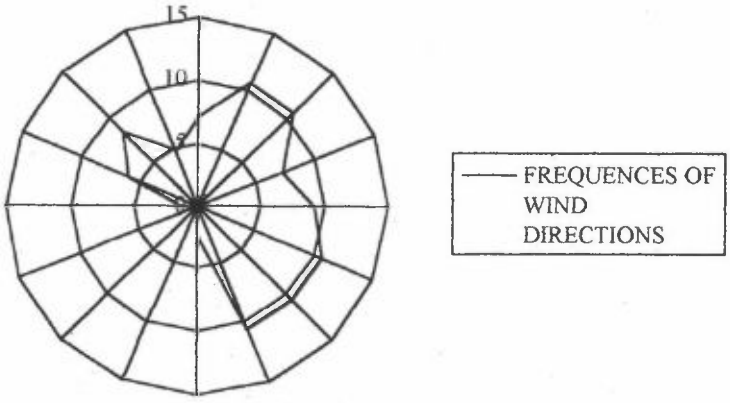
Fig 2.4show the frequences of wind directions at various levels. (in summer,50m and 100m,and in winter,50m and 100m)



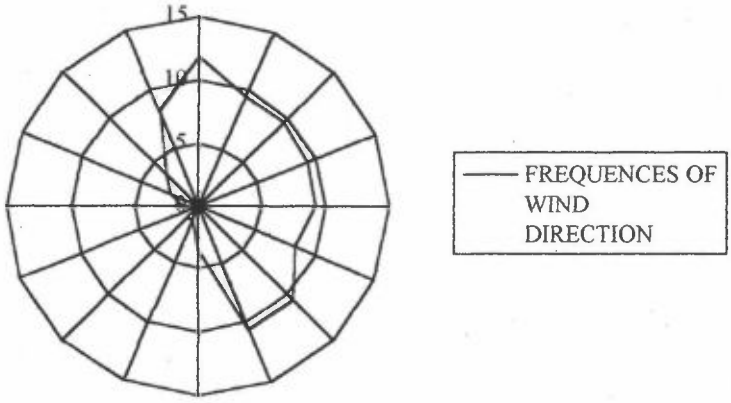
summer 50m



summer 100m



winter 50m



winter 100m

III The Pollution Sources in the Region.

3.1 The Pollution Sources

In order to grasp the rigional distribution situation of the pollutant sources,we divide the zone into 14 areas. The division of the areas mainly accords to the natural and administrative boundary as well as geography features and functions.

Following is the discharging amount statistics of SO_2 and TSP.

Fig 3.1.1 Discharge amount statistics of SO_2 in each area (Winter and Summer).

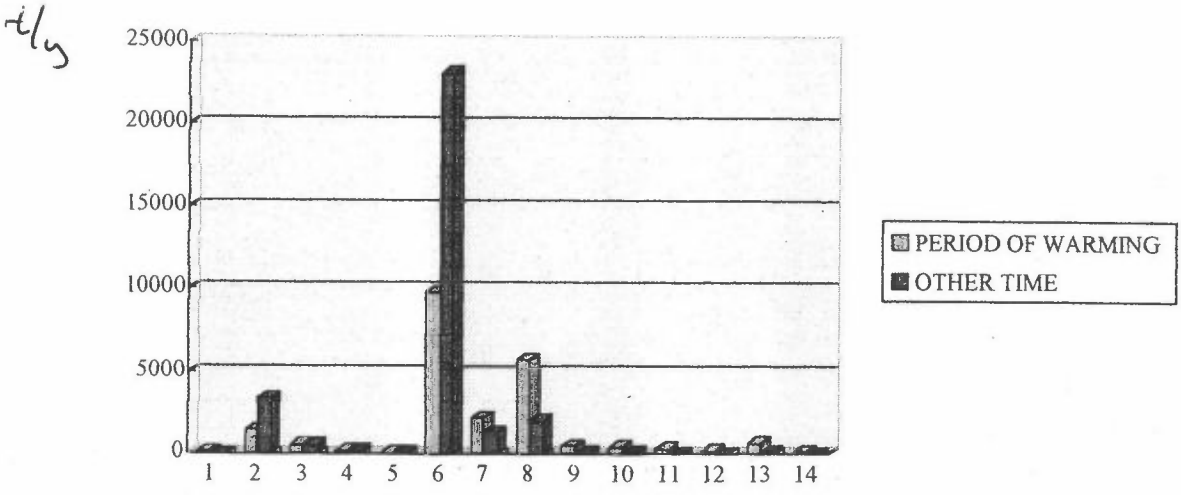
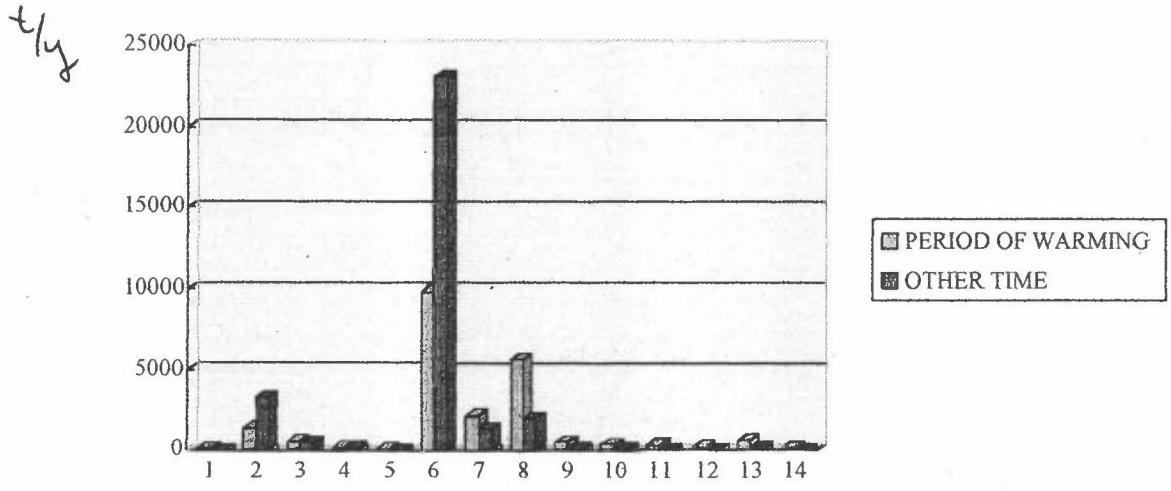


Fig 3.1.2 Discharge amount statistics of TSP in each area (Winter and Summer

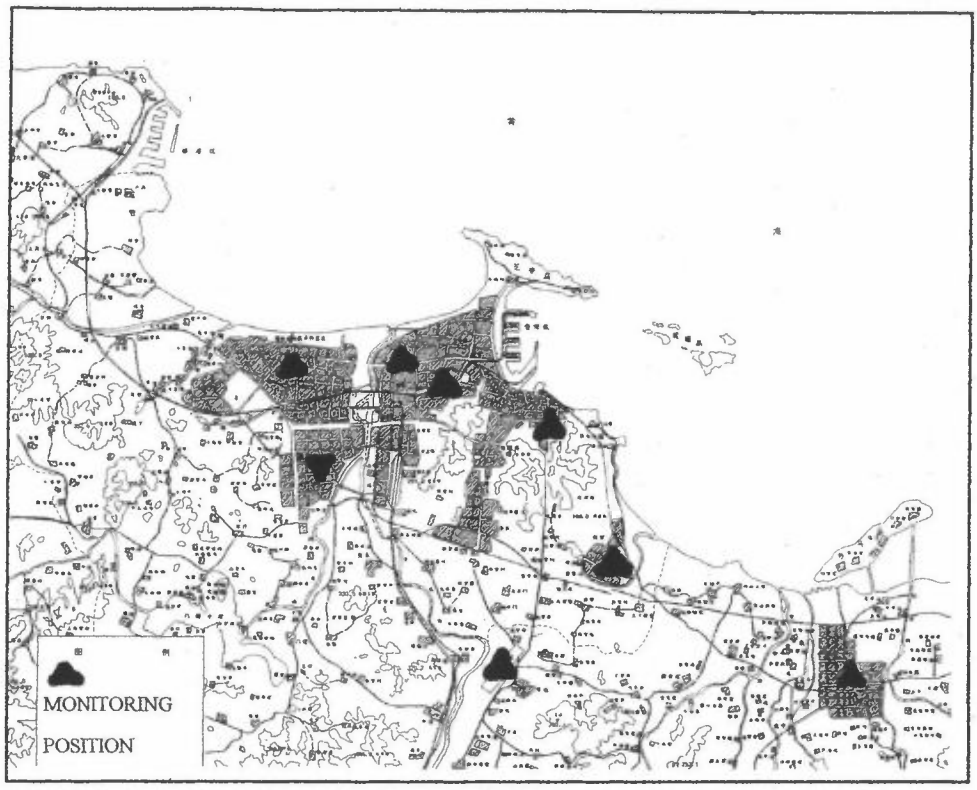


IV.Environmental quality of the atmosphere.

4.1 Air environmental surveylliance situation

The air environmental routine surveylliance of Yantai started from 1981 and other districts from 1990 . After optimization in 1990, three positions were defined. 24-hour continously surveylliance are performed for 14 ~ 16 days each month.. Nine positions are set up in Fushan. Muping district and development zone.One term five days interval surveylliance are performed four terms each year.

Fig 4. 1.1 is the position of the city air environmental surveylliance



4.2 Air environmental quality.

4.2.1 SO_2

The yearly average day value of so_2 in ZiFu district exceed the national creteria two class.There is an increasing tend of so_2 year by year.Following is the yearly changing picture.

Fig.4.2.1 Yearly charging of air pollution in Zhifu District.

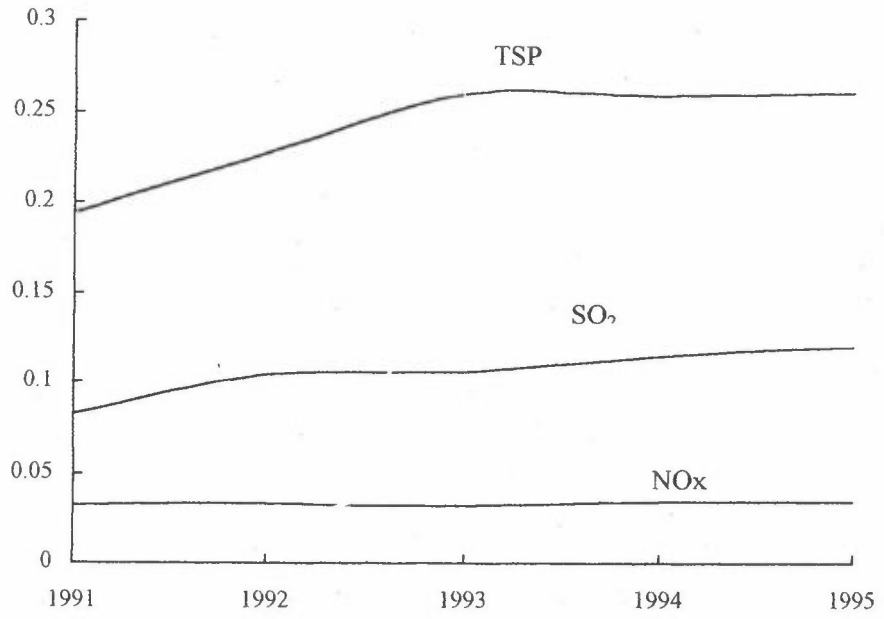
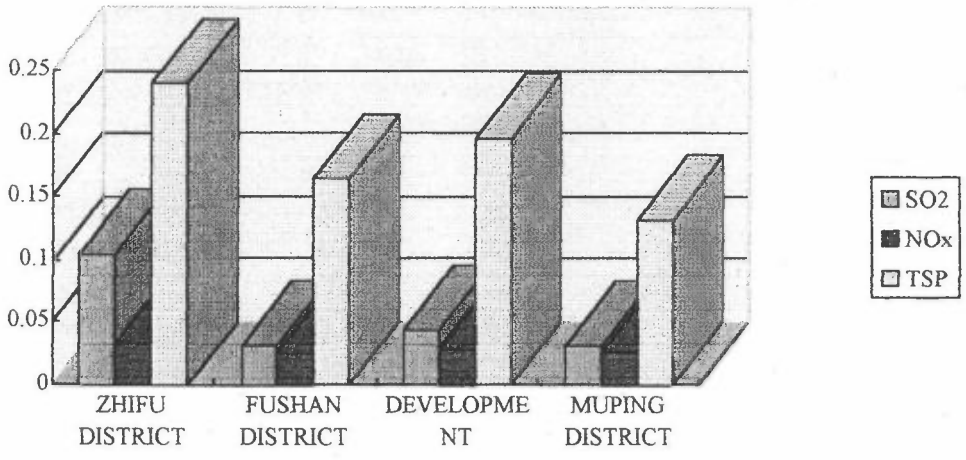


Fig.4.2.2 Air pollution situation of each district



Tab.4.2.1 SO_2 Surveylliant situation in Zhifu district.

TIME	91	92	93	94	95	AVERAGE VALUE
LONCENTRATION (mg/Nm3)	0.082	0.104	0.106	0.114	0.120	0.105

The yearly average day value of other districts don`t exceed the national class two creteria over the years.

Tab.4.2.2 Satistics of SO_2 yearly average day value in each district.

YEAR / DISTRICT	91	92	93	94	95	AVERAGE VALUE
FUSHAN DISTRICT	0.037	0.034	0.036	0.028	0.031	0.032
DEVELOPMENT ZONE	0.076	0.054	0.026	0.033	0.034	0.045
MUPING DISTRICT	0.030	0.028	0.037	0.039	0.026	0.032

The statistics of SO_2 seasonal surveylliance results for each district demonstrate:The first and fourth seasons` concentration higher, and the third season the lowest.

4.2.2 TSP

There is an increasing tend of the average value in Zhifu district. The yearly increasing rate is about 11% ; Viewing from each district shows:There isn`t large changes each year. None of them exceeds national creteria two class

Tab.4.2.3 Zhifu District TSP Surveylliance situation

TIME	91	92	93	94	95	AVERAGE
CONCENTRATION(mg/Nm3)	0.195	0.227	0.260	0.259	0.262	0.241

Tab.4.2.4 TSP Surveylliance situation for each district

YEAR / DISTRICT	91	92	93	94	95	AVERAGE
FUSHAN DISTRICT	0.187	0.160	0.173	0.153	0.154	0.165
DEVELOPMENT ZONE	0.135	0.210	0.277	0.171	0.194	0.197
MUPING DISTRICT	0.121	0.150	0.123	0.132	0.134	0.132

4.2.3 NOx

The statistics of NOx surveylliance results for five years in each district demonstrate:All the concentrations of NOx in each district are comparative low. The scope of yearly average day value of NOx

in Zhifu district from 91-95 is between 0.032-0.034 mg/Nm^3,the changing scope is only 2 ug. In other districts the NOx values are also comparative low.

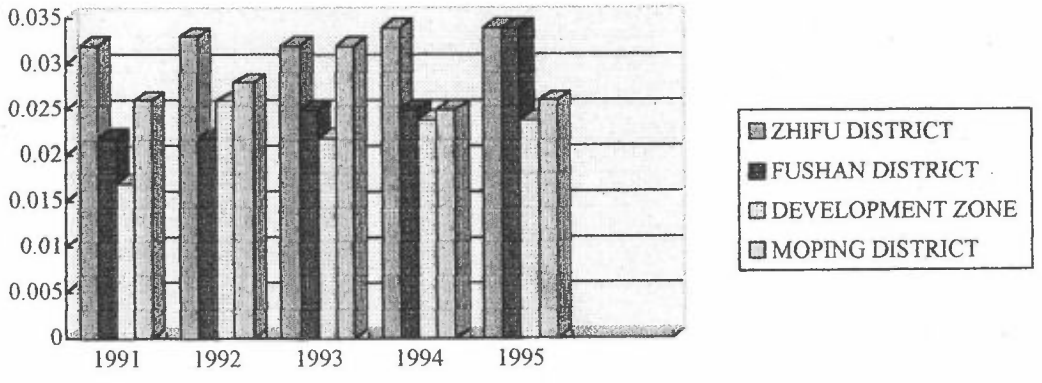
Tab.4.3.1 NOx surveylliance situation in Zhifu District

TIME	91	92	93	94	95	AVERAGE
CONCENTRATION(mg/Nm3)	0.032	0.033	0.032	0.034	0.034	0.033

Tab.4.3.2 NOx surveylliance situation in each district.

YEAR DISTRICT	91	92	93	94	95	AVERAGE
FUSHAN DISTRICT	0.022	0.022	0.025	0.025	0.034	0.026
DEVELOPMENT ZONE	0.017	0.026	0.022	0.024	0.024	0.023
MOPING DISTRICT	0.026	0.028	0.032	0.025	0.026	0.027

Fig.4.3.1 Yearly charging of NOx in each district



V. Yantai air monitoring spots situation

5.1 Basic Situation

5.1.1 Zhifu district situation

Befor 1990,there were four air environmental monitoring spots. In 1989, according to the national environmental monitoring technical standard ,the spots were optimized. East suburb,west suburb and bearing factory were set up as the environmental quality monitoring spots.

5.1.2 Location and function of each spot

a. The east suburb spot set inside ShenLi oil field sanatorium which represent the cleaning area.

b. The west suburb spot can reflect the environmental quality situation of industry area.

c. The pollution in bearing factory spot is very serious. So it has the typical features of mixing industry area with habi
tant area.

Tab.5.1.1 Statistics of pollutant monitoring results in Zhifu district

DISTRICT / PROJECT		EAST	WEST	BEARING FACTORY	ALL DISTRICT
SO_2	MEAN VALUE DAYLY	0.043	0.169	0.128	0.113
	RANGE OF VALUE	0.002 ~ 0.273	0.004 ~ 0.771	0.005 ~ 0.601	0.002 ~ 0.771
NOx	MEAN VALUE DAYLY	0.018	0.034	0.045	0.032
	RANGE OF VALUE	0.002 ~ 0.425	0.004 ~ 0.093	0.010 ~ 0.718	0.002 ~ 0.718
TSP	MEAN VALUE DAYLY	0.177	0.321	0.280	0.259
	RANGE OF VALUE	0.003 ~ 0.578	0.008 ~ 0.944	0.074 ~ 0.995	0.003 ~ 0.995

20 times pr. day
14 days pr. mnd.

5.1.3 The atmospheric monitoring result in Zhifu District

According to the analysis of the monitoring results from 1993 to 1995

,it is considered that all the monitoring spots are representative and can present the actual air environment quality in the district.

5.2 The spots in other districts

The air monitoring system in other districts also set up in compliance with the relevant national regulations, with 2-3 spots in cleaner district, industrial district and mixed areas,respectively. The good representativeness of the pre-selected spots can be seen from Tab.4.2.1 comparied with the monitoring values in various districts.

Tab.5.2 The comparision of the mean values of pollutants in various districts and the mean values from pre-selecting spots.

DISTRICT		FUSHAN DISTRICT		DEVELOPMENT ZONE		MUPING DISTRICT	
PROJECT		ALL DISTRICT	PRE SPOT	ALL DISTRICT	PRE-SPOT	ALL DISTRICT	PRE-SPOR
SO_2	MEAN VALUE DAYLY	**0.032**	**0.031**	**0.029**	**0.036**	**0.038**	**0.047**
	RANG OF VALUE	**0.002 ~ 0.166**	**0.002 ~ 0.166**	**0.000 ~ 0.241**	**0.000 ~ 0.241**	**0.000 ~ 0.455**	**0.000 ~ 0.447**
NOx	MEAN VALUE DAYLY	0.026	**0.026**	**0.024**	**0.030**	**0.031**	**0.034**
	RANG OF VALUE	0.010 ~ 0.042	**0.010 ~ 0.042**	**0.000 ~ 0.082**	**0.001 ~ 0.053**	**0.000 ~ 0.371**	**0.000 ~ 0.241**
TSP	MEAN VALUE DAYLY	**0.154**	**0.161**	**0.217**	**0.248**	**0.127**	**0.148**
	RANG OF VALUE	**0.100 ~ 0.289**	**0.100 ~ 0.289**	**0.025 ~ 0.507**	**0.090 ~ 0.507**	**0.003 ~ 0.433**	**0.005 ~ 0.433**

5.2.1 Fushan district

The pre-selected spot in the district is located on the EPB Building

, which lie in the mixed area of the district.

5.2.2 The Economic Developped Zone

The pre-selected spot is located in EPB, which lie in the central district.

5.2.3 Muping District

The pre-selected spot is in Muping EPB, lieing in the central district.

Appendix D

The introduction to the water environment

The Materials for the Yantai ENSIS Project

The Introduction to the Water Environment

Yantai Environmental Monitoring Centre

1996.11.25

1.Survey about Jia River

Jia river is the main river and the resource of drinking water in Zhifu district.
The river consists of inner jia river and outside jia river and 75 Km long,Total river basin is 2296 Km^2.The maximum discharge follow is 2380 m^3 /sec. The pricipitation is 753 mm every year and is mainly in Jun to Sep.There are two water works on the river.

2.Water monitoring

(1). Monitoring sections
Jia river has 15 sections now and Menlou reservoir 5 sections.
(2).Monitoring times
Province controlled sections on jia river are monitored 6 times every year, other sections 3 times every year.
(3).Monitoring item
There are 19 monitoring items about jia river and Menlou reservior 18 items.
(4).Natural environment
There is no industry discharge at the three

stations which will be set up, domestic effluents is principal.

3.Pollutant source

(1).Industry

. Water discharge of main pollutant source in Yantai are 12, 557, 600 T. Principal discharge industry are paper making, chemical industry and weaving.

. Major pollutant items:

COD, SS, ammonia, volatilize phenol, sulphide.

Pollutant discharge 30475.6 T every year.

(2).Pollutant source on jia river and Menlou reservoir

. Major discharge on jia river are industry and domestic effluents

. No pollutant discharge at Menlou reservoir

. Major discharge at province controlled sections are domestic effluents

(3).Agricultural pollution

Fertilizer and agriculture chemical are widely used, no environment pollution events occured.

4. Water quality

. From 1991 to 1995, water quality of jia river is well, many pollutant concentration approach the standard, water quality is greatly improved. Major pollutants is pH, ammonia, COD, BOD_5.

. No evident change of Menlou water quality happened since 1991. Pollutant average concentration is near to or some exceed the standard. Major pollutants in Menlou reservoir is Σ N, pH.

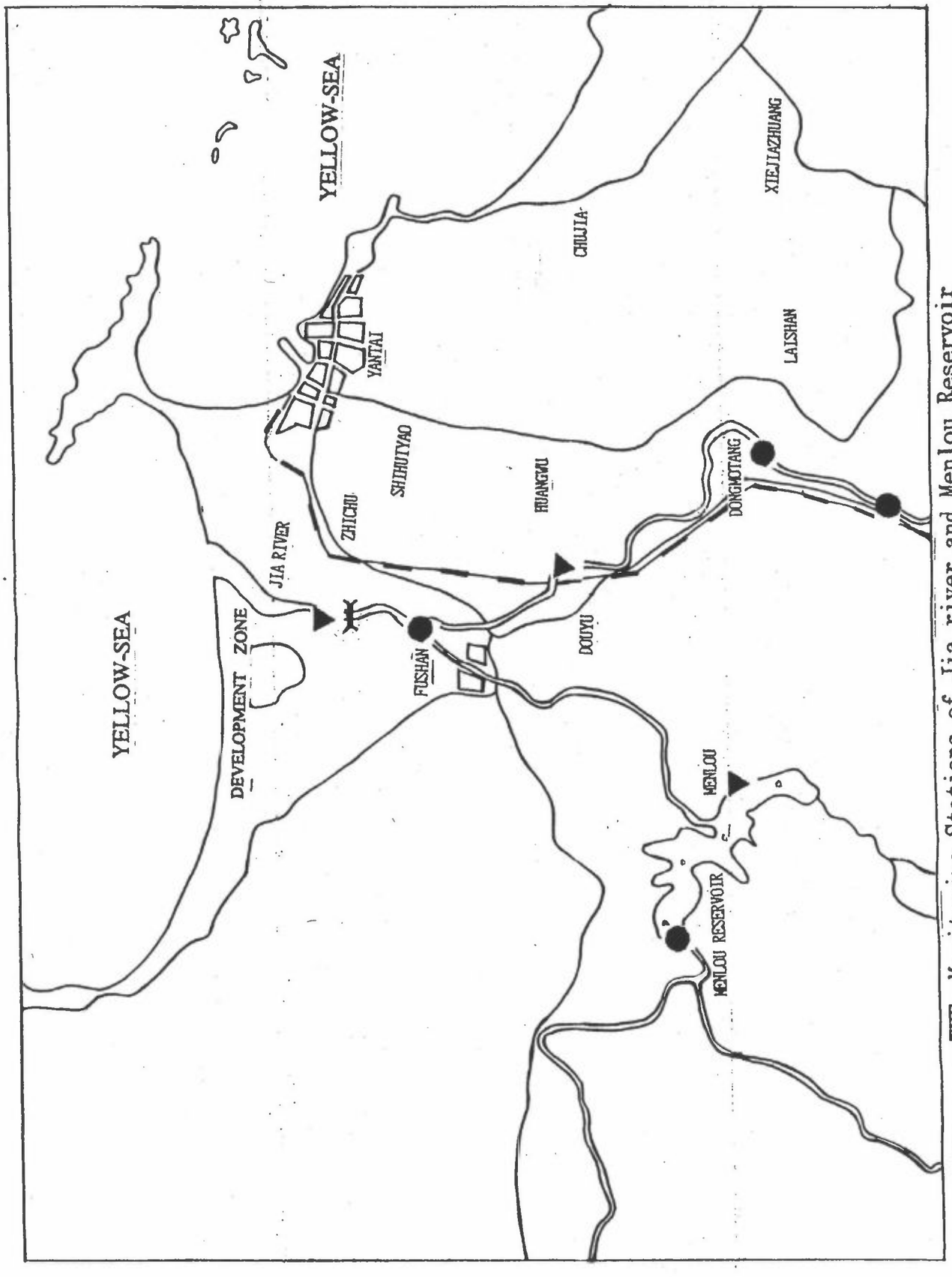


Fig 1 THE Monitoring Stations of Jia river and Menlou Reservoir

图1 夹河及门楼水库监测断面

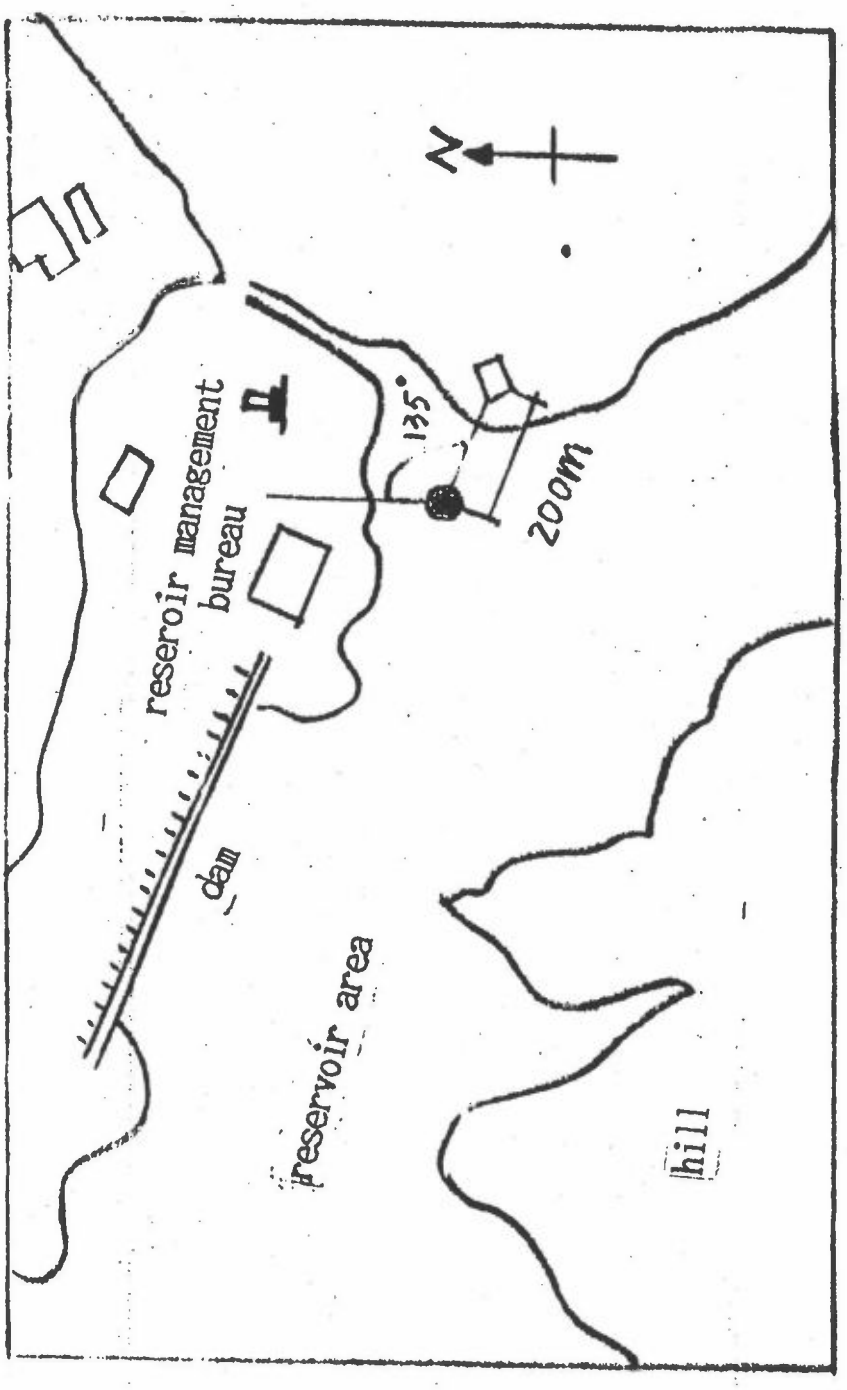


Fig 2 Menluo Reservoir outlet section

图2 门楼水库出口断面

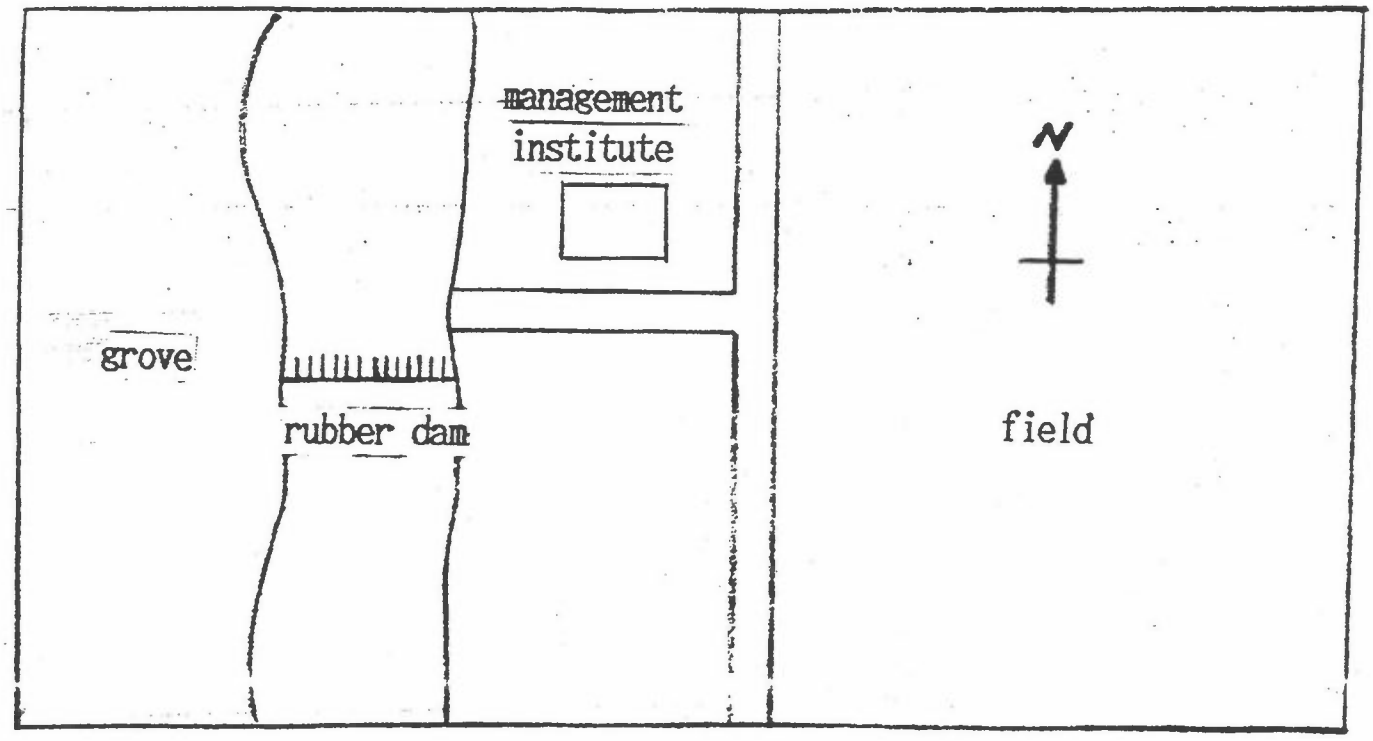


Fig3 TaoKou rubber dam section

图3 套口橡胶坝断面

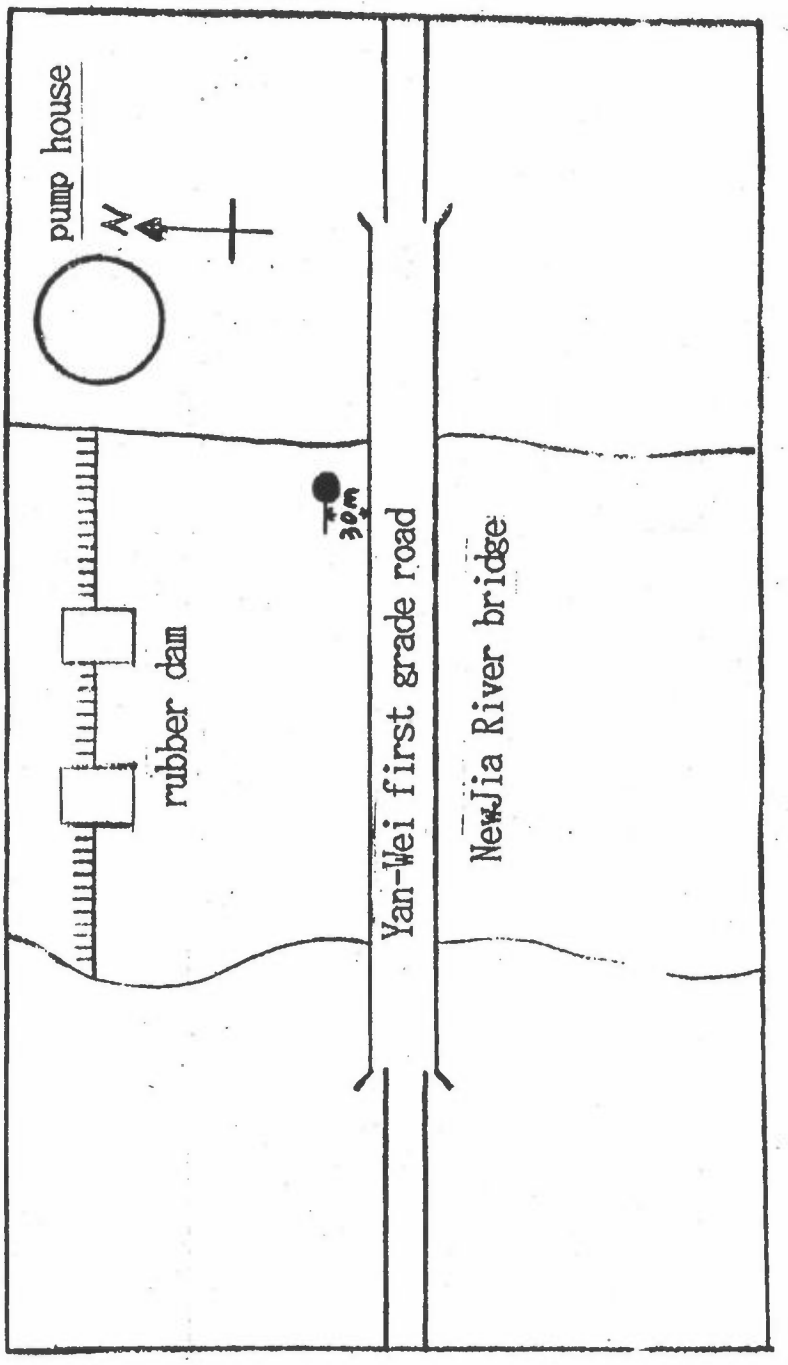


Fig4 Newjia River bridge section

图4 新夹河桥断面

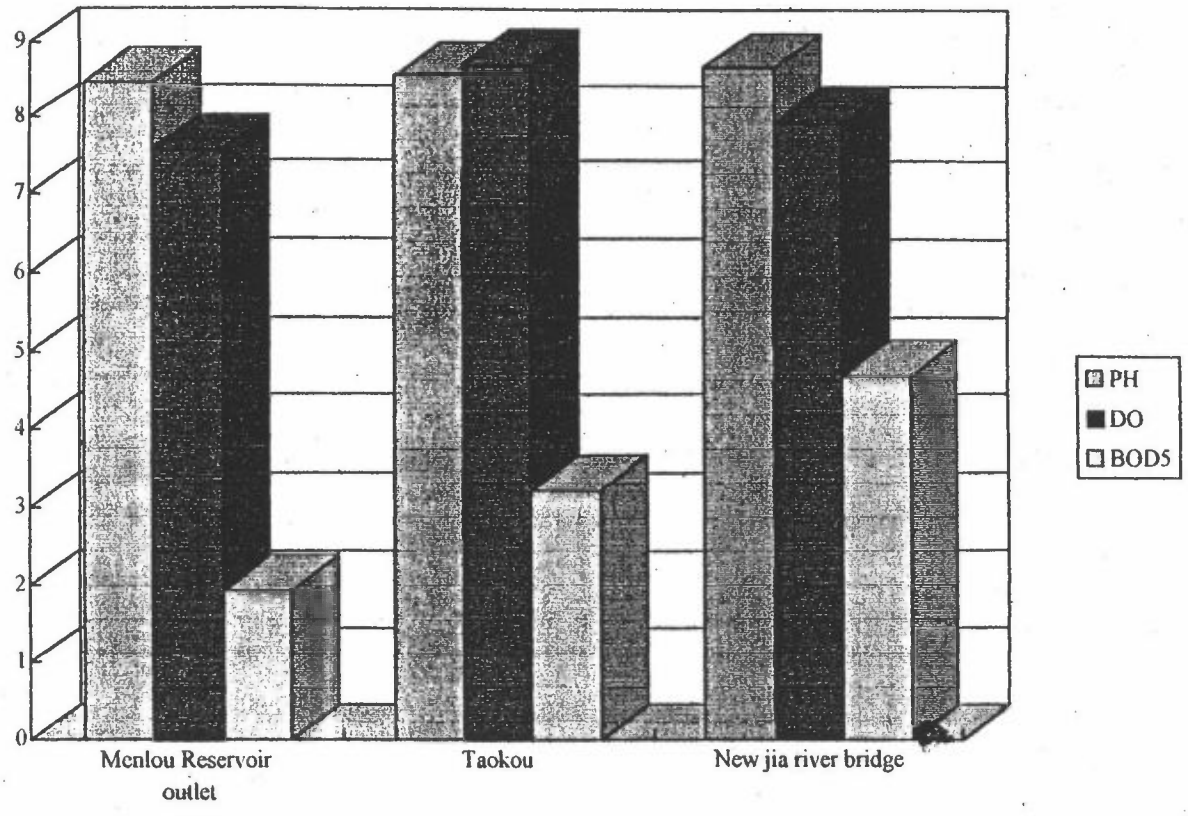


Fig 5. The concentration of main pollutants in jia river(1991-1995)

图5 1991–1995 夹河主要监测断面污染物浓度曲线

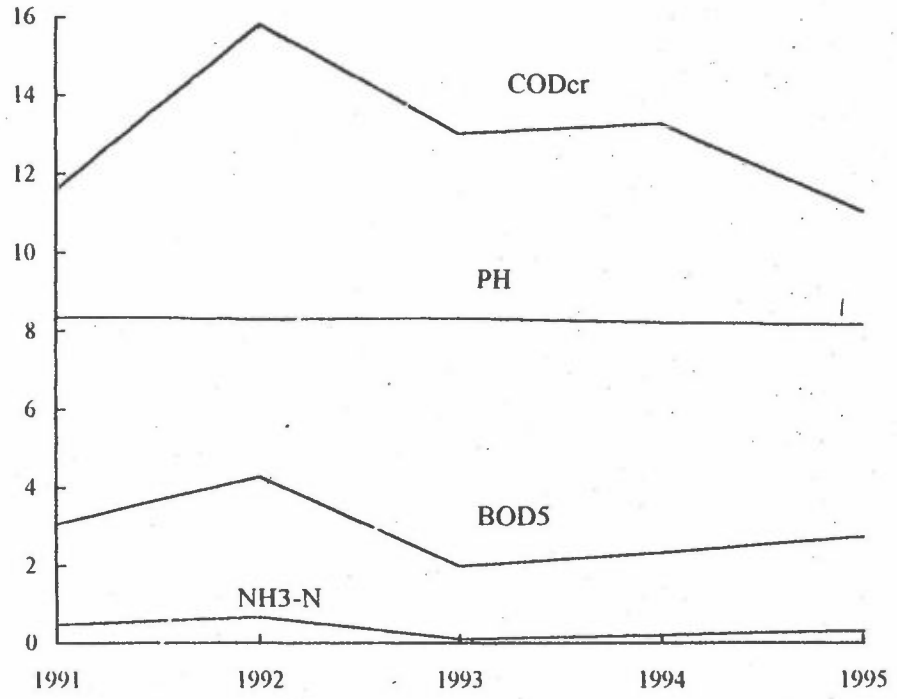


Fig 6. The average value of main pollutants in jia river(1991-1995)

图6 1991-1995 夹河主要污染物年均值变化曲线

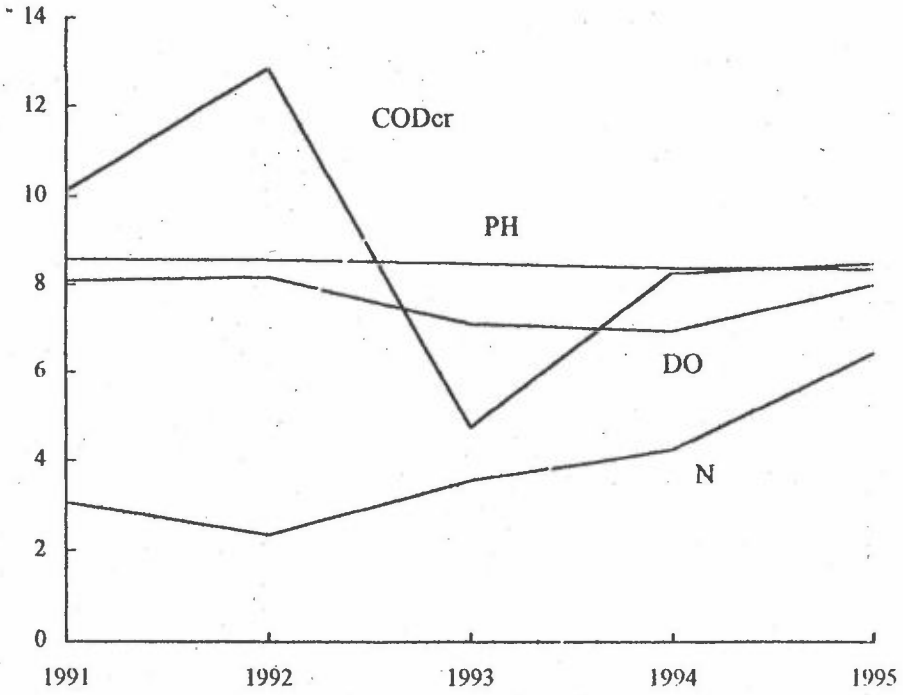


Fig.7 The average value of main pollutants in Menlou reservoir (1991-1995)

图 7 门楼水库 1991-1995 主要污染物年均值变化曲线

Tab. 1 The National Standard of Ground Water quality

items	PH	NO_3-N	NO_2-N	NH_3-N	ΣP	COD_{MN}	DO	CODcr	BOD_5	OIL
IV CLASS	6.5-8.5	20	1.0	0.2	0.2	8	3	20	6	0.5

Tab. 2 The Monitoring Results of Jia River Water Quality

items / value	PH			DO			CODmn			BOD_5			OIL		
section	max	min	mean	max	min	mean	max	min	mean	max	min	mean	max	min	mean
Menlou reservoir outlet	8.88	8.19	8.48	11.2	3.20	7.60	4.81	1.67	2.81	7.28	0.56	1.95	0.27	0.0	0.06
Taokou	9.78	7.82	8.57	14.0	4.56	8.73	7.63	1.75	3.90	6.58	0.92	3.23	2.69	0.0	0.14
New jia river bridge	9.97	8.20	8.70	12.0	4.88	7.97	6.69	2.14	4.63	15.7	0.40	4.70	0.54	0.0	0.09
River basin	9.97	7.43	8.22	15.6	3.20	9.30	9.78	0.72	3.83	15.9	0.22	2.68	2.69	0.0	0.06

Tab. 3 The National Standard of Ground Water quality

items	PH	NO_3-N	NO_2-N	NH_3-N	ΣP	COD_{MN}	DO	CODcr	BOD_5	OIL
III CLASS	6.5-8.5	20	0.15	0.02	0.05	6	5	15	4	0.05

Tab. 4 The Monitoring Results of Menlou Reservoir Water Quality

items / value	PH			DO			CODcr			ΣN			ΣP		
year	max	min	mean	max	min	mean	max	min	mean	max	min	mean	max	min	mean
1991	9.04	8.02	8.57	10.4	4.62	8.08	22.6	5.00	10.1	7.24	1.12	3.07	0.18	0.00	0.04
1992	8.66	8.46	8.58	9.28	6.36	8.17	17.0	11.0	12.9	3.42	1.50	2.37	0.33	0.02	0.05
1993	8.57	8.37	8.47	10.9	3.36	7.14	12.2	8.00	4.79	6.74	2.18	3.57	0.05	0.01	0.02
1994	8.53	8.15	8.39	8.96	3.20	6.96	10.3	3.00	8.24	8.96	1.83	4.28	0.23	0.01	0.04
1995	8.45	8.16	8.33	9.92	6.00	7.99	10.8	6.90	8.47	7.55	3.40	6.46	0.21	0.01	0.07

Appendix E

Air quality guidelines for China

Pollutants	Time (value)	Concentration limit (mg/m^3)		
		Standard I	Standard II	Standard III
SO_2	yearly average	0.02	0.06	0.10
	daily average	0.05	0.15	0.25
	hourly average	0.15	0.50	0.70
TSP	yearly average	0.08	0.20	0.30
	daily average	0.12	0.30	0.50
NO_x	yearly average	0.05	0.05	0.10
	daily average	0.10	0.10	0.15
	hourly average	0.15	0.15	0.30
NO_2	yearly average	0.04	0.04	0.08
	daily average	0.08	0.08	0.12
	hourly average	0.12	0.12	0.24
CO	daily average	4.00	4.00	6.00
	hourly average	10.00	10.00	20.00
O_3	hourly average	0.12	0.16	0.20
Pb	seasonal average	1.50		
	yearly average	1.00		
[a] B[a] P	daily average	0.01		
F	daily average	7 (for urban area)		
	hourly average	20 (same as above)		
	monthly average	1.8		3.0
	vegetation-growth seasonal average	1.2		2.0

Appendix F

Measuring site description for air quality

Site name : **Yantai Synthetic Leather Factory**

Access/availability : Main road out of Yantai to the west. The station is going to be moved from is present site to a place in the neighbourhood. The new place was not yet exactly defined.

Buildings and rooms available : Standard YEMC shelter. Designated shelter 1.5m x 1.4m, 2m high.

Area Description : Industrial area. Relatively low buildings in the neighbourhood . Only 1 floor high

Local sources : No sources within 100 meter, but high stacks in all directions.

Representativity : Should be good for the polluted industrial area.

Parameters measured : SO_2, NO_x and TSP.

Data quality : -

Measurement equipment : Liquid absorption system in bubblers for SO_2 and NO_x. Filter sampler with 120 lpm for TSP.

Infrastructure : Shelter size 1.40m x 1.50m (5xA4 x 6xA4), bench depth 0.7 m.

Intake : Central intake in stainless steel for gases. TSP intake and filterholder above the roof.

Personnel : Responsible YEMC Chang Haoqui

Future monitoring station : The bench must be used for the new SO_2, NO/NO_x and PM_{10} instruments only. The existing samplers must be moved down on the floor. A shelf over the bench must also be installed. Telephone line must be installed.

Site name : **Yantai Bearing Factory**

Access/availability : Near the EW main street in downtown Yantai.

Buildings and rooms available : Designated shelter 1.5m x 1.4m, 2m high. Standard YEMC type. The shelter is placed on roof of 3 floor on the factory building.

Area Description : Downtown Yantai with 8-10 stores buildings in all directions.

Local sources : Yantai main street 100m to north. No sources in the factory. Small sources from the nearest buildings in S and W.

Representativity : Good for downtown measurements.

Parameters measured : NO_x, SO_2, TSP on a daily basis.

Data quality : -

Measurement equipment : Liquid absorption system in bubblers for SO_2 and NO_x. Filter sampler with 120 lpm for TSP.

Infrastructure : Shelter size 1.4m x 1.5m (5xA4 x 6xA4), bench depth 0.7m.

Intake : Central intake in stainless steel for gases. TSP intake and filterholder above the roof.

Personnel : Responsible YEMC Chang Haoqui.

Future monitoring station : The bench must be used for the new SO_2, NO/NO_x and PM_{10} instruments only. The existing samplers must be moved down on the floor. A shelf over the bench must also be installed. Telephone line must be installed.

Site name	: **Sheng Li oil field sanatorium**
Access/availability	: Main road from Yantai downtown to Laishan.
Buildings and rooms available	: Designated shelter 1.5m x 1.4m, 2m high. Standard YEMC shelter.
Area Description	: Flat land near the coast line.
Local sources	: High stack in SW on a Central heater installation. Main road approx. 50 -60m in N. No sources in S and E. The station is situated in a small garden surrounded by trees up to 6 m.
Representativity	: Good as a reference low pollution site.
Parameters measured	: NO_x, SO_2, TSP on daily basis.
Data quality	:
Measurement equipment	: Liquid absorption system in bubblers for SO_2 and NO_x. Filter sampler with 120 lpm for TSP.
Infrastructure	: Shelter size 1.40m x 1.50m (5xA4 x 6xA4), bench depth 0.7 m.
Intake	: Central intake in stainless steel for gases. TSP intake and filterholder above the roof.
Personnel	: Responsible YEMC Chang Haoqui
Future monitoring station	: The bench must be used for the new SO_2, NO/NO_x and PM_{10} instruments only. The existing samplers must be moved down on the floor. A shelf over the bench must also be installed. Telephone line must be installed.

Site name	: **Fushan Environmental Protection Bureau**
Access/availability	: Near main road.
Buildings and rooms available	: Sampler can be placed in a corner in room no. 303 in 3 floor in the south-east corner of the building to the bureau.
Area Description	: Residential area, shops and offices. River 100 meter to east. Most buildings in NW.
Local sources	: Stack for central heating system in NW.
Representativity	: Good for the residential area .
Parameters measured	: New station.
Data quality	: -
Measurement equipment	: -
Infrastructure	: 220 volt mains is available near the samplers. The room must be heated during the winter season. A table for the samplers must be provided.
Intake	: The intake funnels can be mounted over a window pointing to S, approximately 10 meters above ground.
Personnel	: Contact person is Mr. Luo
Future monitoring station	: Two sequential samplers (model FK) will be installed for measuring of 24 hour mean values of SO_2 and NO_2.

Site name	: Laishan chemical factory
Access/availability	: Near main road to Muping
Buildings and rooms available	: Sampler can be placed in a corner in a room in 2 floor in the east corner of the main building.
Area Description	: Residential area, minor industry. A low hill in NE. 50 meter from the main road.
Local sources	: Remote heating central in all directions.
Representativity	: Good.
Parameters measured	: New station .
Data quality	: -
Measurement equipment	: -
Infrastructure	: volt mains will be provided. The room will be heated during the winter.
Intake	: The intake funnels will be mounted outside a window pointing eastwards approx. 10 meters above ground.
Personnel	: **Mr. Liu**
Future monitoring station	: Two sequential samplers (model FK) will be installed for measuring of 24 hour mean values of SO_2 and NO_2.

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ABSTRACT
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 report contains a summary from the start-up workshop in November 1996.

NORWEGIAN TITLE
ENSIS Yantai – Rapport fra startseminar 25.–29. november 1996

KEYWORDS		
Monitoring	Management	

ABSTRACT (in Norwegian)
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 et sammendrag fra det første seminaret i november 1996.

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