STANDARD SUMMARY PROJECT FICHE

Basic Information

1.1. CRIS Number: 2003/005-026.09.01
Twinning light EE03-IB-EN-02

1.2. Title: Development of the National Hydrometric network to EU standards

1.3. Sector: Environment

1.4. Location: Estonia

Objectives

2.1. Overall objective(s):
Estonia fulfils the requirements of the Water Framework Directive (2000/60/EC) for surface water quantity objectives and thus provides the evaluation of its water status.

2.2. Project purpose:
The project purpose is to develop a hydrological network in Estonia in order to improve the monitoring of surface water and to evaluate the integration of quality and quantity aspects of surface water.

2.3. Accession Partnership and NPAA priority:
The project will fall under the environmental priorities of the 2001 Accession Partnership. The priorities relevant to the current project - mentioned in Chapter 4 – Priorities and intermediate objectives of the AP – are:

- To complete transposition of the acquis, with particular emphasis on water quality and waste management.
- To continue implementation of the acquis, in particular as regards:
  - Controlling the discharge of dangerous substances into the aquatic environment (by establishing pollution reduction programs and through effective monitoring);
  - Reducing nitrate pollution from agricultural sources;
  - Meeting the microbiological standards required of water intended for human consumption;
- To further strengthen the administrative capacity, in particular at regional and local level.

The project supports Estonian National Programme for the Adoption of the Acquis (NPAA 2002 part III, chapter 22 Environment). According to the NPAA the monitoring needed for classification of surface water is achieved by implementing the Regulation of the Minister of Environment establishing surface water quality classes, the values of quality indicators of water quality classes and the procedure for determination of water quality classes will be implemented.

National Development Plan (NDP) is designed in line with priorities set up by National Environmental Strategy and National Environmental Action Plan. According to the NDP, the water sector is one of the five main sub-sectors to be given priority during the 2001-2004 period (chapter 8.1. 8.1.5, 8.4.4.-

1 Among others: Water Framework Directive 2000/60/EC
8.4.6) – Surface Water Protection and Sustainable Use). There following priorities are relevant to the current project:

- to achieve on time implementation of EU directives;
- to introduce various environmental standards according to International Standard Organization (ISO) and the European Standard Committee (CEN);
- to train civil servants (water managers and local and regional authorities).

The Regular Report on Estonia’s Progress Towards Accession, 2002 (Ch. 22. Environment) indicates that priority needs to be given to the complete transposition of the acquis, in particular as regards water quality.

- In the field of water quality, the Water Act Amendment Act was passed in December 2000, introducing the catchment-based approach into water legislation. Additionally, based on the Act, four governmental regulations were adopted in 2000 and 2001. The act was prepared in order to harmonise Estonian legislation with the EC Water Framework Directive.
- The water monitoring programmes are under reorganisation.

2.5 Cross Border Impact

N/A

3. Description

3.1. Background and justification:

Background

The Hydrology Department of the Estonian Meteorological and Hydrological Institute (EMHI) is indicated as the National Hydrological Agency. Three Regional Hydrological Centres supervise and operate the hydrometric network and related field measurement activities in scope of each region. The duties of the Hydrology Department comprise co-ordination and data processing of the hydrological monitoring programs, development of instrumentation, maintenance and development of the hydrological database and provision of a hydrological data and analysis. Hydrological modelling forms part of the department’s work but is constrained by a lack of specialists and the limits of finance.

The commitment in the field of hydrology is exercised through the EMHI basic regulation, which is established on the basis of the “State Government Law” paragraph 43 item 5, in accordance with the State Government Regulation 437 of the “The Ministry of the Environment basic regulation” paragraph 14 item 14, 30 December 1999.

Observation network

In the course of recent years the network of hydrological gauges has been drastically reduced (map of existed stations in ANNEX 12). At present it comprises a total of thirty-six river flow monitoring stations, five lake water level monitoring stations and seven stations in the Endla Nature Reserve for measurements of the water balance of the bogs (see ANNEX 5). At many of the hydrological stations meteorological data (air temperature and precipitation) are also taken.

The variables measured by the current EMHI hydrological monitoring networks are:

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. of stations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precipitation</td>
<td>40</td>
<td>Catchment-area values are calculated manually</td>
</tr>
<tr>
<td>Air temperature</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Evaporation</td>
<td>3</td>
<td>By Class A pans</td>
</tr>
<tr>
<td>Surface water level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>of the rivers</td>
<td>36</td>
<td></td>
</tr>
</tbody>
</table>
of the bogs 7
of the lakes 5
River discharge 36
Ice thickness 36 - also dates of freezing/break-up
Water temperature 30 - either surface water or vertical profile

All hydrological stations operate in accordance with the State Surface Water Monitoring Programme (SSWMP). The programme is in accordance with the regulation acts of the Republic of Estonia and with the environmental regulations concurrent with the EU accession. SSWMP covers as follows:

<table>
<thead>
<tr>
<th>Network</th>
<th>No. of stations/sampling sites</th>
<th>Frequency of measurement/sampling</th>
</tr>
</thead>
<tbody>
<tr>
<td>- hydrological monitoring of rivers</td>
<td>36</td>
<td>2-3 times a months</td>
</tr>
<tr>
<td>- monitoring of physico-chemical quality of rivers</td>
<td>58</td>
<td>4-12 times a year</td>
</tr>
<tr>
<td>- biological monitoring of rivers</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>- groundwater level</td>
<td>373</td>
<td>Every 3rd day</td>
</tr>
<tr>
<td>- chemical composition of the groundwater</td>
<td>163</td>
<td>1-2 times a year</td>
</tr>
<tr>
<td>of the groundwater</td>
<td>163</td>
<td></td>
</tr>
</tbody>
</table>

Methods of measurement and equipment
The measuring methods and equipment are indicated in Annex 5. The basic equipment of all monitoring stations is a staff gauge that allows the observer to take daily readings. The observer makes river flow measurements two or three times a month using the velocity-area method. The majority of the instruments used in the EMHI are 35 to 40 years old and the instrumentation park requires improvement.

Maintenance
All the measurement points have designated observers. They inform the relevant Regional Centre about the need for maintenance. The Centre in turn informs the EMHI Hydrology Department or Technical Department.

Data transmission
The Hydrology Department receives data from the Regional Centres and from measurement sites by different media. Manual transmission and restricted so named E-mail systems are available. The Hydrology Department presents the continuous hydrological data to the State Water Cadastre, in accordance with the Data Collection Act paragraph 32 intersection 1 and the Water Act paragraph 36 intersection 2. The Statute of Water Cadastre (1993) regulates the water resources estimation and management, the rules of the data use, database creation and development. The EMHI is identified in these acts as an executor of the surface water hydrological monitoring in Estonia. The Water Act (1994) states that Estonian Government carries out water use and protection on the state level. Local environmental services are responsible for the duties of these functions in counties.

The data is also quarterly transmitted to the Estonian Environmental Information Centre (EEIC), from where the daily discharges are available to end users, such as Department of Environmental Engineering of the Tallinn Technical University (TTU), Institute of Zoology and Botany (IZB) of the Estonian Agricultural University (EAU), Estonian Environment Research Center (EERC), National Monitoring Programme of the University of Tartu, etc. BALTEX, HELCOM and International Environmental Agencies (EUROWATERNET, EUROSTAT) receive the data yearly. See further in ch 6, Implementation arrangements.

The following is a list describing manual possibilities for data transmission:
- Manual observation forms and recorder charts are sent monthly by mail (hard post) from the observers to the Regional Centre.
- Daily discharge data are sent quarterly by e-mail from Regional Centre to the Hydrology Department.
- Manual observations needed daily for operational works are transmitted by telephone or by E-mail to the Hydrological Forecast group. The hydrological code ?? -15 has been used for data transmission (meteorological data, water level, ice phenomena). The frequency of the meteorological data transmission is every three hours.

**Data analyses and storage**

All river flow data (raw, primary, daily and computed daily means) from EMHI hydrometric network are forwarded to the Hydrology Department for analysis and quality control. Manual observation forms (hydrological observation books, complex graphical plot, chart recorder) are stored in the Hydrology Department and the EMHI archive/library.

Data processing, collection and storage are executed using the HYDRO software. The software only permits storage of preliminary processed data (in ASCII format from 1995 year). The output variables (mean, extreme and annual values) are stored in special tables or forms prepared for the hydrological yearbook.

The daily mean flow data (runoff), based on the FoxPro database management system, are stored in the EEIC of the MoE and in the form of the EXCEL tables in the Hydrology Department.

**Data quality and availability**

The primary data processing includes several elements of quality control under the HYDRO package. The quality control of processed data includes only visual inspection. Real-time raw data are available from 15 hydrometric stations once a day only for hydrological forecasts.

**Data dissemination**

Hydrological data are available for the users in the following forms:

- Raw, processed and analysed hydrological data (non-digital)
- Publications
  - Hydrological Yearbook (till 1990)
  - statistical summaries (till 1980)
- Environment Information Centre of the Ministry of the Environment
  - long-term daily discharge data (digital)
- Hydrological forecast (water level, ice chart)

**Problem description and justification**

The main objective of strengthening the national hydrometric network is to support effective implementation of the Water Framework Directive. A strengthened network will enable Estonia to fully meet many requirements of this directive within the required timescale.

Introduction of River Basin Management is central to the Water Framework Directive (WFD), with monitoring of river water quality of special importance. The primary motivation to upgrade the national hydrometric network – i.e. the monitoring of river flow quantity – is to strengthen the monitoring of surface-water pollution loads. Improved river flow monitoring will also directly support the implementation of other aspects of the WFD (control the discharge of dangerous substances into the aquatic environment, reduce nitrate pollution from agricultural sources etc.).

The existing networks for providing data and information on water quantity and quality do not provide an adequate basis for sustainable managing freshwater resources nor for forecasting and mitigating the effects of extreme hydrological events. The low priority for hydrological activity, a shortage of relevant staff and limited funding during recent decades are major reasons that prevent investments in new equipment and technology.
The reduction by 40% of hydrometric and meteorological stations has created problems for the reliable determination of runoff. The present density of the hydrometric network (0.8 stations per 1000 km$^2$) is less than the minimum recommended by the World Meteorological Organisation (WMO) for a basic hydrometric network (Guide to hydrological practice, WMO-Nr.168: 1 station per 1000 km$^2$).

Moreover, insufficient density of the hydrometric network creates difficulties in implementation of the Convention on the Protection and Use of Transboundary Watercourses and International Lakes, (Helsinki 1992, Part I, Article 4, Monitoring, Article 6, Data exchange) and HELCOM requirements.

The majority of the instruments used in the EMHI are 35 to 40 years old. The existing instrumentation park requires improvement. Telecommunication systems are rather old.

Real-time data files are available from 15 hydrometric stations and it is only once a day water level data series. The river flow data production is possible only with a delay of about 3 to 3.5 months. Experience in how to install, calibrate and transmit data through an automated hydrometric network is poor. There is also a lack of electronic specialists in the field of hydrology due to specialists’ salary lower in EMHI than average in Tallinn.

The absence of a hydrological database and its integration with meteorological database at EMHI create difficulties in data storage and restrict hydrological analyses. The last hydrological yearbook was published in 1990 due to the financial limit. Thus, hydrological data are currently only stored in form of tables in the Hydrology Department.

The next problem is connected with water quality, regarding the discharge of wastewater, agricultural pollution and the eutrophication of the lakes and coastal areas. According to Article 8 (Water Framework Directive) the hydrological monitoring must cover the volume and level or rate of flow to the extent relevant for ecological and chemical status and ecological potential. However, only 28 water quality measurement sites are covered by hydrological data, therefore the pollution load cannot be estimated adequately (HELCOM convention requirements).

The problem areas to be addressed are that:

- The existing hydrometric network does not meet the requirements of WFD paragraphs 33, 34, 36, 46 and Article 4 in the field of coordination and integration of qualitative and quantitative aspects of surface waters.
- The existing hydrological equipment is typically 35-40 years old, worn out and does not satisfy the requirements of WFD paragraph 49 and Article 20.
- Telecommunication systems are rather old; therefore near-real time data are unavailable (Article 20 of WFD);
- Graphical software for providing maps showing the surface-water monitoring network is absent. Thus, EMHI cannot provide suitable maps for the river basin management plan according to Annex V (1.3) of WFD, and in order to meet environmental objectives under Article 4 of WFD.
- Only a limited number of the hydrological stations are situated on the transboundary rivers, on large rivers (with catchment area > 2,500 km$^2$), on large lakes and reservoirs, and at such other sites as are required under section 1.3.1 of Annex V to estimate the pollutant loads transferred into the marine environment. Thus the limited number of hydrometric stations does not meet the requirements of paragraph 35 of the WFD.
- The density of the surface-water monitoring network is insufficient to provide decision makers with the required information, which is in disagreement with the requirements of WFD, Annex V (1.3.). It creates difficulties in implementation of the HELCOM Convention and the Convention on the Protection and Use of Transboundary Watercourses and International Lakes, Helsinki 1992, Part I, Article 4, Monitoring, Article 6, Data exchange.
- Water quantity and quality data are insufficiently integrated which is needed in order to implement Article 8 of WFD. Only 28 of 59 water quality measurement sites are covered by hydrological data.
- The archive of hydrological data does not meet the needs of decision makers who will prepare the river management plans in order to achieve the requirements of Article 13 of the WFD;
The existing hydrological network for providing data and information on water quantity and quality does not provide, according to Article 1 of WFD, an adequate basis for sustainable management of freshwater resources nor for forecasting and mitigating the effects of extreme hydrological events (draught, flood etc).

- There is also a lack of trained specialists in new technologies necessary to maintain development of the monitoring network;
- The hydrological database integrated with meteorological database is absent.

The gaps identified to implement the WFD in terms of number and natures of analyses are as follows:
There are 37 hydrometric stations in Estonia, which provide reliable water quantity data for water quality monitoring program (ANNEX 5). However, there are about 60% monitoring points, which are not covered by water quantity data. Only a limited number of the hydrological stations are situated on the Transboundary Rivers, on large rivers, and on large lakes and reservoirs. Moreover, the existing hydrological equipment as well as telecommunication systems are typically 35-40 years old and worn out. Graphical software for providing maps showing the surface-water monitoring network and the hydrological database integrated with meteorological database are absent. No requirements of the WFD are transposed.

The coordination of the measures in respect of surface water belonging to the hydrological system should be pursued for each river basin in order to achieve good water status according to WFD. For the purposes of environmental protection there is a need for a greater integration of qualitative and quantitative aspects of surface water, taking into account the natural flow conditions of water within the hydrological cycle. It is necessary to provide proper information about planned measures and to give report on progress and the implementation of it, with a view of the involvement of general public before final decision.

Thus, the number of stations, which is increasing up to 54 in the frame of the project, allows meeting the requirements of WFD paragraphs 33, 34, 35, 36, 46 and Articles 4, 8 and Annex V (1.3.) in the field of density, coordination and integration of qualitative and quantitative aspects of surface waters and to provide decision makers with the required information.

The establishment of 3 hydrometric stations on the Transboundary Rivers permits to meet the requirement under section 1.3.1 of Annex V and to estimate the pollutant loads transferred into the marine environment.

The modern hydrological equipment, up-to-date telecommunication systems, which are envisaged in the project, allow getting a near-real time reliable data for satisfaction of the requirements of WFD paragraph 49 and Article 20 in Technical adaptation to the Directive.

The modern software, which is foreseen in the project, permits to provide suitable maps for the river basin management plan according to Annex V (1.3) of WFD, and allows to meet the environmental objectives under Article 4 of WFD.

The developed hydrological network for providing data and information on water quantity and quality allows to gain an adequate basis for sustainable management of freshwater resources and for forecasting and mitigating the effects of extreme hydrological events (draught, flood etc) according to Article 1 of WFD.

The modern archive of hydrological data allows meeting the needs of decision makers who will prepare the river management plans in order to achieve the requirements of Article 13 of the WFD.

Selection of stations

A Feasibility study performed by Jacobs Gibb in October 2002 (Summary at annex 4) provided an analysis of the existing network, software and equipment, and defined the needs for its development. Proposals for the design of a hydrometric network in order to achieve an adequate network in an integrated manner were done. The number of stations (some 20-25 upgraded and new sites) was determined during the feasibility study. Following its recommendations, 23 stations will be either built or upgraded for he following reasons.

Proposed station for opening (automatisation)
There is a priority to re-open a station on the Pirita river. Pirita river, which is heavily exploited and located close to the capital, should be gauged close to its outfall into the Baltic Sea. Thus, the establishment of the station is needed for satisfaction of WFD in the frame of the water quality monitoring (Article 8). The satisfactory calculation of the river runoff is difficult, as the river is used for water supply. The proper infrastructure for hydrometric station building exists. High security measures (metal box, alarm, insurance) are intended to apply. The new telecommunication system, for a real-time data transmission, is also planned to install. Thus, if the run of the data stops, the mobile hydrological group, which is planned to organize for maintenance of automatic stations and discharge measurement, goes immediately to check the station (it takes 15 minutes to reach the Pirita measurement point from a main office). List of proposed stations with justification and map of proposed stations are presented in Annex 11 and 12.

There has been consideration to re-open the following stations: the Velise at Valgu, the Vigala at Konuvere and re-equipment of the Kasari at Kasari. There is a specific requirement as they are used in flood warning. Both stations are situated in small villages, where a security can be easily guaranteed, however it is planned to put equipment into a metal box. Moreover training and information will be provided to local inhabitants about the new equipment and its purposes. Proper infrastructures exist only for Kasari station; therefore, additional investment is needed for two stations. The mobile hydrological group from the main office will provide the maintenance of the stations.

There is a special requirement for water quality monitoring because of the periodic inundations on the Võhandu at Vagula. Milk and meat factories heavily pollute the river. Pollution stimulates vegetation grow and river cross-section narrowing (afflux), which creates inundation for Võru town. The planned station is situated close to Võru town, therefore, high security measures are planned to use (metal box, alarm, insurance). The local people will be informed about the new equipment by different media. Investment into infrastructures (electricity, pipes and piles installation) is needed. The maintenance of the station will be provided by the Tartu Regional Center.

According to the recommendation of the feasibility study experts, straightening a calculation of pollution load into the Baltic Sea by hydrological data, as well as, the flood warning system are the key points for opening the following stations on the Pärnu river basin: the Saarjõgi at Kaansoo, the Reiu at Surju, the Sauga at Nurmeveski, the Audru at Audru and re-equipment the Pärnu at Tahkuse and the Pärnu at Oore. All those gauges are in the water quality-monitoring program. Additional investment is needed for the installation of the stations on the Saarjõgi at Kaansoo, the Reiu at Surju and the Sauga at Nurmeveski. At the rest of the stations infrastructures exist. The maintenance will be provided by well-trained hydrologist from Viljandi, who at the moment provide the maintenance of the five existing stations.

There has been consideration to open the stations on the Tänassilma at Oiu and re-open the Tarvastu at Linnaveski. The Tänassilma river receives wastewater discharge from Viljandi town, the Tarvastu receives wastewater discharge from Mustla town. There are water quality monitoring stations, which should be covered by hydrological data. Thus, the establishment of this station is needed for satisfaction of the WFD in the frame of the water quality monitoring (Article 8). Since the stations are situated in small villages security can be easily guaranteed, however it is planned to put the equipment into a metal box. Moreover, training and information will be provided to local inhabitants about the new equipment and its purposes. As the infrastructures are absent, additional investment is needed. The maintenance of the stations will be provided by well-trained hydrologist from Viljandi, who at the moment provide the maintenance of the five existing stations.

There is a priority to re-open a station on the Elva river at Elva. Elva river receives the wastewater from Elva town. Thus, the establishment of the station is needed for satisfaction of the WFD in the frame of the water quality monitoring (Article 8). The station is located on a private land, where a proper infrastructure for hydrometric station building exists and metal box will be used for the security measures. The maintenance of the station will be provided by the Tartu Regional Center.
Many of the greatest water pollution problems (overloading by heavy metals, phosphorus, phenols and oil products) lie in the Viru River Basin District. Therefore, three rivers were chosen, where water quality monitoring is sufficiently important to require gauged flow data: the Pühajõgi, the Seljajõgi, the Loobu. The establishment of those stations is needed for satisfaction of WFD in frame of the water quality monitoring (Article 8). The stations are located close to small villages. As those are new stations, there is a need for additional investments for infrastructure of hydrometric station building. Training and information will be provided to local inhabittance about the new equipment and its purposes. Security measures (metal box, insurance) will be taken for the automatic station. The maintenance of the station on the Pühajõgi and on the Seljajõgi will be provided by the Narva-Jõesuu Regional Center. There is a plan to maintain the Loobu station by the observer from Vanaküla.

Three hydrometric stations are required to comply with the Water Framework Directive requirement concerning transboundary rivers, as well as, for satisfaction of the water quality monitoring (Article 8): the Mustjõgi at Konnuvere, the Piusa at Korela, the Mustajõgi at Narva quarry. The Mustajõgi at Narva quarry is situated at the private area where the daily security is provided and there is no need for additional investment to security. The other two stations are situated close to small villages. Local people will provide the security of the equipment. Training and information will be provided to local inhabittance about the new equipment and its purposes. The equipment will be installed into a metal box. There is a need for additional investment for the infrastructure of the hydrometric station building. The maintenance of the Mustajõgi at Narva quarry will be provided by the Narva-Jõesuu Regional Center. The maintenance of the Mustjõgi at Konnuvere, the Piusa at Korela will be provided by the Tartu Regional Center.

The re-equipment of the existing stations is intended for the following stations at Lake Peipsi: the Mustvee, the Praaga and the Mehikoorma. There is a specific requirement as they are used in flood warning. The Mustvee station is located in Mustvee town, the Praaga and the Mehikoorma are situated in small villages, where security can be easily guaranteed, however it is planned to put the equipment into a metal box and to provide signaling in Mustvee. Training and information will be provided to local inhabittance about the new equipment and its purposes. The equipment will be installed into a metal box. Training and information will be provided to local inhabittance about the new equipment and its purposes. The equipment will be installed into a metal box. There is a need for additional investment for the infrastructure of the hydrometric station building. The maintenance of the Mustjõgi at Narva quarry will be provided by the Narva-Jõesuu Regional Center. The maintenance of the Mustjõgi at Konnuvere, the Piusa at Korela will be provided by the Tartu Regional Center.

Maintenance and security
The need for an efficient maintenance of the network will be secured by a service contracts to cover a sufficiently long period in accordance with increasing number of well-trained observers who will provide the security of automatic stations. The service contract ensures keeping automatic stations in operation after the end of the project. It includes software upgrades and maintenance, configuration management and spare parts service. Part-time observers will be employed from the people, who live close to the automatic station. They will provide the visual inspections of the equipment during the visual observations. Thus, the daily check of equipment will be done. In order to meet professional maintenance of modern equipment and water discharge measurement few expedition groups, might be planned. It is supposed, that the expedition group will consist of two hydrologists with a car. The group will be equipped with a current-meter for discharge measurement and spare parts for prompt problem solving in operation of the automatic stations. Three groups can be organised on the basis of existing regional centres, and in addition one new should be organised for operation in north-west, west and west islands of the Baltic Sea. However, the reorganisation with a redistribution of the responsibilities between those centres is not planned in the frame of this project.

The feasibility study recommended (p. 12.2.6) that four hydrologists and two people from the relevant units receive training in all aspects related to the work of the Hydrology Department. It was emphasized that attending training courses at an appropriate institution is likely to be a highly effective form of training and was strongly recommended.

In order to implement those recommendations, in Contract 1, a training course on the requirements of EC directives is included in the project. Training on the Database Management System Platform and
Information System, and new applications for hydrological data also are planned in the contract, as well as an assessment of the institutional framework procedures. MS Project Leader coordinates the project. Short-term expert 1 is proposed to establish the institutional framework procedures. The training in the requirements of EC directives in hydrology and Database management and Information system as well as new application for hydrological data will be provided for all hydrologists and few relevant specialists by Short-term experts (STE 2) and (STE 3).

Contract 2 provides hydrometric constructions designing and its building (infrastructure). It includes local experts for designing and building of the hydrometric constructions for 17 new (re-opened) and 5 existing hydrometric stations.

The necessity of designing and building the hydrotechnical constructions (infrastructure) is obvious due to installation of new equipment should be done at measurement sites on rivers with different nature conditions and technical facilities. Local winter conditions, when rivers covered by ice and air temperature is negative for a few months, forced to foresee special actions and constructions to protect sensors and pipes against floating of ice and to mount sensors into weather protection houses or other protective boxes. Thus for each new measurement site detailed project should be design and particular infrastructure building should be provided. The action will insure the security of measurement sites as well.

Contract 3 is dedicated to the Hydrological Information System (HIS) development and River flow processing system development. Information system analyst (STTE 1) and IT expert (STTE 2) were included into the Contract for HIS development its training and workshop. Programmer (STTE 3) was included into the Contract for River flow/runoff processing system development.

An initial aim in HIS development has been to extend the system to serve more end-users. It is obvious, that data sets are getting larger and the system has to be able to handle data in different media types and storage formats. Various data formats require also automatic transformation and validation methods. Recent national and international agendas (WFD) and agreements have published forward requirements for river basin management. The implementation of the HIS starts with expectations that rapidly developing Internet technology together with principles of sound software engineering, especially object-oriented modelling, and use of visual modelling language help in many respects in integration of information. The information system HIS consists of software and hardware. The hardware is typically a computer server (ANNEX 8). The software will perform the duties from data and flow processing and data analysis to Internet dissemination. In general, such an information system will be developed in the following stages: strategic design (choosing system architectures and defining required functions), analysis, detailed design, programming, implementation, and testing and tuning.

Task of the STTE 1 is to prepare detailed design of information system HIS during one month. Tasks of STTE 2 are development and implementation of HIS software (metadata, data storage and manipulation; online data entry and dissemination; coding, integration and tuning of the system) and its installation in Regional Centres and Hydrology Department for six months. It was proposed by the Feasibility study that the development of information system would need to be done by a software programmer (STTE 2) working closely with hydrologist. The hydrologist's financing is planned from State budget. STTE 2 will also provide HIS manual and training course for its application and workshop for troubleshooting of the system. Thus, training and workshop will be organised with focus on debug, application and maintenance of HIS. Tasks of STTE 3 are development of river flow/runoff processing software (developed with and integrated into main information system – to process flow data routinely; able to cope with ice and vegetation in rivers) and its installation in Regional Centres and Hydrology Department for nine months. STTE 3 will work in close cooperation with hydrologist from Hydrology Department. STTE 3 will provide River flow processing manual and training course for its application.

Contract 4 includes the procurement of equipment (including spare parts and conventional equipment, and maintenance contract,), hardware and software for operation of hydrological stations and its
installation, and training. In the frame of the project up-to-date equipment for measuring the hydrological, meteorological and hydro-chemical components are planned (List of equipment, ANNEX 7). The software for providing data transmission, processing, storage and dissemination will be supplied and set up. Proposed specifications for telemetry network, database servers and workstations are given in Annex 8. The tendering for equipment, hardware and software will be done from one vendor in order to meet standardization and to limit difficulties in equipment maintenance and support. According to Feasibility study the provision of a maintenance contact with supply firm for at least 3 years after the end of the project is recommended. Therefore, the regular maintenance contract for two levels, such as, System Software and Documentation and Expedited Spare Part Supply as well as 24 hours Telephone support will be provided.

Important lessons already learned include the need for training in the use of new equipment and systems, and for the service contract to cover a longer period. Short factory-based and extensive training courses will be conducted for hydrologists, technicians and IT specialists (Feasibility study recommendation p. 12.2.6.). Trainings will cover a description of field equipment, principles of its installation, commissioning, operation, maintenance and troubleshooting of all components (hardware, software, procedures), data transmission and collection from measurement sites and its primary processing. Standard software such as Oracle, Arc View, GIS will be procured with relevant short training courses.

The Feasibility study recommended a 3-year on-site service/support contract, with a 4-hour response time. Therefore, a training of the Oracle system administrator is included into the Contract for daily operation and routine maintenance of database. However, the service/support contract can be provided only till the end of the project by June 2005.

 Contracts 2 and 3 consist different types of activities: one is the service and another is investment. Therefore, separating these contracts is the only way to provide tenders and better project implementation.

*Views of NGOs*
Considering the nature of the project, no NGOs were consulted during the project preparation process. The project aims at institutional strengthening at the state level and the NGOs are not seen as directly benefiting or having a role in the project’s activities.

3.2. Linked activities: In the frame of the Water Accession project in 1998 a twinning was carried out. The objectives were to carry through the gap analysis of Estonian water related legal acts and create the juridical basis for all water related activities in order to achieve the transposition of the *acquis* and implement the Water Framework Directive in Estonia. The inputs of the experts from the member states helped the national authorities to harmonize the legislation. The main result of the Twinning 1998 was the transposition of the principles of the Water Framework Directive into Estonian national legislation. After the adoption of the changes into Water Act the Estonian territory was designated as one river basin district divided into nine sub-districts. For each basin district a river basin management plan shall be drafted. In order to facilitate the planning and cooperation in drafting the river basin management plans a ministerial working group was established. The working group includes representatives from relevant authorities and institutions dealing with water with the main purpose to harmonise and give guidance river basin management process. In addition to the changes made to the Water Act other relevant water related legislation was also analysed. To work was carried out in cooperation with Swedish and French experts who provided their professional and expert knowledge in improving the Estonian water related legislation. Further more the Twinning 1998 also included training on various aspects related to the harmonised implementation of the acquis.

The Phare 2002 project “Drinking Water Directive, Urban Waste Water Treatment Directive, Directive on Discharge of Dangerous Substances to the Aquatic Environment and relevant Daughter Directives Implementation” proposes assistance via Twinning-light activities to improve the engineering, technical and practical skills of Estonian specialists and to ensure timely implementation...
of Drinking Water Directive, Urban Waste Water Treatment Directive and Directive on discharge of Dangerous Substances to the Aquatic Environment and relevant Daughter Directives. The project foresees strengthening regional and local level capacity to implement abovementioned directives on time and cost effectively. As a result also special institutional instruments are planned additionally to the currently existing directives implementation programmes. The project also covers the revision of the monitoring system based on the requirements of those directives. The monitoring data should be available and adequate for the surface water bodies that are used or will be used for the abstraction of drinking water in order to ensure the compliance with the drinking water quality requirements. At the same time the monitoring information has to provide sufficient data on the status of the recipient water bodies. According to the Water Framework Directive the good status of water bodies must be achieved by the 2015. Therefore, the status of recipient water bodies that are used as recipients of treated wastewater must be clearly known and easily quantifiable. This cannot be done unless properly managed and operated hydrological monitoring system that can be considered as a major indicative factor in determining the changes and trends in status of water bodies.

The current project proposal is more focused on the modernization of the hydrometric network (up-to-date equipments, hardware, software) and establishment of an hydrological information system. The revised monitoring requirements based on the above-mentioned directives will gain an essential part of this project in terms of establishing and adequate system for the hydrological information. Representative hydrological data such as water discharges, water level, water temperature and ice conditions for relevant water bodies shall be needed when elaborating the quality objectives and assessing the status of water bodies. The link between two projects is in the revision and implementation of the effectively working monitoring system. After the monitoring systems have been revised according to the needs of the above mentioned directives the hydrological motoring system and management of the hydrological monitoring information must be changed and revised accordingly. Also reliable hydrological information of the water-monitoring project will strengthen regional and local level capacity for the implementation of relevant water directives.

According to the time-schedule the water-monitoring project should start in March 2003 and be completed in March 2004. The duration of the project is the same as the applied project.

Other linked activities
Increasing number of sites will allow the estimation of the pollution load transferred across a state boundary or into the marine environment. It closely relates to the need to implement and sustain the Helsinki Commission (HELCOM) Convention, and the Convention on the Protection and Use of Transboundary Watercourses and International Lakes. This criterion applies to Estonia in terms of the pollution loads transferred across/along state boundaries in the Narva river catchment, and in the many Estonian rivers discharging into sections of the Baltic Sea. More effective monitoring of river flows is critical for establishing pollution loads entering the Baltic.

The current application is based on the conception of WHYCOS (World Hydrological Cycle Observing System) to the Baltic Sea basin region (Baltic-HYCOS), which was initiated by Poland in 1999, but not started until now. The concept combines state-of-the-art instrumentation; near-real time data transmission by meteorological satellite, common approaches to database (including data quality) management, and adoption of common protocols for data exchange, all implemented using appropriate technology transfer and training. One new station was proposed in the project for Estonia. The Baltic HYCOS estimated cost is approximately 1 500 000 EUR (according to the information received in April 2003), the requested grant for Estonia is 51 000 EUR. The Baltic-HYCOS project currently is under the review.

Since May 2002 the LIFE-Environment project (LIFE00/ENV/EE/000925) ”Viru and Peipsi Catchment Area Management Plan” or ”Viru-Peipsi CAMP” started. The aim of the project is the preparation the Water Management Plan programme with the goal to provide information on surface, coastal and groundwater water quality status, which enable characterisation of all water bodies according to the requirements of the WFD. The sampling campaign and assessment in the study region
will be carried out in the frame of the project. The existing hydrological monitoring data will be used for the environmental assessment. There is no overlapping with acting project due to the fact that the proposed project aim is to develop and to upgrade the national surface hydrometric (quantity) network in order to provide the project "Viru-Peipsi CAMP" on the regional scale by reliable hydrological data. The planning end of the project is 2004, after that the additional information from automat stations will be accessed.

3.3. Results

3.3.1. Contract 1 Twinning-light for institutional framework assessment and training
Phare 38 400

3.3.1.1. The Institutional framework and operational procedures for the implementation of the hydrometric network are established.
3.3.1.2. General training in requirements of EU Water Framework Directives (WFD) in hydrology and water policy is carried out and specialists are trained (main office).
3.3.1.3. Training on the Database Management System Platform and Information System and new applications for hydrological data is carried out and specialists are trained (main office).

3.3.2. Contract 2 Works Contract
National co-financing 75 000
3.3.2.1 Hydrometric stations infrastructure is constructed.

3.3.3 Contract 3 Technical assistance for developing HIS
Phare 158 000

3.3.3.1. Information system is analysed; the architecture of system is selected; the software is selected. Required functions for Hydrological Information System (HIS) architecture are determined. Detailed design of HIS is done.
3.3.3.2. HIS is developed, implemented (metadata, data storage and manipulation; online data entry and dissemination; coding, integration and tuning of the system and its manual), installed at the regional centres, administrated, and maintained
3.3.3.3. River flow processing system (processing river flow data routinely; and with ability to cope with ice and vegetation in rivers) is developed, implemented, document and specialists are trained.

3.3.4. Contract 4 Supply contract for procurement of up-to-date equipment, hardware, software and training
Phare 339 000
3.3.4.1 Up-to-date equipment, hardware and software are procured and in use (sensors, telemetry outstation, data collection server, database server, workstation and notebook (Annexes 7-8). Comprehensive Factory Acceptance Test training from a vendor factory is carried out and specialists are trained.

3.4. Activities:

3.4.1. Contract 1. Twinning-light for institutional framework assessment and training (Phare, 38 400 EUR, 3 months)

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2 For results and indicators see also Annex 1 Logical Framework Matrix.
3 For more detailed cost breakdown see Annex 7 and 8
3.4.1.1. Member State (MS) Project Leader (3 working days per month), Phare 5 200 EUR

**Tasks:**
- Overall co-ordination of the assignment
- Draw up of final report, based on the results of experts’ work

**Profile of MS Project Leader:**
- Full university degree (preferably in the field of organization of water management programs);
- Proven practical experience in the field of water management and organization of water management programs for at least 10 years;
- 10 years working experience in a leading management position in the water section.
- Good command of verbal and written English;
- Long-term civil servant from an EU Member State water section administration.
- Good knowledge of transposition and implementation of EU water related directives

3.4.1.2. Short Term Expert 1 (category II): Establishment of institutional framework and operational procedures (1 working month), Phare 9 700 EUR:

**Tasks of expert 1**
- Assessment of existing institutional framework and operational procedures of the Estonian national hydrometric network
- Draw up the report with proposals for further institutional framework arrangements

**Profile of expert 1:**
- Full university degree (preferably public administration).
- Proven practical experience public administration for at least 5 years
- Good command of verbal and written English;
- Good skills working with different computer programmes (MS Word, MS Excel).
- Good organizer with 5 years of professional experience

3.4.1.3. Short Term Expert 2 (category II): General training in requirements of EU Water Framework Directives (WFD) in hydrology and water policy (5 working days) for 30 persons: hydrologists and relevant specialists in the field of water, Phare 2 300 EUR:

**Tasks of expert 2**
- Organisation and providing of comprehensive training on requirements of EU WFD and its implementation in hydrology and water policy.

**Profile of expert 2:**
- Full university degree (preferably water-related);
- Proven practical experience in the field of water management and/or hydrology for at least 5 years;
- Knowledge and experience in organising the seminars and training courses.
- Good knowledge of transposition and implementation of EU water related directives;
- Good command of verbal/presentational and written English;
- Good skills working with different computer programmes (MS Word, MS Power Point, MS Excel).

3.4.1.4. Short Term Expert 3 (category III): Training on the Database Management System Platform and Information System, and new applications for hydrological data (5 working days), Phare 2 300 EUR:
Tasks of expert 3
- Organisation and providing of comprehensive training on the Database Management System Platform and Information System, and new applications for hydrological data

Profile of expert 3:
- Full university degree (preferably water-related);
- Proven practical experience in the field of database and information system management and/or new applications for hydrological data for at least 5 years;
- Knowledge and experience in organising the seminars and training courses.
- Good command of verbal/presentational and written English;
- Good skills working with different computer programmes (MS Word, MS Power Point, MS Excel).

For more detailed information on Twinning light component please see Terms of Reference in Annex 10.

3.4.2 Contract 2. Works Contract

3.4.2.1. Construction of hydrometric stations infrastructure.

3.4.3 Contract 3. Technical Assistance for developing HIS (Phare 158.000 EUR, 13 calendar months).

3.4.3.1 Short-term (category III) technical expert 1 (STTE 1): Technical assistance for information system analysis for providing detailed design of Hydrological Information System (HIS) (1 working months), Phare 10 000 EUR

Tasks of expert 1:
- Selection of Hydrological Information System architectures
- Selection of the software
- Determination of required functions for HIS
- HIS detailed design

Profile of expert 1:
- Full university degree (experience in software detailed design);
- Proven practical experience in software production, Hydrological Information System;
- Excellent computer skills, software production;
- Good command of verbal and written English;
- Good communication skills;
- Good organizer with 5 years of professional experience

3.4.3.2. Short-term (category III) technical expert 2 (STTE 2): Technical assistance for HIS software development and implementation (6 working months), Phare 60 000 EUR

Tasks of expert 2:
- Development and programming of Hydrological Information System (HIS) software (metadata, data storage and manipulation; online data entry and dissemination; coding, integration)
- HIS debug and implementation
- HIS installation at the main office
- Compilation of a HIS software manual
- Providing training materials and training course
- Installation of HIS at the Regional Centres
Profile of expert 2:
• Full university degree (experience in development and programming of software);
• Proven practical experience in software production; Hydrological Information System;
• Excellent computer skills, software production
• Good command of verbal and written English;
• Good organizer with 5 years of professional experience
• Knowledge and experience in organising of training course

3.4.3.3. Short-term (category III) technical expert 3 (STTE 3): Technical assistance for river flow processing software development and implementation (8 working months), Phare 80 000 EUR

Tasks of expert 3:
• Development and programming of the river flow data (with runoff) processing software, taking into account ice and vegetation correction
• Debug and implementation of flow/runoff processing software
• Compilation the river flow/runoff processing software manual
• Providing training materials and training course for flow/runoff processing software

Profile of expert 3:
• Full university degree (experience in development and programming of software);
• Proven practical experience in software production;
• Excellent computer skills, software production
• Good command of verbal and written English;
• Good organizer with 5 years of professional experience
• Knowledge and experience in organising of training course

3.4.3.4. 1½ IT administrators (12 working months)

Tasks of IT administrator:
• HIS administration and maintenance

Profile of IT administrator:
• Full university degree (experience in development and programming of software);
• Proven practical experience in software production;
• Excellent computer skills, software production

3.4.4 Contract 4: Supply contract for procurement of up-to-date equipment, hardware, software and training (Phare 339 000 EUR)

3.4.4.1. Procurement for hydrometric stations of up-to-date equipment (sensors), hardware (telemetry outstation, data collection server, database server, workstation, notebooks) and software and its installation.
3.4.4.2. Comprehensive Factory Acceptance Test training (equipment, hardware, software) from a vendor factory is carried out and specialists are trained.
3.4.4.3. Installation of equipment, hardware and software of hydrometric station.
3.4.4.4. Procurement standard software (Oracle, Database Management System platform, Information System, ArcView, GIS) including training for data transmission, processing, storage, analysis and dissemination system.

3.5. Lessons learned:

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4 The complete list of needed equipment and software to be installed was clarified in the Feasibility Study, see further in Annexes 7, 8.
The MoE’s experience from previous Phare projects implementation (considering the lessons learned) has shown that the most important is to compile a logical project proposal (identifying the problems, defining realistic objectives, results, activities, management organisation, objectively verifiable indicators, monitoring). After the proposal has been considered acceptable the tendering should be as smooth as possible. In conclusion, the project implementation process should not be hindered in any way. Therefore the preparatory works (as drafting tender documents) should be done on time. Next important step is to ensure the qualitative project monitoring at the beginning of the project to solve the possible problems on time.

Lessons Learned have been incorporated in project management, implementation arrangement and monitoring. The incorporation of Lessons Learned has been executed as follows:

- Training arrangement for the MoE in the preparation of Monitoring Reports;
- Measurable indicators have been identified that allow proper evaluation of project’s progress in achieving objectives;
- Project implementation and management has been arranged according to the requirements (all the necessary institutions are involved in project implementation).

The EMHI experience from previous activity and other national investment projects as well as co-operation with other institutions has shown that the most important part is to ensure the financial resources adequate for the project. Moreover, providing the future maintenance of the developed hydrometric network is also very important item. As the EMHI budget is funded from the State budget, it will insure the continued operation of the developed hydrometric network.

The co-operation with other institutions and participation at the State Surface Water Monitoring Programme 2002 has shown good agreement of all involved institutions in providing monitoring without overlapping.

Previous experience from the EMHI hydrometric network development has shown that the lack of proper training in new technologies and the absence of well-trained specialists in modern hydrometric equipment have caused delays for the equipment installation and data providing from measurement sites. There are still problems with telecommunication systems that cannot provide data transmission in real time. Thus, the factory-based and software-based training courses have been included in the project.

The security of the equipment is the next weak point of the development of the network. Experience shows that trained local observers preserve the security of expensive equipment and provide visual observations at measurement sites. Thus, the organised workshops will provide information about the purpose of the project, about equipment and its maintenance for at least 30 persons, which supposed to be local people or observers.

Lessons learned have been incorporated in the project as follows:

- EMHI funding from State budget will ensure continued operation of the developed hydrometric network
- trained specialists will sign an agreement with the Employer to continue their work at the EMHI during at least three years after the project will be finished;
- security of the equipment will be provided by trained local observers;
- co-operation with other institutions will allow to avoid any overlapping in the project and will ensure the development of hydrometric network in an integrated manner.

In conclusion, all above mentioned will insure the successful implementation and maintenance of the project.

4. Institutional Framework

The Estonian Ministry of the Environment (MoE) coordinates the Estonian Meteorological and Hydrological Institute. The Strategy and Investment Department of the MoE is responsible for co-ordination of Phare project preparation and implementation in the Ministry of the Environment.
Estonian Meteorological and Hydrological Institute (EMHI) is subordinated by MoE. The EMHI is funded from the state budget. The EMHI is responsible for quantitative surface water monitoring of the State Surface Water Monitoring Programme (SSWMP). The Hydrology Department manages the network through the Regional Centres. The Hydrology Forecast group provides hydrological forecasts using the operative data obtained from the network.

Ministry of Finance (MoF) – overall co-ordination of Phare programmes in Estonia.

Central Financing and Contracting Unit (CFCU) – as Implementing Agency responsible for tendering, contracting and disbursement.

National Fund (NF) – as the financial and control management body for EU funds.

Tallinn Technical University (TTU) carries out the qualitative surface water programme of the SSWMP. TTU is managed by Ministry of Education in co-ordination and under supervision of the Estonian Ministry of the Environment.

Institute of Zoology and Botany (IZB) carries out surface water biological-chemical quality programme of the SSWMP. IZB is managed by the Estonian Agricultural University (EAU) in co-ordination and under supervision of the Ministry of Education.

Tartu University (TU) carries out the coordination of the National Monitoring Program (NMP). The State Surface Water Monitoring Program (SSWMP) is a basis to apply monitoring of the quantity and quality of surface waters, the comprehensive ecological and chemical status of surface waters, with an aim to be continuously informed on the status of surface waters and its changes, preventing the pollution problems and to possess initial information for reporting, developing plans, projects and legislation. TU is managed by Ministry of Education.

Geological Centre (GC) carries out groundwater quality and quantity monitoring programme of the SSWMP. MoE manages GC.

The Estonian Environment Information Centre (EIC) of the Ministry of the Environment is responsible for carrying out the State Environmental Monitoring Programs, the co-ordination between all involved Institutions, the presentation of annual reports, and the administration of the databases.

Processed hydrological data are transmitted to the State Surface Water Monitoring Program (SSWMP) yearly or by request. The SSWMP has assembled experience on the institutional frameworks when all involved institutions of the programme understand the importance of co-operation and transfer data according to the Water Cadastre Law into the Water Cadastre (WC) where the information is available to end-users and decision-makers. However, it is currently is planned to establish a new structure for data management, the State Environmental Register (SER). The SER is under preparation at the moment and will be ratified in the beginning of 2003 (structure of the SER is presented in Annex 9). The coordinator of the Water Cadastre will be the Estonian Environmental Information Centre (EEIC) of the MoE. All information will be transferred to the EEIC through the National Monitoring Programme (NMP) and if necessary directly to the main actors. The co-operation between involved institutions has already a long tradition and thus ensures effective participation and successful project implementation. Involved institutions such as Tallinn Technical University (TTU), Estonian Agricultural University (EAU), Institute of Zoology and Botany (IZB), Estonian Environment Research Centre (EERC), and Tartu University will have a benefit from the project as users of hydrological information.

The existing data management system presumes very tight cooperation between institutions and monitoring units. The existing data management system is presented below in chapter 6 Implementation Arrangements. In the future, the responsibility and management of the networks and data will remain unchanged (Annex 13).
The Ministry of the Environment will be the official owner of the project investments. The main beneficiary of the proposed project will be the MoE, EMHI. Co-beneficiaries will be the Water Department and the Environment Information Centre of the MoE, and TTU.
5. Detailed Budget

<table>
<thead>
<tr>
<th>Contract 1</th>
<th>Twinning-light for institutional framework assessment and training</th>
<th>Phare Support (EUR)</th>
<th>National Co-financing*</th>
<th>IFI</th>
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<td>Investment Support</td>
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National co-financing

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<td>Total national co-financing</td>
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<td>209 600</td>
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National co-financing of 209.600 EUR is planned from the state budget (EMHI) for 2004-2005.

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5 Twinning light detailed budget breakdown is presented in Term of Reference (Annex 10).
6 For more detailed cost breakdown see Annex 7 and 8.
7 Procurement contract includes 3 years maintenance contract, 6000 EUR.
Providing design and building of the infrastructure for 17 new (re-opened) and one existing hydrometric stations (parallel co-financing 75 000 EUR, article 212.13 “Structure building”); 
1.5 IT administrators for 1 year (parallel co-financing 14 000 EUR, article “Salary fund”)
HIS training, training materials and workshop (parallel co-financing, EUR 6 000, article 212.04 “Training expenses”);
Procurement of the measuring equipment and software and training (joint co-financing, 114 600 EUR). The EMHI has applied for a financial support from the budget 2003 of the Environmental Investment Centre (Water protection programme).

The amounts for co-financing in the table correspond to cash co-financing. In addition, in-kind contributions from the Estonian administration for a good implementation of the twinning light/technical assistance may be detailed in the terms of reference/technical specifications. The co-financing expenses will be monitored by the beneficiary and the NAO. For the earmarked co-finance a clear and verifiable set of costs will be provided. Flow and stock data on co-finance will be submitted quarterly for steering committees, twice a year to the Sector Monitoring Working Group. The beneficiary together with the NAO commits to sound financial management and financial control.

6. Implementation Arrangements

6.1. Implementing Agency
The Implementing Agency is the CFCU. The CFCU will be responsible for tendering, contracting and payments. The responsibility for project preparation, implementation and control will remain in the recipient institution. The CFCU carries out administrative verification of strategic plans, work programs and monitoring and evaluation reports submitted by the Programme Officer (PO) for forwarding to the EC Delegation. After a winner of a tender has been selected, the CFCU drafts a contract; negotiates its terms with the winner; prepares the final contract and proposes the Programming Authorising Officer (PAO) to sign the contract on behalf of the Estonian Government.

The Programming Authorizing Officer/PAO is:
Mr. Renaldo Mändmets,
Deputy Secretary General of the Minister of Finance
Address: Suur-Ameerika 1, Tallinn 15006, Estonia
Phone: (+372) 6 113 545
Fax: (+372) 6 966 810
e-mail: renaldo.mandmets@fin.ee

The Commission will transfer funds to the National Fund (NF) in accordance with the Memorandum of Understanding signed between the Commission and Estonian Ministry of Finance. The National Fund will transfer funds to the CFCU in accordance with Financing Agreement signed between the NF and the CFCU. Transfer of funds will be based on cash-flow projections and detailed budget breakdown of the project in accordance with the corresponding Phare 2003 Financing Memorandum. CFCU will make payments to the contractor.

The MoE will be responsible for preparation, implementation, supervision and monitoring of the project. Overall responsibility for implementation of the project lays on EU Phare Programme Officer in the Ministry of the Environment - Mr. Harry Liiv, Water Department (contact details given below in this section). Water Department will ensure that DIS Manual requirements and Practical Guide to Phare, ISPA and SAPARD Contract Procedures is followed throughout the project implementation.

The Programme Officer/PO is:
Mr. Harry Liiv,
Address: Toompuiestee 24, Tallinn 15172, Estonia
Tel: (+372) 6 262856
Fax: (+372) 6 262869
The main responsibilities of the EMHI under the project will include:

- Approving the standards for data collection, data exchange, and database management
- Preparing the project design
- Participating in detailed design of the observing network to meet criteria set as a result of the Feasibility study
- Equipment specification
- Installing the equipment
- Training
- Operating and maintaining the observing network in conformance with EU standards

The number of qualified hydrologists and relevant specialists under the EMHI who will participate in the project is estimated to be eight.

The Project Manager will be responsible for the final project preparation (especially the preparation of detailed terms of reference) and co-ordination. Her duty is also to ensure smooth day-to-day cooperation and implementation of the project. The Project Manager is civil servant and 50% of her working time will be allocated for the project.

A Steering Committee will be set up to oversee project implementation. The Steering Committee will meet once per quarter and it will include the representatives of the Twinning-light Member State, the Water Department and Estonian Environment Information Centre of Ministry of the Environment, Tallinn Technical University, the EC Delegation in Tallinn, the Ministry of Finance, Estonian Water Companies Union and Local Authorities Unions. The institutional framework of the project is presented on ANNEX 13.

The signed agreement between EMHI and TTU laying down their respective responsibilities and cooperation for a continuous exchange of monitored data is presented in ANNEX 14.

6.2. Twinning-light
Project beneficiary is the Hydrology Department of the EMHI and the Estonian contact person is the Head of Hydrology Department Alvina Reihan (contact data given in p. 6.1.).

6.3. Non-standard aspects
- No non-standard aspects are foreseen. The DIS Manual and Practical Guide will be strictly followed.

6.4. Contracts:
The following contracts are planned:
1. Contract 1 Twinning light (total 38 400 EUR, Phare contribution 38 400 EUR)
2. Contract 2 Works (total 75 000, Phare contribution 0 EUR)
3. Contract 3 Service (total 178 000, Phare contribution 158 000 EUR)
4. Contract 4 Supply (total 453 600, Phare contribution 339 000 EUR)

7. Implementation Schedule
7.1. Start of tendering/call for proposals
- October 2003

7.2. Start of project activity
- March 2004

7.3. Project Completion
- August 2005

8. Equal opportunity
Equal opportunity for men and women to participate in the project will be guaranteed and measured by recording the experts and consultants employed. Equal opportunity will be ensured by the Steering Committee during the implementation of the project. The Estonian laws and regulations and ratified international conventions concerning Equal Opportunities will strictly be followed.

9. Environment
The project has an exclusively positive impact on the environment. The effective application of hydrological and related data will support the sustainable management of water resources, the reduction of natural disasters and protection of the environment. Some of its activities will contribute to other environmental programs such as HELCOM, Baltex, State Surface Water Monitoring and water management programs and so on.
According to the national legislation, the planned project activities do not require formal Environmental Impact Assessments (EIA-s) studies to be carried out.

10. Rates of return
Investments into the project can be estimated by the hydrological information benefit, which defined by the World Meteorological Organization is typically of the order of a benefit-cost ratio of 40:1. That means the advantage of hydrological information is 40 times larger than the cost for its production. The WMO assessment recognises that hydrological data collected now will have both short and long-term value.

Other national agencies with responsibility for water quality and environmental monitoring will also benefit from the project, particularly through introduction of telemetry to provide near-real time data on water quantity and quality.

11. Investment criteria
11.1 Catalytic effect:
The Phare support catalyses a prior accession driven action in relation to on time implementation of the EC Water Framework Directive.

11.2 Co-financing:
The project is co-financed from the Estonian National Budget. The Phare contribution is not replacing national funding. The funds to be allocated by Estonia are envisaged for co-financing of design and construction of hydrometric stations infrastructure, office administrative expenditures such as telephone, fax, post, stationary, transportation, factory based training, and HIS training courses and workshop, collecting and analysing necessary data by local experts.

Contract 2 Works Contract will be financed (75 000 EUR) by Estonia (EMHI). Parallel and joint co-financing is foreseen by Estonian National Budget through EMHI for the contracts 3 and 4. The investment part 20 000 EUR for contract 3 will be provided as the parallel co-financing and 114 600 EUR for the contract 4 will be provided as the joint co-financing.

11.3 Additional:
Phare grants do not displace other financiers.

11.4 Project readiness and size:
The project is ready for implementation after completion of all necessary technical studies. The feasibility study for the project investment component was done by 18 October 2002. The aim was to prepare a feasibility study for investments directed for setting up the network of hydrological stations to collect data about water quality and quantity, and for software for Hydrological Information System. The framework consultants under the PPPTMF carried out the assignment. Further information about feasibility study is given in Annex 4. Technical Specifications for sensors tendering are given in Annex 7. Specifications for tendering of telemetry network, database servers and workstations are given in the separately attached Annex 8. Necessary staff for the project implementation is informed of their planned activity. The preparation of Tender Documents for the project will be outsourced to a consultant by October 2003.

Budget of the project is 745 000 EUR, Phare total contribution for the project is 535 400 EUR.

11.5 Sustainability:
The investment is sustainable in the long term, i.e. beyond the date of accession. It complies with EC norms and standards and is in line with the EU environmental Acquis. The project’s environmental effects are overwhelmingly positive. The data and information that will be produced and disseminated will improve the knowledge of the hydrological cycle and water resources and therefore will support environmental protection and sustainable development of freshwater resources. The data will also be relevant to assessing long-term trends and mitigating the effects of floods.

HIS development needs a system, which will consist of two parts: operating system MS Windows 2000 and the database system Oracle. One of conditions that two permanent professionally trained Oracle database system administrators have to be employed in the EMHI IT Department in order to provide a maintenance of the system during the project implementation. One of them, working half-day on the hydrological information system, will provide the system maintenance only during the project implementation. The second system administrator shall provide the maintenance after the project will be completed.
The project will furthermore be made sustainable via the training of additional staff in the use and maintenance of the equipment. The agreement with people participating to the training stating that they would remain in function for at least 3 years after completion of the project is planned. Additionally, to insure security of measurement stations a general training for local population and number of well-trained observers who will provide the security of automatic stations, will be done. The training will be partly covered from the EMHI budget through the MoE.
The regular maintenance contract for System Software and Documentation, and Expedited Spare Part Supply with a supply firm for 24 hours Telephone support will be provided during at least 3 years. It will insure together with the agreement with the training staff the regular activity of the modern network for the near future after the project completion.

Service (maintenance) Contract, with such modules as System software and documentation and Expedited spare part supply, was recommended by Feasibility study. This is a condition to the provision of equipment operation after the completion of the project. Thus, it is also taken into account as the conditionality and the maintenance of equipment is foreseen in the project.

The security of stations is a conditionality of the project. Thus, the supervision for automatic station by observers and local people, as well as alarm are envisaged in the project.

The EMHI is responsible for the hydrometric network under supervision of the Estonian Ministry of the Environment (MoE). The Finance Department of the MoE is responsible for the EMHI budgetary. The additional finance support is needed for the developed hydrometric network maintenance. Thus, the MoE will ensure the additional funding to the EMHI budget for the maintenance of the network.
11.6 Compliance with state aids provisions:
State aid is regulated by Estonian Competition Law, which is harmonised and in compliance with European Union regulations. All state aid provisions deriving from the Estonian Competition Law will strictly be followed during the implementation of the project.

11.7 Contribution to National Development Plan/ Single Programming Document (NDP/SPD):
The project will assist with implementation of the NDP/SPD, Environmental Strategy and Environmental Action Plan.

12. Conditionality and sequencing

12.1 Conditionality
Ministry of Environment ensures that all necessary staff and subsequent training plans, as well as national financial means will be dedicated to the implementation of the project and further maintenance of the equipment provided with Phare support.

12.2 Sequencing
Tendering for Contract 1 for a twinning light for institutional framework assessment and training will be done from October to December 2003. The contracts expected to be signed by February 2004.
Tendering for Works Contract under contract 2 will be done from October to December 2003. The contract expected to be signed by February 2004.
Tendering for a technical assistance (HIS developing) under contract 3 will be done from November 2003 to January 2004. The contracts expected to be signed by March 2004.
Tendering for a procurement of software, hardware and equipment under contract 4 will be done from January to March 2004. The contracts expected to be signed by May 2004.
The design of hydro-technical constructions is planned from February to March 2004.
The establishment of institutional framework procedures and relevant scheme will be done by March 2004.
The EU WFD training seminar will be organised in March 2004.
The Database management and Information system, new application for hydrological data training seminar will be organised in March 2004.
The river flow processing software development is planned to start from March 2004 and to complete by November 2004.
The build of new stations will be done from April to November 2004.
The delivering of equipment, hardware and software is planned from May to July 2004.
The factory-based training course in equipment will be provided in May 2004.
The HIS design is planned to start in May 2004, after the equipment, hardware and software are delivered.
The installation of the equipment on 5 existing stations will be done from July to August 2004.
The river flow processing software training will be provided by November 2004.
The HIS development will be done from June to November 2004. The HIS installation is planned to complete by November 2004.
The installation of the equipment, hardware and software on the new 17 stations will be done from July 2004 to March 2005 (at least 2-3 stations per month).
System maintenance by IT administrators is planned from July 2004 to June 2005.
Standard software training courses will be organised by October 2004.

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The training for the HIS implementation and maintenance will be provided by December 2004.

Consequent workshop for HIS debugs, testing and final application will be organised by April 2005.

The maintenance contract will start after the one-year warranty period for the equipment. It starts from May 2005 and finishes in May 2008.

**All project activities will be carried out by July 2005.**
ANNEXES TO PROJECT FICHE
1. Logical framework matrix in standard format ANNEX 1
2. Detailed implementation chart ANNEX 2
3. Contracting and disbursement schedule by quarter for full duration of programme ANNEX 3 A, B
4. Results of the feasibility study ANNEX 4
5. List of hydrometric stations. ANNEX 5
6. Problem tree ANNEX 6
7. List of proposed new (re-opened) stations with specifications for sensors and its total price ANNEX 7
8. Proposed specifications for telemetry network, database servers and workstations ANNEX 8
9. Structure of State Environmental Register ANNEX 9
10. Terms of Reference for Twinning Light ANNEX 10
11. List of proposed stations with justification ANNEX 11
12. Map of existed and proposed hydrometric stations ANNEX 12
13. Management scheme of an institutional framework ANNEX 13
14. Agreement of co-operation between EMHI and TTU ANNEX 14
# LOGFRAME PLANNING MATRIX FOR

**Project title:** Development of National Hydrometric network according to the EU standards

<table>
<thead>
<tr>
<th>Programme name:</th>
<th>No:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contracting period</strong></td>
<td>expires 30/11/2005</td>
</tr>
<tr>
<td><strong>Disbursement period</strong></td>
<td>expires 30/11/2006</td>
</tr>
</tbody>
</table>

**Project Number ES 00.xx**

<table>
<thead>
<tr>
<th>Total Budget:</th>
<th>MEUR 0.745000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phare budget:</td>
<td>MEUR 0.535400</td>
</tr>
</tbody>
</table>

### Overall Objective

**Estonia fulfils the requirements of the Water Framework Directive (2000/60/EC) for surface water quantity objectives and thus provides the evaluation of its water status.**

**Objectively verifiable indicators**

Adoption of standards and procedures for operation and maintenance of the observation and data transmission system required by Water Directive (2000/60/EC) by 2006.

**Sources of verification**

Estonian Environmental Monitoring Report

### Project purpose

**The project purpose is to develop a hydrological network in Estonia in order to improve the monitoring of surface water and to evaluate the integration of quality and quantity aspects of surface water.**

**Objectively verifiable indicators**

The hydrometric network with density 1 station per 850 km² integrated with water quality measurement sites by July 2005 is established. At least 90% of up-to-date equipment is operational by the end of the project.

**Sources of verification**

Annual Hydrological Reports. Hydrological Information in EMHI FTP-Server

**Assumptions**

National co-financing is provided

### Results

**Contract 1**

<table>
<thead>
<tr>
<th>Contract 1</th>
</tr>
</thead>
</table>

3.3.1.1. The Institutional framework and operational procedures for the implementation of the hydrometric network are established.

**Objectively verifiable indicators**

Scheme of institutional framework by March 2004.

**Sources of verification**

Report of the assessment of the institutional framework

**Assumptions**

Institutional co-operation is increased

3.3.1.2. General training in requirements of EU

**Objectively verifiable indicators**

Trained specialists in EMHI and other relevant

**Sources of verification**

Certificates of relevant

**Assumptions**

Required and provided
Water Framework Directives (WFD) in hydrology and water policy is carried out and specialists are trained (main office).

<table>
<thead>
<tr>
<th>Contract 2</th>
<th>3.3.1.3. Training on the Database Management System Platform and Information System and new applications for hydrological data is carried out and specialists are trained (main office).</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3.2.1. Hydrometric stations infrastructure is constructed.</td>
<td></td>
</tr>
<tr>
<td>Contract 3</td>
<td>3.3.3.1. Information system is analysed; the architecture of system is selected; the software is selected. Required functions for Hydrological Information System (HIS) architecture are determined. Detailed design of HIS is done.</td>
</tr>
<tr>
<td>3.3.3.2. HIS is developed, implemented (metadata, data storage and manipulation; online data entry and dissemination; coding, integration and tuning of the system and its manual), installed at the regional centres, administrated, and maintained</td>
<td></td>
</tr>
<tr>
<td>3.3.3.3. River flow processing system (processing river flow data routinely; and with ability to cope with ice and vegetation in rivers) is developed, implemented, document and specialists are trained.</td>
<td></td>
</tr>
</tbody>
</table>

Contract 2:

- Trained specialists in EMHI understand Database Management System platform, Information system and new applications for hydrological data by April 2004.
- Certificates of relevant specialists
- Training programmes are in a good agreement

Contract 3:

- Designed HIS by June 2004
- Professional skills of 6 trained specialists are improved by December 2004.
- Software license and HIS Manual. The system is in use.

Contract 4:

- Implemented flow processing system by November 2004.
- The system is installed in main office and at the Regional Centres by November 2004.
- Software license and Flow processing manual. The system is in use.
3.3.4.1 Up-to-date equipment, hardware and software are procured and in use (sensors, telemetry outstation, data collection server, database server, workstation and notebook (Annexes 7-8). Comprehensive Factory Acceptance Test training from a vendor factory is carried out and specialists are trained.

<table>
<thead>
<tr>
<th>Activities</th>
<th>Means</th>
<th>Costs</th>
<th>Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Contract 1 – Twinning-light for institutional framework assessment and training</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Twinning-light</td>
<td>1. Twinning-light</td>
<td>Phare 38 400</td>
<td>Estonia</td>
</tr>
<tr>
<td><strong>3.4.1. Member State (MS) Project Leader</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>✦ Overall co-ordination of the assignment</td>
<td>MS Project Leader</td>
<td>5 200</td>
<td></td>
</tr>
<tr>
<td>✦ Draw up of final report, based on the results of experts’ work</td>
<td>3 working days per month (in total 9 working days)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3.4.1.2. Short-Term Expert 1 (STE 1) (category II)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Establishment of institutional framework and operational procedures</td>
<td>Expert (1)</td>
<td>9 700</td>
<td>Increasing of Institutional co-operation</td>
</tr>
<tr>
<td>✦ Assessment of existing institutional framework and operational procedures of Estonian national hydrometric network</td>
<td>Short-term expert (STE 1) for 1 working month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✦ Draw up the report with proposals for further institutional framework arrangements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3.4.1.3. Short-Term Expert 2 (STE 2) (category II)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General training in requirements of EU Water Framework Directives (WFD) in hydrology and water policy (5 working days) for 30 persons: hydrologists and relevant specialists in the field of water</td>
<td>Expert (2)</td>
<td>2 300</td>
<td></td>
</tr>
<tr>
<td><strong>Equipment for PRO field</strong></td>
<td>Equipment for 23 observation stations and data collection server, database server and workstation procured by August 2004. Professional skills of 6 trained specialists of EMHI (2 hydrologists, 2 technicians, 2 programmers) are improved in vendor factory by June 2004.**</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Contract for procurement of the equipment, hardware and software</strong></td>
<td>Contract for procurement of the equipment, hardware and software. Certificates of relevant specialists.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>National co-financing is provided</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Organisation and providing of comprehensive training on requirements of EU WFD and its implementation in hydrology and water policy

3.4.1.4. **Short-Term Expert 3 (STE 3) (category III)**
Training on the Database Management System Platform and Information System, and new applications for hydrological data

<table>
<thead>
<tr>
<th>Contract 2</th>
<th>Works Contract</th>
<th>2. Works Contract</th>
<th>75 000</th>
</tr>
</thead>
</table>

3.4.2.1 Construction of hydrometric stations infrastructure

<table>
<thead>
<tr>
<th>Contract 3</th>
<th>Technical Assistance for developing HIS</th>
<th>3. Technical Assistance Contract</th>
<th>158 000</th>
<th>20 000</th>
</tr>
</thead>
</table>

3.4.3.1. **Short-term (category III) technical expert 1 (STTE 1)**
Technical assistance for information system analysis for providing detailed design of Hydrological Information System (HIS)

<table>
<thead>
<tr>
<th>Expert (1)</th>
<th>Short-term technical expert (STTE 1) for 1 working-month</th>
<th>10 000</th>
</tr>
</thead>
</table>

3.4.3.2. **Short-term (category III) technical**

<table>
<thead>
<tr>
<th>Expert (2)</th>
<th>60 000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expert 2 (STTE 2)</td>
<td>Technical assistance for HIS software development and implementation</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Development and programming of Hydrological Information System (HIS) software</strong> (metadata, data storage and manipulation; online data entry and dissemination; coding, integration).</td>
<td></td>
</tr>
<tr>
<td><strong>HIS debug and implementation</strong></td>
<td></td>
</tr>
<tr>
<td><strong>HIS installation at the main office</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Compilation of a HIS software manual</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Providing training materials and training course</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Installation of HIS at Regional Centres</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3.4.3.3. Short-term (category III) technical expert 3 (STTE 3)</th>
<th>Technical assistance for river flow processing software development and implementation</th>
<th>Expert (3)</th>
<th>Short-term technical expert (STTE 3) for 8 working-months</th>
<th>80 000</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Development and programming of the river flow data (with runoff) processing software, taking into account ice and vegetation correction</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Debug and implementation of flow/runoff processing software</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Compilation the river flow/runoff processing software manual</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Providing training materials and training course for flow/runoff processing software</strong></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

| 3.4.3.4. 1.5 IT administrators | HIS administration and maintenance | 1.5 IT administrators (system maintenance) for 12 working-months | 14 000 |

| Contract 4 | Supply contract for procurement of up-to-date equipment, hardware, software and training | 4. Supply Contract | 339 000 | 114 600 |
| 3.4.4.1. Procurement for hydrometric stations of up-to-date equipment (sensors), hardware (telemetry outstation, data collection server, database server, workstation, notebooks) and software and its installation. | Supply contract (including training) | | |
| 3.4.4.2. Comprehensive Factory Acceptance Test training (equipment, hardware, software) from a vendor factory is carried out and specialists are trained. | | | |
| 3.4.4.3. Installation of equipment, hardware and software of hydrometric station. | | | |
| 3.4.4.4. Procurement standard software (Oracle, Database Management System platform, Information System, ArcView, GIS) including training for data transmission, processing, storage, analysis and dissemination system. | | | |

**Pre-conditions**
National co-financing exists
<table>
<thead>
<tr>
<th>E.g.</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contract 1</strong>&lt;br&gt;Twinning-light for institutional framework assessment and training</td>
<td>T</td>
<td>I</td>
<td>T</td>
</tr>
<tr>
<td>MS Project Leader</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STE 1 for 1 working month</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>STE 2 for 5 working days</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STE 3 for 5 working days</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Contract 2</strong>&lt;br&gt;Works Contract</td>
<td>T</td>
<td>T</td>
<td>T</td>
</tr>
<tr>
<td><strong>Contract 3</strong>&lt;br&gt;Technical Assistance for developing HIS</td>
<td>T</td>
<td>T</td>
<td>T</td>
</tr>
<tr>
<td>STTE 1 for 1 month (HIS structure)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>STTE 2 for 6 month (HIS development)</td>
<td></td>
<td></td>
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<tr>
<td>STTE 3 for 8 month (flow processing)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,5 IT administrators (system maintenance)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIS and river flow processing software trainings, training materials, and workshop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Contract 4</strong>&lt;br&gt;Supply contract for procurement of up-to-date equipment, hardware and software, its installation and training</td>
<td>T</td>
<td>T</td>
<td>T</td>
</tr>
<tr>
<td>Procurement contract for purchase of up-to-date equipment, hardware and software</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factory-based training course</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation of equipment, hardware and software</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard software training</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance (service) contract for 3 years</td>
<td></td>
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</tr>
</tbody>
</table>

* Installation will be done by two stages: installation of 5 existing stations from July to August 2004; installation of new stations, at least 2 stations per month, from August 2004 to March 2005.
CUMULATIVE CONTRACTING SCHEDULE
Project No:
Project Title: Development of National Hydrometric network according to the EU standards

<table>
<thead>
<tr>
<th>Contract</th>
<th>Description</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>30.12</td>
<td>30.03</td>
<td>31.06</td>
</tr>
<tr>
<td>Contract 1:</td>
<td>Twinning-light for institutional framework assessment and training</td>
<td>38 400</td>
<td>38 400</td>
<td>38 400</td>
</tr>
<tr>
<td>Contract 3:</td>
<td>Technical Assistance for developing HIS</td>
<td>158 000</td>
<td>158 000</td>
<td>158 000</td>
</tr>
<tr>
<td>Contract 4:</td>
<td>Supply contract for procurement of up-to-date equipment, hardware and software, its installation and training</td>
<td>339 000</td>
<td>339 000</td>
<td>339 000</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>535 400</td>
<td>535 400</td>
<td>535 400</td>
</tr>
</tbody>
</table>
CUMULATIVE DISBURSEMENT SCHEDULE

Project No:  
Project Title: Development of the National Hydrometric network according to the EU standards

<table>
<thead>
<tr>
<th>Contract 1: Twinning-light for institutional framework assessment and training</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30.03</td>
<td>31.06</td>
<td>31.09</td>
</tr>
<tr>
<td>Contract 3: Technical Assistance for developing HIS</td>
<td>10 000</td>
<td>60 000</td>
<td>120 000</td>
</tr>
<tr>
<td>Contract 4: Supply contract for procurement of up-to-date equipment, hardware and software, its installation and training</td>
<td>339 000</td>
<td>339 000</td>
<td>339 000</td>
</tr>
<tr>
<td>TOTAL</td>
<td>387 400</td>
<td>437 400</td>
<td>497 400</td>
</tr>
</tbody>
</table>
RESULTS OF THE FEASIBILITY STUDY

Project Title: Development of the National Hydrometric network according to the EU standards

The global objective of the feasibility study was successful launch of Phare 2003 project “Development of the National Hydrometric network according to the EU standards”. The specific objective was determined as a preparation of feasibility study for investments directed for setting up the network of hydrological stations to collect data about water quality and quantity, and for software for Hydrological Information System.

The problem areas to be addressed are that:
- Existing hydrological equipment is older than 35-40 years and worn out.
- The number of monitoring stations has declined in recent years by up to 40 %, as a result of financial constraints.
- Density of the surface-monitoring network to provide decision makers by the required information is insufficient;
- Telecommunication systems are rather old.
- Near-real time data are unavailable;
- Water quantity and quality data are insufficiently integrated;
- Archive of hydrological data does not meet the needs of users;

Primary tasks of the expert 1 were the following:
- Designing and mapping the integrated hydrometric network.
- Analysis and optimisation of observations stations according to the criteria:
  - all major transboundary rivers have stations close to the border;
  - stations have a regional and international significance with long historical data series;
  - cost-efficiency of the hydrological network.
- A detailed evaluation of existing hydrological, meteorological and water quality observation stations.
- A design of the data transmission system and dissemination web site management.
- Specification of equipment needed to establish the integrated hydrometric network according to standards.

Primary tasks of the expert 2 were the following:
a) Recommendations for designing the Hydrological Information System, which should include:
- network metadata (descriptions of observing stations);
- data transmission system;
- data processing system;
- data storage (database);
- data summaries and statistical analyses;
- Internet-based tools for the dissemination of information products to end-users;
- use of Geographical Information System, Arc Info, etc.

Experts Dr. Duncan Reed and Dr. Daoyi Chen from the firm JE Jacobs GIBB provided the feasibility study for Phare 2003 IB project “Development of the national hydrometric network according to the EU standards”.

The study identified the shortcomings to fulfil the Water Framework Directive (WFD) requirements, including training needs and cost assessment of the equipment. The experts emphasized that the main objective of strengthening the national hydrometric network is to support effective implementation of the Water Framework Directive. The experts outlined that
the density of the hydrometric network does not meet all requirements of the WFD, the equipment of the hydrometric network is very old, and some aspects of the data collection methods are out of date. Moreover, there are serious difficulties in primary data processing, with the possibility of collapse. The investigation showed that the database for hydrological information is absent. Attending training courses at an appropriate institution (e.g. an equipment manufacturer, a university specializing in statistical application in hydrology, a database workshop arranged by WMO) is likely to be a highly effective form of training and is strongly recommended. The Final Report (FR), submitted in 18 October of 2002, includes all information of feasibility study and is accessible at the EMHI, MoE, MoF and JE Jacobs GIBB.

Received results from the experts:

a) the list of hydrometric stations of the integrated hydrometric network was suggested (see Annex 7).

b) the observation stations were offered according to the criteria
   - all major transboundary rivers have stations close to the border;
   - stations have a regional and international significance with long historical data series;
   - cost-efficiency of the hydrological network.

c) the existing hydrological, meteorological and water quality observation stations were evaluated.

d) some elements of the data transmission system and dissemination web site management were proposed.

e) specification of equipment needed to establish the integrated hydrometric network according to standards were suggested.

Not standards were suggested at this study. Several standards and quality control procedures according to EU requirements were proposed for data acquisition and management. List of a general hardware and software with its cost estimation and number of stations were recommended. It allowed fulfilling gaps in the project fiche. However, there are some slight disagreements in recommendations and final conclusions of the FR, therefore, in order to exclude any misunderstanding, some comments are given below.

The conclusions of the feasibility study

The costs estimated in the feasibility study are presented separately for hardware, software, and sensors (see Annex 7). These costs refer to the systems required for introducing automated hydrometric stations at 20 to 25 sites. They do not include the costs of preparing the new (or re-opened) sites in terms of ground clearance or building work.

Summary of the earlier estimates, and includes an allowance for some investment in conventional hydrometric equipment, such as current meters and surveying equipment are provided. Experts did several suggestions concerning a cost-efficiency of the hydrological network:

- a requirement to invest only in flow measurement that is itself sustainable;
- there appears continuing with manually observed stations will still require investment in new equipment;

Thus, necessary improvement of the project was done to make the investment in the new equipment for conventional hydrometry network, which is cheaper than automated hydrometry. The procurement at least 4 current meters and few cable-ways are planed. The procurement contract will be organise, according to recommendation that all equipment will be ordered from one vendor.

It is indicated, that the main objective of strengthening the national hydrometric network is to support effective implementation of the Water Framework Directive. A strengthened network will enable Estonia to more fully meet the many requirements of this directive within the required timescale.
Introduction of River Basin Management is central to the WFD, with monitoring of river water quality of special importance. The primary motivation to upgrade the national hydrometric network is to strengthen the monitoring of surface-water pollution loads.

The hydrometric network and measurement practices have been summarized. The equipment used is very old, and the data collection methods are out of date. There are serious difficulties in primary data processing, with the possibility of collapse. There is no effective database.

It is essential that the introduction of automation be seen as a way of increasing capability rather than as a way of reducing staff numbers. The introduction of automated hydrometry requires a clear policy on the functions for which the observer will be responsible and the functions for which specialists will be responsible.

EMHI is accumulating experience in the operation and maintenance of automated sensors and telemetry systems. One important lesson learned so far is the need to secure a service contract to cover a sufficiently long period.

Flow processing of data from ice-covered rivers is a special feature in Estonia. The current software HYDRA for data processing is sophisticated in design and capability. However, the version used by EMHI is now out of date and without any technical support. Certain important functions provided by HYDRA no longer work in the manner intended. It is concluded that EMHI is correct to seek to replace the functionality of HYDRA by another package.

The need for current-metering will continue, with a consequential requirement for robust and up-to-date field equipment. To attain compliance with the Water Framework Directive (WFD), it is necessary:
- to gauge river flows from a greater proportion of the Estonian land mass;
- to gauge all significant transboundary rivers;
- to better integrate the river flow monitoring with the monitoring and analysis of river water quality, notably by Tallinn Technical University.

The introduction of new equipment and software systems presents a considerable challenge. Specialist skills are required, and the organization structure must itself adapt to ensure that the skills are absorbed and used in an effective manner.

Costs have been estimated for all equipment, hardware and software required in the Phare project. The total sum of these costs is between about €500k and €660k. Other costs have not been estimated.

**The main recommendations are as following:**

- Tallinn Technical University (TTU) should continue to manage the river flow measurement at the automatic hydrology posts specifically associated with their river water quality monitoring and analysis;
- EMHI introduce automated hydrometry at 20-25 sites; half of these are currently operating sites, and the remainder are new or re-opened sites;
- It should be a pre-condition of upgrading any station that deficiencies in its hydrometric performance in recent years – evident in observer notes, uncertain data or missing periods of data – be explicitly considered prior to its re-equipment;
- There is a requirement to invest only in flow measurement that is itself sustainable. This need must take precedence over all other factors;
- Particular attention be paid to the security at all sites where high-value equipment is installed;
- The equipment monitoring selected water quality variables can be installed at one or two hydrometric stations close to the Narva regional office, as a capacity-building measure;
- Monitoring water temperature is standard at all EMHI automated hydrometry sites;
It is recommended that the Alastvere at Alastvere catchment be instrumented by TTU – as part of their research and monitoring of river water quality variations in small agricultural catchments. It appears reasonable that the Phare project should fund at least the equipment costs; The MoE Water Department should require Tallinn Water Ltd to improve their flow monitoring on the Pürita and Jägala so that water level is recorded at all stages, in addition to river flows when the discharge is less than 5 m$^3$s$^{-1}$.

There is a clear need to obtain a new software system for processing river flow data. The new system needs to cope with river flow measurement in iced rivers; The Hydrology Department is reorganised into specialist rather than regional units, in order to get the best out of both conventional hydrometry and automated hydrometry. Training is an important component. EMHI be given some flexibility in deciding how training is most appropriately delivered; We encourage the EC to consider funding this important project.

Several comments
The review has identified about 20 sites for re-opening or for new installations. Not all the suggestions will be found to be practical, and it is possible that one or two existing sites will be discontinued due to operational or local factors. Thus, it is envisaged that, in the initial development, the network will grow from its current size of 37 to about 48 sites.

At the preliminary phase an analysis of the existing network, software and equipment, and needs for its development was defined. Some proposals for design of the hydrometric network in order to achieve an adequate network in integrated manner were done. At the end of the project the network is intended to comprise 48 observing stations that monitor river level/flow, water quality (selected parameters) and weather conditions. There is a slight disagreement between proposal and final recommendation. According to paragraph 11 page 38 it is “identified 20 sites for re-opening or for new installation”. So, 8 sites were identified for re-opening and 11 for new installation. Thus, it is envisaged, that in the initial development the network will grow from its current size of 37 to about 54 sites, but not 48. And the density of developed hydrometric network will be 1 station per 850 km$^2$.

There is a slight misunderstanding in suggestion for re-opening of few measurement sites. In our case any re-opening of sites means, that it is necessary to work out the project of a new construction, to build it and to install new pipes and piles, due to the sites, selected for re-opening, were closed long time ago and only on few of them the construction is still exists and sites are suitable for installation of new automatic station with only small preparatory work.

The recommendation for instrumentation of the Alastvere hydrochemical station by automatic station in scope of this project is rejected. There is no doubt that the Alastvere river catchment is very interesting area for research; however, due to the project is directed to the development of hydrometric network and hydrological monitoring according requirements of the WFD, not for research, we neglected the recommendation and focused our strengthening on re-equipment of existing stations for flood forecast purposes.

Feasibility study has underlined that the introduction of automation is seen as a way of increasing capability rather than as a way of reducing staff numbers. On the contrary, the need to secure a service contracts to cover a sufficiently long period in accordance with increasing number of well-trained observers who will provide the security of automatic stations.

The general arrangements were done for telemetry network, which consists of the telemetry outstations and data collection server. It was shown, that the most critical part of information is the data for forecasting purpose. The proposed system and database for use in this project have two central data collection servers and the ORACLE database. Besides, it was noted, that a 3-year on-site service/support contract, with a 4-hour response time, is appropriate. The suggestion is taken into account in the project.
Special attention was given to training requirements. It was important mentioned, that the introduction of new equipment and software systems presents a considerable challenge. So, specialist skills are required, and the organization structure must itself adapt to ensure that the skills are absorbed and used in an effective manner. It was outlined, that the EMHI has had difficulty in getting good service-support from one of the vendors of automatic stations. Thus, providing relevant training is necessary. Even with extensive training, there will be a considerable period before operation of the stations becomes routine. Attending training courses at an appropriate institution is likely to be a highly effective form of training and is strongly recommended. Factory-based training and software training, as well as training in HIS application are included in the project.

It is recommended that the Hydrology Department be reorganized into specialist rather than regional units, in order to get the best out of both conventional hydrometry and automated hydrometry. It means that each Regional Centre would specialise in certain aspect. Particularly for Estonian conditions, the reorganization of Hydrology Department is needed additional funding for providing proper equipment, software, and a car. However, within a scope of this project this funding is not foreseen. Therefore, a working system of Hydrology Department will be applied during this project. This suggestion will be taken into account for a future.

Costs have been estimated for all equipment, hardware and software required in the Phare project. The total sum of these costs is between about €500k and €660k. However, the costs for training and for construction projects and building were not estimated. Therefore, our estimated budget based on the pre-investigation is little differing from the proposed by the experts. At the same time it is within the range of the cost.
## Annex 5

### List of existing hydrometric monitoring stations

**Table 1.**

<table>
<thead>
<tr>
<th>gauging site</th>
<th>water body</th>
<th>owner</th>
<th>equipment</th>
<th>drainage basin km²</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Narva River (Gulf of Finland)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vasknarva</td>
<td>Narva</td>
<td>EMHI</td>
<td>W,S,Q</td>
<td>47800</td>
</tr>
<tr>
<td>- Peipsi Lake drainage basin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Räpina</td>
<td>Võhandu</td>
<td>EMHI</td>
<td>W,S,Q</td>
<td>1130</td>
</tr>
<tr>
<td>Rannu-Jõesuu</td>
<td>Emajõgi</td>
<td>EMHI</td>
<td>W,S,Q</td>
<td>3370</td>
</tr>
<tr>
<td>Tartu(Kvisssental)</td>
<td>Emajõgi</td>
<td>EMHI</td>
<td>W,S,Q</td>
<td>7840</td>
</tr>
<tr>
<td>Törvė</td>
<td>Pedja</td>
<td>EMHI</td>
<td>W,S,Q</td>
<td>776</td>
</tr>
<tr>
<td>Pajusi</td>
<td>Pööltsamaa</td>
<td>EMHI</td>
<td>W,S,Q</td>
<td>1030</td>
</tr>
<tr>
<td>Reola</td>
<td>Porijõgi</td>
<td>EMHI</td>
<td>S,Q</td>
<td>241</td>
</tr>
<tr>
<td>Ahja</td>
<td>Ahja</td>
<td>EMHI</td>
<td>S,Q</td>
<td>896</td>
</tr>
<tr>
<td>Piigaste I</td>
<td>Piigaste oja</td>
<td>EMHI</td>
<td>W,S,Q</td>
<td>11,5</td>
</tr>
<tr>
<td>Tölliste</td>
<td>Väike-Emajõgi</td>
<td>EMHI</td>
<td>W,S,Q</td>
<td>1050</td>
</tr>
<tr>
<td>Törvė</td>
<td>Õhne</td>
<td>EMHI</td>
<td>W,S,Q</td>
<td>269</td>
</tr>
<tr>
<td>Kääpa</td>
<td>Kääpa</td>
<td>EMHI</td>
<td>W,S,Q</td>
<td>266</td>
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<tr>
<td>Mulgi</td>
<td>Avijõgi</td>
<td>EMHI</td>
<td>W, Q</td>
<td>366</td>
</tr>
<tr>
<td>Roososta</td>
<td>Rannapungerja</td>
<td>EMHI</td>
<td>W, Q</td>
<td>313</td>
</tr>
<tr>
<td>Tudulinna</td>
<td>Tagajõgi</td>
<td>EMHI</td>
<td>S,Q</td>
<td>252</td>
</tr>
<tr>
<td>Alajõe</td>
<td>Alajõgi</td>
<td>EMHI</td>
<td>W,S,Q</td>
<td>140</td>
</tr>
<tr>
<td>- Gulf of Finland</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kehra</td>
<td>Jägula</td>
<td>LTD H</td>
<td>W,S,Q</td>
<td>903</td>
</tr>
<tr>
<td>Pajupea</td>
<td>Leivajõgi</td>
<td>EMHI</td>
<td>W,S,Q</td>
<td>96,2</td>
</tr>
<tr>
<td>Lüganuse</td>
<td>Purtsė</td>
<td>EMHI</td>
<td>W,S,Q</td>
<td>784</td>
</tr>
<tr>
<td>Sämi</td>
<td>Kunda</td>
<td>EMHI</td>
<td>W,S,Q</td>
<td>406</td>
</tr>
<tr>
<td>Vanaküla</td>
<td>Valgejõgi</td>
<td>EMHI</td>
<td>W,S,Q</td>
<td>404</td>
</tr>
<tr>
<td>Pudisoo</td>
<td>Pudisso</td>
<td>EMHI</td>
<td>S,Q</td>
<td>123</td>
</tr>
<tr>
<td>Hüürü</td>
<td>Vääna</td>
<td>EMHI</td>
<td>W,S,Q</td>
<td>209</td>
</tr>
<tr>
<td>Keila</td>
<td>Keila</td>
<td>EMHI</td>
<td>S,Q</td>
<td>635</td>
</tr>
<tr>
<td>Vihterpalu</td>
<td>Vihterpalu</td>
<td>EMHI</td>
<td>S,Q</td>
<td>474</td>
</tr>
<tr>
<td>- Gulf of Riga</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Luguse</td>
<td>Luguse</td>
<td>EMHI</td>
<td>S,Q</td>
<td>97,6</td>
</tr>
<tr>
<td>Kasari</td>
<td>Kasari</td>
<td>EMHI</td>
<td>W, S, Q</td>
<td>2640</td>
</tr>
<tr>
<td>Türi-Alliku</td>
<td>Pärnu</td>
<td>EMHI</td>
<td>W, S, Q</td>
<td>579</td>
</tr>
<tr>
<td>Tahkuse</td>
<td>Pärnu</td>
<td>EMHI</td>
<td>W, S, Q</td>
<td>2080</td>
</tr>
<tr>
<td>Oore</td>
<td>Pärnu</td>
<td>EMHI</td>
<td>S,Q</td>
<td>5150</td>
</tr>
<tr>
<td>Vodja</td>
<td>Vodja</td>
<td>EMHI</td>
<td>W, S, Q</td>
<td>52</td>
</tr>
<tr>
<td>Põhjakaja I</td>
<td>Esma</td>
<td>EMHI</td>
<td>W, S, Q</td>
<td>215</td>
</tr>
<tr>
<td>Põhjakaja II</td>
<td>Särgvere prk</td>
<td>EMHI</td>
<td>W, S, Q</td>
<td>7,3</td>
</tr>
<tr>
<td>Tori</td>
<td>Prandi</td>
<td>EMHI</td>
<td>W, S, Q</td>
<td>279</td>
</tr>
<tr>
<td>Location</td>
<td>Station Area</td>
<td>Owner</td>
<td>Equipment</td>
<td>Number of inland waters</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------</td>
<td>-----------------</td>
<td>-----------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>Aesoo</td>
<td>Navesti</td>
<td>EMHI</td>
<td>W, S, Q</td>
<td>1030</td>
</tr>
<tr>
<td>Riisa</td>
<td>Halliste</td>
<td>EMHI</td>
<td>S, Q</td>
<td>1880</td>
</tr>
<tr>
<td>Uue-Lõve</td>
<td>Lõve</td>
<td>EMHI</td>
<td>W, S, Q</td>
<td>134</td>
</tr>
</tbody>
</table>

- **Peipsi Lake**
  - Kulgu sadam Narva veehoidla EMHI W, S 55800
  - Mehikoorma Peipsi-Pihkva järv EMHI S 43895
  - Praaga Peipsi-Pihkva järv EMHI W,S 43895
  - Mustvee Peipsi-Pihkva järv EMHI W,S 43895
  - Rannu-Jõesuu Võrtsjärv EMHI W,S 3100

- **Endla Nature Reserve**
  - Linnusaare Linnusaare oja EMHI W, S 2.6
  - Koluvere Mustjõe prk. EMHI W, S 2.8
  - Tulijärve Mustjõe prk. EMHI W, S, Q 13.9
  - Tooma 1 Tooma kr. EMHI W, S 0.93
  - Tooma 5 Põdra kr. EMHI W, S 0.7
  - Tooma 4 Männiku kr. EMHI W, S 0.1
  - Tooma 6 Dreenaazikoguja EMHI W, S 0.035
  - Tooma 7 Tooma prk. EMHI W, S

Equipment:  
S = staff gauge, W = water level recorder, Q = discharge.

**List of monitoring stations for surface water quality**  
Table 2.

<table>
<thead>
<tr>
<th>River basin</th>
<th>Owner</th>
<th>Number of inland waters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gulf of Finland</td>
<td>TTU</td>
<td>19</td>
</tr>
<tr>
<td>Gulf of Riga</td>
<td>TTU</td>
<td>11</td>
</tr>
<tr>
<td>Peipsi Lake</td>
<td>TTU</td>
<td>29</td>
</tr>
</tbody>
</table>

Responsible: EMHI - Estonian Meteorological and Hydrological Institute, TTU – Tallinn Technical University, LTD Horizon - LTD H.
Problem tree

- Lack of nationally and internationally recognised standards
- National hydrometric network poorly satisfies to EU Water Framework Directive requirements
- Insufficient implementation of transboundary waterbodies and HELCOM conventions
- Insufficient public awareness system

- Insufficient customer service
- Insufficient quality of hydrological forecast

- Data dissemination system poor
- Data transmission system poor
- Data exchange difficult
- Digital database absence (only paper)

- Lack of experience
- No real-time data
- Old telecommunication system
- Insufficient data collection
- Insufficient integrated water quantity and quality monitoring

- Low priority for hydrological activity
- Lack of trained specialists in new technologies
- Old and worn out measuring equipment
- Insufficient density of hydrometric network

National hydrometric network poorly satisfies to EU Water Framework Directive requirements
<table>
<thead>
<tr>
<th>Proposed specifications for sensors</th>
<th>Output signal</th>
<th>4-20 mA</th>
<th>4-20 mA</th>
<th>4-20 mA</th>
<th>4-20 mA</th>
<th>4-20 mA</th>
<th>4-20 mA</th>
<th>4-20 mA</th>
<th>4-20 mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>0-5 m</td>
<td>0…+ 35 °C</td>
<td>(-40)+ 40 °C</td>
<td>0-100 mm/hr</td>
<td>0-14 pH units</td>
<td>0-5000 uS</td>
<td>0-100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>(+/-0.2 %FS)</td>
<td>(+/- 0.1 °C)</td>
<td>(+/- 0.1 °C)</td>
<td>(+/- 1%)</td>
<td>(+/- 1 %FS)</td>
<td>(+/-0.5 %FS)</td>
<td>(+/-0.5 %FS)</td>
<td>(+/-0.5 %FS)</td>
<td>(+/-0.5 %FS)</td>
</tr>
<tr>
<td>Operating temp.</td>
<td>(-40)+ 40 °C</td>
<td>(-40)+ 40 °C</td>
<td>(-40)+ 40 °C</td>
<td>&lt;0+ 40 °C</td>
<td>(-40)+ 40 °C</td>
<td>(-40)+ 40 °C</td>
<td>(-40)+ 40 °C</td>
<td>(-40)+ 40 °C</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No</th>
<th>River</th>
<th>Water level sensor</th>
<th>Water temp. sensor</th>
<th>Air temp. sensor</th>
<th>Precipitation sensor</th>
<th>pH sensor</th>
<th>Conductivity sensor</th>
<th>Dissolved Oxygen sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pirita</td>
<td>Harju</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Kasari (Teenuse)</td>
<td>Matsalu</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Velise (Valgu)</td>
<td>Matsalu</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Vigala (Konuvere)</td>
<td>Matsalu</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Vändra (Kiisa)</td>
<td>Pärnu</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Reiu</td>
<td>Pärnu</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Tarvastu (Linnaveski)</td>
<td>Võrtsjärv</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Audru</td>
<td>Pärnu</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Mustjõgi (Konnuvere)</td>
<td>Koiva</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>10</td>
<td>Piusa (Koiva)</td>
<td>Peipsi</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>11</td>
<td>Pühajõgi</td>
<td>Viru</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>12</td>
<td>Seljajõgi</td>
<td>Viru</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>13</td>
<td>Loobu</td>
<td>Viru</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>14</td>
<td>Sauga</td>
<td>Pärnu</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>15</td>
<td>Tänassilma</td>
<td>Võrtsjärv</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>16</td>
<td>Soodla</td>
<td>Harju</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>17</td>
<td>Mustajõgi</td>
<td>Viru</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

**Existing stations**

<table>
<thead>
<tr>
<th>No</th>
<th>River</th>
<th>Water level sensor</th>
<th>Water temp. sensor</th>
<th>Air temp. sensor</th>
<th>Precipitation sensor</th>
<th>pH sensor</th>
<th>Conductivity sensor</th>
<th>Dissolved Oxygen sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Kasari (Kasari)</td>
<td>Matsalu</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Pärnu (Oore)</td>
<td>Pärnu</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Pärnu (Tahkuse)</td>
<td>Pärnu</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Peipsi (Mustvee)</td>
<td>Peipsi</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Peipsi (Praaga)</td>
<td>Peipsi</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Peipsi (Mehikoorma)</td>
<td>Peipsi</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Cost, EUR**

| Cost, EUR | 96 000 | 36 000 | 6 000 | 6 000 | 43 000 | 1600 | 1800 | 1600 |

Cost does not include the price of 5 spare parts 10 000 EUR. Total cost for sensors is 106 000 EUR.
## Table 2. Proposed specifications for telemetry network, database servers and workstations

<table>
<thead>
<tr>
<th>Technical specifications</th>
<th>Sensors</th>
<th>Telemetry outstation</th>
<th>Data collection server</th>
<th>Database server</th>
<th>Workstation</th>
<th>Notebook</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>data loggers with analogue inputs (expandable to 10) and with 16 bit A/D conversion for 0-20mA signal</td>
<td>To cover 33 stations initially (expandable to 64 stations).</td>
<td>2 Xeon 1.4GHz CPU</td>
<td>P4 2.0GHz</td>
<td>Pentium 4-1800</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9600bps GSM modem</td>
<td></td>
<td>1 GB memory</td>
<td>256 MB memory</td>
<td>256 MB DDRAM, 20 GB, CD-RW-DVD-ROM, 14”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Extension of the service contract to two years</td>
<td></td>
<td>4 SCSI 36GB HD</td>
<td>60 GB HD</td>
<td>DVD-ROM, 14”</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3 years 24 by 7, 4 hr on site service</td>
<td>4 note-books for stations</td>
<td>TFT UXGA, USB</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Windows 2000</td>
<td>maintenance</td>
<td>for stations</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>maintenance</td>
<td></td>
</tr>
</tbody>
</table>

| Quantity | 23 sets | 23 sets + 1 spare part | 2 | 1 | 5 | 4 |

<table>
<thead>
<tr>
<th>Operational temperature</th>
<th>-30–50°C</th>
<th>-30–50°C</th>
<th>0–50°C</th>
<th>0–50°C</th>
<th>0–50°C</th>
<th>0–50°C</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Unit price</th>
<th>€4 200*</th>
<th>€5 000</th>
<th>€10 000</th>
<th>€18 000</th>
<th>€2 000</th>
<th>€3 750</th>
</tr>
</thead>
</table>

2 000 for spare parts + €2 000 (installation)
+ €1 000 (extension of service contract)
2 500 for spare part

**Cost includes 2 stations equipped with water-quality sensors; ** Subtotal cost for telemetry, database and workstations is 355 500 EUR

## Table 3. Proposed specification of software for database

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
<th>Cost, EUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle 9i RDBMS and application server (off the shelf)</td>
<td>License for 10 users</td>
<td>10 000</td>
</tr>
<tr>
<td>Database Management System platform (off the shelf)</td>
<td>According to WMO guidelines</td>
<td>10 000</td>
</tr>
<tr>
<td>GIS</td>
<td>Basic GIS, spatial analysis, geostatistics</td>
<td>7 500</td>
</tr>
<tr>
<td>Specialist hydrological analysis packages</td>
<td>Time-series modelling, extreme value analysis</td>
<td>5000</td>
</tr>
</tbody>
</table>

**Total, EUR** 32 500
Table 4. **Total cost, EUR**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost, EUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware (sensors, telemetry, database servers, workstations, notebooks)</td>
<td>355 500</td>
</tr>
<tr>
<td>Factory Acceptance Test training (3 days for 6 specialists)</td>
<td>22 500</td>
</tr>
<tr>
<td>Software (for up to 33 sites but extendable) + maintenance (6000 €)</td>
<td>38 500</td>
</tr>
<tr>
<td>Conventual’s hydrometric equipment (4 current meters, 2 cable-ways)</td>
<td>37 000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>453 500</strong></td>
</tr>
</tbody>
</table>

Cost of proposed hardware, software and conventional hydrometric equipment (PPTMF, Table 13.1)
TERMS OF REFERENCE

Program Title & Number:

Project Title: Development of National Hydrometric Network According to EU Standards

Twinning Light for establishing institutional framework procedures and training.

Contract Number:

1 BACKGROUND INFORMATION:
The Water Directive Articles 8 and 16.1 require the establishment of the programmes for monitoring of surface water status in order to establish a coherent and comprehensive overview of water status within each river basin district. The programmes shall cover: the volume and level or rate of flow to the extent relevant for ecological and chemical status and ecological potential, and technical specifications and standardised methods for analysis and monitoring of water status in accordance with the requirements of the Water Directive (Article 21).

Hydrological Department of the Estonian Meteorological and Hydrological Institute (EMHI) could be indicated as a National Hydrological Agency. Three Regional Hydrological Stations (Centres) conduct the arrangement and control of the hydrometric network and field measurement activities in scope of each region. The duties of the Hydrological Department comprise co-ordination and data processing of the hydrological monitoring programs, development of instrumentation, hydrological data service and maintenance and development of the hydrological database. The Hydrological Department presents the continuous hydrological data to State Environmental Register.

In the course of the recent years the network of hydrological gauges has been discontinued considerably. At present it comprises a total of 36 hydrological monitoring discharge stations of the rivers, 5 stations monitoring water level of the lakes and 7 measuring stations in the Endla Nature Reserve for measurements of bog water level, runoff, evaporation and so on. The Tallinn Technical University (TTU) maintains the surface water quality network and the Geological Centre (GC) maintains the groundwater quantity and quality network.

The Hydrological Department of the EMHI receives data from 3 Regional Hydrological Centres by different media. Only manual transmission system is available. Processed hydrological data are transmitted to the users, which are Water Cadastre, the State Environmental Register, State Hydrochemical Monitoring Programme, EURONETWORK, EUROSTAT, BALTEX and HELCOME.

However, existing hydrological network for providing data and information on water quantity and quality do not provide an adequate basis for sustainable managing freshwater resources nor for forecasting and mitigation the effects of extreme hydrological events.

Under the main project the Hydrometric Network will be improved and developed and Hydrometric Information System created. However, the precision is needed regarding the responsibilities of the different institutions involved and their co-operation arrangements. Assessment of the institutional framework and operational procedures as well as staffing of each institution is needed in order to achieve the full success of the project.

2 DESCRIPTION OF THE ASSIGNMENT
2.1 Contact data of the beneficiary(ies)

2.1.1 Beneficiaries:
Ministry of the Environment, Estonian Meteorological and Hydrological Institute.

2.1.2 Contact data of the beneficiary(ies)
2.2 Objectives

2.2.1 Global objective
Successful implementation of the project Development of National Hydrometric Network according to EU Standards.

2.2.2 Specific objective
To establish institutional framework procedures and provide training on the requirements of EC directives.

2.3 Requested services per expert

2.3.1 Tasks of Member State (MS) Project Leader (3 working days per month over 3 consecutive months)
- Overall co-ordination of the assignment
- Draw up of final report, based on the results of experts’ work

2.3.2 Tasks of expert 1 (1 working month):
- Assessment of existing institutional framework and operational procedures of Estonian national hydrometric network.
- Draw up the report with proposals for further institutional framework arrangements

2.3.3 Tasks of expert 2 (5 working days):
- Organising and providing of comprehensive training on requirements of EU WFD and its implementation in hydrology and water policy.

2.3.4. Tasks of expert 3 (5 working days):
- Organisation and providing of comprehensive training on the Database Management System Platform and Information System, and new applications for hydrological data

2.4 Expected results per expert

2.4.1 Results of MS Project Leader:
- Assignment is co-ordinated. Final report, based on results of experts work, is drawn up.

2.4.2 Results of expert 1 (1 working month):
- Institutional framework and operational procedures are established. Existing institutional framework and operational procedures of Estonian national hydrometric network are assessed. Report with proposals for further institutional framework arrangements is drawn up.

2.4.3 Results of expert 2 (5 working days):
- General training in requirements of EU Water Framework Directives (WFD) in hydrology and water policy is carried out and specialists are trained (main office).

2.4.4 Results of expert 3 (5 working days):
- Training on the Database Management System Platform and Information System and new applications for hydrological data is carried out and specialists are trained (main office).
3. EXPERTS PROFILE

3.1. Profile of MS Project leader

• Full university degree (preferably in the field of organization of water management programs);
• Proven practical experience in the field of water management and organization of water management programs for at least 10 years;
• 10 years working experience in a leading management position in the water section.
• Good command of verbal and written English;
• Long-term civil servant from an EU Member State water section administration.
• Good knowledge of transposition and implementation of EU water related directives

3.2. Profile of the expert 1:

• Full university degree (preferably public administration).
• Proven practical experience public administration for at least 5 years
• Good command of verbal and written English;
• Good skills working with different computer programmes (MS Word, MS Excel).
• Good organizer with 5 years of professional experience

3.3. Profile of the expert 2:

• Full university degree (preferably water-related);
• Proven practical experience in the field of water management or hydrology for at least 5 years;
• Knowledge and experience in organising the seminars and training courses.
• Good knowledge of transposition and implementation of EU water related directives;
• Good command of verbal/presentational and written English;
• Good skills working with different computer programmes (MS Word, MS Power Point, MS Excel).

3.4. Profile of the expert 3:

• Full university degree (preferably water-related);
• Proven practical experience in the field of database and information system management and/or new applications for hydrological data for at least 5 years;
• Knowledge and experience in organising the seminars and training courses.
• Good command of verbal/presentational and written English;
• Good skills working with different computer programmes (MS Word, MS Power Point, MS Excel).

Working Languages:
Working language is English.

4. LOCATION AND DURATION

4.1. Project Duration: (50 calendar days)

• Starting date\(^9\) within 14 days after signing the Letter of Contract by contractor
• Finishing date starting date + 50 calendar-days

The expert 1 has to perform his/her services 23 calendar days from the beginning of the assignment and then 7 calendar days before the end of the assignment (in total 30 calendar days). Briefing is foreseen 10 calendar days. The expert 2 has to perform his/her services during 7 calendar days from the beginning to the end of the assignment (no briefing is foreseen). The expert 2 has to start his/her assignment after the expert 1 assignment is completed.

4.2. Project Location

\(^9\) Cannot be before the date of signature of the letter of contract.
The experts will be equipped with a workplace (incl. computer, tel., fax, photocopier, etc.) in the Estonian Meteorological and Hydrological Institute in Tallinn (address: Rävala 8, 10143 Tallinn). This will function as the base for the management and implementation of the assignment.

5. REPORTING
Two reports have to be prepared during the execution of the assignment: inception and final report.
- A detailed work plan for the whole assignment. Inception report with working plan must be presented to Beneficiary (see p. 2.1.1) for approval 1 week after the beginning of the assignment at the latest.
- Inception report will be approved by Beneficiary and forwarded to the Strategy and Investment Department (Ministry of the Environment) for final endorsement. Strategy and Investment Department will forward the inception report to the Ministry of Finance (CFCU) and EC Delegation for notice.
- Final report shall give an overall view of the implementation of the assignment and whether original target objectives, outputs and inputs have been realised. Framework contractor elaborates project final report (5 copies) and submits the final reports for approval to the Beneficiary (see p. 2.1.1) 1 week after the completion of the tasks. Invoices must be presented to Mr Rainer Rohesalu (Strategy and Investment Department, Ministry of the Environment) during 1 month after the completion of the tasks. Strategy and Investment Department will endorse finally the reports and invoices after the Beneficiary has approved the outcomes.
- Mr Rohesalu submits the final reports (5 copies) and invoices for approval to the Ministry of Finance (CFCU).
- All the reports should be written in English and should follow Phare standards for reports.

6. BUDGET
Eligible costs for Phare support are following:

<table>
<thead>
<tr>
<th>Budget item</th>
<th>Cost (Euro)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total expert fees (€220 per working day) 32 man days</td>
<td>7 100</td>
</tr>
<tr>
<td>EU Member State Admin Costs (1.5 x total expert fees)</td>
<td>10 600</td>
</tr>
<tr>
<td>Per diem (€159 per calendar day) 45 calendar days</td>
<td>7 200</td>
</tr>
<tr>
<td>EU Member State Project Leader (9 man days and 3 visits to the CC, international transportation costs)</td>
<td>5 200</td>
</tr>
<tr>
<td>International Transportation Costs (for foreign experts, average return flight to Estonia costs 600 EUR)</td>
<td>2 400</td>
</tr>
<tr>
<td>Local Transportation Costs (if the nature of the project so requires)</td>
<td>-</td>
</tr>
<tr>
<td>Other costs (translation, seminar materials, etc.)</td>
<td>2 000</td>
</tr>
<tr>
<td>Audit certificate</td>
<td>3 000</td>
</tr>
<tr>
<td>Reserve (2.5% of the total budget)</td>
<td>900</td>
</tr>
<tr>
<td>Total</td>
<td>38 400</td>
</tr>
</tbody>
</table>
### List of proposed stations with justifications

<table>
<thead>
<tr>
<th>Nr.</th>
<th>River</th>
<th>Hydrochemical measurement point (TTÜ)</th>
<th>Catchment area, km²</th>
<th>Justification of proposed stations</th>
<th>Station security</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Piusa</td>
<td>Värksa-Saatse mnt</td>
<td>733</td>
<td>new h/s⁵ SSWMP⁴, TR²</td>
<td>metal box⁵</td>
<td>local observer</td>
</tr>
<tr>
<td>2</td>
<td>Võhandu</td>
<td>Vagula väljavool</td>
<td>495</td>
<td>new h/s CP³ (heavy metal), Võru town inundation</td>
<td>metal box</td>
<td>local observer</td>
</tr>
<tr>
<td>3</td>
<td>Tarvastu</td>
<td>suue</td>
<td>108</td>
<td>re-open h/s, SSWMP</td>
<td>metal box</td>
<td>hydrologists from Viljandi</td>
</tr>
<tr>
<td>4</td>
<td>Tanassilma</td>
<td>Oiu</td>
<td>454</td>
<td>new h/s CP (heavy metal, phosphorus, phenol, oil products)</td>
<td>metal box, alarm, insurance</td>
<td>hydrologists from Viljandi</td>
</tr>
<tr>
<td>5</td>
<td>Puhajõgi</td>
<td>suue</td>
<td>196</td>
<td>new h/s CP (heavy metal, phosphorus, phenol, oil products)</td>
<td>metal box, alarm, insurance</td>
<td>mobile group from Narva-Jõesuu</td>
</tr>
<tr>
<td>6</td>
<td>Selja</td>
<td>suue</td>
<td>410</td>
<td>new h/s CP (heavy metal, phosphorus, phenol, oil products)</td>
<td>metal box, alarm, insurance</td>
<td>mobile group from Narva-Jõesuu</td>
</tr>
<tr>
<td>7</td>
<td>Loobu</td>
<td>Vihasoo</td>
<td>308</td>
<td>new h/s CP (heavy metal, phosphorus, phenol, oil products)</td>
<td>metal box</td>
<td>local observer</td>
</tr>
<tr>
<td>8</td>
<td>Pirita</td>
<td>suue</td>
<td>794</td>
<td>new h/s SSWMP, HELCOM⁴</td>
<td>metal box, alarm, insurance</td>
<td>mobile group from Tallinn</td>
</tr>
<tr>
<td>9</td>
<td>Kasari</td>
<td>Kasari hp</td>
<td>2640</td>
<td>upgreat SSWMP, HELCOM</td>
<td>metal box</td>
<td>mobile group from Tallinn</td>
</tr>
<tr>
<td>10</td>
<td>Pärnu</td>
<td>Tahkuse hp</td>
<td>2080</td>
<td>upgreat SSWMP</td>
<td>metal box</td>
<td>hydrologists from Viljandi</td>
</tr>
<tr>
<td>11</td>
<td>Pärnu</td>
<td>Oore hp</td>
<td>5150</td>
<td>upgreat SSWMP, HELCOM</td>
<td>metal box</td>
<td>hydrologists from Viljandi</td>
</tr>
<tr>
<td>12</td>
<td>Saarjõgi</td>
<td>Kaansoo hp</td>
<td>191</td>
<td>new h/s SSWMP, reference river</td>
<td>metal box</td>
<td>hydrologists from Viljandi</td>
</tr>
<tr>
<td>13</td>
<td>Vigala</td>
<td>Konuvere</td>
<td>618</td>
<td>re-open h/s forecast</td>
<td>metal box</td>
<td>mobile group from Tallinn</td>
</tr>
<tr>
<td>14</td>
<td>Velise</td>
<td>Valgu</td>
<td>135</td>
<td>re-open h/s SSWMP, forecast</td>
<td>metal box</td>
<td>mobile group from Tallinn</td>
</tr>
<tr>
<td>15</td>
<td>Audru</td>
<td>Audru</td>
<td>326</td>
<td>new h/s forecast</td>
<td>metal box, alarm, insurance</td>
<td>hydrologists from Viljandi</td>
</tr>
<tr>
<td>16</td>
<td>Reiu</td>
<td>allp. Lahkmat</td>
<td>548</td>
<td>new h/s SSWMP, reference river</td>
<td>metal box, alarm, insurance</td>
<td>hydrologists from Viljandi</td>
</tr>
<tr>
<td>17</td>
<td>Sauga</td>
<td>Nurme veski</td>
<td>546</td>
<td>new h/s CP (heavy metal, phosphorus, phenol, oil products)</td>
<td>metal box, alarm, insurance</td>
<td>hydrologists from Viljandi</td>
</tr>
<tr>
<td>18</td>
<td>Mustajõgi</td>
<td>Narva kariār</td>
<td>389</td>
<td>new h/s SSWMP, TR</td>
<td>metal box</td>
<td>mobile group from Narva-Jõesuu</td>
</tr>
<tr>
<td>19</td>
<td>Mustjõgi</td>
<td>Konnuvere</td>
<td>1220</td>
<td>new h/s SSWMP, TR</td>
<td>metal box</td>
<td>local observer</td>
</tr>
<tr>
<td>20</td>
<td>Elva</td>
<td>Elva</td>
<td>246</td>
<td>re-open h/s forecast</td>
<td>metal box, alarm, insurance</td>
<td>mobile group from Tartu</td>
</tr>
<tr>
<td>21</td>
<td>Lake Peipsi</td>
<td>Mustvee</td>
<td>47800</td>
<td>upgreat SSWMP, forecast</td>
<td>metal box, alarm, insurance</td>
<td>hydrologist from Tiirikoja</td>
</tr>
<tr>
<td>22</td>
<td>Lake Peipsi</td>
<td>Praaga</td>
<td>47800</td>
<td>upgreat SSWMP, forecast</td>
<td>metal box</td>
<td>local observer</td>
</tr>
<tr>
<td>23</td>
<td>Lake Peipsi</td>
<td>Mehikoorma</td>
<td>47800</td>
<td>upgreat SSWMP, forecast</td>
<td>metal box</td>
<td>local observer</td>
</tr>
</tbody>
</table>

**Total:**

---

51
1. SSWMP  State Surface Water Monitoring Program
2. TR Convention on the Protection and Use of Transboundary Watercourses and International Lakes
3. CP Contamination problem
4. HELCOM Helsinki Convention
5. metal box Equipment installed inside weather protection house inside of metall safe
6. All new hydrometric stations include infrastructure establishment

local observer 6
hydrologists from Viljandi 2
mobile group from Narva-Jõesuu 3
mobile group from Tallinn 3
mobile group from Tartu 3
hydrologist from Tiirikoja 1
Map of existed and proposed hydrometric stations
Management scheme of an institutional framework

Estonian National Environmental Monitoring Programme (Surface water programme)

- Hydrometric network (quantity of surface water)
- Hydrochemical network (quality of surface water)
- Hydrobiological network (biological composition of surface water)
- Hydrogeological network (quantity and quality of groundwater)

- EMHI (Hydrology Department, Regional Centers)
- TTU
- EAU (Institute of Zoology and Botany)
- Geological Center

EIC of the MoE (Water Cadastre, end users)
ANNEX 14 (please see attached file)