

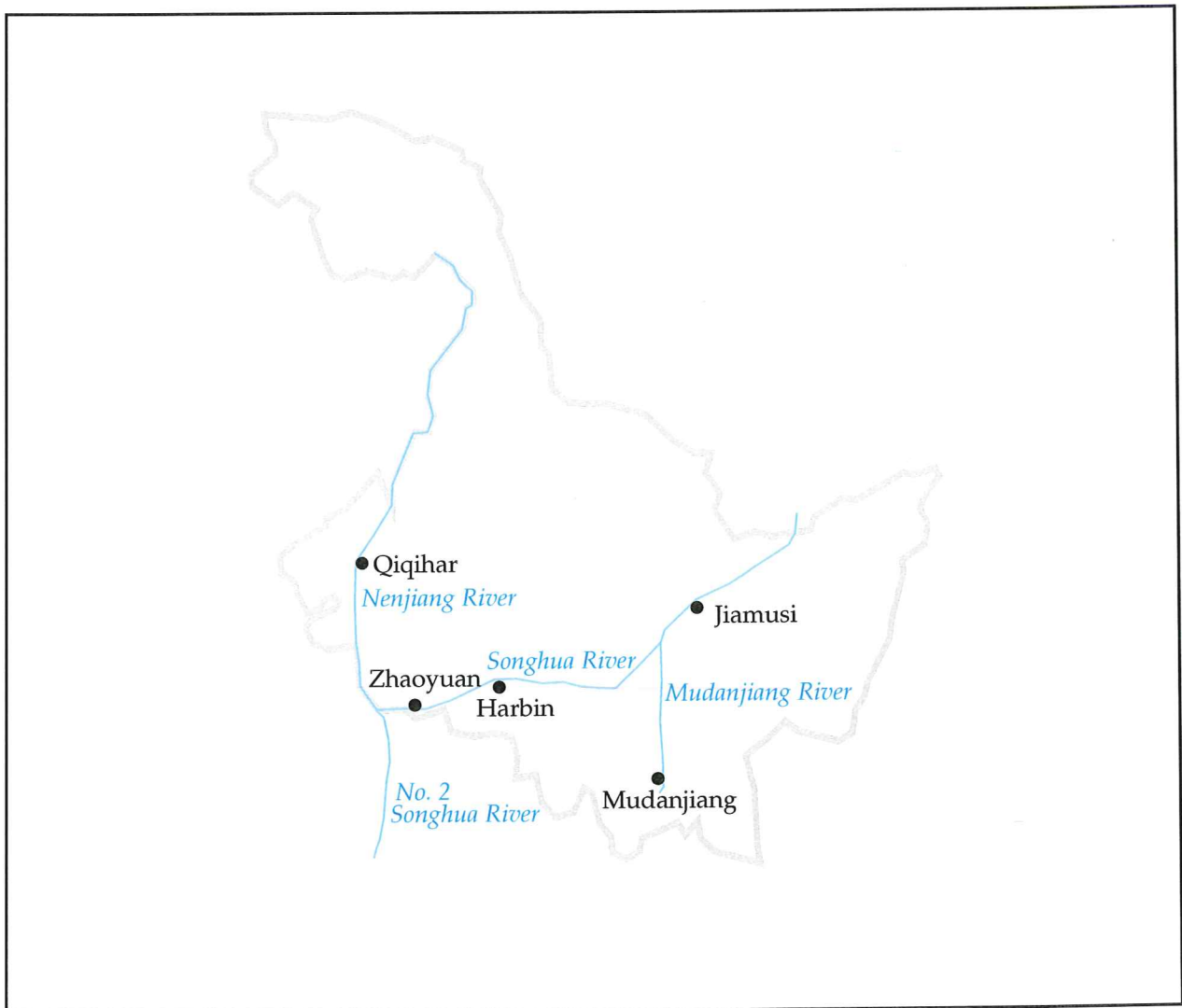
NIVA



REPORT SNO 4205-2000

**Surveillance of Water  
Quality in the Songhua  
River System in  
Heilongjiang Province,  
P.R. of China, CHN 017**

Consolidated Summary Report of  
NIVA's mission to Mudanjiang  
and Harbin, September -  
November 1999



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Abstract This report describes the activities taking place under NIVA's missions to Mudanjiang and Harbin in Heilongjiang Province in September - November 1999 on the project "Surveillance of Water Quality in the Songhua River System in Heilongjiang Province, P.R. of China". The report consists of three main parts, reporting on a mission to Mudanjiang in September on Abatement strategy, on a training session in Harbin in October, and a project meeting in Harbin in November.
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**Surveillance of Water Quality in the Songhua River  
System in Heilongjiang Province, P.R. of China,  
CHN 017**

Consolidated Summary Report of NIVA's missions to  
Mudanjiang and Harbin September - November 1999

# Preface

During autumn 1999, three missions were accomplished by the Norwegian project partners in the project "Surveillance of the Water Quality in the Songhua River System in Heilongjiang Province, P.R. of China". This reports is divided into three parts, describing the outcome of the three missions, namely:

1. Project Meeting in Mudanjiang. A Summary Report on NIVA's mission to Mudanjiang 31 August - 10 September 1999.
2. Project Meting in Harbin 7-14 October 1999. Summary Report on Data input and Training in the ENSIS system.
3. Project Meeting in Harbin 1- 4 1999 November.

The Norwegian project teams have signed the reports together with their respective Chinese teams, to indicate that the content of the reports have been accepted by both sides.

Oslo, 9. February 2000

*Bente M. Wathne*

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

**CHN 017**

**Project Meeting in Mudanjiang**

**31 August–10 September 1999**

**Summary Report**

**1. Participation**

**Mudanjiang Monitoring centre**

Mr Sun Zi Meng, Director Senior Engineer  
Mr Ye Dan, Vice-Director Senior Engineer  
Mr Niu Xian Chun, Office Director Senior Engineer  
Ms Yu Shi Hong, Engineer

**Harbin Environmental Protection Bureau**

Ms Qu Mo Li, Engineer

**NIVA**

Mr Stig A. Borgvang  
Mr Jon Lasse Bratli

**2. Opening**

Mr Sun Zi Meng, Director Senior Engineer, opened the project meeting and welcomed the Norwegian project partners to Mudanjiang.

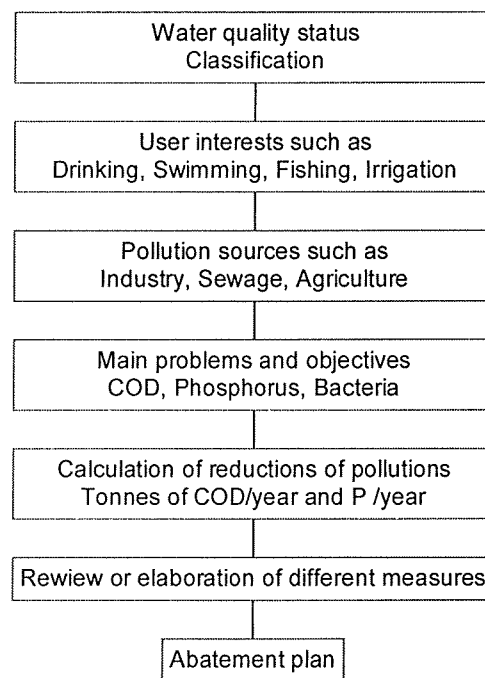
NIVA expressed its thanks for being provided with the possibility to co-operate with MEPB in Mudanjiang and recalled the background for the Sino-Norwegian project and the decision to move the 'abatement part of the project' to the Mudanjiang river catchment (see Annex 1).

### 3. Introduction

NIVA recalled that there are two main planned products of the Mudanjiang catchment area, as a case study on abatement strategy for the Songhua River catchment:

- One is procedural, whereby NIVA will endeavour to develop a suggested procedure for abatement strategy for later use in other areas/catchments
- One is result orientated, and is applied to the specific catchment of the Mudanjiang river system.

The Abatement Strategy as such could be summarised in the following steps:



During this mission, NIVA would concentrate on the further collection of environmental data, pursue discussions with MEPB staff with local knowledge about the river catchment and agree on a structure of the report on the sub-project on abatement strategy. A 'day-to-day' overview of the activities undertaken and the main events that took place during the mission is at Annex 2.

### 4. Agreements

For the follow-up of the work on the pilot study on abatement strategy in the Mudanjiang catchment, it was agreed that:

- NIVA would send a preliminary abatement strategy report to MEPB for checking of factual information in the report by 1 October 1999;
- MEPB would comment on the factual information in the report to NIVA by 1 November 1999
- MEPB will pursue its efforts in trying to find a more detailed 'ditu' for the Mudanjiang river catchment
- NIVA will try to find a way to purchase a digital device for MEPB to use when calculating delimited surface areas on maps

- Mr Ye Dan will be the MEPB contact person for finalising the first case study on abatement strategy in the Mudanjiang river catchment (fax number 0453 6423225) and Mr Stig A. Borgvang the contact person at NIVA (fax number 0047 22 185200)
- MEPB will establish tables for average concentrations of COD, BOD<sub>5</sub>, total nitrogen, total phosphorus and bacteria for all water monitoring sampling sites for the years 1995, 1996 and 1997 by 1 October 1999
- It would be of great benefit for the Mudanjiang river environment if it was possible to continue the co-operation work in the Mudanjiang river catchment, both as regards a more detailed abatement strategy work (such as studies of effects of measures) and special issues related to the catchment, such as limnological studies of the Jin Bo Hu (e.g. yearly algal blooms and possible toxin production)
- NIVA should discuss any extension of the work in the Mudanjiang catchment with Harbin EPB and NORAD.

## 5. Acknowledgements

NIVA would like to thank Mr Sun Zi Meng, Director Senior Engineer of the Mudanjiang Monitoring centre and his staff for the assistance provided during NIVA's stay in Mudanjiang, the transfer of local knowledge, the social activities and the exceptional trip to the Jin Bo Hu. In particular, NIVA would like to thank Mr Ye Dan, Mr Niu Xian Chun, Ms Yu Shi Hong and Ms Qu Mo Li (HEPB) for their support and tremendous spirit of co-operation.

Signed by:

Mudanjiang 8 September 1999-09-08

For MEPB

For NIVA

Mr Ye Dan

Mr Stig A. Borgvang



## ANNEX 1: PROJECT BACKGROUND

During discussions between the Heilongjiang Environmental Protection Bureau (HEPB), the Heilongjiang Environmental Monitoring Central Station (HEMCS) and their Norwegian partner in the Sino-Norwegian project in the Songhua River system, the Norwegian Water Research Centre (NIVA), it was suggested to single out one sub-catchment as a case catchment in the Songhua River catchment.

After further consideration, the Mudanjiang catchment appeared to be appropriate for the purpose of the co-operation project. The criteria used in the selection process were, *inter alia*, the presence of:

- A certain number of industrial activities (small and large plants)
- Agricultural activities
- Planned construction of wastewater plants
- Existing chemical and hydrological monitoring stations
- A number of user interests linked to the river
- Varying land-cover
- Appropriate catchment size

Furthermore, the Mudanjiang catchment includes a natural lake and one artificial reservoir and has local expertise about the catchment, to facilitate the work of NIVA.

Against this background, Stig A. Borgvang (NIVA) visited the Mudanjiang Environmental Protection Bureau (MEPB) for a first preliminary study of the river catchment in April 1999. The visit was successful and the Environmental Authorities in Mudanjiang expressed their willingness and interest in such a pilot abatement strategy project.

## ANNEX 2: DAY-TO-DAY PROGRAMME

### Monday 30 August 1999

Late evening meeting between MEPB and NIVA to discuss the mission programme for the first week.

### Tuesday 31 August 1999

Visit to:

- *The Pi Jiu chang brewery* in Mudanjiang city proper. Mr Xing informed NIVA about the investments that had been carried out to improve the brewery's performance both as regards production and environmentally. Furthermore NIVA was informed about the technicalities in the production and shown around on the production site. 150 000 tonnes of beer is being produced per year. The brewery discharges about 1650 tonnes/day of wastewater into the Mudanjiang river, with an average COD concentration of 1000 mg/l. When the planned municipal wastewater treatment plant in Mudanjiang is operational, the wastewater will be connected to that plant.
- *The Zhao zi chang pulp and paper plant* in Mudanjiang city proper. Ms Wu informed NIVA about the investments that had been carried out to improve the plant's performance both as regards production and environmentally. Furthermore NIVA was informed about the technicalities in the production and shown around on the production site. On the basis of 'broad leave trees', 14 000 tonnes of pulp and 25 000 tonnes of paper is being produced per year. The plant discharges 35 000 tonnes of wastewater per day into the Mudanjiang river, with a COD concentration of 5-800 mg/l and a concentration of suspended solids of 300-500 mg/l. The technology is currently based on chlorine bleaching, but will move to ozone bleaching by the year 2000. An internal treatment plant is being built and, when it is operation by the year 2000, the COD concentration in the wastewater will be reduced to 350 mg/l and the concentration of suspended solids to 200 mg/l.
- *The Fao dian chang coal power plant* is located in Mudanjiang city proper. Mr Tang informed NIVA about the running of the plant and its environmentally related issues. The plant was constructed in 1978 and generates electricity since 1981. About 1000 MW is being generated per year. 17 000 tonnes of cooling water is being discharged per hour into the nearby Mudanjiang river, but no ecological effects due to the temperature of the cooling water have been observed. Furthermore, it discharges sanitary water from 4000 people (1000 people staff and 3000 of family), with a COD concentration of 150 mg/l

### Wednesday 1 September 1999

*Wednesday morning:*

Visit to Hai Lin city's environmental bureau. Mr Ma informed NIVA about environmental issues linked to the Hai Lin city and the Hai Lin municipality. Hai Lin city is the largest of the nine towns in the Hai Lin municipality. It produces 150 000 tonnes of wastewater per day. There are two major industrial sources within the city namely a, a steel plant and a brewery. There are also a cigarette plant and wood processing plant.

Within the municipality the two other large towns are Chang ting (60 000 inhabitants) and Heng dao (40 000 inhabitants). The main agricultural products are water rice, soya beans and corn.

Hai Lin environmental authorities consider that the main environmental problem in the Hai Lin river is petroleum oil pollution emanating from the boat traffic. Bacteria concentrations due to discharges of raw sewage into the river are not considered to be of any problem.

There is currently no treatment of the sanitary wastewater neither in the city nor in the municipality. Within Hai Lin city- there are 420 000 inhabitants, 50 000 with water closet. The sewage from households without water closet is being spread on agricultural land.

There are plans to build a wastewater treatment plant in three stages, viz.:

1. First stage- capacity of treating 20 000 tonnes/day- by the year 2002
2. Second stage- additional 20 000 tonnes/day- by the year 2005
3. Third stage- additional 20 000 tonnes/day- by the year 2010

### **Wednesday afternoon**

Visit of environmental bureau in Ning an. Meeting with Mr Wang Chuang Jiang, Director of Ning an EPB, who provided information about Ning an city and the municipality.

The municipality is divided into 19 towns. There are 434 777 people in the municipality out of which 239 544 live in Ning an city.

In the city there are a sugar plant. The wastewater from the production contains, before aeration tank, 1500 mg COD/l, after the tank (treatment) 300 mg COD/l. The plant produces about 2500 tonnes wastewater/day.

The most important industrial plants in the municipality (outside the city) are a steel plant, with discharges of cooling water, and a concrete plant where there are no wastewater

A feasibility study has been undertaken for the construction of a wastewater treatment plant with a treatment capacity of 20 000 tonnes of wastewater per day for population and industry.

### **Drive to Jin Bo Hu**

### **Thursday 2 September 1999**

Study of the Jin Bo Hu. Excursion on the lake. There was a large bloom of *Microcystis aeruginosa* in the lake, and concern was expressed about this yearly event (July to September) as the Jin Bo Hu is also used as a drinking water source. NIVA has experienced that *M. aeruginosa* in many lakes is a severe toxin producer and may be harmful to man.

### **Friday 3 September 1999**

Data on population, industry and land-use were examined and discussed.

### **Saturday 4 September 1999**

NIVA worked on the draft Abatement Strategy report and on the Mission report.

## **Sunday 5 September 1999**

NIVA worked on the Abatement Strategy report and on the Mission report. Special attention was given to the development of outlines of user interest maps, water quality maps and land-use maps, to be developed in the days to come with MEPB.

## **Monday 6 September and Tuesday 7 September 1999**

The work on data collection was pursued. User interest maps, water quality maps and land-use maps were developed. Data on population, areal distribution in administrative areas and catchment areas, division into sub-catchments was elaborated on.

Maps on present, and future water quality (objectives) were developed. Furthermore the procedure for the elaboration of future objectives were discussed.

MEPB provided NIVA with a map of the Mudanjiang municipality at a scale of 1: 500 000.

## **Wednesday 8 September**

MEPB pursued its efforts to procure more detailed maps on the Mudanjiang river catchment, but it appeared to be difficult.

MEPB and NIVA visited the Zi Lai shui gong si drinking water station. Mr Sun, producing manager, gave a guided tour on the plant. He explained that the construction works of the plant started in 1995 and that the plant had become operational in 1997.

The drinking water plant produces 200 000 tonnes of treated water per day. The plant is located 1,5 km from the water intake in the Mudanjiang river. The raw water is very turbid (FTU about 100). It undergoes several treatment steps, with precipitation with aluminium sulphate as the precipitation agent. No landfill is used, as the sludge is pumped back to the Mudanjiang river at a quantity of 500 000 tonnes per year.

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

**CHN 017**

**Project Meeting in Harbin**

**7-14 October 1999**

**Summary Report on Data input and Training in the  
ENSIS system**

**1. Participation**

**HEMC**

Ms Chen ai fen

Ms Li jiming

Ms Qu mo li

Ms Li Fen

Mr Jiang Bo

Mr Chen Xiao Bin

**Translators**

Ms Yu shi hong

Ms Du bing yi

**NIVA**

Mr. Tor Haakon Bakken

Ms. Kjersti Dagestad

## 2. Training and Installation

### 2.1 Introduction and goal for the training

The goals for the training during the current Project Meeting were to:

- Synchronise the local database with the most recent version of the ENSIS database
- Install an updated version of the ENSIS application
- Discuss questions and problems encountered in the period since the previous training session
- Export all the monitoring data within the Songhua River Catchment from FoxPro to Excel, and convert the data to ENSIS format
- Build a complete monitoring database by importing converted data to ENSIS, and enter other necessary data for the system
- Discuss pollution source data and how to proceed within the current project.

### 2.2 Overall conclusions

The day-to-day summary is at Annex 2; a summary of the programme is listed in Annex 1.

This section provides a brief summary of the main conclusions of the Project Meeting:

- A new Ensis version was installed, and Oracle was upgraded to 7.3.4 in the server
- All data available related to the Songhua River Catchment was converted from Fox Pro to ENSIS
- A larger amount of the data was imported.
- The national Chinese water quality system for classification of rivers and lakes was entered into the ENSIS database
- The remaining data will be imported by NIVA before November 1999 (Norgit will bring the updated project database together with better maps to China).
- NIVA will also delete some old dataserries in the database before it is returned in November.
- NIVA will try to improve the functionality in ENSIS in order to distinguish between measurement positions in the user interface<sup>1</sup>
- HEMC will work on a copy of the project for training purpose until November
- HEMC will keep a master copy of the project and will establish a good back up routines for this master database.
- HEMC personnel learned the monitoring database in depth, including the use of monitoring data in graphics and statistics.
- Pollution sources could not be covered, and was given lower priority than the learning of a more in depth knowledge of the monitoring database
- The training in depth for pollution sources, including the building up of a pollution inventory in ENSIS, needs to be covered as part of an extension of the project.

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<sup>1</sup> The measurement positions have very similar x and y co-ordinates so so a better solution needs to be founs to distinguish between these measurement positions in the user interface of the application. If possible this functionality will be implemented in the application.

## 2.3 Agreements

The table below lists the agreed follow-up actions as an outcome of the Training in Harbin 7-14 October 1999

Issues	Deadlines	HEMCS	NIVA
Project Meeting in Harbin (NIVA and Norgit)	1. week of November	x	X
ENSIS user manual in Chinese (to be discussed 1. Alternative ,Interest money, 2 Alternative . Part of project extension)		x	
Monitoring Instruments: HEMC will get assistance in October to solve the problems with the COD instruments. The tap water problem at Jiamusi will be dealt with.  A detail plan for the implementation of the mobile wagon will be undertaken as soon as everything is working with the stationary monitoring instruments.  HEMC will ensure that the stationary monitoring stations are working by the 1 of November 1999, before the next project meeting takes place and the new version of ADACS is installed.	1. week of November		
Mrs. Wathne will bring a bill of approximately 5000 Yuan to HEPB for the purchase of voltage protection. She will bring this bill to be signed and paid by HEPB in the beginning of November 1999.	1. week of November		X
NORGIT will bring new digitalised maps in the beginning of November.			Norgit
All monitoring data was converted. NIVA will import the remaining of the data that was converted from FoxPro before the next project meeting. Other smaller adjustments to the database will also be undertaken. HEMC will receive the master project.	01. November		X
HEMC will incorporate good back up routines for the database. Training should always be done on a copy of the database		x	
NIVA and Norgit will try to improve the functionality of ENSIS in order to distinguish between measurement positions.	Before 1. week of November		NIVA and Norgit
Norgit will install a new ENSIS version	1. week of November		Norgit
Norgit will train HEMC in 1) Technical issues including UDB, 2) ADACS, and 3) Report generator.	1. week of November		Norgit
Discuss ENSIS work as part of future projects with a focus on pollution inventory and modelling (with Mudanjang as a model catchment)	1. week of November	x	X

## 2.4 Delivered Files

All files are stored on the directory 'Delivered\_October'

Directory	Description
FoxPro	See. Description in file imported_description Contains converted files from FoxPro in addition to original FoxPro files (1986-1997)
QA Assurance	Contains parameter limits
Station	Contains stations and measurement positions
Time-series	Contains all dataseries imported into ENSIS and a list of lake and river parameters
Quality Classification	Contains the classification system for river and lake
Excel presentation	Contains some Excel templates for presentation of monitoring result.
Dumps	Contains dumps of the ENSIS project, including the master project.
Report	Contains the report from the work .

The server also contains user documentation, training material, ODBC, ENSIS installation etc.

Harbin, 13.10,1999

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HEMC / Li jiming

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NIVA/ Kjersti Dagestad



## Annex 1: Day-to-day programme

Day	Activity
Thursday	<ul style="list-style-type: none"> <li>• Arrival in the morning</li> <li>• Status and agreement on the programme</li> <li>• Discussion of pollution sources-How to proceed</li> </ul>
Friday	<ul style="list-style-type: none"> <li>• Installation of new version of ENSIS</li> <li>• Questions from students-Special problems</li> <li>• (Repetition of basic concepts, GIS, other ENSIS parts)</li> <li>• Discussion of conversion of the FoxPro database- conversion of measurement positions</li> <li>• Collection of monitoring data from instruments (INTAB programme and conversion to ENSIS-repetition)</li> <li>• Start FoxPro conversion (in parallel with training)</li> </ul>
Saturday	<ul style="list-style-type: none"> <li>• Further training in use of the monitoring database</li> <li>• Import of hydrological data</li> <li>• Conversion of FoxPro database, cont'd (in parallel with training)</li> </ul>
Sunday	<ul style="list-style-type: none"> <li>• Training in use of the monitoring database</li> <li>• Conversion of FoxPro database, cont'd (in parallel with training)</li> </ul>
Monday	<ul style="list-style-type: none"> <li>• Training in use of the monitoring database</li> <li>• Conversion of FoxPro database, cont'd (in parallel with training)</li> </ul>
Tuesday	<ul style="list-style-type: none"> <li>• Training in use of the monitoring database</li> <li>• Import of monitoring data from the FoxPro database</li> </ul>
Wednesday	<ul style="list-style-type: none"> <li>• Training in pollution source module</li> </ul>
Thursday	<ul style="list-style-type: none"> <li>• Summing up and agreements, departure</li> </ul>

## **Annex 2: Day-to-day summary of the training part of the mission**

**Thursday 07.10.1999**

Participants

HEMC:

Ms Chen ai fen

Ms Qu mo li

Ms Yu shi hong

NIVA:

Ms. Kjersti Dagestad

Mr. Tor Haakon Bakken

### **Goal**

- Get a status of the project,
- Status of agreements since last meeting and
- Agree upon the plan for the training and work during the visit.

### **Discussion and conclusions**

Project meeting in November

NIVA informed HEMC that NIVA (represented by Ms Wathne) and NORGIT will, if possible, attend a meeting in November (week 44 starting around the first of November)

The main issues for this meeting will be:

- Discuss project status and annual report
- Discuss future co-operation projects
- Install new version of ADACS, train HEMC personnel in the use of ADACS, install an Oracle version, which is compatible with year 2000, train HEMC personnel in technical issues such as installation of new ENSIS versions, how to take project dumps, how to use the User database administrator etc

Translation of the ENSIS user manual from Chinese to English

This is not part of the project budget. There can be two alternatives to solve this issue:

- Apply to Norad to use some of the interest money for translation
- Incorporate this as an activity in future projects

Agreement : HEMC will discuss with HEPB

Status monitoring stations:

<b>Location</b>	<b>Telephone number</b>
1. Harbin	0451-4307606
2. Qiqihar	0452-2729664
3. Mudanjiang	0453-6423815
4. Jiamusi	0454-8372333

- The mobile wagon has not been prepared yet
- Problems with COD at locations 1 and 2
- Problems with ammonia at station 2; because of low density there is an auto-calibration problem.
- There were problems with the DO electrode at location 1, but this is now fixed.
- There are no monitoring results from location 4. This is due to the technical solution at the site, there is no tap water. NIVA has already commented on this and suggested changes.

*Agreements:*

HEMC will get assistance in October to solve the problems with the COD instruments. Thereafter will the problem at Jiamusi be dealt with.

A detail plan for the implementation of the mobile wagon will be undertaken as soon as everything is working with the stationary monitoring instruments.

HEMC will ensure that the stationary monitoring stations are working by the 1 of November 1999, before the next project meeting takes place and the new version of ADACS is installed.

Bill of the voltage protection:

NIVA has paid for 5 voltage protection equipment, totally approximately 5000 Yuan.

Agreement: Mrs. Wathne will bring a bill of approximately 5000 Yuan to HEPB for the purchase of voltage protection. She will bring this bill to be signed and paid by HEPB in the beginning of November 1999.

Better Maps

A paper map of the Heilongjiang in the scale of 1:500 000 has been prepared to be used in the project. It is not likely that this will be digitalised within the budget of the current project.

However, Norgit will probably be able to convert the map stored on the tape received during the previous meeting. If possible, NORGIT will send the digitalised maps to NIVA during this stay, otherwise NORGIT will bring the maps in the beginning of November 1999. If it is not possible to convert the maps, the already existing digitised maps in ENSIS will be used.

Agreement: If maps are received from Norgit during NIVA's stay, they will be made available in ENSIS.

Remaining issues according to the ENSIS work and work programme for the rest of the week

Keeping an overview of monitoring data and use these data in the environmental management is one of HEMC's most important tasks. It is therefore essential that the personnel operating ENSIS has in depth knowledge about the monitoring database module.

It is also of great importance that the monitoring data currently stored in an old fashion monitoring database (FoxPro) is converted into the ENSIS system in order for HEMC to have access to monitoring data through modern and user friendly technology. All monitoring data will then be stored in one database and HEMC only needs to maintain one of them.

The major focus for the project work and training during this stay should therefore be to convert old data from FoxPro to ENSIS format and import the data into the ENSIS database.

If time is available, data for some pollution sources will be entered into the system. However, a complete inventory of pollution sources (and conversion of old pollution source data), must be part of future projects, where also modelling should come more in focus)

*Agreement:*

Focus on mastering the monitoring data and get the monitoring data stored in FoxPro converted to ENSIS format.

Incorporate the development of a complete pollution inventory as part of a future project, where also modelling should be more focused upon.

## **Friday 08.10.1999**

### **Installation of a new version of Ensis ENSIS?**

Several problems appeared during the installation of the September version of Ensis. The main problem was due to changes in name conventions of the tablespaces. This made a direct import of dumps from a more recent version impossible and the entire database had to be reinstalled. A newer version of Oracle, version 7.3.4, that is 2000 compliance, faster and user-friendlier was then installed. The second major problem that appeared was Oracle's handling of network protocols. This problem was also solved, and the server was then properly upgraded.

### **Training and conversion of FoxPro data**

All monitoring data from lakes and rivers were exported from the FoxPro database and converted into Excel files as the first step of the conversion process to ENSIS. The Excel files were organized in such a way that there was one file for each year. The files for the individual years contained all stations and all parameters for the year in question.

Measurement position:

- It was necessary to decide how it should be distinguished between samples made on the center of the river (pos 2), along the left shore (pos 1) and along the right shore (pos 3) These positions have a code in the FoxPro database. A conversion

form for creating the measurement positions was used. The station co-ordinates were used as a basis and the approximate positions were created, based on the flow directions.

- The exact location of measurement positions can be corrected at a later stage when better maps become available and the measurement positions can be edited through the GIS interface. The important thing was that the measurement positions were created in order to link the data to these positions.
- Hydrological stations have only one measurement position, in contrast to the water quality stations (pos. 2).
- In addition, there are some mixed measurements (taken along the cross section of the river as a mixed sample). These data pares are linked to the middle position (pos 2)
- All dataseries that are imported into Ensis are so far imported with a measurement position depth (z-value) = 0. This needs to be corrected, the depth shall be -0.5 meters. All data-series with measurement position's z-value = 0, shall be deleted from the database.

#### Medium and parameter:

The terms “medium” and “parameter” were explained, and it became appearent that there are too many media and parameters defined in Ensis compared to what is needed. It was decided to keep the list in general, but delete the ones that are not necessary (for the time being and in the future).

#### Quality Flags and parameter limits:

Quality flags are not used in the FoxPro database, but the monitoring center is checking if the values are within a reasonable range. Ensis, can do the same operation by using the parameter limits test (quality assurance 1). HEMC prepared a complete list of parameters. The monitoring center shall check the predefined parameter limits in Ensis, and correct the ones that have wrong limits, enter the parameter limits that are not defined, and delete the ones that are not used. All parameters that are used in the parameter limits menu have to be defined before limits are assigned to them.

## **Saturday 09.10.1999**

### **Installation of September version of ENSIS on the clients**

One of two clients were up-and-running Saturday morning. The second client lacked necessary network software.

### **Training and conversion of FoxPro data**

#### Measurement Positions:

- Measurement position were entered manually in ENSIS, as an example
- All measurement positions were then imported successfully

Data series:

- The concept of data-series was explained. Data-series need to be created after station and measurement positions: Data-series are needed to import the values stored in FoxPro.
- The students trained on how to create a data-series
- The students trained in how to enter values manually in the created data-series
- Quality flags and the use of them were explained
- The students trained in the use of quality flags.
- Parameter limits definition for checking the quality of measurements were imported successfully.
- The monitoring station names were changed in ENSIS to be identical with the station names in FoxPro (a number code). Except for the lakes, stations with an "L" were kept in the name to not confuse the lake stations with the river stations with the same names as the lake stations.
- The surrounding area code at the stations are used to distinguish the different types of stations.

## **Sunday 10.10.1999**

### **Goal**

- Technical training, including ENSIS client installation and User Database Manager
- Training in use of monitoring data and preparation for import

### **Technical training**

Installation of a second ENSIS client was accomplished. This was done after fixing the network software on the client. The installation of the ENSIS client was performed by the computer specialist at HEMC, guided by the NIVA personnel. Configuration of SQL Net and Intersolve ODBC was explained.

The computer specialist (Chen Xiao Bin) from HEMC was trained in the use of the User Manager application of ENSIS. The person was trained in adding new maps as shape themes, configuring attributes, and deleting themes. The person was explained the concept in how the User Manager affects the installation on the client side.

The person was explained the export of all data stored in the Heilongjiang project, called "making a dump of the project". The procedure will be repeated later during the training, and will be explained in detail by specialists from Norgit.

All installation files, except the Oracle installation files, were copied to the HEMC server. In addition, the user documentation, training material and other relevant information was copied onto the same computer.

## **Training in use of monitoring data and preparation for import**

New extract of the FoxPro database:

- The FoxPro database contains all monitoring data within the Heilongjiang province, not only the data related to the Songhua river catchment. It was decided that only data for stations within the Songhua river catchment should be imported as part of the project. The rest will be imported at a later stage by HEMC

Data-series

- A complete parameter list with FoxPro parameters code and corresponding ENSIS codes were prepared. This list will, in the future, give an overview over the data that has been converted to ENSIS in the period 1986-1998 (Parameter necessary.xls)
- The preparing work for import of data-series to ENSIS was finished (approximately 8000 data-series)

**Monday 11.10.1999**

**Goal**

- Training in the use of the geography and datasets menu in ENSIS
- Continue training and converting monitoring data

### **Technical training**

Personnel from HEMC was trained in the use of the 'geography part' of ENSIS, which includes search for and registration of data on rivers, lakes and catchments. Adjustment of codes on administrative regions was carried out, and it was also considered to change the codes of the rivers to match the ones already used by HEMC.

Personnel from HEMC was also trained in the use of data-sets, which is a very efficient way of presenting the quality status of the rivers and lakes.

The technical specialist from HEMC imported a new database dump (export of the entire database) to the HRMC server, guided by NIVA.

## **Training in the use of monitoring data and preparation for import**

Data-series:

- The students learned how to import data-series
- All data-series were imported successfully

Conversion of FoxPro data:

- The students learned how to convert the FoxPro data. Thanks to previous days' experiences, the students grasped quickly how this had to be undertaken.
- All values for river stations (standard parameters) were converted (approximately 150.000)

## **Tuesday 12.10.1999**

Participants

### **HEMC:**

Ms Li Jiming  
Ms Qu mo li  
Mr Jiang Bo  
Mr Chen Xiao Bin  
Mr Yu shi hong

### **NIVA:**

Ms. Kjersti Dagestad  
Mr. Tor Haakon Bakken

## **Goal**

- Prepare data for using the water quality classification system
- Complete the preparation of monitoring data and import measurement values
- Train in advanced use of the monitoring database, including graphics, statistics and calculations

Personnel from HEMC was trained in the use of data-sets, both regional data-sets and river linked data-sets. Two national Chinese water quality classification systems were entered into the database by personnel from HEMC, and a brief instruction in use of it was provided by NIVA

It was decided to leave the inclusion of better maps until the training in November, due to lack of response/communication with the FTP-server at Norgit.

### *Monitoring Data:*

- All data conversion was finished
- Some data was imported into the database (the import takes time and it will be a matter of time available. The rest will be imported in Oslo before November)



**Wednesday 13.10.1999**

**Goal**

- Import measurement values
- Train in advanced use of the monitoring database, including graphics, statistics and calculations
- Final report

**Work**

- More data was imported to the system.
- A final report was agreed upon
- A final list of documentation and a list of already imported data was prepared
- Use of the monitoring database, including graphics, statistics and calculations was demonstrated

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

CHN 017

## Project Meeting in Harbin

1-4 November 1999

### Participation

#### HEPB

Mr. Guo Yuan, Mr. Chen Yong, Ms Ming Xiannan

#### HEMCS

Ms Chen Aifeng

#### NORGIT

Mr Torstein Skancke (ENSYS A/S), Mr Geir Bakke Nielsen

#### NIVA

Ms Bente M. Wathne

### 1. Opening

Mr Guo Yuan opened the Project Meeting and welcomed the Norwegian project partners to Harbin. On behalf of the Norwegian visitors, Ms Bente M. Wathne expressed her appreciation for the warm welcome and the possibilities to work together with the Chinese partners on this project. She recalled that 1999 was a year where substantial progress had been achieved within the project, as both the monitoring instruments for water quality and the ENSIS system had been installed and were in operation.

### 2. Draft Agenda

The agenda, as at Annex 1, was agreed without any amendments. It was also agreed that when Mr Torstein Skancke and Ms Bente M. Wathne would discuss administrative matters at HEPB, Mr Geir Bakke-Nielsen should work in the Monitoring Centre (HEMCS).

### 3. Administrative matters

Mr. Guo presented a fax from MOST, referring to a letter sent by NORAD on financial matters. (see Annex 2.). As explained in the letter, there has been a long history of negotiations and changes of financial procedures and handling routines during the running of the project. This had resulted in a transfer of a too large proportion of the project funds to MOST. According to the letter, an additional amount of 0.191 mill NOK should be made available for NIVA from the money transferred to MOST.

The Chinese project partners stated that MOST had not agreed to the overall budget referred to in the fax. The transferred money had been spent on project related issues, with the understanding that the amount was correct. The annual budgets for both sides had not been agreed due to this fact.

It appeared that it was very difficult, at this stage, to reallocate the money. NIVA agreed to explain the problem to NORAD and seek their advice for an acceptable solution. NIVA would also ask NORAD if it was possible to provide the 0.191 mill NOK as extra funding for the project.

Mr Guo signed the invoice from NIVA for the project work in the 3<sup>rd</sup> quarter 1999. It was noted that the over voltage protection for the monitoring stations, provided by NIVA, should be paid by HEPB at a later stage.

### 4. Project Status

Ms Chen Aifeng informed about the project status under the following headings:

- Installation of ENSIS
- Installation and activities at the monitoring stations
- Transmission of data
- Installation of instruments for analytical labs, AAS (atomic absorption spectrophotometer) and ion chromatograph
- Abatement strategy work

#### 4.1 Installation of ENSIS.

The installation of ENSIS had been planned for March 1999, but due to delay in the transport of the server, the installation had only been possible on the computer at the time of NORGIT's visit in March 1999. In April the first installation of ENSIS had taken place during the Workshop (see Consolidated Summary Report of NIVA's mission in Harbin, April 1999).

All the goals set for the Workshop had not been fulfilled due to:

- a. A delay of the server installation, giving no possibilities for the Chinese partners to prepare for the April training
- b. Problems not accounted for in the first ENSIS version, when positioning the sampling points in the traverses in the Songhua River
- c. The fact that the transfer of data from the monitoring station had not worked properly

The training planned for August had been postponed to October, but was then carried out to satisfaction both for the Chinese and the Norwegian partners. The period May – September had been used for training on the system, translation into Chinese, and converting monitoring data from the Foxpro database into ENSIS. Data from 1997, 1998, and 1999 in all 8404 data

sets were converted, and of them, 6784 data sets had already been imported from Foxpro. For the last 12 years, 19970 data sets had been converted, and 13933 imported to ENSIS.

It was agreed that cross sections with monitoring points and water flowing directions were sufficient for Chinese water model.

#### **4.2 Installation of instruments at the monitoring stations**

In April, the installation had been carried out for the water monitoring instruments at four stations namely Jiamusi, Mudanjiang, Harbin, and Qiqihar. (see Consolidated Summary report of NIVA's mission in Harbin, April 1999). The instruments at the stations were running, but there were still some starting problems with some of the monitors. The instrument delivery firms were working to solve the problems.

#### **4.3 Transmission of data**

The transmission of data was working adequately. with ADACS for the ACCESS data base. ADACS for the ENSIS data base would be installed during the present meeting to improve the work.

#### **4.4 Installation of instruments for analytical labs**

AAS (atomic absorption spectrophotometer) Hitachi Z-500 and ion chromatograph Shimadzu HIL-14A, were installed in the lab at HEMCS. The instruments were performing well. They were used respectively for analysis of Cu, Pb, Cd, Mn, Cl, F and SO<sub>4</sub>.

#### **4.5 Abatement strategies**

Mr Stig A. Borgvang and Mr Jon Lasse Bratli were working on an abatement strategy for the Mudanjiang catchment. It is taken as a case study on abatement strategy for the Songhua River catchment. They visited the Mudanjiang catchment in August-September to prepare the strategy plan together with the local environmental experts.

## **5. The water monitoring stations, and status for the installation/running of the instruments.**

As described above, and in even more detail in the Consolidated Summary Report of NIVA's mission in Harbin, April 1999, the water monitoring instruments had been installed at four stations, Jiamusi, Mudanjiang, Harbin, and Qiqihar. Some starting up problems had been solved, but at present there still were some problems to be solved, such as the fact that:

- The monitor for dissolved oxygen worked improperly below 5 °C. The problem has now been solved.
- The automatic calibration routines for the nitrate and ammonium monitors were not functioning well at low concentrations. The problem seemed to be solved only for ammonium at the station in Harbin.
- The turbidity monitor had some problems with calibration. The results did not correlate properly with the results from the manually analysed samples
- The COD instrument from IONICS had been installed in May 99. The instrument had not yet passed all the tests for delivery. A representative from IONICS was working on the problem
- The air compressor was not functioning at the station in Mudanjiang
- The Conductivity meter had been exchanged
- The mobile monitoring station had not yet been put together, but all the instruments were delivered. Configuration and installation would be carried out after the solution for the above-mentioned problems had been found.

## 6. Planning of the Annual Report

The main headlines for the Annual Report were discussed on the basis of the programme set up for phase 2 and 3 in the original project proposal and the plans given in the Annual Report for 1998. The Annual report will be based on the two consolidated workshop and mission reports for the workshops, training sessions and meetings during April and September-October 1999. The Annual Report will summarise the activities through the year 1999, including the project costs for the 1999 activities, and the budget for 2000. Delivery of the Norwegian input to the Project Annual report will be in January 2000. The Project Annual report shall be delivered to NORAD 6 weeks before the annual meeting between NORAD and MOST in Beijing, normally held in March or April each year.

## 7. Discussions on extension of the ongoing project and on new project proposals

Extension and new project proposals were discussed. For each proposed task, comments were given referring to Annex 3. Priority was given to the tasks in the following sequence:

1. *Activities within ENSIS WaterQuis*
2. *Activities that generate results and data to be fed into ENSIS*
  - A. Analysis of the results of the two intercomparison exercises and solutions to any problems that may have occurred (extension), including capacity building in organic chemistry. Taking a trainee from the analytical lab for training in analysis of organic compounds 6 months in Norway
  - B. Limnological study of the Jing Bo Hu with emphasis on the understanding of the algal blooms in the lake, including toxin analysis (new)
  - C. Limnological study of the Lian Hua lake (artificial dam), with emphasis on the assessment of the ecological effects of the construction of the dam and the development of an efficient monitoring programme related to the dam (chemical, physical and biological programme) (new).
  - D. Further development of the abatement strategy (extension)
3. *Support and service performance*

This last point may be an integrated activity, following the three projects using the ENSIS system in China.

The proposal for Air Quality monitoring, discussed at earlier project meetings, should still be given priority.

## 8. Intercalibration activities

Mr Håvard Hovind had informed that the letter from HEMCS, confirming their participation in the international intercalibration exercise, had been received by NIVA, and in this way informed the group that the samples to be analysed should be sent out later this week.

## **9. Discussion on support and service performances for the ENSIS-product**

The support and service performances paid by NORAD for the ENSIS-product after completion of the project, were discussed based on a proposed contract. The contract would be with ENSYS A/S, that is the sales company for the ENSIS-product set up by NILU, NIVA and NORGIT. The owners have full responsibility for the ENSIS-product, but have organised the commercial sales work, all warranties, support and all programme service through ENSYS. The future projects could still be handled directly with ENSYS's mother institutions, one of them being NIVA.

Furthermore, the different tasks in the service and support were discussed.

## **10. Planning of 2000 activities**

The following activities, defined in phase 3 of the project, were agreed for next year:

- To make the model operational
- The installation of the complete Chinese version of ENSIS in the Heilongjiang Province
- Further training of the Chinese staff in Heilongjiang Province in operating the ENSIS system
- Finalise the abatement strategy report for Mudanjiang catchment as a case study on abatement strategy for the Songhua River catchment.
- Finalise the plan for extensions and new project activities for the water monitoring and surveillance

It was agreed that a draft of the Final report should be discussed during the Final Workshop in May-June 2000, and then finalised after the Workshop.

<b>Activity</b>	<b>Date</b>
Delivery of the input to the Annual Report from NIVA	End of January 2000
Training in Harbin, (provided by NORGIT)	End of January 2000
Final abatement strategy report	End of January 2000
Annual Report from HEPB to MOST	End of February
Monitoring stations, follow up	January-June 2000
Installation of the water model and the complete Chinese version of ENSIS	May 2000
Final Workshop <ul style="list-style-type: none"> <li>• Dissemination of results</li> <li>• Presentation of the technical ENSIS system</li> <li>• Presentation of how to use the ENSIS system</li> <li>• Plans for extensions of the water monitoring and surveillance programme</li> <li>• Presentation of the abatement strategy</li> </ul>	May/June 2000
Final report	June 2000

Harbin 4. November 1999

For HEPB

For NIVA

Mr. Guo Yuan

Ms Bente M. Wathne

## Annex 1

### Agenda for the Project Meeting in Harbin

November 1-4 1999

Day	Activity	
Monday 1/11 <b>Joint session</b>	<ul style="list-style-type: none"> <li>• Arrival in the morning</li> <li>• Welcome and programme overview</li> <li>• Agreement on the programme and agenda</li> <li>• Status for the running of the project. Reference to notes from earlier project meetings.</li> </ul>	
Tuesday 2/11 <b>Parallel sessions</b>	<u>At HEPB</u> <ul style="list-style-type: none"> <li>• The water monitoring stations, and status for the instruments.</li> <li>• Planning of the annual report</li> <li>• Start discussions on extension of the project</li> <li>• Start discussions on new project proposals</li> </ul>	<u>At HECMS</u> <ul style="list-style-type: none"> <li>• Installation of new maps</li> <li>• Training in UDB (User DataBase administration)</li> </ul>
Wednesday 3/11 <b>Parallel sessions</b>	<u>At HEPB</u> <ul style="list-style-type: none"> <li>• Planning of year 2000 activities</li> <li>• Extension of the ongoing project.</li> <li>• New project proposals</li> </ul>	<u>At HECMS</u> <ul style="list-style-type: none"> <li>• Installation of ADACS</li> <li>• Training in ADACS</li> </ul>
Thursday 4/11 <b>Joint session</b>	<ul style="list-style-type: none"> <li>• Any remaining topics</li> <li>• Summing up and agreements, departure.</li> </ul>	



**Annex 2 (Fax from MOST)**

21/09 '99 11:17 ☎001  
 29/09/99 13:07 NORAD → 201

MOST P.R.CHINA

☑001

NR.110 002

To: 周元 Tel. 0451 - 233 1018  
 黑龙江 科技厅合作司 李刚 Fax. 0451 - 233 1247

- **CHN 0017 Heilongjiang:** The project seems to be progressing well, but as discussed previously the budget has been somewhat difficult to understand. The budget of 1998/99 has not yet been approved by MOST and NORAD and there are some misunderstanding concerning the final amount available for the two implementing parties under the project. The project was originally divided into 3 phases, which did not follow the calendar year. The first phase of the project included end of 1996 and a few months of 1997.

In 1996 NORAD transferred 1.5 million NOK to MOST which we believed was to cover expenses for the year 1996, but it seems however, that the funds was to cover the projects cost for the entire phase 1 (1996/97).

The 1.5 million NOK was to cover expenses only to the Norwegian institution (NIVA).

- △ MOST reimbursed NIVA 0.778 mill NOK in 1996, which left the remaining amount of 0.722 mill NOK with MOST. In 1996 MOST was reimbursing both implementing institutions, while from 1997 and onwards NORAD was reimbursing the Norwegian institutions and MOST the Chinese. Now this mistake has followed the complexity of the budget for the entire period of the project.

- △ In addition to this mistake the implementing institutions have renegotiated the budget as the project was progressing. As we are trying to sum up the status it seems like there has been transferred to much funds for the project. The amount of 0.191 mill NOK which is in MOST' accounts should be made available for NIVA.

The financial status for the project is explained in the below table:

**BUDGET**

	Phase 1 - 1996/97	Phase II - 1997/98	Phase III - 1998/99	TOTAL
HEPB		5.030	0.060	5.090
NIVA	1.500	1.730	3.270	6.500
TOTAL	1.500	6.760	3.330	11.590

**REIMBURSED**

	Phase 1 - 1996/97	Phase II - 1997/98	Phase III - 1998/99	TOTAL
HEPB	0.722	4.539		5.281
NIVA	0.778	1.730	0.937	3.445
TOTAL	1.500	6.289	0.937	8.726

The remaining funds in NORAD for 1999/2000 is 2.364 Mill NOK which is allocated for NIVA.

## **Annex 3**

### **Sino-Norwegian Co-operation project**

#### **Heilongjiang Environmental Protection Bureau (HEPB), Heilongjiang Environmental Monitoring Centre (HEMCS), the NORGIT Centre and the Norwegian Institute for Water Research (NIVA)**

#### **Proposals for extension of the existing project and proposals for new projects in the Heilongjiang Province**

**June 2000-May 2003**

#### **Objectives**

The objective of the proposal is twofold, namely:

- To extend the project period for some of the existing project activities
- To launch new project activities that have emerged as a result of the activities during the current project period

The overall frame of the project is the general use of ENSIS as a modern environmental management system in the Heilongjiang Province. The Mudanjiang catchment will be used as a pilot area for implementation and training in the full scale use of ENSIS WaterQuis at a regional scale. Thereafter ENSIS WaterQuis may be implemented in other sub-catchments and regions within the Heilongjiang catchment. That means that ENSIS will be used as an management tool to provide a scientific basis for decision making. The objectives listed in the following are mostly within ENSIS activities. However, some of the activities will require field work, intercomparison exercises, but the results of these activities will be fed into the ENSIS system.

## **List of Activities**

### **Activities within ENSIS WaterQuis**

1. To extend ENSIS to cover most monitoring data and pollution sources within Heilongjiang Province, in order for HEMC to have a complete environmental monitoring data system bank. Set up a demonstration project on discharge monitoring, if possible
2. Develop capacity building in water resources management and build up routines of how ENSIS can function as a water management tool
3. Develop ENSIS as a complete water management system that can be used in the future both as a monitoring data system, a system for planning reductions in the environmental impacts of pollution in the area, including a special solution for handling accidents and spills resulting in severe water pollution. The system shall be used together with Internet as an information system to the public and other interest groups.
4. Install ENSIS in Mudanjiang Environmental Monitoring centre and transfer knowledge from HEMC (province level) to the Mudanjiang Monitoring Centre (regional/local level).
5. Use ENSIS (the data and modelling result) in the Mudanjiang model area as a tool in an in-depth abatement analysis study in the area, including cost-effectiveness analysis of the most relevant measures
6. Demonstrate data flow from the regional monitoring centres to HEMC
7. Increase the public awareness in environmental issues, with use of the Internet

Objective 1 and 2 is related to the extension of existing project, while objectives 3-7 are suggestions for new projects.

### **Activities that generate results and data to be fed into ENSIS**

All activities hereafter concern the Mudanjiang catchment.

1. Further development of the abatement strategy (extension)
2. Analysis of the results of the two intercomparison exercises and solutions to any problems that may have occurred (extension) Capacity building for a trainee from the analytical lab for training in analysis of organic compounds. 6 months in Norway
3. Limnological study of the Jing Bo Hu with emphasis on the understanding of the algal blooms in the lake, including toxin analysis (new)
4. Limnological study of the Lian Hua lake (artificial dam), with emphasis on the assessment of the ecological effects of the construction of the dam and the development of an efficient monitoring programme related to the dam (chemical, physical and biological programme) (new).
5. Upgrading of the chemical laboratory. (See proposal from meeting in April). From next year January 1<sup>st</sup> NEPA will set up criteria for 40 organic compounds in water. National criteria

# Explanations of activities and suggested time period

## 1. Tasks included for activity 1 (extension of existing project):

There are three river systems in the Heilongjiang Province, Songhua, Wusuli and Heilongjiang. This task will make it possible to cover the two other river systems in the province, in addition to the Songhua, and handle environmental information for them all in the ENSIS system.

HEPB/HEMCS also want to include a demonstration project for how to do discharge monitoring from the most important industry. Also the discharge information shall be imported into the ENSIS system.

- Detailed project plan
- Adjust the ENSIS application to cover the need HEMCS have in order to store monitoring data, and data about domestic and industrial pollution sources
- Collect, organise and import all monitoring data for the entire province in ENSIS
- Build up a pollution inventory for the Heilongjiang provinces (collect, systemise, convert existing data, collect missing data and import the pollution source data to the ENSIS database). A special focus will be on collecting and systemise the industrial pollution sources and discharge factors linked to these
- Provide training in the use of a the pollution inventory in ENSIS (data input, GIS, statistical tools etc)
- Implement the first version of a pollution budget model for municipal and industrial pollution sources and provide training in the use of this.
- Adjust the maps in the application
- Provide technical training to achieve good maintenance of the ENSIS system.
- Translate the documentation and training material into Chinese
- Purchase and training in use of GPS (global position system). This will be a very convenient tool in making a geographical reference to monitoring stations, pollution sources, etc.
- Implement a version of the ENSIS application in Chinese
- Reporting

**Timeline: June 2000-June 2001**

## 2. Tasks included for activity 2 (extension of existing project):

- Detailed project plan
- Provide training and exchange information in the handling and use of manually collected monitoring data. Issues will be how to design a monitoring programme, collection of data, laboratory analyses, use of statistics (correlation, significance, etc), comparison/correlation of physical, biological and chemical data.
- Strengthen technical skills and developed routines for maintenance of automatic monitoring equipment and collection of data from these on the basis of the first year of monitoring practice. Originally the instruments should have been installed during the first year of the project to secure

the possibilities for the Chinese partners to ask NIVA for advice for the running the system when necessary, through two years of project work. Due to the delay in the delivery of the instruments, there will only be one year of monitoring before the original project is finalised.

- Provide extended training in use of automatically monitoring data in the ENSIS system. With a focus on statistical analysis.
- Provide training in the methodology of pollution abatement analysis and how a system like ENSIS can be used as a tool to undertake these types of analysis.
- For training in the above topics also receive 2-3 Chinese trainees in Norway for fully understanding the ENSIS system and be able to do better dissemination and knowledge transfer within the Heilongjiang Province.
- Develop suggestions for improvement in the monitoring programme for river water quality, lake water quality, and point pollution sources.
- Develop suggestions for improvement of laboratory routines.
- Reporting

**Timeline: June 2000-June 2001**

### 3. Tasks included for activity 3 (within New Project )

- Detailed project plan
- Adjust the ENSIS-application to cover all types of pollution sources within the province (remaining point pollution sources and diffuse pollution sources such as run off from agriculture), including a special solution for handling accidents and spills resulting in severe water pollution
- Adjust the model functionality to be able to simulate the pollution situation in the province
- Develop and implement a pollution routing model to cover transport of pollution in the river basin in order to find the ambient water quality
- Improve the digital, thematical map information (administrative regions, land use, etc) and investigate the possibilities of buying and using satellite photos.
- Enhance the combinative use with other systems like ArcView, statistical software, presentation programs, etc.
- Training and operative, long-term use of new modules in ENSIS (both technically and as a water management system)
- Reporting

There must be a separate budget for necessary software and for data which can not be supplied by HEPB or HEMC. There might be problems with mixed credits as HEPB has limited amount of money available for .

**Timeline : June 2000-June 2001**

#### 4. Tasks included for activity 4 (within new project):

- Detailed project plan
- Install the ENSIS system phase 1.
- Provide transfer knowledge from HEMC to MEMC, carried out by personnel from HEMC
- Provide training in advanced use of ENSIS, carried out by specialists from NIVA and Norgit.
- Reporting

The installation of ENSIS and training of personnel in Mudanjang will be covered in two phases. The first version of ENSIS will be installed during the summer year 2000 and the installation and training of Mudanjang personnel will be undertaken of Norwegian expert in co-operation with Chinese personnel at HEMC. The transfer of existing knowledge at HEMC, dissemination of results and training of personnel will be focused.

The second version of ENSIS (finalized in May 2001) will be installed during the summer 2001 and the training will be undertaken in parallel with the training of HEMC personnel.

There must be a separate budget for technical equipment/hardware and software. There may be problems with mixed credits as HEPB has limited amount of money.

**August 2000-January 2002**

#### 5. Tasks included for activity 5 (within New Project)

Mudanjang will be used as a model area for running the pollution budget model with data from all sources (both point and diffuse sources included).

The area will be used as an example of how pollution abatement analysis can be undertaken. The study will result in concrete suggestions for how to reduce the pollution in the area to the lowest costs.

The Mudanjang area will also be an example of how future data collection, data management and environmental management can be performed.

- Detailed project plan
- Methodology transfer (same tasks as described under objective 2, but HEMC will take actively part together with Norwegian experts for transfer of knowledge.
- Provide training and exchange information in the handling and use of manually collected monitoring data. (How to design a monitoring programme, collection of data, analyses, use of statistics (correlation, significance etc)
- Strengthen technical skills and developed routines for maintenance of automatic monitoring equipment and collection of data from these on the basis of the existing monitoring practice.
- Provide extended training in use of automatically monitoring data in the ENSIS system. With a focus on statistical analysis.
- Provide training in the methodology of pollution abatement analysis and how a system like ENSIS can be used as a tool to undertake these types of analysis.

- Data collection (water quality data , point pollution sources, diffuse pollution sources, information about environmental goals, user interests, physical description of water systems and catchment, maps etc.) The data collection program needs to be focused and has to go further than the data which are already collected at the monitoring centers. Examples of data not currently available are data about diffuse pollution sources and hydrological monitoring data.
- Training in use and maintenance of ENSIS (undertaken as part of objective 4 and will have both a technical and a science component )
- Conversion and import of data to build up a complete database (monitoring data, pollution source data, maps and other data used in the management of water resources)
- Adjustment of models and running and documentation of modeling scenarios.
- Reporting

There must be a separate budget for the data and maps which need to be purchased. The monitoring station in Mudanjiang is a reduced station in, nitrate and COD is missing. There is a wish from HEMCS to have COD/TOC on-line. Important project.

**June 2000-May 2003**

#### 6. Tasks included for activity 6 (within new project):

- Detailed project plan
- Build up routines for transfer of data from local/regional authorities (MEMC) to the provincial center (HEMC)
- Evaluation of technical solutions
- Demonstrate possible administrative and a technical solution for data flow
- Install technical tools to enhance the dataflow between the two administrative levels.
- Train the personnel at both HEMC and MEMC to use the technical tools.
- Reporting

The project will go on through the whole project period and shall improve data flow between the monitoring centers. HEMCS wishes more information on how the technical tools, a “thin client” solution will work.

**June 2000- May 2003**

## 7. Tasks included for activity 7 (within new project)

One important overall goal for the Norwegian support to projects in Heilongjiang is to improve the environmental situation in the area and enhance sustainable development.

This goal can only be accomplished through better management of the water resources. However a better management of water resources and solutions to improve the environment must be political feasible. Which again means that the attitude towards environmental problems must change and improve.

The understanding and awareness around environmental problems can be enhanced by providing the public with targeted, timely and reliable information , which in the second turn can provide a better climate for changes.

A monitoring and management system such as ENSIS should in addition to be a water resources management system for specialists also provide information to the public. This can be undertaken by connecting the ENSIS internet module to the system, and adapt this to Chinese conditions. The ENSIS internet module takes data from the ENSIS system and present these data in a user friendly manner on internet.

The tasks for objective 7 should include:

- Detailed project plan
- Installation of ENSIS internet module
- Training in the use and maintenance of the system
- Definition of additional needs (user and technical specification)
- Adjustment of the ENSIS internet Module to Chinese conditions and needs (both in terms of functionality and language)
- Installation and training of a final Chinese internet version.
- Implementation of the ENSIS internet module to the internet homepage of HEPB and HEMC.
- Evaluation of technical solution for presentation to the public (i.e a big monitor at the HEPB with a PC connected to internet)
- Reporting

There must be a separate budget for technical equipment/hardware and software.

**Timeline: January 2001-May 2003**



## **Activities that generate results and data to be fed into ENSIS**

All activities hereafter concern the Mudanjiang catchment.

### **1. Further development of the abatement strategy (extension):**

ENSIS either already stores data such as on water recipient monitoring data or will store in the near future data on e.g. industrial discharges, wastewater load per selected unit. The work on abatement strategy has to date generated some additional background information such as information about land-use, crops grown, fertiliser statistics. The first report on the abatement strategy will:

- Describe the general principles of an abatement strategy
- Describe data collection procedures, i.e. type of data needed, collection methodology
- Identify the most important polluting substances in the Mudanjiang catchment
- Identify the user interests
- Provide an outline of the possible load reduction solutions

The next step in the abatement strategy work for the Mudanjiang catchment is to collect more detailed information about e.g. population pattern and sewage pipes, agricultural practices. Furthermore it is necessary to develop a more complete list of possible measures to be undertaken to reach agreed goals for water quality.

In that respect it is of importance to use reliable tools for assessing the various possible measures to be undertaken to reduce the load from the most important polluting substances. Depending on the type of substance under consideration (for the Mudanjiang catchment parameters such as organic load, phosphorus, and bacteria concentrations will need to be assessed), measures within the agricultural sector, urban wastewater and/or industry will need to be considered. Cost-effectiveness analyses are required to select the most appropriate measures.

Furthermore it may be appropriate to consider the usefulness of the measures compared to effects e.g. related to health effects, or the effects of financial instruments such as taxes on fertiliser, reduced price support. There are existing computeractive processes/models.

Amore detailed project plan will be prepared.

### **2. Analysis of the results of the two intercomparison exercises and solutions to any problems that may have occurred (extension)**

A first low-scale and low cost intercomparison exercise was carried out in 1998 with the participation of laboratories in Yantai and Harbin. A more comprehensive, but still low-cost exercise is currently being prepared, with the participation of laboratories in Mudanjiang, Harbin and Yantai. It is important to assess the results of the exercises and to find solutions to any discrepancies in the results. Better data will enhance the value and reliability of the results of all the other activities within the project. The solutions are to be found in altered laboratory practices and/or change in laboratory equipment. Capacity building through receiving a trainee from the analytical lab at HEMCS for training in analysis of organic compounds. 6 months stay in Norway

### **3. Limnological study of the Jing Bo Hu with emphasis on the understanding of the algal blooms in the lake, including toxin analysis (new)**

The lake is of importance for recreational purposes, but also as a drinking water reservoir. The monitoring activities in the lake are related to surface water samples being taken 8 times a year at the inlet, middle (but in a bay) and outlet of the lake. In order to get a better understanding of the chemical and biological processes in the lake and, in order to prepare the ground for improving the water quality in the lake, it is necessary to extend the monitoring activities in the lake by:

- Taking more frequent samples, in particular in periods of algal blooms,
- Taking samples at more sites in the lake
- Taking samples from the surface to the bottom of the lake
- Study, in particular, the phosphorus, organic matter and oxygen concentrations throughout the water column
- Measure the phytoplankton biomass and identify the dominant algae throughout the year
- Perform toxin tests of the algae
- Perform analyses on sediment cores.

Such extended monitoring activities will be necessary to enable sound suggestions for improving the water quality in the lake. Furthermore it will be necessary to establish co-operation with the authorities in the Ji Lin County, as there is a substantial input of e.g. organic matter from the Dun Hua City.

It may be necessary to procure additional field equipment for such monitoring activities, e.g. oxygen meters, water samplers, Secchi disks

The Chinese experts have identified three topics where needs assistance is needed:

- Measuring production of biomass
- Toxin analysis
- Samples at lower depths than 0.5 m (the max depth for the lake is 40 m)

### **4. Limnological study of the Lian Hua lake (artificial dam), with emphasis on the assessment of the ecological effects of the construction of the dam and the development of an efficient monitoring programme related to the dam (chemical, physical and biological programme) (new).**

The dam was constructed 2 years ago. Hitherto there has been no extensive monitoring activities for the purpose of obtaining a good chemical and biological overview of the lake, nor any assessment of the ecological effects of the dam construction.

In order to get a better understanding of the chemical, physical and biological processes in the dam, it is necessary to extend the monitoring activities in the lake by:

- Taking more frequent samples, in particular in periods of extreme water flow/levels (high and low),
- Taking samples at more sites in the dam
- Taking samples from the surface to the bottom of the dam
- Study, in particular, the phosphorus, organic matter and oxygen concentrations throughout the water column

**5. Upgrading of the chemical laboratory. (See proposal from meeting in April -99).**

From next year January 1<sup>st</sup>, SEPA will set up criteria for 40 organic compounds in water. National criteria should be followed by surveillance, but HEMCS does not have the possibility to the necessary analyse. They need a GC-MS to be able to analyse the components.

## Annex 4. Report from NORGIT - CHN 0017

### Summary of activities at HEMCS 2.11.99 – 3.11.99

#### Planned activities at the HEMC:

1. Import partly fixed database, prepared by Kjersti and Tor Haakon in Norway.
2. Import rest of measurements (Mixed samples)
3. Setting up new transformed maps
4. Installation and setup of ADACS.
5. Training of ADACS

#### Tuesday 2.11.99

0900

Arrival and a very warm welcome at HEMC.

0900 – 1000

Meeting to plan activities for the visit

Agreed program

Tuesday morning	Import of database and measurements.
Tuesday afternoon	Setup off new map shape files in UDBA
Wednesday morning	Installation of ADACS
Wednesday afternoon	Setup/testing/training ADACS

1100- 11.30

Import of the partly fixed database. The test\_prj user was deleted and recreated. The project was renamed to Heilongjiang November. The partly fixed database was imported successfully. Starting import off mix sample measurements. Some problems with tie identification, but sorted out after talking to Tor Haakon at NIVA.. The qr3 file is 34000 records and must be imported in sections off 6000 records. Importing this file will take approximately 12 hours.

1130 – 1300

Lunch

1300 – 1700

Setting up the UDBA with the new maps. There were some problems with the railroad theme. This seems like a bug in the system, has to be tested further. The staff at the monitoring centre did most off the work to define the map themes. To improve the maps it is required that the monitoring centre acquire a copy of the ArcView GIS system. Some of the map themes could not be identified, and therefor not set up in the system.

A small part of the mix sample measurements qr3 file (100 records) was imported. The staff of the monitoring centre did the import.

## **Tuesday 2.11.99**

0900 - 1000

We started in the morning with a status of yesterdays activities.

1000 - 1130

We installed the ADACS system, on the workstation. The installation was successful, and the ADACS system connected OK to the ENSIS database. We connected to the training project and started testing the communication with the data loggers. The test was done using the Harbin station. The ADACS system connected to the logger modem, but we where nor able to read any data from the logger. On all other stations we where not able to connect to the modem. We tried different settings in ADACS but where not able to read any data.

1130 – 1300

Lunch

1300 – 1530

Start of training of ADACS. The training was done on the November project. All stations, loggers and instrument where defined in ADACS by the HEMC staff.

1530

Meeting to sum up the activities and problems.

### **Conclusion**

The HEMC staff handles import of measured data very well. The definition of map data in the UDBA is also handled very well. We did not manage to run the ADACS fully, but I feel that the HEMC staff has a good overview over the system and can operate this in the future. The problem with the communication with the loggers has to be investigated future. I will test similar stations in Norway and report back to HEMC the result.

### **Personal comments.**

The HEMC staff is very skilful and very willing to learn. But most important of all they are very warm and helpful people. I am very glad that I have had the opportunity to work with them, and hope that we soon will meet again.

Harbin 3.11.99

Geir Bakke Nielsen.

**Surveillance of Water Quality in the Songhua River System  
in Heilongjiang Province, P.R. of China, CHN 017**

**Project Meeting in Harbin**

**November 1 – 4 1999**

**Participation**

**HEPB**

Mr. Guo Yuan, Mr. Chen Yong, Ms Ming Xiannan

**HEMCS**

Ms Chen Aifeng

**NORGIT**

Mr Torstein Skancke (ENSYS A/S), Mr Geir Bakke Nielsen

**NIVA**

Ms Bente M. Wathne

**1. Opening**

Mr Guo Yuan opened the Project Meeting and welcomed the Norwegian project partners to Harbin. On behalf of the Norwegian visitors Ms Bente M. Wathne expressed her appreciation for the warm welcome and the possibilities to work together with the Chinese partners on this project. It was recalled that 1999 was a year of extensive progress within the project, as both the monitoring instruments for water quality and the ENSIS system have been installed and are in operation.

**2. Agreement on the agenda**

The agenda as it is shown in Annex 1 was agreed upon. It was also agreed that Mr Geir Bakke-Nielsen should work in the Monitoring Centre (HEMCS) in parallel with the discussions at HEPB of the administrative matters.

**3. Administrative matters**

Mr. Guo presented a fax from MOST referring to a letter sent by NORAD on financial matters. (See Annex 2.) As explained in the letter there has been a long history of negotiations

and change of financial procedures and handling routines within the project, and the result is that there has been transferred too much of the project funds to MOST. According to the letter, an amount of 0.191 mill NOK should be made available for NIVA. The Chinese project partners stated that MOST has not agreed to the overall budget referred to in the fax. The transferred money was spent on the project with the understanding that the amount was correct. The annual budgets for both sides have not been agreed due to this fact, and that is the cause behind the actual situation. It is very difficult at this stage to reallocate the money. NIVA promised to explain the problem to NORAD and seek their advice for an acceptable solution. NIVA will ask NORAD for the possibility to provide the necessary amount as extra funding for the project.

Mr Guo also signed the invoice from NIVA for the project work in the 3<sup>rd</sup> quarter 1999. It was noted that the over voltage protection provided from NIVA should be paid by HEPB at a later stage.

#### 4. Project Status

Ms Chen Aifeng reported the project status under the following headings:

- Installation ENSIS
- Installation and activities at the monitoring stations
- Transmission of data
- Installation of instruments for analytical labs, AAS (atomic absorption spectrophotometer) and ion chromatograph
- Abatement strategy work

**4.1 Installation ENSIS.** Installation of ENSIS was planned for March 1999, but due to delay in the transport of the server, installation was only possible on the computer when NORGIT visited in March. In April the first installation of ENSIS was performed during the Workshop held (See Consolidated Summary report of NIVA's mission in Harbin, April 1999). All goals set for the Workshop were not fulfilled due to:

- a. delay of the server, giving no possibilities for the Chinese partners to prepare for the April training
- b. problems not counted for in the first ENSIS version, when positioning the sampling points in the traverses in the Songhua River
- c. transfer of data from the monitoring station was not working properly

The training planned for August was postponed to October, but was then carried out to satisfaction both for the Chinese and the Norwegian partners. The period May – September was used for training on the system, translation into Chinese, and converting monitoring data from the Foxpro database into ENSIS. Data from 1997, 1998, and 1999 in all 8404 data sets were converted, and of them 6784 data sets have already been imported from Foxpro. For the last 12 years 19970 data sets are converted, and 13933 imported to ENSIS.

It was agreed that cross sections with monitoring points and water flowing directions were sufficient for Chinese water model.

#### 4.2 Installation of instruments at the monitoring stations

In April installation was carried out for the water monitoring instruments at four stations, Jiamusi, Mudanjiang, Harbin, and Qiqihar. (See Consolidated Summary report of NIVA's mission in Harbin, April 1999). The instruments at the stations are now running, but there are still some starting problems with some of the monitors. The instrument delivery firms are working to solve the problems at the moment.

#### **4.3 Transmission of data**

Transmission of data is working O.K. with ADACS for the ACCESS data base. ADACS for the ENSIS data base will be installed during this meeting to improve the work.

#### **4.4 Installation of instruments for analytical labs**

AAS (atomic absorption spectrophotometer) Hitachi Z-500 and ion chromatograph Shimadzi HIL-14A, were installed in the lab at HEMCS. The instruments are performing well. They are used respectively for Cu, Pb, Cd, Mn, and Cl, F, SO<sub>4</sub>.

#### **4.5 Abatement strategies**

Mr Stig Borgvang and Mr Jon Lasse Bratli are working on an abatement strategy for the Mudanjiang catchment. It is taken as a case study on abatement strategy for the Songhua River catchment. They visited the area in August-September to prepare the strategy plan together with the local environmental experts.

### **5. The water monitoring stations, and status for the instruments.**

As described above and in more detail in the Consolidated Summary report of NIVA's mission in Harbin, April 1999, the water monitoring instruments have been installed at four stations, Jiamusi, Mudanjiang, Harbin, and Qiqihar. At present there are some starting problems not all solved:

- The monitor for dissolved oxygen worked improperly below 5 degrees C. The problem has now been solved.
- The automatic calibration routines for the nitrate and ammonium monitors are not well functioning at low concentrations. The problem seems to be solved only for ammonium in Harbin.
- The turbidity monitor has some problems with calibration. The results do not follow properly the results from the manually analysed samples
- The COD instrument from IONICS was installed in May 99. The instrument has not yet passed all the tests for delivery. A representative from IONICS is working on the problem
- The air compressor is not functioning in Mudanjiang

Conductivity meter has been exchanged

The mobile monitoring station has not yet been put together, but all the instruments are delivered. Configuration and installation will be made after the solution for the above-mentioned problems is found.

### **6. Planning of the Annual Report**

The main headlines for the Annual Report were discussed on the basis of the programme set up for phase 2 and 3 in the original project proposal and the plans given in the Annual Report for 1998. The Annual report will be based on the two consolidated workshop and mission reports for the workshops, training sessions and meetings during April and September-October 1999. The Annual Report will summarise the activities through the year 1999, including the project costs for the 1999 activities, and the budget for 2000. Delivery of the Norwegian input to the Project Annual report will be in January 2000. The Project Annual



report shall be delivered to NORAD 6 weeks before the annual meeting between NORAD and MOST in Beijing, normally held in March or April each year.

## **7. Discussions on extension of the running project and on new project proposals**

Extension and new project proposals were discussed. For each proposed task comments were given referring to Annex 3. Priority was given to the tasks in the following order:

1. *Activities within ENSIS WaterQuis*
2. *Activities that generate results and data to be fed into ENSIS*
  - A. Analysis of the results of the two intercomparison exercises and solutions to any problems that may have occurred (extension) including capacity building in organic chemistry. Taking a trainee from the analytical lab for training in analysis of organic compounds. 6 months in Norway
  - B. Limnological study of the Jing Bo Hu with emphasis on the understanding of the algal blooms in the lake, including toxin analysis (new)
  - C. Limnological study of the Lian Hua lake (artificial dam), with emphasis on the assessment of the ecological effects of the construction of the dam and the development of an efficient monitoring programme related to the dam (chemical, physical and biological programme) (new).
  - D. Further development of the abatement strategy (extension)
3. *Support and service performance*

This last point may be an integrated activity following the three projects using the ENSIS system in China.

The proposal for Air Quality monitoring, discussed at earlier project meetings is still given priority.

## **8. Intercalibration activities**

Mr Håvard Hovind sent the information that the letter from HEMCS confirming their participation in the international intercalibration exercise was received by NIVA, and in this way informed the group that the samples to be analysed should be sent out later this week.

## **9. Discussion on support and service performances for the ENSIS-product**

The support and service performances paid by NORAD for the ENSIS-product after completion of the project, were discussed with basis in a contract. The contract will be with ENSYS A/S that is the sales company for the ENSIS-product set up by NILU, NIVA and NORGIT. The owners have full responsibility for the ENSIS-product, but have organised the commercial sales work, all warranties, support and all programme service through ENSYS. The projects for the future can still be directly with ENSYS's mother institutions like NIVA.

The different tasks in the service and support were discussed.

## **10.Planning of 2000 activities**

The following activities defined in phase 3 of the project are agreed for next year:

- Make the model operational
- Installation of the full Chinese version of ENSIS in the Heilongjiang Province
- Further training of the Chinese staff in Heilongjiang Province in operating the ENSIS system
- Finalise the abatement strategy report for Mudanjiang catchment as a case study on abatement strategy for the Songhua River catchment.
- Finalise the plan for extensions and new project activities for the water monitoring and surveillance

It is agreed that a draft of Final report shall be discussed the Final Workshop in May-June 2000, and then finalised after the Workshop.

Project Meeting in Harbin  
CHN 017 November 1-4 1999

Activity	Date
Delivery of the input to the Annual Report from NIVA	End of January 2000
Training in Harbin, (provided by NORGIT)	End of January 2000
Final abatement strategy report	End of January 2000
Annual Report from HEPB to MOST	End of February
Monitoring stations follow up	January-June 2000
Installation of the water model and the full Chinese version of ENSIS	May 2000
Final Workshop <ul style="list-style-type: none"><li>• Dissemination of results</li><li>• Presentation of the technical ENSIS system</li><li>• Presentation of how to use the ENSIS system</li><li>• Plans for extensions of the water monitoring and surveillance programme</li><li>• Presentation of the abatement strategy</li></ul>	May/June 2000
Final report	June 2000

Harbin 4. November 1999

For HEPB

Mr. Guo Yuan



For NIVA

Ms Bente M. Wathne

