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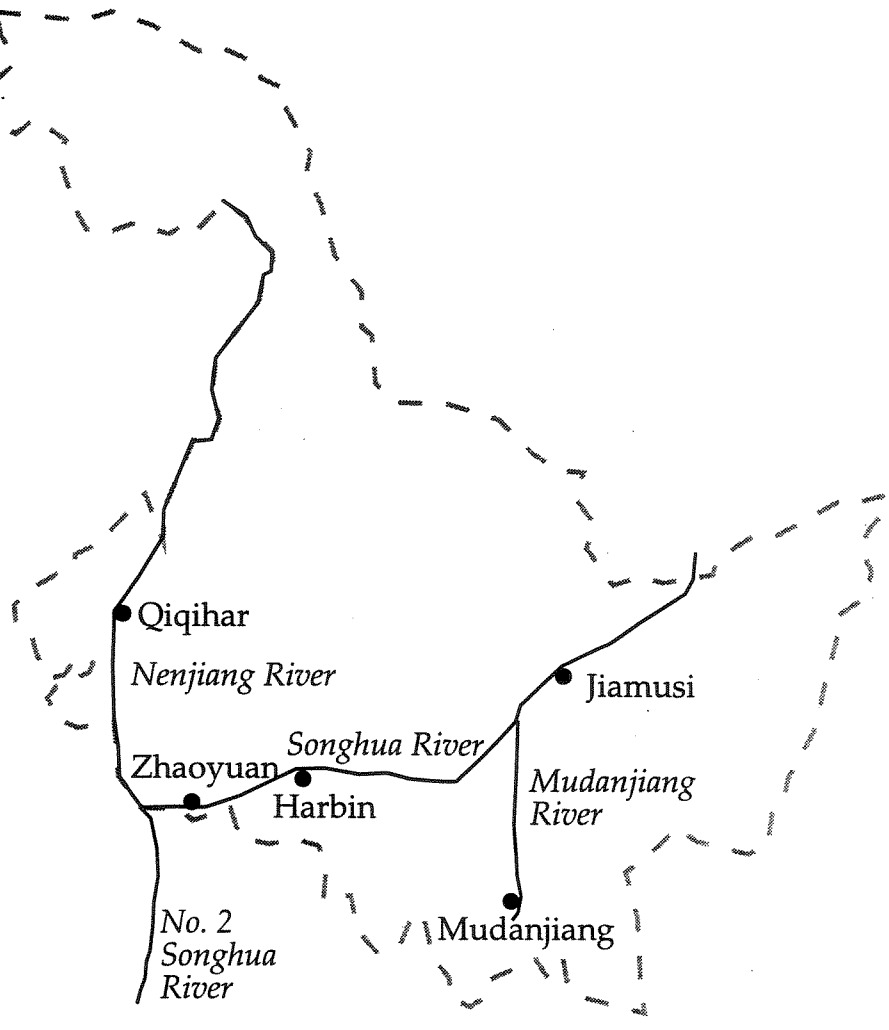
Workshop Report from

Surveillance of Water Quality in the Songhua River System in Heilongjiang Province, P.R. of China

Harbin, Heilongjiang 17 - 22 November 1996



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Abstract

The first Workshop within the project "Surveillance of Water Quality in the Songhua River System in Heilongjiang Province, P.R. of China" was held in Harbin, Heilongjiang 17 - 22 November 1996. The report describes the discussions and the agreed results from the workshop. Also reported are results form the inspection trip to water monitoring sites along the Songhua River System.

4 keywords, Norwegian	4 keywords, English
1. ENSIS	1. ENSIS
2. Overvåking	2. Surveillance
3. Vassdrag	3. Water system
4. Luft	4. Air

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0. Introduction

On November 8., 1996 an Agreement was signed in Beijing between the Norwegian Agency for Development Cooperation (NORAD) and The Chinese State Science and Technology Commission (SSTC) regarding Surveillance of Water Quality in the Songhua River, Heilongjiang Province, China. According to this Agreement and the Projetc Proposal on the above mentioned project, a Workshop was held in Harbin, Heilongjiang Province in the period 17 - 22 November 1996.

This Workshop Report describes the visit and discussions between the Heilongjiang Environmental Protection Bureau (H/EPB), Heilongjiang Environmental Central Monitoring Station (H/EMCS) and the ENSIS group consisting of Norwegian Institute for Water Research (NIVA), Norwegian Institute for Air Research (NILU) and the Norgit center (NORGIT).

The purpose of the visit was to sign a project contract between Heiliongjiang EPB and NIVA, exchange information and accomplish discussions necessary to prepare a more detailed workplan for the Project.

1. Visits in Harbin

1.1 Information center of Heilongjiang EPB

On the first working day of the visit, Monday 18 November, the ENSIS group were taken to the information center in Heiliongjiang EPB. An interesting presentation of the center was given and plans for the future work were discussed.

1.2 Harbin Environmental Protection Bureau and Harbin Environmental Monitoring Center Station

On Wednesday 20 November a visit was made to the Environmental Protection Bureau (EPB) of the City of Harbin. The work of the EPB and Harbin Environmental Monitoring Center Station (EMCS) was presented, and the localisation of the on-line monitoring point for water quality in Harbin were decided. The site chosen for the regular on-line station is at the drinking water inlet to the city water works upstream Harbin.

2. Summary from the working groups

On Tuesday 19 November three working groups of Chinese and Norwegian experts were established. They corresponded to the defined working groups of the projects Water Quality, Air Quality and Information Technology.

2.1 Water Quality

Participants in the working group for Water Quality are listed in the following table.

Chinese participants (H/EMCS)	Norwegian participants (NIVA)
Ms Chen Aifeng	Ms Bente M.Wathne
Mr Jiang Dexiang	Mr Finnur Olafsson
Mr Song Lanzhe	
Mr Chen Jiahou	
Ms Jia Dongling	

The topics discussed follow the sub tasks defined in the Project Organisation Plan (Appendix A):

- Screening river water data and quality assurance
- Water discharge inventory
- Water modelling
- Water monitoring on-line systems
- Water pollution abatement strategies

The results of the discussions and the conclusions drawn are presented in the following.

2.1.1 Screening river water data and quality assurance

There are 20 river monitoring stations in the Songhua River System, with 140-150 monitoring points. River profiles are measured with 3 points across the river.

The Chinese side promised to prepare a list giving the chemical parameters analysed as routine, presenting also the analytical methods and instrumentation used. The list was prepared and delivered to NIVA during the Workshop (see Appendix C). The parameters listed in the Project Proposal are considered as the routine analyses parameters and are analysed 8 times a year. At the inlet of the drinking water plants the same parameters together with turbidity are analysed 12 times a year. The monitoring programme has been running for 10 years.

All monitoring data collected in the Heilongjiang Province are stored in a database maintained by EMCS of Heilongjiang Province. A preliminary description of this database and the pollution source inventory will be given to NIVA(see Appendix D). Any further information needed may be obtained in May 1997.

Representatives from the H/EMCS have identified a need to extend the number of parameters analysed routinely to include special organic pollutants such as PAH and chlorinated hydrocarbons. Water samples from a section of the river were during a surway from 1980 to 1982 sent to the Medical University of Harbin for analyses. Pollution from organic components was identified as a serious problem, and routine analysis of these parameters were recommended for inclusion in the monitoring programme.

There are several hydrographic stations along the river system measuring flow and water depth. Of these hydrographic stations, 6 main stations deliver data to H/EMCS when they sample from the river. Measurements are taken every fith day and the results presented in an annual report. The stations are maintained by the Hydrological Agency and H/EMCS has to purchase the date.

2.1.2 Water discharge inventory

A pollution source inventory database was established in 1992. The H/EMCS monitors 75 main industrial pollution sources in the province, which represent 75 % of the total pollution discharged to the river. The city administrations/local EMCSs are responsible for the control of the pollution discharges within the city boundaries. Discharge control and frequency of sampling may vary from daily monitoring to sampling 2 times a year.

At Harbin EPB it was explained that the Harbin EMCS controlled 150-160 major pollution sources, while the seven district EMCSs in the city controlled 700-800 pollution sources.

Information about sewage discharges from the cities Qiqihar, Harbin and Mundanjiang is available. Discharge measurements from 13 existing sewage discharge points in Harbin city have been taken twice a year. The city of Harbin has started the construction of its first sewage treatment plant. Qiqihar has a sewage treatment plant based on natural aeration.

Detailed information about discharges of domestic sewage from the municipalities is lacking. The Chinese Authorities expressed the wish to obtain more accurate information about these discharges.

2.1.3 Water modelling

Two models that can be included in the ENSIS system were presented. One model provides an overview of the total pollution load into the river system. It is based on information about discharges from industrial sites, agriculture and municipal activities, and on natural background run-off. The model provides an overview of the pollution sources and preliminary studies for abatement strategies.

The other model presented is the mathematical model QUAL2E, developed by the USEPA. It is a more data consuming model.

2.1.4 Water monitoring on-line systems

In the original Project Proposal 8 on-line stations of which one is a mobile station are listed. All stations are to be placed along the Songhua River System.

The Chinese Authorities wished to modify the number, instrumentation and location of the stations for the following reasons:

- There is a need for educated personnel to maintain the stations
- There is a urgent need for drinking water monitoring
- There is a need for information on water quality from sidebranches of the Songhua river.

They suggested to reduce the number of stations to 5, of which one should be a mobile station. The three fully equipped stations should be at the drinking water inlets of Qiqihar and Harbin and as a mobile station. Two stations with reduced instrumentations should be placed at Mudanjiang and Jiamusi. The mobile station should be placed with H/EMCS, which will be able to work at special tasks all over the province.

The Chinese Authorities also suggested to replace the on-line ortophosphate monitor by an on-line COD monitor. NIVA will evaluate this possibility.

There is a need for abrupt pollution emergency measurements. A mobile water quality monitoring station is necessary. The possibilities to purchase a motor vehicle for the mobile station within the

grant were discussed. This could be. This could be covered by the funds saved by the reduced number of on-line stations. The Chinese Authorities have already inquired the necessary information, and the price of such a motor vehicle will be approx. 500.000 NOK. The final instrumentation list must be discussed at the 1997 Beijing meeting. NIVA eill deliver specifications about the practicle location of monitoring equipment and other details to the Chinese Authorities.

The possibilities of including a mobile van as a part of the mobile station were also discussed. The Chinese Authorities will inquire about information and prices of such a van. NIVA will deliver specifications about the practical location of monitoring equipment and other details to the Chinese Authorities.

2.1.5 Water pollution abatement strategies

A water pollution abatement strategy plan will be a part of the project. The abatement strategy will be based on the results and information gathered in the the first part of the project. This information will be the basis for an evaluation of the pollution state of the river, and the evaluation of the need for improved water quality on the bases of users interests.

2.1.6 Conclusions from the Water Quality Group

The following conclusions and guidelines for further work were noted:

- The number of monitoring stations should be reduced from 8 to 5, of which one will be a mobile station.
- Replacement of the on-line phosphate monitor with a COD on-line monitor in the 3 fully equipped stations should be considered. Both the Chinese and NIVA will obtain further information about the COD monitors available on the market.
- The reduction in the number of monitoring stations, enables to prioritize a motor vehicle for the mobile station on the purchase list for the project. The Chinese Authorities will obtain further information about the it.
- Discussions on practical problems with on-line stations with Mr. Arne Veidel from NIVA were postponed until he returned from the site inspection trip.
- Details of measurement and pollution source inventory databases will be made available to the Norwegians during the Workshop.
- A list of analytical parameters, methods and instruments used by the EMCS of Heiliongjiang should be prepared and delivered during the workshop.

2.1.7 Time schedule

The future work will in coarse features follow the plans drawn in the Project Proposal. In 1997 the most important deadlines are:

- A Workshop Report covering the topics discussed and the conclusions made shall be prepared and presented three weeks befor the Beijing meeting in March.
- A list describing the instruments for purchase shall be ready for the Beijing meeting. The first draft of the list shall be prepared during December-96/January-97.
- Housing and telephone lines for the on-line stations should be ready for installation of the instruments by the edn of June 1997.

2.2 Air Quality

Participants: Mr. Yan Weiliang (H/EMCS), Mr. Liu Haiqiao (H/EMCS), Mr. Chen Yong (H/EMCS) Ms. Dong Lijie (H/EMCS) and Mr. Trond Bøhler (NILU)

The following topics were discussed :

- Emission Inventory for Harbin city.
- Air pollution situation in the Heilongjiang Province.
- Installation of a mobile monitoring unit.

2.2.1 Emission inventory for Harbin city

To better understand the source contribution to the air pollution in Harbin, an emission inventory for the city has to be performed. The emission inventory should be based on information on consumption of fossil fuels, traffic load and emissions from industry. By using local or standard emission factors for the different fuel types and vehicle classes, the source contribution to emissions to air can be estimated. The emission inventory should consist of the source distribution of SO_2 NO_x and particles from the source categories industry, transport, heating and cooking.

2.2.2 Air pollution situation in the Heilongjiang Province

The delegates from HEPB described the present air pollution situation in the province. The measuring programme consists of 6 stations in Harbin and several stations in the Heiljongjiang Province. The measurements are carried out four times a year over a period of five days and at a rate of four samples per day. In 1997 seven stations with continuous sampling of daily averages will be installed in Harbin city.

The main air pollution problem in Harbin is particles emitted mainly from coal burning for heating and cooking. The HEPB personnel will prepare a summary of their annual reports in order to describe the air pollution situation in the province.

2.2.3 Installation of a Mobile Monitoring Unit

The Project Plan included the installation in phase 3 of an on-line monitoring station in the center of Harbin city. In 1997 the Government of P. R. China will give HEPB 7 continuous monitoring units in Harbin and 46 stations in the Heilongjiang Province for measuring daily averages of SO_2, NO_2, TSP and CO.

The air quality group therefore decided to prioritize a mobile unit for direct measurements of NO_2, SO_2, and PM_{10} (particles with diameter less than 10 micrometer). It was decided that the equipment should be installed in an independent vehicle. The air pollution situation may be evaluated directly by using a PC for presentation of measurements in the mobile unit. Since the cost of the vehicle is not included in the Project Plan, the funding of this has to be clarified. The Chinese Authorities suggested to allot extra NOK 100.000 as supplementary fund for purchasing the mobile unit including the necessary vehicle from the funds saved by the reduced number of on-line monitoring stations for water quality.

2.2.4 Future work

NILU will send the following information to HEPB :

- The selected monitoring equipment
- Design of the mobile unit
- The NILU Measuring and Analysing methods of daily averages of SO_2 and NO_2

HEPB will send the following information to NILU :

- The new Governmental Air Quality guidelines for China
- Annual summary reports on emissions to air in Harbin
- Annual summary reports on air quality measurements in the Province

2.2.5 Time schedule

In the Project Plan, evaluation of air quality was a part of phases 2 and 3 with start up of the measurements in phase 3. The air quality group wants to speed up the air quality part by finishing the screening of the air pollution situation and the emission inventory in 1997. The installation of the mobile unit will be coordinated with other projects in China and will, at the earliest, be installed autumn 1997.

2.3 Information technology

Participants: Mr Torstein Skancke (Norgit center), mr Yan Weilang (H/EPB), mr. Li Jiming (H/EPB), Mr. Zhou Shuping (H/EPB).

2.3.1 Topics discussed

- Information on the Environmental Information Center visited
  - Time schedule for the project
  - Use of server and ArcInfo
  - Use of Sybase
- Brief description of the Chinese/Norwegian project
  - the different modules in the total system and the communication between them
  - the software-package from the ENSIS-group
  - the technical description and its eventually changes
  - hardware to be installed
- Information needed for the project
  - Maps.
  - Base maps 1:1 000 000
  - Base map 1:100 000 or only the riversides
  - Administrative statistical units geographically
  - Information about the river (depth, types of bottom material, a.o)
  - Location of the stations, both manual and automatic
  - Discharge points
  - Catchment areas
  - Farming areas/non arable land/cities
  - Administrative statistical units population
  - Discharge for the same units
- Other information:
  - Time schedule for the Information Technology Group
  - Chinese man resources needed
  - Further work

2.3.2 The different modules in the total system and the communication between them

The chart shown in figure 2.1 was used. The links between the different modules was discussed. The datatechnical work in each part was described.

On the presentation-module was the following question asked from the Chinese Autorities:

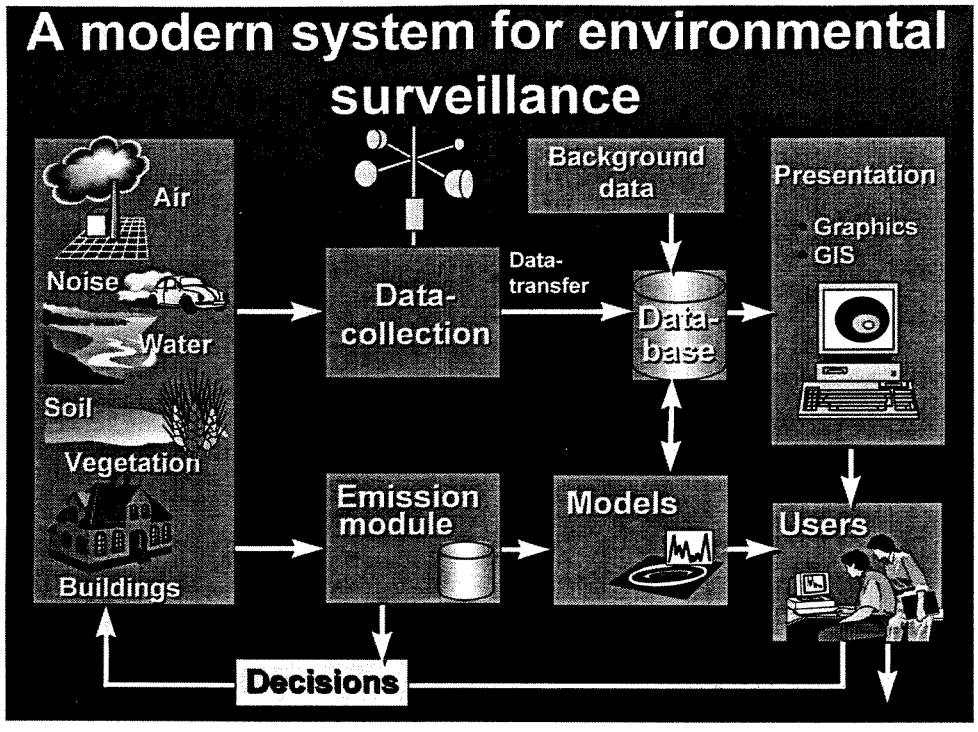


Figure 2.1. The different modules in the total system and the communication between them

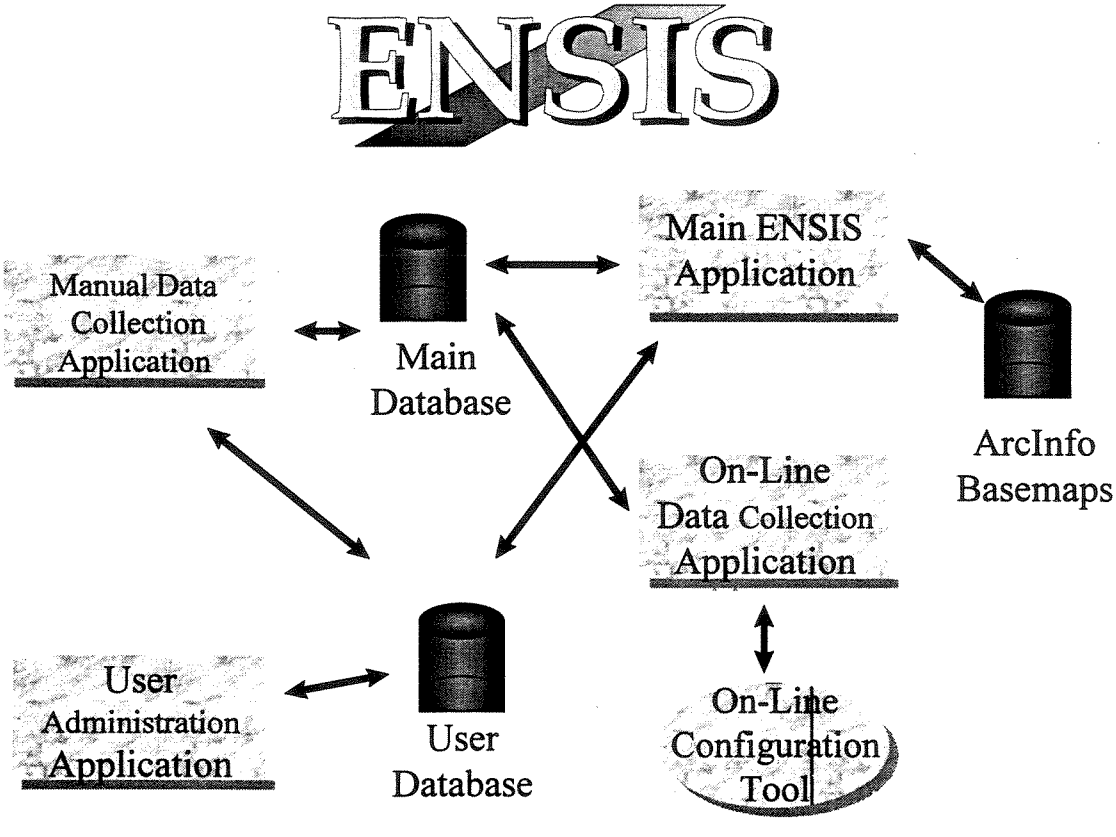


Figure 2.2. The software-package from the ENSIS-group

Should it be possible to have two different places to view the ENSIS system. I.e. one workstation at H/EPB and H/EMC (5 kilometers between the places). NORGIT should consider whether it is possible to manage this in the project. There are two possibilities:

1. To cable the two places and place a PC in H/EPB.
2. To use a telephone with dedicated 256 Kbyte-lines

There are 2 Mg-lines in Harbin. The Chinese Authorities considered the described system to be a very modern and advanced system.

2.3.3 The software-package from the ENSIS-group

The separate SW-packages were described. The possibilities for automatic check of the information and the security-system for the database were discussed.

The Norwegians wanted to use the ArcInfo equipment to produce the missing geographical data. This will be discussed by the Chinese Authorities before the data production starts.

2.3.4 The technical description and eventually changes in the hardware to be installed

The description in the proposal from NORAD was discussed. NORGIT explained that most of the equipment described was now 1,5 years old and much has happened on this technology. NORGIT, on behalf on the ENSIS-group, guarantied that the same functionality or better would be installed in Harbin. The ENSIS-group will change the UNIX Server described on the proposal to a NT-server. This represents a better solution for the Chinese Authorities as everything will be within one operative system. The training in different operative systems could then be used on the system.

The Chinese Authorities expressed the wish to get a big screen (33'' was mentioned) in H/EPB. NORGIT saw no problems with this, if the solution on two places was chosen. The quality of the very big screen is normally poor. The Chinese Authorities have inquired abou the costs, and they would be close to 35 000 NOK.

2.3.5 Data needed for the project

The system requires much data. Specification as given below.

Maps

- Base maps 1:1 000 000
  The base map at scale 1:1 000 000 is available in Chart of the World from ESRI. The possibility for chinese characteres will be checked by NORGIT.

- Base map 1:100 000 or only the riversides
  The information in the models and most of the other information is geographically oriented. This information should be displayed in scales 1:100 000 or smaller. The Chinese Authorities explained that there are no maps available in this scale. The current city-maps may be used, but they will not cover the whole river. There is an airphoto of the river in 1:10 000.

  The use of the data to construct the riversides were discussed. The best available map could then be used for the other road and city-information. The current city maps may be used, but they do not cover the whoel river. This is a problem that has to be solved if the system is to function according to the plan. The project should give priority to find a solution. The Chinese Authority

will have the responsibility to make this map, but also the Norwegians must contribute to find the best solution.

- Administrative statistical units geographically
  The information on administrative units is used to find the impact of the pollution on the river. It is only for presentation purposes in scales 1:500 000 or maybe 1:1 000 000.

- Information about the river (depth, types of bottom material, a.o)
  Information about the river has to be used as input to the models.
  It should be available.

- Location of the stations, both manual and automatic
  No problem to place this if the base map is available.

- Discharge points
  There are 75 industrypoints from HEPB, 200 from HCEMS and several hundred from the local District EMS.

- Catchment areas
  The definition of the catchment areas is available.

- Farming areas/non arable land/cities
  It is possible for the Chinese Authorities to make these data avaiable.

Statistics:

- Administrative statistical units population
  This is available

- Discharge for the same units
  This is available

- Other information:
  Sewage plants, overflow, other areas that the above data take into consideration (population and industry) will be included

2.3.6 Time schedule for the Information Technology Group

The following timeschedule was agreed:
First milestone 1 July 1997 when the database with the available data is installed.
Second milestone 1 March 1998 when the complete system is installed.
Third milestone 1 March 1999, when the revised, quality-checked system is installed.

2.3.7 Chinese man resources needed

The Chinese Authorities explained the system would require 8 persons, although it would be possible to manage with maybe 5-6 persons. ENSIS suggested that these man resources should be supervisors for different major tasks in the system. The following distribution of tasks is proposed:

- ENSIS (who should have a major responsibility for solving the scientific problems the users with less experience will face)
- 1 superengineer (who should have responsibility for the technical use of the system)
- 1 dataresponsible (who should quality-check the data and the aggregate the data)

- 1 mapping responsible (who should maintain the geographical data and head the work of imporoveing the data)
- 2 manual data responsible (who should enter and maintain tha data from the different sources and laboratories into the system)
- 1 on-line-data inspector (who should check the instruments loggers and the data produced)
- 1 extra systems engineer (who should ensure that there is always a system responsible present)

2.3.8 Further work within the IT part of the project

The information on the datamodel from the inhouse Foxpro base should be delivered during the workshop.

The other data should be delivered as follows:

Base maps 1:1 000 000	To NORGIT in January 1997
Base map 1:100 000 or only the riversides	At the latest a HEPB in Dec. 1997
Administrative statistical units geographically	To HEPB in Sept. 1997
Information about the river	To HEPB in Dec. 1997
Placement of the stations, both manual and automatic	To HEPB in February 1997
Discharge points	To HEPB in February 1997
Catchment areas	To HEPB in Sept. 1997
Farming areas/non arable land/cities	To HEPB in Sept 1997
Statistics:	
Administrative statistical units population	To HEPB in Sept. 1997
Discharge for the same units	To HEPB in February 1997
Other information:	To HEPB in Sept 1997

3. Inspection trip to water monitoring sites

During the time when the main part of the ENSIS-group had Workshop discussions in Harbin, two members of the ENSIS-group went on an inspection trip together with Chinese colleagues to decide sites for on-line monitoring of water quality within the Heilongjiang Province. High prioroty has been given to the drinking water inlets in the province, and these stations were the first to be visited by the inspection group. A map showing the new monitoring sites and the places visited during the trip is given in Appendix E.

3.1 Qiqihar

The monitoring site is a drinking water inlet situated upstream of the city of Qiqihar. The station will be located at the water treatment plant. Raw water will be supplied to a faucet in the station. Instrumentation will comprise a full station including pH, conductivity, temperature, oxygen, turbidity, nitrate, ammonia, phosphate and TOC (TOC may be replaced by COD).

The station is well located and should not present any technical problems. Analytical solutions for the instruments can be prepared by the treatment plant lab.

Contact person is Vice Director Manager Engineer from the Qiqihar Environmental Protection Bureau: Senior Engineer Zhang Dewen.

3.2 Harbin

The monitoring station is a full station situated at the local water treatment plant.

Due to road work, the water treatment plant was not accessible. We need more information to proceed with this site.

The water treatment plant will be responsible for site operation and analytical solutions for the instruments.

Contact person is Department Director & Senior Engineer Mr Li Guiyou of the Harbin Province Environmental Protection Bureau.

3.3 Mudanjiang.

The monitoring station at Mudanjiang is a reduced station comprising pH, conductivity, temperature, oxygen, turbidity and ammonia. For technical reasons, we were not able to access the water treatment plant. It is an open question whether we will be able to locate the station at the water treatment plant which is normally the most cost efficient solution. The alternate location is in the hydrographic station opposite the plant.

The contact person is Bureau Director Senior Engineer Li Tingzhang of the Environmental Protection Bureau of Mundanjiang City, Heilongjiang. Chief Director Dr. Ing. Guo Qingyuan, will be responsible for site operation.

3.4 Zhao Yuan

The first planned Zhaoyan station was visited and evaluated as a possible reduced station, located at the water laboratory. The location of the site was evaluted as not ideal with respect to sample availability. After later suggestions from the Chinese Authoriteis this station was taken out of the programme.

3.5 Jiamusi

In Jiamusi a reduced station is planned, located at the local water treatment plant.

Due to weather conditions (blizzard), this station was inaccessible.

3.6 Mobile water monitoring station

The Mobile station is a full station mounted as a movable laboratory. The Environmental Protection Bureau of Heilongjiang Province (HEPB) although located in Harbin, will manage the station and have the possibility to use it all over the province. HEPB would like to equip the mobile station in a trailer with a separate motor vehicle.

4. Adjustment of funding

It has been suggested to make some changes in relation to adjustment in fund allocation in the original project plan. Under the condition that the total funding is fixed, the Chinese Authorities has suggsted that the funds saved by the reduced numbers of on-line stations will be alloted according to the following order of priority:

(1) A motor vehicle for the mobile water quality monitoring station. (Approximately NOK 500.000)
(2) Supplementary fund for the mobile air quality monitoring unit. (Approximately NOK 100.000)
(3) Supplementary fund for the expences needed for the procurement and training in Norway of the Chinese side. (Approximately 300.000 NOK)

Unprioritised:
(a) Long range communication line between H/ERB + H/EMCS

5. Signing of contract

NIVA and H/EPB have, after detailed discussions come to agreement on a contract for the Project (Appendix F). A signing ceremony was held 21 November 1996 in Harbin, Heilongjiang. The delegation of Norwegian experts were received by Ms Ma Shujie, Deputy-Govenor of Heilongjiang Province. Copies of the signed contract are submitted respectively to SSTC and NORAD for approval. The Sino-Norwegian Cooperative Project will enter into force shortly there after. Both the Chinese and Norwegian participants at the meeting expressed strongly their will to succeed with the Project.

6. Questions that need further discussion

The Chinese Authorities wishes to see an increase in the number of the Chinese experts who will go to Norway for procurement and training, because of the need for a translator and procurement administrating relevant experts. Relevant expenses are then to be paid from the Norwegian grant. The NIVA representative will transfer this request to NORAD for consideration.

7. Future work

Based on the discussion of this workshop, a detailed workplan will be prepared for the NORAD, SSTC, NIVA and H/EPB consultation meeting to be held in Beijing 4March 1997. Three weeks before this meeting a detailed workplan will be presented.The Chinese and the Norwegian partners agreed that they will cooperate to complete the workplan required by the Beijing consultation meeting in 1997 in time.

8. Conclusions

During the visit the Project participants met good will from the Heilongjiang Province Authorities and the City of Harbin. The Norwegian participants experienced a cooperative spirit both from the EPB and EMCS of Heiliongjiang, and the EPB and EMCS of Harbin. All meetings with these organisations were organised in an excellent way and characterised by a professional and friendly spirit.

It was decieded:

1. To co-operate in the preparations for the consultation meeting in Beijing.

2. The number of on-line monitoring stations for water quality should be reduced from 8 to 5, of which one will be a mobile station.

3. Replacement of the on-line phosphate monitor with a COD on-line monitor in the 3 fully equipped stations should be considered.

4. The reduction in the number of water quality monitoring stations, enables to prioritize a motor vehicle for the mobile water quality station on the purchase list for the project. The Chinese side will obtain further information about the equipment.

5. To complete housing and telephone lines for the various on-line water quality monitoring stations before end of June 1997.

6. To complete and test run all the on-line water monitoring stations before 31 December 1997

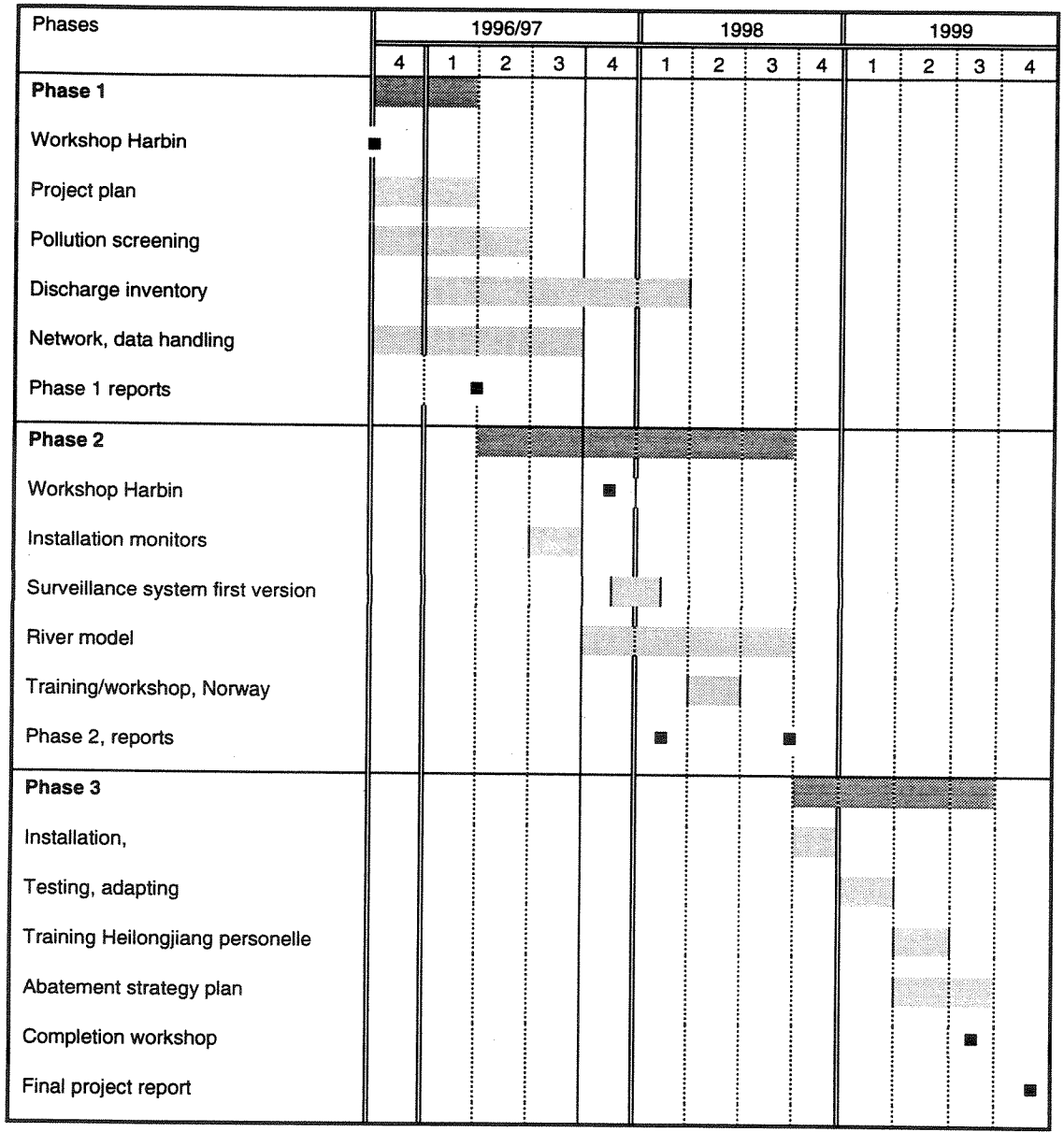
7. To deliver the data and information between the partners after the time schedules given in this report under the summaries from the working groups in chapter 2.

8. To deliver the automatic air monitoring van before 1 November 1997.

9. Work Plan

The following time schedule is presented for each of the three phases and tasks described in chapter 5 in the Project Proposal. Plans are made for a three years project starting autumn (4 quarter) 1996. A more detailed work plan is prepared as a separate document.

Table 9.1. Time schedule.



Appendix A.

Project Organisation and List of Contact Persons

The Project Organisation for The Surveillance of Water Quality in the Songhua River in Heilongjiang Province, China

As stated in the Agreement between The State Science and Technology Commission (SSTC) and The Norwegian Agency for Development Cooperation (NORAD), SSTC will have the overall responsibility for the project "Surveillance of Water Quality in the Songhua River in Heilongjiang Province, China". SSTC will delegate responsibility for the implementation of the project to the project partners in Heilongjiang; i.e. Heilongjiang Environmental Protection Bureau (H/EPB) and Heilongjiang Environmental Monitoring Central Station (H/EMCS). H/EPB has entered into a contract with Norwegian Institute for Water Research (NIVA) on behalf of the ENSIS syndicate consisting of NIVA, Norwegian Institute for Air Research (NILU) and NORGIT Centre for implementation of the project.

The suggested project organisation is built on the descriptions given in Chapter 8: Organisation and personnel in the Project Proposal. There it is proposed that the the project organisation should include:

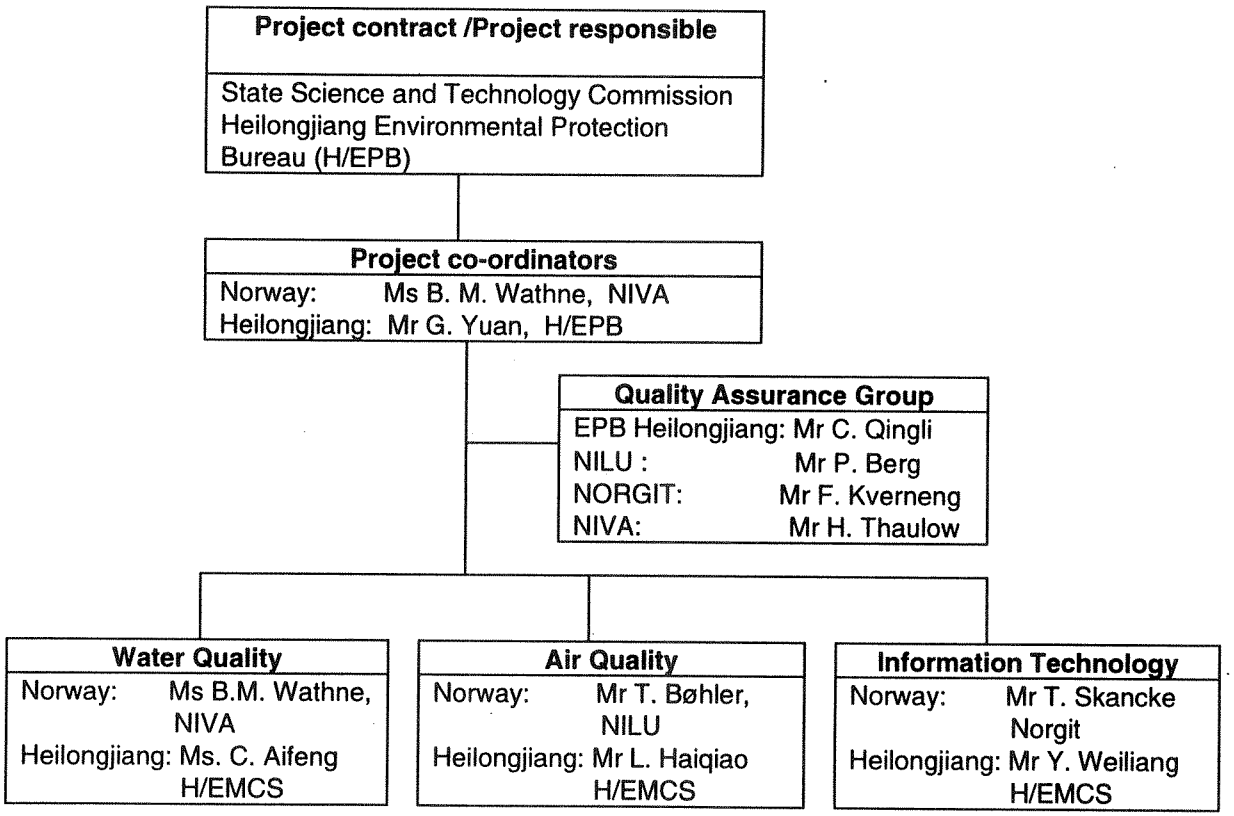
- A quality Assurance Group (QAG) consisting of personelle from NORAD and the collaborating institutions which do not participating in the project work.

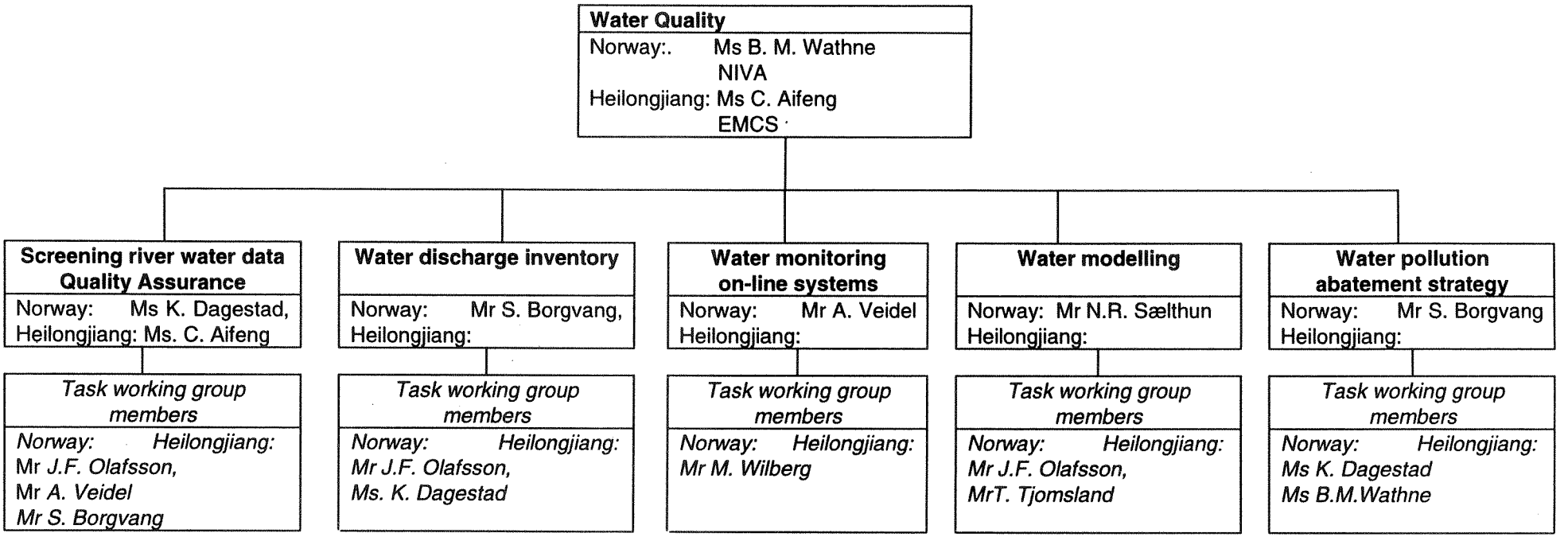
- The Project Groups in Heilongjiang and Norway, consisting of one person from each institute/sector.

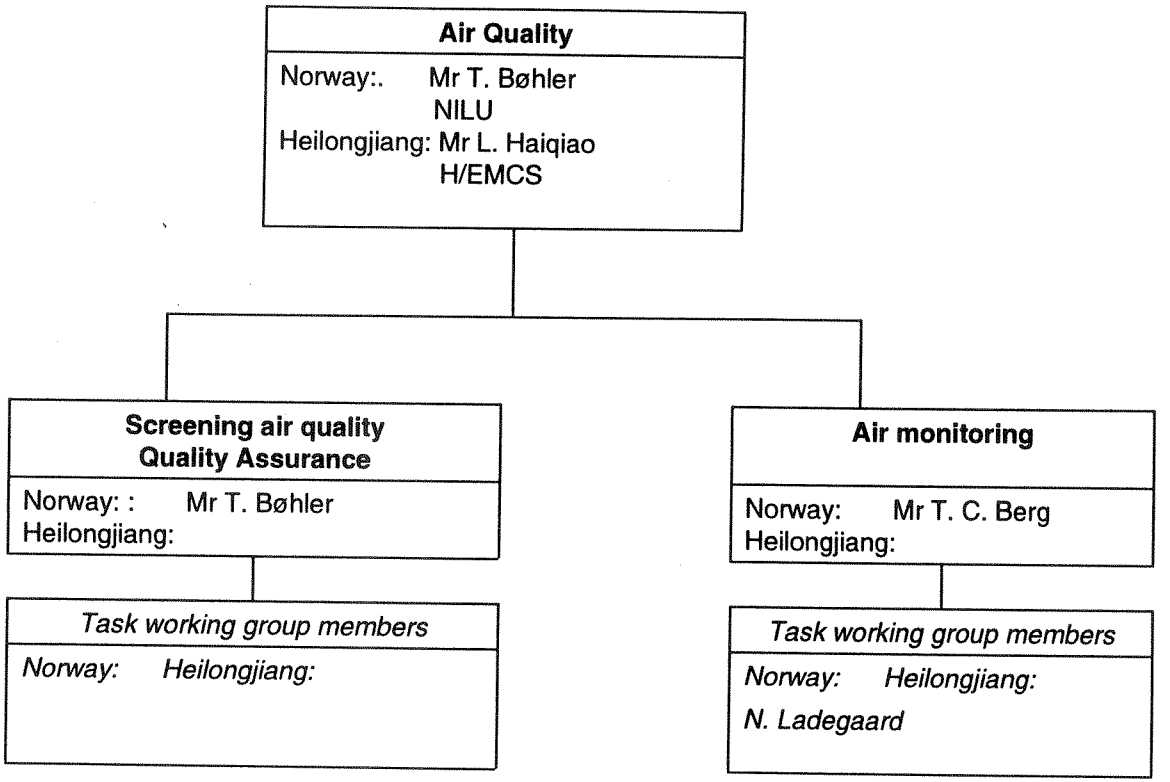
- The Task Working Groups, consisting of the staff/scientists in Heilongjiang Province and Norwegian Institutions actually contributing to the task.

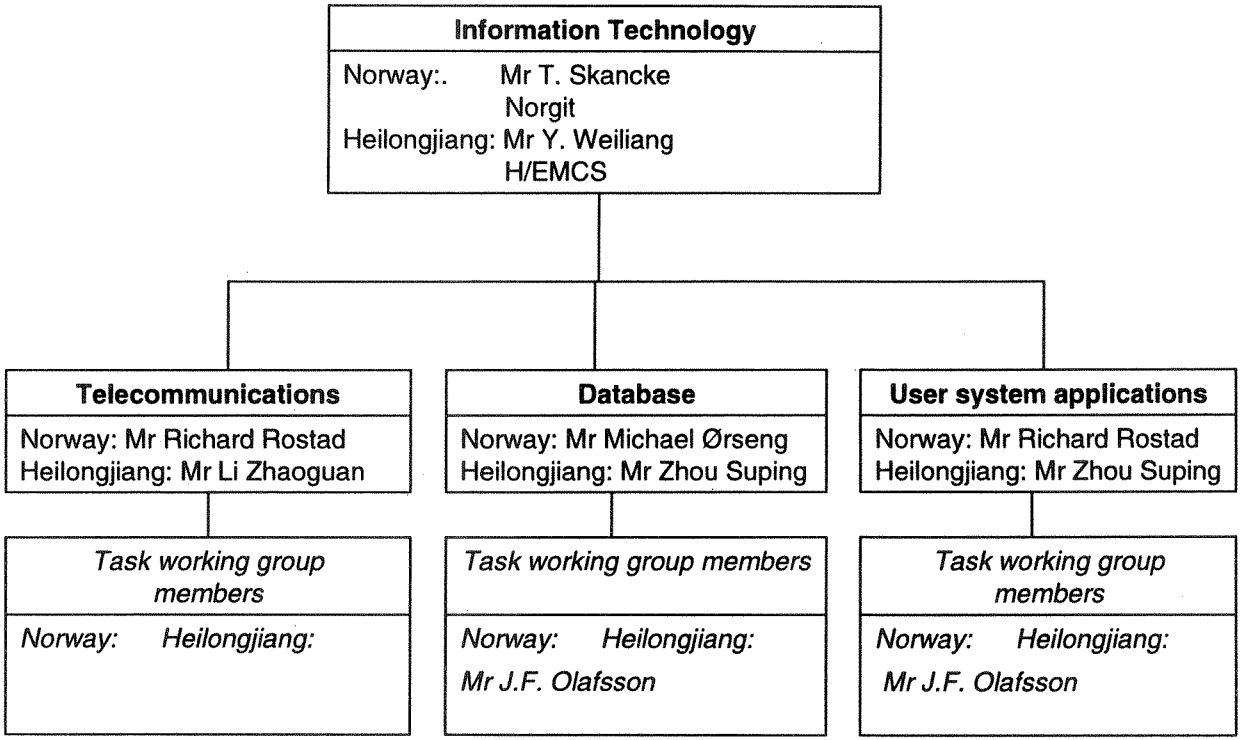
On this basis of organisation charts shown on the following pages have been drawn.

The Project Organisation for
The Surveillance of Water Quality in the Songhua River in Heilongjiang Province, China




Water Quality
Norway:. Ms B. M. Wathne
NIVA
Heilongjiang: Ms C. Aifeng
EMCS
Screening river water data Quality Assurance
Norway: Ms K. Dagestad,
Heilongjiang: Ms. C. Aifeng
Task working group members
Norway: Heilongjiang:
Mr J.F. Olafsson,
Mr A. Veidel
Mr S. Borgvang
Water discharge inventory
Norway: Mr S. Borgvang,
Heilongjiang:
Task working group members
Norway: Heilongjiang:
Mr J.F. Olafsson,
Ms. K. Dagestad
Water monitoring on-line systems
Norway: Mr A. Veidel
Heilongjiang:
Task working group members
Norway: Heilongjiang:
Mr M. Wilberg
Water modelling
Norway: Mr N.R. Sælthun
Heilongjiang:
Task working group members
Norway: Heilongjiang:
Mr J.F. Olafsson,
MrT. Tjomsland
Water pollution abatement strategy
Norway: Mr S. Borgvang
Heilongjiang:
Task working group members
Norway: Heilongjiang:
Ms K. Dagestad
Ms B.M.Wathne


Air Quality
Norway:. Mr T. Bøhler
NILU
Heilongjiang: Mr L. Haiqiao
H/EMCS
Screening air quality
Quality Assurance
Norway: : Mr T. Bøhler
Heilongjiang:
Task working group members
Norway: Heilongjiang:
Air monitoring
Norway: Mr T. C. Berg
Heilongjiang:
Task working group members
Norway: Heilongjiang:
N. Ladegaard



SSTC = State Science and Technology Commission
H/EPB = Heilongjiang Environmental Protection Bureau
H/EMC = Heilongjiang Environmental Central Monitoring Station

List of contact persons for Surveillance of Water Quality in the Songhua River, Heilongjiang Province, China

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Mr. Guo Yuan	Director of Foreign Cooperation Div. of H/EPB	+ 86 451 2331019	+ 86 451 2331247
Ms Lin Shuojie	Senior Engineer of Pollution Monitoring Div. of H/EPB	+ 86 451 2331219	+ 86 451 2331247
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Ms. Chen Aifeng	Vice-chief of H/EMCS	+ 86 451 7671856	+ 86 451 7673422
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Mr. Chen Jiahou	Engineer at Comprehensive Tech. Div. of H/EMCS	+ 86 451 7681003	+ 86 451 7673422
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Mr. Stig A. Borgvang	Research Scientist, Research Dep. for Freshwater, NIVA	+ 47 22 185 107	+ 47 22 185 200
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Mr. Torulv Tjomsland	Research Scientist, Research Dep. for Freshwater, NIVA	+ 47 22 185 155	+ 47 22 185 200

Name	Position/Institution	Telephone	Fax
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Mr. Tor C. Berg	Head of Instrumentation Dep., NILU	+ 47 63 898 000	+ 47 63 898 050
Mr. Nils Ladegaard	Engineer, Instrumentation Dep., NILU	+ 47 63 898 000	+ 47 63 898 050
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Mr. Torstein Skancke	Managing Director, NORGIT	+ 47 63394801	+ 47 63 394910
Mr. Richard Rostad	Senior consultant, NORGIT	+ 47 63394800	+ 47 63 394910
Mr. Michael Ørseng	Senior consultant, NORGIT	+ 47 63394800	+ 47 63 394910
Ms. Tori Nettelhorst Tveit	Senoir Executive Officer, NORAD	+ 47 22 314312	+ 47 22 314484
Mr. Semund Haukland	Consultant, NORAD	+ 47 22 314514	+ 47 22 314401

- H/EPB = Heilongjiang Provincial Environmental Protection Bureau
  No. 6 Hengshan Road, St Xiangfang Dist.
  Harbin, 150036 Heilongjiang Province
  P.R. China

- H/EMCS = Heilongjiang Environmental Central Monitoring Station
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  P.R. China

- NIVA = Norwegian Institute for Water Research
  P.B. 173, Kjelsås, 0411 Oslo
  Norway

- NILU= Norwegian Institute for Air Research
  P.B. 100, 2007 Kjeller
  Norway

- NORAD
  P.B. 8034 Dep., 0030 Oslo
  Norway

- NORGIT
  P.B. 229, 1601 Fredrikstad
  Norway

Appendix B.

Workshop Programme

SCHEDULE FOR NORWEGIAN DELEGATION

一、Consulting Group

Date	Time	Spot	Activity	Participator
17th, Nov. Sunday	14:10	Airport	Greet Nor.Visitors	Mr.Guo Yuan.Ms.Chen Aifeng Mr.Chen Yong and six Nor. visitors
	15:40	Swan Hotel	Check in	Same as above
	16:00	Swan Hotel	Discuss about the schedule	Same as above
	18:00	Western Food Restaurant in Swan Hotel	A banquet for greeting	Mr.Li Wei Xiang .(Chief) Mr.Wang Jing chun (Vice Chief) and those as above
18th, Nor. Mondag	8:40	Swan Hotel	Meet Nor. Guests	Mr.Chen Yong
	9:00	The fifth floor meeting room in H/EPB	Hove a meeting	Chiefs of H/EPB Nor. guests
	9:00	Informatiom cemter of H/EPB	Inspecting the center	Nor.guests
	9:30	The third floor meeting room in H/EPB	1)Brief introduction of project plans 2)Organezafion of project 3)Main svbjects of the working fasks	Mr.Li(Chief),Mr.Wang(Vice-chief),Mr. Cheng Qing Li.Mr.Yan Weiliang Ms.Chen Aifeng four Nor.guests Mr.Jiang Dexiang and Chen Youg
	12:00	Dinning-hall in H/EPB	Working lunch	Same as above
	13:30	The third meeting room in H/EPB	1)Identificafion of the responsibilities 2)Draft a contract 3)The conditions of the contract 4)The responses from chinese side	Mr.Wang (Vice-chief) Mr.Chen Qingli Ms.Chen Qifeng Mr.Jiang Dexiang Mr.Chen Yong and four Nor. guests.
	17:30	Same as above	Call it a day	Mr.Guo Yuan
	18:00	Hua Mei Reataurant	Have a dinner	Mr.Chen Yong and Nor. gucsts.

Time	Spot	Activity	Participator
19th, Nov Tuesday 8:40 9:00	Swan Hotel 1. The fifth-floor meeting room 2. The fourth meeting room 3. The fourth meeting room	meet the Nor guests 1. meeting mith Chinese scientists on seperate fields 2. Detailed organizatian of personnel	1. Water Quality Group Mr. chen Qing li Mr. chen Aiteng the group from water science division of H/IEMCS Interpreter: Mr. Jiang Dexing Mr. Bente Wothne Mr. Finnur Olafsson 2. Air Qulity Group: Mr. Yan Wei Liang the air science division of H/EMCS Mr. Tromd Bohle Interprcter: Mr. Chen Yong 3. Info. Group: Mr. Li Jiming Mr. Zhou Shuping Mr. Li zhao quan Interpreter: Mr. Nie zhang Yi Mr Torstin Skancke
12:00 13:30	Dinning hall in H/EPB Same as those in the morning	working lunch 1. Dscussing in 3 working groups : a. Water Quality. b. Air Quality c. Information Tech.	Same as above Same as above
17:30 18:00	H/EPB Western food restauran t in Swan Hotel	The meeting is over and sending back the Nor. guests to the Hotel. Have a dinner	Mr. Chen Yong Nor. guests
20th Nov Wednesda y 8:40 9:00 12:00	EPB of Harbin meeting room Harbin	meet the Nor. guerts Inspecting the monitorin g point in Harbin Consulting about the on-line monitoring points of water quality and air pollution Working lunch	Nor. visitors Mr. chen Qing Li Mr. Guo Yuan Mr. Chen Yong and the related persone of Harbin

Date	time	Spot	Activity	Participater
	13:30	Meeting room	Same as those in 19th afternoon	Same as those on 19th, Nor
	17:30	Same as above	The meeting is over and Mr.Chen Yong send the Nor. group back	Mr. Chen Yong
	18:30	Harbin	Have a banquet	Mr. wang (Vice chief Mr. Chen Qing Li Mr. Guo Yuan Mr. Yang Weiliang, Mr. Chen Aifong Mr Chen Yong and the related presonels from EPB of Habin
21th, Nov., Thursday	8:40	Swan Hotel	Meet Nor. guoup	Mr. Chen Yong
	9:00	Meeting room in H/EPB	A meeting on Revision of working plan.	Nor. group Mr. Mr.Li(Chief),Mr.Wang (Vice-Chief), Mr. Guo Yuan,
	12:00	Dinning hall in H/EPB	Working lunch	Mr Chen Qing Li, Mr. Yan Weiliang
	13:00	Meeting room in H/EPB	Go on the meeting	Same as above
	16:00	The fifth floor meeting room in H/EPB	Mr. Ma(Vice-governor of HLJ Prov.)will meet the Nor group	Ms Ma(Vice-governor of HLJ Prov),Mr Zhao (Chief Secretary off HLJ Prov) Mr. Li Wei Xiang Mr. Wang Jing Chun Mr. Nie Zhang Yi Mr. Chen Qingli
	17:00	Same as above	signing the contract	Mr. Chen Qingli Ms.Chen Aifeng Mr. Guo Yuan Mr. Zhou Shuping Mr. Chen Yong
	18:00	Swan Hotel	Have a banquet for farewell	Same as above
	20:00	H/EPB	Send Nor. growp back to the Hotel	Mr. Chen Yong

Date	time	Spot	Activity	Participater
22th, Nor., Tharsday	9:00	Swan Hotel	Meet Nor. guests	Mr. Chen Yong
	9:30	Confusian Museum	go sightseeing and Shopping	Nor. guests, Ms. Chen Aifeng
	11: 00	Brownie Fast Food	lunch	Same as above
	11:30		Back to Swan Hotel	Mr. Chen Yong
	11:40		Have a break	
	12:30		go to the airport to see off the Nor. growp	Mr. Guo Yuan Ms. Chen Aifeng, Mr. Chen Yong
	14:20	Airport	fly to Beijing	Nor. growp

二、Site inspecting group: Mr Arwe Vevdel Mr Richord Rostod
Escorting personel: Ms. Lin Shujie and interpreter.

Time	Spot	Activity	Tren portation	Accommodation
18th, Nov. 13:30 17:00 18:30	Harbin Qiqihar Qiqihar	Head for Qiqihar Arrive in Qiqihar Have a banquet for greeting	Car	Hu Bin Hotel
19th, Nov. 8:30 12:00 13:30 18:00	Qiqihar Same as above	Inspecting monitoring Points Lurch Visit Zha Long National reservation Have a dinner	Car	Hubin Hotel
20th, Nov. 7:30 12:00 14:30 18:30	Qiqihar ZhaoYuan ZhaoYuan Harbin	Head for Zhao Yuan Town Inspecting Monitoring points after lunck Back to Harbin Attend the banquet in Harbin	Car	Swan Hotel
21th, Now. 9:00 12:00 13:30	Harbin	Inspecting the moniforing points in Harbin Back to H/EPB after lunch attend meeting for exchang of ideas and the rite of signing the cortract	Car	Swan Hotel
22th, Now	Harbin	Go back to Beijing		

Appendix C.

List of chemical parametres, analytical methods and instrumentation used at H/EPB

The monitoring items and methods of surface water

order	item	method	instrument
1	PH	Electode	PH meter
2	SS	Weight	
3	Total Hardness	EDTA titrimetric	
4	Conductivity	conductivity gauge method	Conductivity gauge
5	DO	Iodometric method	
6	COD_{Mn}	Acid potassium permanganate	
7	BOD_5	Dilution and seeding	Biochemicae seeding box
8	NH_3-N	Nessler's reagent colorimetric	722 spectrumeter
9	NO_2-N	.N-(1-naphthy)-1-ethylenediamine	722 spectrumeter
10	NO_3-N	Phenol disulfonic acid,or IC	722 spectrumeter,or IC
11	Volatile phenol	4 -AAP spectrophotometery	〃
12	CN	Iso-nicotinic acid pyrazolone	〃
13	As	Silver diethyldithiocarbamate spectrophotometric	〃
14	Hg	Cold atomic absoption	mercury analysis instrument
15	Cr^{6+}	Diphenylcor bohgdrazide spectrophotometric	722 spectrumeter
16	Pb,Cd	AAS	AAS
17	Oil	Ultra-spectrophotometric,or weight	751 ulfra-spectrumeter
18	T		Tmeter

Data statistic method

A. Data statistic method for surface water

The following table show you the water quality statistic index

index	by water date	by year
Total sample	the total analytical sample of a post during the whole date	the total analytical samtple of a post during the whole yeat
average value	the sum of determining value of a post during a date / the total sample of the post during the date	The arithmetic mean of determining value of a post during all date in a year are calculated averagely in the same right
maximum (minimum)	the maximum (minimum) of the determinimg value of a post during a date	The maximum (minimum) of the determining value of a post during a year
The over standard multiple of max	(the maximum of determinimg vaue of a post during a date / standrd of surface water) − 1	(The maximnm in a year / standard of surface water) − 1
The rate of over standard	(the over standard sample times of a post during a date / the toatl samples of a post during a date) × 100%	(The over standard sample times of a port during a year / The total samples of a post during a year) × 100%

attention: The average value of total bacreria and colibacillus group used here is geometrical mean. The function is:

$$\overline{C}=\sqrt[n]{\prod_{i=1}^{n} C_i}$$

where: $\overline{C}$ —— geometrical mean;

C_i —— determining value;

n —— the time of monitoring.

B. Calculation of evaluation index

1. integrated pollation index of surface water:

$$P_j=\sum_{i=1}^{n}P_{ij}$$

$$P_i=\frac{C_{ij}}{C_{io}}$$

where: P_j——water pollution integrated index of post;

P_{ij}——i item pollutant pollution index of j post;

C_{ij}——the average value of i item pollutant of j post;

C_{io}——The evluation standard of i item pollutant;

n——the number of pollutant used in evaluation.

2. reponsibility rate of pollution:

$$K_i=\frac{P_{ij}}{P_j}\times 100\%=\frac{P_{ij}}{\sum_{i=1}^{n}P_{ij}}\times 100\%$$

where: K_i——responsibility rate of the total pollutants of a post;

P_{ij}, P_j, n see above.

3. Pollution load rate

$$K_j=\frac{P_j}{\sum_{j=1}^{m}P_j}\times 100\%$$

where: m——the number of post used in evaluation;

K_j——pollution load rate of j post.

4. Ouantitative analysis of pollution tendency

The method of tendency examination are decided by the requirment. The usual method we recommended is the method of *Spearman* order inter-rdlatded coefficient.

Appendix D.

Description of the database and pollution source inventory of Heilongjiang Province

The Database Structure for Lake

	Field_Name	Type	Width	Dec		
1	[illegible]CODE	Numeric	6		字段含义	field meaning
2	[illegible]	Numeric	2		测站代码	monitoring station code
3	[illegible]CODE	Numeric	3		年度	year
4	[illegible]	Numeric	2		垂线代码	vertical code
5	[illegible]	Character	1		采样点代码	~~post~~ sampling site code
6	[illegible]	Numeric	2		水期代码	water date code
7	[illegible]	Numeric	2		月	month
8	PH	Numeric	5	2	日	day
9	W_SUS	Numeric	8	1	pH	pH
10	HD	Numeric	7	2	悬浮物	SS
11	TRANSP	Numeric	3		总硬度	Hardness
12	DO	Numeric	5	2	透明度	transparency (or. diaphaneity)
13	CODMN	Numeric	7	2	溶解氧	DO
14	BOD5	Numeric	7	2	高锰酸盐指数	MnO_4^{2-} index (COD_{Mn})
15	N_TOTAL	Numeric	6	3	生化需氧量	BOD_5
16	NH3_N	Numeric	8	4	总氮	total nitrogen (T-N)
17	NO2_N	Numeric	6	3	非离子氨	non-ion ammonia
18	NO3_N	Numeric	6	2	亚硝酸盐	NO_2-N
19	[illegible]	Numeric	7	3	硝酸盐	NO_3-N
20	CN_TOTAL	Numeric	6	3	挥发酚	volatile phenol
21	AS_TOTAL	Numeric	6	3	总氰化物	T-CN
22	HG_TOTAL	Numeric	8	5	总砷	T-As
23	CR6	Numeric	7	3	总汞	T-Hg
24	PB_TOTAL	Numeric	7	3	六价铬	Cr^{6+}
25	CD_TOTAL	Numeric	8	5	总铅	T-Pb
26	P_TOTAL	Numeric	6	3	总镉	T-Cd
Total			142		总磷	T-P (total phosphous)

	Name	Type	Width	Dec		
1	[illegible]	Numeric	6		字段含义	field meaning
2	[illegible]	Numeric	2		测站代码	monitoring station code
3	[illegible]	Numeric	3		年度	year
4	[illegible]	Numeric	2		垂线代码	vertical code
5	[illegible]	Character	2		采样点代码	sampling site code
6	[illegible]	Numeric	2		水期代码	water date code
7	[illegible]	Numeric	2		月	month
8	[illegible]	Numeric	3		日	day
9	[illegible]	Numeric	14	4	项目代码	item code
Total			37		监测值	value (determining data)

The Database Structure for Surface Water (River)

Field Name	Type	Width	Dec	字段含义	field meaning
STCODE	Numeric	6		测站代码	monitoring station code
YE	Numeric	2		年度	year
RSCODE	Numeric	3		断面代码	post code
SAMPH	Numeric	2		水平向代码	horizontal (level) code
SAMPR	Numeric	2		垂直向代码	vertical code
RSC	Character	1		水期代码	~~ds~~ water date code
MON	Numeric	2		月	month
DAY	Numeric	2		日	day
W_TEMP	Numeric	4	1	水温	water temperature
WD	Numeric	5	2	水深	water depth
WQ	Numeric	7	1	流量	flow
PH	Numeric	5	2	pH	pH
W_SUS	Numeric	8	1	悬浮物	SS
HD	Numeric	7	2	总硬度	total hardness
DO	Numeric	5	2	溶解氧	DO
CODMN	Numeric	7	2	高锰酸盐指数	MnO_4^- index (COD_{Mn})
BOD5	Numeric	7	2	生化需氧量	BOD_5
NH4_N	Numeric	8	3	非离子氨	non-ion ammonia
NO2_N	Numeric	6	3	亚硝酸盐	NO_2-N
NO3_N	Numeric	6	2	硝酸盐	NO_3-N
V_PHEN	Numeric	7	3	挥发酚	volatile phenol
CN_TOTAL	Numeric	6	3	总氰化物	T-CN
AS_TOTAL	Numeric	6	3	总砷	total As
HG_TOTAL	Numeric	8	5	总汞	total Hg
CR6	Numeric	7	3	六价铬	Cr^{6+}
PB_TOTAL	Numeric	7	3	总铅	total Pb
CD_TOTAL	Numeric	8	5	总镉	total Cd
OILS	Numeric	6	2	石油类	oil
COND	Numeric	7	1	电导率	conductivity
		158			

Field Name	Type	Width	Dec	字段含义	field meaning
STCODE	Numeric	6		测站代码	monitoring station code
YE	Numeric	2		年度	year
RSCODE	Numeric	3		断面代码	post code
SAMPH	Numeric	2		水平向代码	horizontal code
SAMPR	Numeric	2		垂直向代码	vertical code
RSC	Character	2		水期代码	water date code
MON	Numeric	2		月	month
DAY	Numeric	2		日	day
ITEM	Numeric	3		项目代码	item code
VALUE	Numeric	14	4	监测值	value (determining data)
		39			

~~Mention: in the table, change the~~

The Database Structure for Industrial Pollution Source

DBF	FIELD NAME	FIELD TYPE	FIELD LEN	FIELD DEC	字段含义 field meaning	单位 unit	ZDDM	JC
[illegible]	[illegible] U01	C	8	0	企业代码 enterprise code			
[illegible]	[illegible] U02	N	2	0	年度 year			
[illegible]	[illegible] U03	N	9	2	年用水总量 amount of using water	万吨/年		1
[illegible]	[illegible] U04	N	9	2	城市自来水 running water of city	万吨/年		
[illegible]	WR06 U05	N	9	2	地面水 surface water	万吨/年		
[illegible]	WR06 U06	N	9	2	井水 well water	万吨/年	1.0×10⁴ Ton/year	
[illegible]	WR06 U07	N	9	2	海水 seawater	万吨/年		
[illegible]	WR06 U08	N	9	2	其它 the other	万吨/年		
[illegible]	WR06 U09	N	9	2	重复用水量 repeating used water	万吨/年		1
[illegible]	WR06 U10	N	9	2	生产用水总量 the total damand of productive water using	万吨/年		1
[illegible]	WR06 U11	N	9	2	城市自来水 running water of cities	万吨/年		
[illegible]	WR06 U12	N	9	2	地面水 surface water	万吨/年		
[illegible]	WR06 U13	N	9	2	井水 well water	万吨/年		
[illegible]	WR06 U14	N	9	2	海水 seawater	万吨/年		
[illegible]	WR06 U15	N	9	2	其它 the other	万吨/年		
[illegible]	WR06 U16	N	9	2	重复用水量 repeating using water	万吨/年		1

DBF	FIELD_NAME	FIELD_TYPE	FIELD_LEN	FIELD_DEC	字段含义 field meaning	单位 unit	ZDDM	JC
[illegible]	[illegible] U01	C	8	0	企业代码 code of enterprise			
[illegible]	[illegible] U02	N	2	0	年度 year			
[illegible]	[illegible] U03	C	4	0	废水类型代码 type of waste water			
[illegible]	[illegible] U04	N	9	2	废水年排放量 amount of waste water discharge yearly	万吨/年		1
[illegible]	[illegible] U05	N	9	2	需处理量 amount to be treated	万吨/年		0
[illegible]	[illegible] U06	N	9	2	经处理量 amount of existing treat	万吨/年	1.0×10⁴ Ton/year	
[illegible]	[illegible] U07	N	9	2	经处理达标量 amount of ~~[illegible]~~ being treated which meet the standard	万吨/年		
[illegible]	[illegible] U08	N	8	2	总达标量 total amount which meet the standard	万吨/年		1

FIELD_NAME	FIELD_TYPE	FIELD_LEN	FIELD_DEC	字段含义 field meaning	单位 unite	ZDDM JC
U01	C	8	0	企业代码 enterprise code		
U02	N	2	0	年度 year		
U03	N	2	0	排放口编号 number of discharge site		
U04	N	4	0	废水年排放时数 hours of waste water discharge yearly	小时/年 hourse/year	
U05	N	9	2	废水年排放量 amount of waste water discharge yearly	万吨/年 1.0×10^4 Ton/year	
U06	N	8	1	悬浮物 SS	吨/年	
U07	N	8	1	化学耗氧量 COD_{Cr}	吨/年	
U08	N	8	1	生化耗氧量 BOD_5	吨/年 Ton/year	
U09	N	7	4	汞 Hg	吨/年	
U10	N	7	3	镉 Cd	吨/年	
U11	N	8	3	铅 Pb	吨/年	
U12	N	8	3	六价铬 C_rH	吨/年	
U13	N	8	3	砷 As	吨/年	
U14	N	8	3	挥发酚 volatile phenol	吨/年	
U15	N	8	3	氰化物 C_N	吨/年	
U16	N	8	2	石油类 oil	吨/年	
U17	N	8	2	硫化物 S^{2-}	吨/年	
U18	N	8	2	氨氮 NH_3-N	吨/年	
U19	C	2	0	污染物代码1 code I of pollutant	III	
U20	N	8	3	排放量 amount of discharge	吨/年	
U21	C	2	0	污染物代码2 code II of pollutant	III	
U22	N	8	3	排放量 amount of discharge	吨/年	
U23	C	2	0	污染物代码3 code III of pollutant	III	
U24	N	8	3	排放量 amount of discharge	吨/年	
U25	C	1	0	排放规律代码 code of discharge way	II	

	DBF	FIELD_NAME	FIELD_TYPE	FIELD_LEN	FIELD_DEC	字段含义 field meaning	单位 unit	ZDDM JC
113	WR09	U01	C	8	0	企业代码 enterprise code		
114	WR09	U02	N	2	0	年度 year		
115	WR09	U03	C	16	0	出厂排放口名称 name of plant discharge site		
116	WR09	U04	N	2	0	排放口编号 number of discharge		
117	WR09	U05	C	4	0	排水途径代码 code of waste water discharge way		
118	WR09	U06	C	4	0	进环境排放口代码 code of discharge site which lanch into envir.		
119	WR09	U07	C	8	0	最终去向代码 code of final lanch 9		
120	WR09	U08	C	20	0	河段名称 name of river segment		
121	WR09	U09	C	2	0	河段代码 code of river segment		

	DBF	FIELD_NAME	FIELD_TYPE	FIELD_LEN	FIELD_DEC	字段含义 field	单位 unit	ZDDM JC
	WR10	U01	C	8	0	企业代码 enterprise code		
	WR10	U02	N	2	0	年度 year		
	WR10	U03	N	2	0	出厂排放口编号 name of plant discharge site		
	WR10	U04	N	2	0	监测日期 月 monitoring date month		
	WR10	U05	N	2	0	监测日期 日 monitoring date day		
	WR10	U06	N	6	0	废水流量 water water flow 毫/小时	T/H	
	WR10	U07	N	5	2	PH pH		1
	WR10	U08	N	6	1	悬浮物 ss		1
	WR10	U09	N	6	1	化学耗氧量 COD_{Cr}	毫克/升	1
	WR10	U10	N	6	1	生化需氧量 BOD_5	毫克/升	1
	WR10	U11	N	6	3	挥发酚 volatil phenol	毫克/升	mg/L 1
	WR10	U12	N	6	3	氰化物 T—CN	毫克/升	1
	WR10	U13	N	6	2	石油类 oil	毫克/升	1
	WR10	U14	N	6	2	硫化物 S^{2-}	毫克/升	1
	WR10	U15	N	6	2	氨氮 NH_3-N	毫克/升	1

	DBF	FIELD_NAME	FIELD_TYPE	FIELD_LEN	FIELD_DEC	字段含义 field meaning	单位 unit	ZDDM JC
113	WR09	U01	C	8	0	企业代码 enterprise code		
114	WR09	U02	N	2	0	年度 year		
115	WR09	U03	C	16	0	出厂排放口名称 name of plant discharge site		
116	WR09	U04	N	2	0	排放口编号 number of discharge		
117	WR09	U05	C	4	0	排水途径代码 code of waste water discharge way		
118	WR09	U06	C	4	0	进环境排放口代码 code of discharge site which lanch into envir		
119	WR09	U07	C	8	0	最终去向代码 code of final lanch 9		
120	WR09	U08	C	20	0	河段名称 name of river segment		
121	WR09	U09	C	2	0	河段代码 code of river segment		

	DBF	FIELD_NAME	FIELD_TYPE	FIELD_LEN	FIELD_DEC	字段含义 field	单位 unit		ZDDM JC
122	WR10	U01	C	8	0	企业代码 enterprise code			
123	WR10	U02	N	2	0	年度 year			
124	WR10	U03	N	2	0	出厂排放口编号 name of plant discharge site			
125	WR10	U04	N	2	0	监测日期 月 monitoring date month			
126	WR10	U05	N	2	0	监测日期 日 monitoring date day			
127	WR10	U06	N	6	0	废水流量 water water flow 吨/小时		T/H	
128	WR10	U07	N	5	2	Ph pH			1
129	WR10	U08	N	6	1	悬浮物 ss			1
130	WR10	U09	N	6	1	化学耗氧量 COD_{Cr}	毫克/升		1
131	WR10	U10	N	6	1	生化需氧量 BOD_5	毫克/升		1
132	WR10	U11	N	6	3	挥发酚 volatil phenol	毫克/升	mg/L	1
133	WR10	U12	N	6	3	氰化物 T-CN	毫克/升		1
134	WR10	U13	N	6	2	石油类 oil	毫克/升		1
135	WR10	U14	N	6	2	硫化物 S^{2-}	毫克/升		1
136	WR10	U15	N	6	2	氨氮 NH_3-N	毫克/升		1

	OBJ	FIELD_NAME	FIELD_TYPE	FIELD_LEN	FIELD_DEC	字段含义 field meaning	单位 unit	ZDDM	JC
	WR11	U01	C	6	0	企业代码 enterprise code			
	WR11	U02	N	2	0	年度 year			0
	WR11	U03	N	2	0	出厂排放口编号 number of discharge site of plant			
140	WR11	U04	N	2	0	监测日期 月 monitoring date month			
141	WR11	U05	N	2	0	监测日期 日 monitoring date day			
142	WR11	U06	C	2	0	项目代码 item code			
143	WR11	U07	N	10	4	监测值 value (determining data)	毫克/升 mg/L		

	OBJ	FIELD_NAME	FIELD_TYPE	FIELD_LEN	FIELD_DEC	字段含义 field meaning	单位 unit	ZDDM	JC
	WR12	U01	C	6	0	企业代码 enterprise code			
	WR12	U02	N	2	0	年度 year			
	WR12	U03	N	2	0	车间编号 number of workshop			
	WR12	U04	N	2	0	车间排放口编号 number of workshop discharge site			
	WR12	U05	N	2	0	监测日期 月 monitoring date month			
	WR12	U06	N	2	0	监测日期 日 monitoring date day			
120	WR12	U07	N	5	0	废水流量 flow of waste water	吨/小时 ton/hour		
	WR12	U08	N	4	0	年排放小时数 total hours of discharge yearly			
	WR12	U09	N	6	5	总汞 T-Hg	毫克/升 mg/L		
	WR12	U10	N	6	5	烷基汞 alkyl Hg	毫克/升 mg/L		
	WR12	U11	N	6	5	总镉 T-Cd	毫克/升		
	WR12	U12	N	6	5	总铬 T-Cr	毫克/升		
	WR12	U13	N	6	5	六价铬 Cr^{6+}	毫克/升		
	WR12	U14	N	6	5	总砷 T-As	毫克/升		
	WR12	U15	N	6	5	总铅 T-Pb	毫克/升		
	WR12	U16	N	6	5	总镍 T-Ni	毫克/升		
	WR12	U17	N	7	5	苯并(a)芘 Benzopyrene	毫克/升		

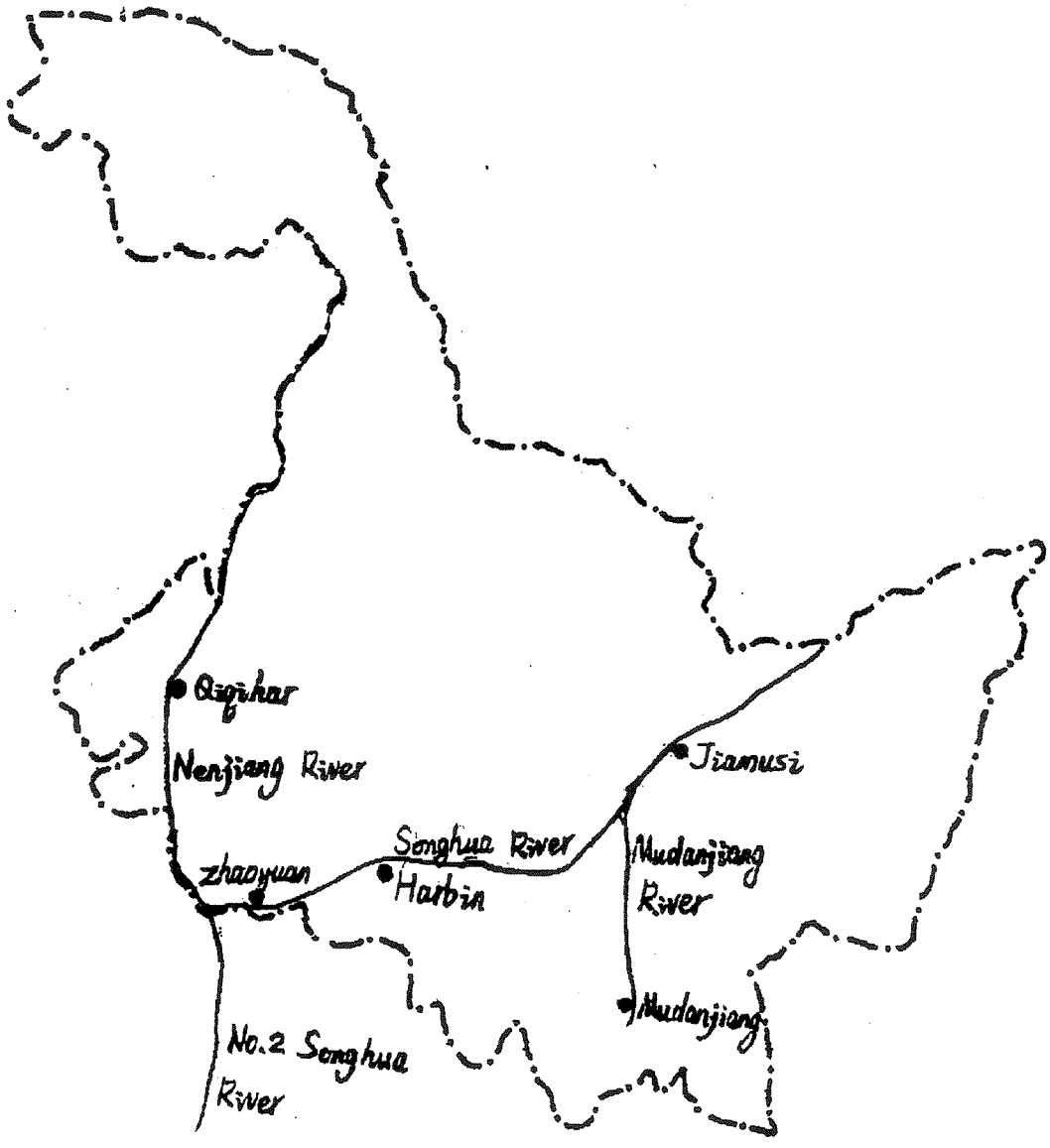
	FIELD_NAME	FIELD_TYPE	FIELD_LEN	FIELD_DEC	字段含义 field meaning	单位 unit	ZDDM JC
1	WR13 U01	C	8	0	企业代码 enterprise code		
2	WR13 U02	N	2	0	年度 year		
3	WR13 U03	N	2	0	废水处理装置编号 number of waste water treated facilities		
4	WR13 U04	C	20	0	废水处理装置名称 name of waste water treated facilities		
5	WR13 U05	N	8	2	总投资金额 total investment	万元	1.0×10^4 ¥ yuan (RMB)
6	WR13 U06	N	7	2	年运转费用 operativ expensive yearly	万元	1.0×10^4 RMB
7	WR13 U07	N	3	0	设备总台数 number of facilities	台	set
8	WR13 U08	N	3	0	设备完好台数 number of intact facilities	台	set
9	WR13 U09	N	6	0	应运行小时数 hours of opreative	小时	set
10	WR13 U10	N	6	0	实际运行小时数 the existing hours of operative	小时	
11	WR13 U11	C	4	0	处理废水类型 type of waste water treatment		
12	WR13 U12	C	4	0	废水处理方法 method of waste water treatment		
13	WR13 U13	N	10	3	废水处理量 设计 amount of treated waste water design	万吨/年	1.0×10^4 ton/year
14	WR13 U14	N	10	3	实际 existing	万吨/年	
15	WR13 U15	C	2	0	治理污染物代码1 code I of treated pollutant		
16	WR13 U16	N	10	4	进口浓度 import density	毫克/升	mg/L
17	WR13 U17	N	10	4	出口浓度 export density	毫克/升	
18	WR13 U18	C	2	0	治理污染物代码2 code II of treated pollutant		
19	WR13 U19	N	10	4	进口浓度 import density	毫克/升	
20	WR13 U20	N	10	4	出口浓度 export density	毫克/升	
21	WR13 U21	C	2	0	治理污染物代码3 code III of treated pollutant		
22	WR13 U22	N	10	4	进口浓度 import density	毫克/升	mg/L.
23	WR13 U23	N	10	4	出口浓度 export density	毫克/升	

	FIELD_NAME	FIELD_TYPE	FIELD_LEN	FIELD_DEC	字段含义 field meaning	单位 unit	ZDDM JC
1	WR14 U01	C	8	0	企业代码 enterprise code		
2	WR14 U02	N	2	0	年度 year		
3	WR14 U03	N	2	0	废水处理装置编号 number of waste water treated facilities		
4	WR14 U04	C	20	0	废水处理装置名称 name of waste water treated facilities		
5	WR14 U05	C	4	0	废水处理类型 type of waste water treatment		
6	WR14 U06	N	8	2	废水流量 flow of waste water 小时	ton/hours	
7	WR14 U07	C	2	0	治理污染物代码1 code I of treated pollutant		
8	WR14 U08	N	10	4	进口浓度 import density 毫克/升	mg/L	
9	WR14 U09	N	10	4	出口浓度 export density 毫克/升		
10	WR14 U10	C	2	0	治理污染物代码2 code II of treated pollutant		
11	WR14 U11	N	10	4	进口浓度 import density 毫克/升	mg/L	
12	WR14 U12	N	10	4	出口浓度 export density 毫克/升		
13	WR14 U13	C	2	0	治理污染物代码3 code III of treated pollutant		
14	WR14 U14	N	10	4	进口浓度 import density 毫克/升	mg/L	
15	WR14 U15	N	10	4	出口浓度 export density 毫克/升		

attention: in the twhle, change the "import" to "input", while "export" to "output"

Appendix E.

Map showing the monitoring sites in Heilongjiang Province


Qiqihar
Nenjiang River
Songhua River
Harbin
zhaoyuan
No.2 Songhua River
Jiamusi
Mudanjiang River
Mudanjiang

Appendix F.

Contract between NIVA and H/EPB regarding survellance of water quality in the Singhua River, Heilongjiang Province, China

CONTRACT

between

THE NORWEGIAN INSTITUTE FOR WATER RESEARCH (NIVA), NORWAY

and

HEILONGJIANG ENVIRONMENTAL PROTECTION BUREAU (H/EPB), CHINA

regarding

Surveillance of Water Quality in the Songhua River, Heilongjiang Province, China ("the Project")

0. Preamble

An Agreement between The Norwegian Agency for Development Cooperation (NORAD) and The State Science and Technology Commission (SSTC) in China ("the Agreement") regarding Surveillance of Water Quality in the Songhua River, Heilongjiang Province, China ("the Project") during an estimated period of 3 years was signed on November 8. 1996. The Agreement focuses on establishing a co-operation within the field of water and air pollution, and is further outlined in the Project Document "Surveillance of Water Quality in the Songhua River in Heilongjiang, China", as referred to in the Agreement Article I Clause 2.

With reference to Article II, Clause 3 in the Agreement, NIVA and H/EPB ("the Partners") have entered into the following contract ("the Contract") under which NIVA shall provide the services as specified below.

1. Scope and Objectives

This contract sets forth the terms and procedures regarding cooperation between NIVA and H/EPB as outlined in Annex I to the Agreement.

The Goal of the Project is:

- Improving the environmental situation in Heilongjiang.

The purpose of the Project is:

- Developing an environmental surveillance system; "Environmental Surveillance and Information System" (ENSIS) for the Songhua River System, and

- Developing the system for environmental monitoring and planning for the entire Heilongjiang Province

2. Cooperation - Representation - Administration

2.1 H/EPB will enter into contract with the Norwegian Institute for Water Research ("NIVA") acting on behalf of a Norwegian syndicate consisting of NIVA, Norwegian Institute for Air Research ("NILU") and NORGIT Centre. A copy of the contract shall be submitted to SSTC and NORAD for approval before entering into force, as soon as possible and at the latest within 31 December 1996.

All other contracts H/EPB might enter into with NIVA during the Project, shall be submitted to SSTC and NORAD for information.

2.2 Representatives from NORAD, SSTC, H/EPB and NIVA shall have consultations in Beijing in March/April each year ("the Consultations") in order to:

- review the progress of the Project;
- discuss possible revisions of plans and budgets for the Projects;
- approve workplans and budgets for the next year;
- discuss issues of special concern for the implementation of the Project.

2.3 SSTC will be responsible for the coordination of calling and chairing the Consultations and will submit to NORAD all documentation to be discussed no later than 3 weeks before the Consultations.

Central elements of the discussions and all decisions from the Consultations shall be recorded in Agreed Minutes.

3. Obligations of NIVA

3.1 NIVA shall:

- provide professional assistance as described in Annex I to the Agreement

- arrange for training of selected experts from China in Norway during the time of the Agreement.

- make available sufficient and qualified personnel.

- carry out their obligations in accordance with the highest professional standard.

3.2 Should it become necessary to replace any member of the NIVA personnel, NIVA shall arrange for such replacement with a person of comparable experience.

3.3 NIVA shall inform H/EPB in advance about any contract to be entered into between NIVA and advisors within the agreed fields of co-operation, and submit the contracts to H/EPB for information. Such contracts shall only be made with duly qualified specialists.

4. Obligations of H/EPB

H/EPB shall undertake the obligations of China specified in the Agreement, and shall thereunder:

- make available sufficient and qualified personnel to cooperate with and receive training from NIVA personnel regarding all activities under this Contract.

- facilitate and carry out necessary preparations and follow up of tasks in connection with this Contract.

- make available for NIVA personnel appropriate office facilities and necessary infrastructure such as telephone, fax and surface transport to undertake the tasks specified in this Contract.

5. Procurement

Procurement is carried out according to the Agreement, Article V. Practical arrangements will be discussed by NIVA and H/EPB when appropriate.

6. Payments

H/EPB shall make available to NIVA a financial grant not exceeding NOK 11,590,000.- to be used exclusively to finance the Project.

6.1 NIVA can submit requests for disbursements from the Grant as follows:

- for the pre-project period (1996/1997), NOK 1.500.000.- after signing of the present Agreement.

- for the first year of the Project (1997), up to NOK 8.244.000.- after the first Consultations based on and related to approved detailed workplans and budget for the first year of the Project, and approved contract between H/EPB and NIVA.

- For 1998: NOK 1.551.000,- and for 1999: NOK 295.000,- are made available. The requests for the second and third year of the Project shall be based on and related to approved Annual Reports. They shall be accompanied by an audit report on the Project accounts. Any amount, including interest if any, which is already disbursed but not fully utilized shall be taken into account when requests are made.

6.2 NIVA shall be paid by H/EPB in conformity with standard Norwegian rates and procedures set out in this section below:

- The prices are based on rates for the year 1996. The prices will be adjusted every year from January 1st. Work carried out after turn of the year, will result in an increase of the prices.

- Travel expenses for international travels will be covered in accordance with the Norwegian Government Regulations. Excursion tickets shall be used, whenever possible.

6.3 NIVA shall forward invoices every three months to H/EPB. The invoices shall be certified by NIVA stating that the invoiced expenses are in accordance with this Contract and the Norwegian Government Regulations.

- The invoices regarding travels shall identify the participants, purpose, time and duration of each travel. The invoices regarding personnel costs (salaries) shall include a specification of the number of hours spent and name and position of the personnel.

- H/EPB shall, after approving the invoices from NIVA, within 30 days effect payment to NIVA.

6.4 All payments under this Contract shall be made directly to the bank account designated by NIVA in NOK (Norwegian kroner).

6.5 Travel expenses and subsistence allowance for H/EPB personnel travelling to Norway will be covered by the Grant according to Norwegian Government Regulations.

7. Reports

NIVA shall assists H/EPB to submit to NORAD all reports and plans as described in Article VII in the Agreement.

8. Entry into force - Duration - Termination

8.1 The Contract signed by NIVA and H/EPB shall enter into force after approval by SSTC and NORAD, or when the Agreement has entered into force, whichever is the latter.

8.2 The Contract shall remain in force until the expiration of the Agreement, or as otherwise agreed between the Partners in writing.

8.3 Each partner may terminate the Contract by giving three months written notice to the other Partner, with copy to NORAD and State Science and Technology Commission (SSTC)

8.4 Upon receipt of such notice of termination both Partners shall exert their best efforts to bring the work to an end in a rapid, orderly and economical manner, and will deliver to each other any plans or documents completed as part of the Agreement.

8.5 In the event of termination, the Parties shall be entitled to payment for services satisfactorily performed and expenses properly incurred prior to the date of termination.

In witness thereof the undersigned, acting on behalf of their respective institutions, have signed this Contract in four originals in the English language.

Place and date 哈尔滨 1996.11.21

For Heilongjiang Environmental Protection Bureau (HEPB)

Place and date Harbin 21/11-96

For Norwegian Institute for Water Research (NIVA)

Appendix G.

Notification format for various industrial sectors

Overview of the reporting system and procedures on hazardous substances in Norway

Notification format for various industrial sectors: Level 1

INDUSTRIAL SECTOR	COMPANY IDENTIFICATION	CO-ORDINATES	TYPE OF PROCESS/ PRODUCTION	WATER FLOW (TONNES/YEAR)	TREATMENT[1]	MONITORING FREQUENCE[2]
Pulp and paper			Sulphite			
			Sulphate			
			Other			
Energy production			Coal			
			Oil			
			Gas			
			Nuclear			
			Other			
Mines and selected coal products			Coal Mine			
			? Mine			
Oil processing industry			Refineries			
			Petro-chemical			
			Other			
Ferrous metal and Metallurgic industry[3]			Ferrous metal industry			
			Metallurgic industry			

1 1: Treatment at the plant itself
2: Outlet to municipal treatment plant
3: Treatment at the plant itself and outlet to municipal treatment plant
4: Discharge to freshwater recipient without prior treatment

2 1: Number of samples Daily (D), weekly (W), monthly (M)
2: No monitoring

3 Would it be possible to distinguish between primary iron and steel industry and secondary iron and steel industry?

INDUSTRIAL SECTOR	COMPANY IDENTIFICATION	CO-ORDINATES	TYPE OF PROCESS/ PRODUCTION	WATER FLOW (TONNES/YEAR)	TREATMENT[1]	MONITORING FREQUENCE[2]
Machine industry[3]						
Mine and selected[4] non-ferrous metal industry[5]			Non-ferrous metal mine			
			Non-ferrous metal industry			
Chemical industry[6]			Pharmaceutical industry			
			PCV production			
			Others			
Food processing industry			Canned food			
Textile industry						
Forage processing industry						

1 1: Treatment at the plant itself
2: Outlet to municipal treatment plant
3: Treatment at the plant itself and outlet to municipal treatment plant
4: Discharge to freshwater recipient without prior treatment

2 1: Number of samples Daily (D), weekly (W), monthly (M)
2: No monitoring

3 Please explain what you mean by "machine industry".

4 Why selected non-ferrous metal industry?

5 How do you define the "non-ferrous metal industry"? Do you include the secondary aluminium industry?

6 How do you define your "chemical industry"? What industries are included?

Overview of the reporting systems and procedures on hazardous substances in Norway

With regard to the 50/70% reduction target and the reports submitted within the North Sea Conference framework:

- on inputs, discharges and/or losses of heavy metals and pesticides to water, Norway reports on point discharges from industries and waste water treatment plants, on losses from diffuse sources and on riverine inputs and direct discharges to estuaries and to coastal areas;
- atmospheric emissions of heavy metals, Norway reports on emissions from point sources and emissions from some diffuse sources;

1 Introduction

Norway establishes reports on discharges/emissions/losses of hazardous substances to various international organisations where Norway is Contracting Party/Member States. Among those organisations are :
the North Sea Conference framework, Norway organises the Fifth International Conference on the Protection of the North Sea some time in the period 2000-2002 and the preparations have already started;
Oslo and Paris Commissions (OSPAR), reporting on atmospheric emissions, riverine inputs and direct discharges to coastal waters; and
the European Union, reporting on the implementation of Directives, Decisions and Regulations which are binding for Norway.

There are many different channels through which the necessary data is collected depending on the various sources concerned such as industrial sources, agricultural sources (pesticides), sewage works. With regard to the industrial sources for example the Norwegian Pollution Control Authority's internal control system has been devised to standardise and increase the efficiency of the data collection through reports on discharges/emissions established by industrial plants. The plants which are required to report are those with significant discharges/emissions.

National reports for the Norwegian Ministry of Environment are being developed in order to verify compliance with international (such as the North Sea Conference framework where there is a 50/70% reduction target on inputs of hazardous substances) and national reduction targets as well as to provide the basis for further work. The reports on discharges/emissions consider sources (plants, products, transport, energy, counties) and the recipients (water, air and soil).

2. Collection of Data on Discharges/Emissions from Industrial Activities

The INKOSYS database was established in 1978 in order to get a better overview of the environmental data related to industrial activities. This database consists of three main sections namely

- an overview of all discharge/emissions permits granted including the specific requirements for each plant;
- an overview of the inspections which have taken place;
- an overview of the yearly discharges/emissions from each plant and the waste generated.

The data which is available from the INKOSYS database is not only the basis for national reports made on discharges/emissions from industry in Norway it provides also the basis for reports made to international bodies such as OSPAR and the North Sea Conference framework.

Currently about 1600 Norwegian plants carry out activities which, according to the Norwegian Pollution Control Act, creates pollution and therefore need to get a discharge/emission permit. These permits may comprise requirements related to production quantity, consumption of raw material, discharges to water, emissions to air, generation of waste as well as requirements related to noise.

The plants report to the appropriate Norwegian authorities following a standardised, mandatory notification format which was adopted in 1992. The notification format consists of three parts:

- reporting according to specific requirements in each permit;
- reporting on deviations from the requirements set in the permit;
- reporting on total yearly discharges/emissions, and generation of waste for the whole plant

i.e. discharge/emission data per calendar year for selected substances as well as waste.

In addition the plants are asked to explain the reasons for any substantial increase or decrease in discharge/emission compared to what is seen as normal as a result of new raw material, change in production or other reasons, even if the discharges/emissions do not exceed the requirements set in the permits.

The table below provides an overview of substances which are part of the standard notification format with the exception of nutrient related substances

Table 1: Notified Substances Discharged to Water or Emitted to Air

Free cyanide-air and water	Silver-water
Tio-cyanide-water	Aluminium-water
Chrome (III)-water	AOX-water
Chrome (VI)-air and water	Arsenic-water
Chromium-water	Gold-air and water
Copper-water	Boron-water
Dioxins-air and water	BOD_7-water
Iron-water	Cadmium-air and water
Phenol-air and water	Chlororganic compounds-air and water
Fluorides-air and water	Organohalogen compounds-air and water
Hydrogen sulphide-air and water	Organic solvents-air and water
Hydrochloric acid-air and water	Sulphur organic compounds-air and water
Hydrofluoric acid-water	Chlorine water
Zinc-water	Total cyanide-air and water
Formaldehyde-air	Vanadium-water
Mercury-air and water	Organic softeners-Air
Cobalt-water	
Methanol-air and water	
Magnesium-water	
Manganese-water	
Molybdenum-water	
Nickel-water	
Oil-air and water	
PAH-air and water	
Lead-air and water	
Tin-water	
Titanium-water	
Tar-air and water	
TOC-air and water	
Other inorganic compounds-air and water	
Other organic compounds-air and water	

3. Hazardous Substances in Products

The Norwegian Pollution Control Authority establishes yearly reports on losses/inputs of hazardous substances. Diffuse sources constitute for many hazardous substances important sources and there are several hazardous substances in products which either end up in the environment through usage or as waste.

Existing data on hazardous substances in products was systematically updated in 1994 in order to establish a yearly up-dating system/programme. This includes an assessment of emission factors for inputs to water and soil and emissions to air. The yearly update comprises those products or groups of products which all together represent more than 95% of the total known consumption of the relevant hazardous substance.

The sale of products containing mercury, cadmium, lead, copper, chromium, arsenic, nickel, zinc, organostannic compounds, PAH, dichlorvos and chlorinated solvents is calculated on the basis questionnaires, and statistics from various institutes. Information about other chlorinated substances which are on the North Sea Conference priority list or are part of the Montreal protocol is provided by the importers. The Norwegian Agriculture Inspection Service establishes statistics about sales of pesticides.

4. Reporting on Inputs to Coastal Waters

For the estimation and calculation of input loads to coastal waters the OSPAR standard methods is being used. OSPAR Contracting Parties now report annually on riverine input and direct discharges to estuaries and coastal waters according to an agreed reporting format. The data represent total loads (based on monitoring of at least 90% of the presumed total riverine inputs and direct discharges of each substance); the reporting format enables the voluntary submission of supplementary data e.g. concentration ranges, comments, other determinants. The Quality Assurance is the responsibility of each Contracting Party, the reporting format contains an entry for the accuracy of the reported value, but this accuracy assessment is interpreted differently by Contracting Parties.

The mandatory hazardous substances to be monitored are five metals (mercury, cadmium, copper, zinc and lead), four nutrients (nitrates, orthophosphates, total nitrogen and total phosphorus), one pesticide (gamma HCH, also known as lindane) and two general parameters (suspended particulate matter and salinity). PCBs are to be monitored on a voluntary basis for seven congeners (different forms of PCB).

In the most recent report (1994 figures), input figures for 10 main rivers and 145 tributaries are provided. The monitoring programme therefore covers drainage from 75% of the main land areas. For direct discharges from sewage and industrial effluents, estimates are based on figures from effluent control

programmes. Greatest emphasis with regard to accuracy is given to the input estimate of the Skagerrak region (90% of the river inputs are monitored in this area), as this is considered to be the most sensitive part of the Norwegian part of the North Sea.

For most Norwegian rivers the input to the sea shows large annual variations due to differences in water flow. In order to make use of the data for the purpose of the follow-up of the Ministerial Declarations at the North Sea Conferences, the data from 1994 are "normalised", i.e. the 1994 concentrations in rivers have been multiplied by normal annual run-off (LTA) for the period 1961-1990 for main rivers) and for the period 1931-1960 for tributaries.

In 1994 the following substances were, *inter alia*, monitored: copper, zinc, cadmium, lead, mercury, lindane and 7 PCB congeners.