FINAL REPORT

DatabasiN

PROJECT:

“ Information management system and infrastructures for the transboundary Daugava/Zapadnaya Dvina and Nemunas/Neman river basins”

UNEP GRID ARENDAL
Environmental Knowledge for Change

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1. Introduction

Administrative regions, such as counties, states and countries, are rarely the most appropriate for management of water related resources. Lakes, rivers and ground water cross and span our, from a water perspective, "artificial" administrative boundaries. Water management through drainage basins represents an alternative for our shared water resources, which in Europe lately has been championed by the EU Water Framework Directive. Drainage basins, or watersheds, represent the land areas where all the surface water flows into a single river. These basins can vary in size, and one large basin is made up of multiple smaller basins.
This project takes a transboundary and basin-wide approach at spatial information for the Daugava/Zapdnaya Dvina and Nemunas/Neman river basins. These rivers originate in Russia and Belarus and pass through Latvia and Lithuania, respectively, before reaching the Baltic Sea.
The overall aim of the project is to develop joint information infrastructures and services for these two river basins, and thereby contribute to reduced asymmetric access to pertinent environmental (spatial) information among the countries concerned. This is one way to minimise problems related to mistrust and increase effectiveness.
To enable management, and planning, a first step is to get an overview and assemble the available data and information, to support decision-making and assessment. In practice, this means assembling basin-wide map databases on existing data, primarily from national sources, as well as from global and regional datasets. National data will need to be harmonized to establish basin-wide layers. Furthermore, the data and information collated and harmonised will be made available, as much as copy right restrictions allow, through the Internet using WebGIS services.

This report is prepared by UNEP/GRID-Arendal, the project implementing agency, for the donor, the Swedish Environmental Protection Agency.

2. Project synopsis

Project objective:

1. To increase information access and exchange of data (nature resource condition, socio-economic data etc.) which are relevant for the purpose of characterising the river basins in line with the Water Framework Directive and the Convention of the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) (Helsinki, 1992).
2. To propose an infrastructure and organisation for transboundary information management and data exchange that is sustainable in a long term perspective.

Excepted results:

A. Identified prioritised transboundary water issues and end-users needs, inventory of existing data and information, and identified key stakeholders.
B. A set of prioritised GIS databases, which can be used to support the Water Framework Directive and national decision-making process.
C. Accessible information for the public in the form of maps, statistical information and GIS databases.
D. An Internet based user-friendly interactive system that supports the exchange of data between the countries, public access to information and interaction with stakeholders.
E. Increased knowledge by the Government administration how to use GIS databases for decision making.
F. A summary of the experience gained, identification of data and knowledge gaps, recommendation for future activities and a proposal for infrastructure and organisation for information management and data sharing, including technical, institutional and financial issues.
G. A marketing plan, based on the assessment of the information channels, available to partners for distribution of the project results. A preliminary assessment of current donor options and a draft general project proposal.

Project duration: March, 2006 - March, 2008

3. Project Implementation

According to the project plan the following activities were outlined for implementation:

A. Project preparation and initial workshop
B. Preparation of GIS datasets
C. Preparation of information for the public
D. Development of an interactive Internet-based resource
E. Training workshop in information management system, GIS and its potential for water resources management
F. Final workshop to present and discuss project outcome and conclusions
G. Marketing of the project results and preparation of a draft project proposal for funding

3.1 Activity A. Project preparation and initial workshop

The objective of Activity A was to agree on what data should be developed at a transboundary level and for what purpose should it be used. At the preparatory phase a working meeting has developed goals for cooperation and key transboundary water issues were identified and agreed upon. A survey was prepared and sent out to each country to identify national goal, priorities, needs and available data. The starting workshop has been prepared and carried out. Stakeholders and information holders were identified and some were invited to the workshop. The workshop was followed by a steering committee and technical group meeting. An inception report was prepared documenting the outcome of the preparatory phase and the starting workshop.

3.1.1 Activity A1. Project mobilisation and the workshop preparation

In the pre-starting phase the project application was assessed by project partners prior to its submission to the donor agency. The working meeting of the parties was arranged, funded by the Swedish EPA. All parties (except Latvians) met in St. Petersburg, Russia on December 22, 2005. The agenda of the meeting included:

1. Acquaintance of the partners;
2. Presentation of the project and informing the participants about the conditions of financing;
3. Detailed discussion of the text of the proposal;
4. Discussion of the project working plan;
5. Discussion of unresolved issues and issues of concern;
6. Development of an action plan for the pre-starting phase

The Project approach and methodology was thoroughly discussed with the representatives of the partner countries at the stage of project development. Good working relationships were established between the project manager and country representatives.

Participants were also asked to provide input on how the project can build on their current activities, which issues should be addressed during the starting seminar and how to establish best cooperation with the project partners in other countries. To facilitate input, the participants were given a brief description of the project, and a work plan of project activities and a timeline.

The decisions of the meeting were summarized in the final document (see *Attachment 1*).

According to the project implementation plan drafted in the pre-start meeting, the starting seminar had to be arranged in the first phase of the project. It was preceded by the preparation period of 2 months, when decisions of the pre-starting meeting were implemented, including translation and distribution of the full text of the project and preparation and signing of the letter by MNR of Russia on the approval of the database entries allowed to be released from the Russian side.

A number of bilateral negotiations with the countries were held by the project manager to get feedback on project activities and approach. This was very useful to get sufficient level of commitment by the countries. At the same time additional stakeholders were identified and invited to the workshop.
Further on the time and place of the seminar were agreed upon, the agenda and the list of participants finalized, speakers identified and contacted, presentation themes outlined, discussed and confirmed.

Additionally, prior to the starting seminar participants were provided with the specially developed questionnaire (see *Attachment 2*) in order to identify national priorities and goals, needs and available data for the development of the GIS database. Project partners were invited to raise issues and provide comments for project approach and methodology. Unfortunately, only the participants from Belarus managed to fill and mail the questionnaires. Thus the discussion of the issues outlined in the questionnaire had to be moved to the seminar discussions.

3.1.2 Activity A2. Seminar to discuss transboundary key water issues, identify user needs, to agree on prioritised datasets and to prepare a detailed project work plan

The starting seminar of the project 'Information management system and infrastructures for the transboundary Daugava/Zapadnaya Dvina and Nemunas/Neman river basins' was held on June 8-9, 2006 in St. Petersburg, Russia. There were 23 participants from Belarus, Latvia, Lithuania, Russia, Sweden and Netherlands, representing Ministries: of Environment and Natural Resources, Environmental Protection and Federal Water Agencies, river basin authorities, the Swedish expert group and project supervisors from the donor agency (see *Attachment 3* for the List of participants).

Topics addressed included the use of the GIS tools in water basin management, web-based GIS and interactive systems, development and use of transboundary GIS, development of the transboundary plan for early warning and notification, Decision Support System in water resources management. Synergies with on-going and planned projects, focusing on river basins of Daugava/Zapadnaya Dvina and Nemunas/Neman, particularly in the Republic of Belarus, were established (see also 2.5. in the project analysis).

In the roundtable discussion the key transboundary water issues were outlined and user needs identified. The steering committee approved the prioritized list of datasets available in the countries for development of the pilot transboundary geoinformational system for basin management and agreed on the detailed project work plan.

For the cost and time efficiency the starting seminar, steering committee meeting I and technical working groups meeting were held back to back. (see *Attachment 4* for the Seminar program).

Seminar proceedings are listed below:

- Use of the GIS tools in water basin management: European experience *Presentation* [Sindre Langaas, consultant (KTH)] (ppt.eng)
- Web-GIS and interactive systems, *Presentation* [Hugo Ahlenius, UNEP/GRID-Arendal] (ppt.eng)
- Development and use of transboundary GIS: Lake Peipus experience [Sindre Langaas, consultant (KTH) Natalia Alexeyeva, CTC] (ppt.eng)
- MATRA project Improvement of knowledge and capacities for transboundary water resources management in the Western Dvina river basin [Corinne van Voorden (Ameco)] (ppt.eng)
- Development of the transboundary plan of danger warning and notification for the Nemunas river basin [Olga Zhukova, Republican center of radiological control and environmental monitoring, Belarus] (ppt.rus)
- Decision Support System (DSS) in Water Resources Management: brief overview of the U.S experience [Ivan Maximov, Federal Water Agency, Russia] (ppt.eng)

- Presentation of previous experience and available data from Belarus [Alexander Pakhomov, CRICUMWR, Belarus] (ppt.rus)
- Presentation of previous experience and available data from Lithuania [Aldona Margeriene, Environmental Protection Agency of Lithuania] (ppt.eng)
- Presentation of previous experience and available data from Latvia [Dzidra Hadonina, Ministry of Environment of Latvia] (ppt.rus)

3.1.3 Activity A3. Steering committee meeting I

Steering Committee was established prior to the starting seminar (see *Attachment 5* for the list of members of the Steering Committee). In the Steering committee meeting the key transboundary water issues were outlined and priority aims for transboundary cooperation were identified, based on the summary, prepared by Belarus.

Nemunas river basin

- Transboundary movement of pollutants – Nemunas and Villia
- Change in natural hydrological balance of water basins (the river Nemunas - constriction of hydropower station (Lithuania, Belarus), Minsk water system)

Daugava river basin

- Transboundary movement of pollutants - Daugava
- Possible contamination of the river with oil as a result of accidents on the oil refineries and other oil-chemical enterprises

National priorities of the Republic of Belarus for the water management and water use in the basins of rivers Nemunas and Daugava:

- Industrial and agricultural water use and water distribution, water supply to urban and rural population, insurance of recreational facilities, hydropower, fishing (for Daugava only).
- Rational use of natural resources
- Reducing of number of sources of water pollution
- Preservation and protection of water ecosystems
- Reduction of risks of floods and its consequences for the land, reduction of risks of water erosion (for Nemunas only)

Priority aim for transboundary cooperation

1. Sustainable use and protection of the water basins of rivers Nemunas and Daugava
2. Collaboration on the following directions:
    - Water Establishments (development of common approaches to EIA in transboundary context, ext.)
    - Protection of water ecosystems
    - Tourism and recreational utilities
    - Protected areas
    - Development of early warning and notification systems in case of emergency situations
    - Monitoring and evaluation of water quality (development of the common programme for transboundary monitoring of water resources at the river basins for evaluation of the transboundary movement of pollutants, international research…)
    - Exchange of transboundary information

Latvia and Lithuania have pointed out that their priorities were to implement the EU Water Directive.

The steering committee discussed and approved the prioritized list of datasets available in the countries for development of the pilot transboundary geo-information system for basin management. After the seminar the

draft was sent to the countries for final comments and additional verification (see *Attachment 6* for the approved list of datasets). The special discussion was held on the distribution of available financial resources. Finally the steering committee discussed and approved the detailed work plan.

It was agreed to conduct the Steering committee meeting II as planned, but using communication tools like video/telephone conferencing and/or on-line communication instead of a personal meeting, thus saving some resources that can be used for unforeseen expenses, for example, increasing the Russian share for expert fees an the like.

Technical group meetings were planned to be conducted predominantly on-line, using skype or tiki-wiki tools. The project web-page has been started on GRID-Arendal's web server at www.enrin.grida.no/databasin/

3.1.4 Activity A4. Preparation of the Inception report

The inception report, which included the analysis of the project, the output from the seminar and the detailed work plan was prepared and submitted to the donor.

3.2 Activity B. Preparation of GIS datasets

Based on the outcome of the workshop and steering committee decisions in the preparatory phase (activity A) the Technical Working Group has specified technical requirements for the data. The meeting was held back-to-back with the workshop and steering committee meeting (activity A2 and A3). Issues to discuss and agree upon included GIS database specifications (scale, classification systems, attribute information, data format, geodetic reference etc.) and quality assurance routines. Issues of future characters could also be discussed such as frequencies of up-dating of data, data flow, data host etc. The GIS datasets, description of the work, database specifications etc. were documented in a report and on a CD, and distributed to all partners

3.2.1 Activity B1. Technical working group meetings to discuss and agree on technical issues regarding harmonisation and preparation of GIS data sets, and division of responsibilities of different tasks.

The technical group has met and discussed the formats, data layers, software, means of communication and development and other technical issues. The initial pilot database framework will be developed by Swedish expert group headed by Mr. Sindre Langaas The Swedish Expert Team, headed by Dr. Sindre Langaas, was formed. For the sake of the Phase I, besides Langaas it consisted of Ms Dorothy Furberg, MSc, an independent GIS consultant with recent expertise in working with international GIS data in the context of the EU Water Framework Directive. (See *Attachment 7* for the results of the technical group meeting)

The proceedings of the seminar and results of the steering committee meeting and technical group meeting are published on the internet and can be downloaded from http://enrin.grida.no/proceedings.cfm?article=31

3.2.2 Activity B2. Preparation of national data sets and extraction of GIS data sets based upon pan-Baltic, pan-European or global data, including harmonisation according to database specifications.

Once the project partner data priorities were established, it was possible to begin an inventory of data sources. Factors considered during the search for and acquisition of data sources included issues on data quality, availability, cost and user rights. The initial inventory of data sources was performed by the SINDREEnvironment consultancy (see Langaas, 2006). Following that inventory, the proposed data sources were collected, formatted and researched by the GIS consultant. Members of the technical working group then suggested additional data sources or discouraged the use of previous ones, and the preliminary contents of the database were changed accordingly.

The data (digital) were obtained from the following sources:

DatabasiN project partners:

- River Basin District shapefile, KTH

Online public domain GIS data:

- SRTM 90m Digital Elevation Data
- BALANS Land Cover Data
- NIMA DCW VMAP0
- CCM, The Joint Research Centre
- GEOnet Names Server
- Gridded Population of the World, Version 3
- Landsat GeoCover 2000/ETM+ Edition Mosaics

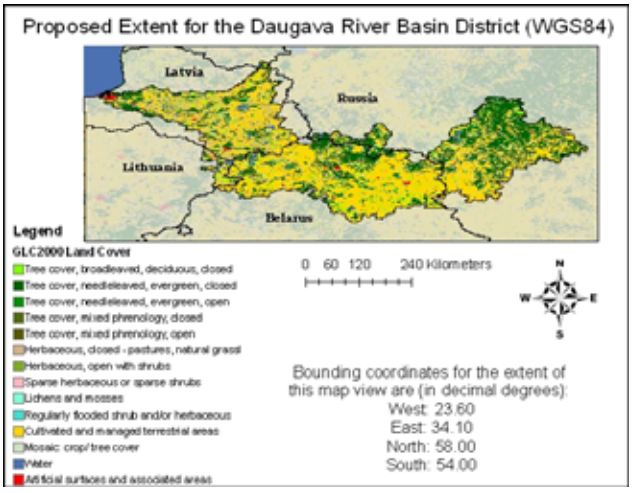
Personal contacts:

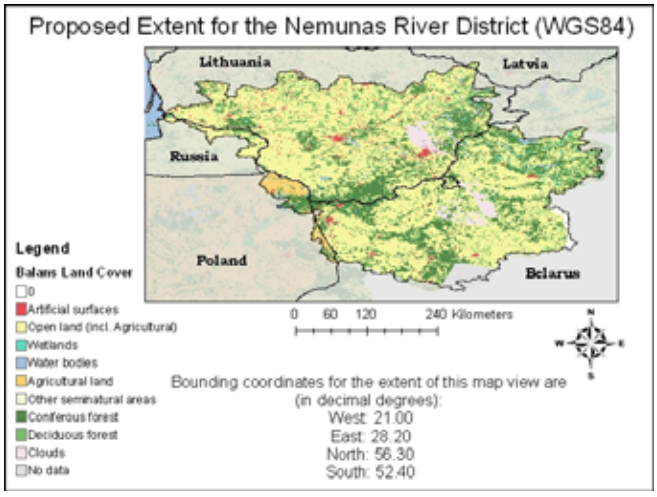
- FAO Soil and Terrain Database
- Bartholomew Digital Map Data

Data harmonization was one of the main challenges of developers. Concerning the geodetic reference system for this GIS database, all geodetic harmonisation procedures were carried out using ArcGIS 9 (ArcMap/ArcCatalog) software. Firstly, data were projected into the database projection system. Secondly, if specific data source covered a larger area then the database area, it was clipped according to the defined database boundaries. Raster files were re-sampled during the projection process either using a "nearest neighbor" resample method for land cover data or a bilinear resample method for elevation data and satellite imagery.

3.2.3 Activity B3. Preparation of data report and CD.

The report documented the preparation of a pilot multi-thematic GIS database with 26 layers covering the transboundary Daugava/Zapadnaya Dvina and Nemunas/Neman river basin districts shared between Belarus, Latvia, Lithuania and Russia. The layers have been organized in six thematic groups: Administration; Hydrology; Land cover; Pedology and Topography; Population; and Satellite Imagery. The varying scales (resolutions) and quality of the layers reflect the wide variety of primary data sources used in their creation, which were chosen according to early data priorities of the project partners. The pilot database is composed of mainly "top-down" layers based on publicly accessible and best available data sources. Partner priorities and information needs specified in the EU Water Framework Directive have guided the definition of the thematic content of the pilot GIS database. It was developed within the framework of the DatabasiN Project from July to September 2006 by the Swedish Expert Team (Dorothy Furberg and Sindre Langaas). The full text of this report is available in the *Attachment 8*





Instead of relying on country submissions, the pilot database was compiled from existing global datasets and resources, and further subset and refined for the two drainage basins that this project covers.

During this phase of the work at some cases, input and feedback from the members of the Technical Working group was requested.

The pilot database, was finalized and delivered to the partners in late October 2006. The collection was prepared as a CD-ROM, with the full data files, a report on the collection of data in the pilot database, and map output products. In addition, the report and map outputs have also been made public on the official project web-site. All data has been documented with full metadata, according to international standards.
To support the future work and the development of the final database, the full pilot data collection has been entered into the UNEP/GRID-Arendal internal GIS database, for additional improvement with national submitted data, and for presenting in an upcoming interactive map presentation (WebGIS).

3.3 Activity C. Preparation of information for the public

3.3.1 Activity C1. Technical working group meeting to discuss and propose what information should be available for the public, and division of responsibilities of different tasks.

At the end of the Activity B3, Ms. Furberg was replaced in the Swedish Expert Team by Ms. Moa Holmlund and Mr. Fredrik Hannerz, both from the Dept of Physical Geography, Stockholm University. Hannerz was involved in the GIS project development in 2003-2004 and was also main responsible for the Lake Peipsi GIS database prepared within the MANTRA-East project, the model effort for DatabasiN. He has also worked for a shorter period in the DG Environment Water Framework Team and is currently completing his PhD degree in which he among other topics do research on information system issues in the context of water management.
To present the pilot database and to discuss the next steps, there was a conference call in the beginning of December. This represented the start of the real database activities for the technical group, and all countries were represented, in addition to people from UNEP/GRID-Arendal and the Swedish Expert Team. Information on the Pilot database and a suggested outline (prepared by Sindre Langaas, Fredrik Hannerz and Hugo Ahlenius) for the "Phase II" work, had previously been circulated to the parties, in advance of the meeting.
This technical meeting reported on the current status, and most importantly the pilot database, for the participating experts, and then went on to introduce and discuss the next steps, and the time schedule for national data submissions and deliveries, and what standards and documentation is required for the data. In addition, there was a short review on rights and access to data layers, and the documentation on those issues.
On the time schedule – with the upcoming holidays (meeting was held in the beginning of December 2006) it was decided to postpone the initial suggested deadline one month, and it was decided by the participants to do the initial submission of the first batch of data to the Swedish Expert Team by January 31st 2007. The suggested datasets for this delivery was specified in the preparatory material to the conference.
The outcome of the meeting was prepared and has been posted for review by the partners, and made available on the technical documentation web-site – together with minutes, data documentation guidelines and additional background material, such as the pilot database report.

3.1.2 Activity C2. Steering committee meeting II (see activity D2).

3.1.3 Activity C3. Preparation of GIS datasets, statistics and cartographic outputs

At this stage the pilot database designed according to the agreed criteria priorities and information needs identified among project partners, containing the data available form the open European sources has been saturated by data provided by national partners. Specifications in the EU Water Framework Directive have also guided the definition of the thematic content of the GIS database.

The finalized database contained the following thematic layers:

Hydro layers:
• River basin districts (polygon)
• Generic sub-catchments (where tributaries enter the main river; polygon)

• Rivers (line)
• Lakes (polygon)
• National hydro chemical measurement stations (point)
• National hydro chemical station catchments (polygon)
• National water discharge stations (point)
• National water discharge station catchments (polygon)

Pressure layers:
• Marine coastline (line)
• International Boundaries (polyline)
• Sub-national Boundaries level 1 (polyline)
• Sub-national Boundaries level 2 (polyline)
• Settlements (point)

3.1.3.1 C3.1 Acquisition of data sets

Once the project partner data priorities were established, submission of national layer data sets began, after which an inventory of the data sets was made by the Swedish Expert Team (SET). Layers of National hydro chemical station catchments, National water discharge station catchments (hydro layers), Industrial pollution point sources and Industrial hazardous point sources (pressure layers), that only have partial coverage of the two river basins were omitted (data sets on these layers were only submitted by two project partners respectively).
In addition to the prioritized layers additional layers on population distribution, soil properties, topography and land cover were included in the database. With exception for the population distribution data these layers were also included in the pilot database by Furberg (2006) and were all gathered from available datasets covering larger geographical areas.

3.1.3.2 C3.2 Thematic harmonisation

All editing and harmonisation was preformed using ArcGIS 9.1 and ArcGIS 9.2 (ArcMap/ArcCatalog). All national data sets were submitted to SET in a common reference system, hence mainly thematic harmonisation was preformed, that is, intra- and interlayer harmonisation with respect to thematic content4. The acquired national data that were to be included in the database had several different national coding systems attached to them. In some cases metadata was lacking, which made the harmonisation both a challenging and a time consuming process. Desirable attribute data identified in the SET proposal was extracted from the national data sets and added to the new basin-wide layers along with attributes that different partners requested to be included in the basin-wide data layers. The task of editing the national data sets involved matching international borders, transboundary watercourses and lakes. The national data sets display varying detail in digitalization and spatial resolution, which is reflected in the final basin-wide layers.

3.1.3.3 C3.3 Database documentation

Relevant metadata is of great importance in order to facilitate assessments of the data sets relevance and usefulness. Metadata for each data layer has been created based on metadata in the submitted national data sets using the ArcCatalog Metadata Tool. The metadata follows the US Federal Geographic Data Committee standard (FGDC).

3.1.3.4 C3.4 Database description

As mentioned above, all national data sets submitted to the DatabasiN project were of the same coordinate system and geodetic model:
Horizontal Datum Name: WGS 1984
Ellipsoid Name: WGS 1984
Semi-major Axis: 6378137.000000
Denominator of Flattening Ratio: 298.257224
Geographic coordinate system name: WGS 1984
Latitude Resolution: 0.000000
Longitude Resolution: 0.000000
Geographic Coordinate Units: Decimal degrees

The Daugava river basin district region has the bounding coordinates (in decimal degrees):
West Bounding Coordinate: 23.87
East Bounding Coordinate: 33.89
North Bounding Coordinate: 57.56
South Bounding Coordinate: 54.37

The Nemunas river basin district region has the bounding coordinates (in decimal degrees):
West Bounding Coordinate: 20.96
East Bounding Coordinate: 28.02
North Bounding Coordinate: 56.14
South Bounding Coordinate: 52.61

The DatabasiN GIS database has the bounding coordinates (in decimal degrees):
West Bounding Coordinate: 20.50
East Bounding Coordinate: 34.50
North Bounding Coordinate: 58.50
South Bounding Coordinate: 52.00

3.1.3.5 C3.5 Data quality issues

The Nemunas/Neman and Daugava/Zapadnaya Dvina GIS-database is based upon a wide variety of national data sources, some of which are meticulously documented and others lacking metadata all together. As every data set of the GIS database is compiled of three or four different national data layers, they too are of varying quality. As the input data sources are of different scales, the scale of the database data sets also vary. Despite the above mentioned uncertainties, we consider this database to be of great importance as it currently is the only existing GIS database covering the full extent of the transboundary Daugava and Nemunas River Basin Districts.

3.1.3.6 C3.6 Database description: sources and layers

The GIS database contains eleven layers, arranged in seven thematic groups: Hydrology – Basic, Hydrology – Analytic, Administration, Population, Landcover and Pedology & Topography. Below follows a description of each data layer, including the attribute data, and what steps have been taken to harmonise the submitted national data. The description shows which submitted data sets have been used, which operations have been performed and which attribute fields have been added to the different layers.

Theme: Hydrology – Basic

Layer: Daugava River Basin District and Nemunas River Basin District

These GIS data sets provide a representation of the Daugava and Nemunas River Basin Districts, in the approximate scales of 1:25,000 (Lithuanian data set source), 1:100,000 (Latvian data set source) and 1:200,000 (Russian data set source) represented as one polygon respectively.

Layer: Generic sub-catchments of Daugava RBD and Nemunas RBD

These GIS data sets provide a representation of sub-catchments of the Daugava and Nemunas RBD, in the approximate scales of 1:25,000 (Lithuanian data set source, the digital base map), 1:100,000 (Latvian data set source) and 1:200,000 (Russian data set source).

Layer: Rivers

These GIS data sets provide a representation of the Daugava and Nemunas river networks, in the approximate scales of 1:50 000 (Lithuanian data set source, digital base map prepared by Lithuanian National Land service), 1:50 000 (Latvian data set source) and 1:200 000 (Russian data set source). The features are defined as the river network of the Daugava RBD and the river network of the Nemunas RBD and represented as lines. Names, national identification codes, length, size (width), type of watercourse and information on if used for shipping are included as attribute information where provided by the project partners.

Layer: Lakes

These GIS data sets provide a representation of lakes in the Daugava and Nemunas RBD:s, in the approximate scales of 1:50,000 (Lithuanian data set source), 1:50,000 (Latvian data set

source) and 1:200,000 (Russian data set source). The features are represented as polygons. Names, national identification codes, area, type of waterbody and information on if used for shipping are included as attribute information where provided by the project partners.

Theme: Hydrology – Analytic

Layer: National hydrochemical measurement stations

These GIS data sets contain locations, as points, for 180 (in Daugava RBD) and 380 (in Nemunas RBD) hydrochemical measurement stations, currently in use or in use within the year 2007. Names, national identification codes, WFD types, monitored substances, and location type (e.g. river, lake, reservoir) are included as attribute information, as well as any additional information, where provided by the project partners.

Layer: National water discharge stations

These GIS data sets contain locations, as points, for 52 (in Daugava RBD) and 29 (in Nemunas RBD) national water discharge, currently in use or in use within the year 2007. Names, national identification codes, monitored substances, and location type (e.g. river, lake, reservoir) are included as attribute information, as well as any additional information, where provided by the project partners.

Theme: Administrative layers

Layer: Marine Coastline

This GIS data set provide a representation of the coastline of the DatabasiN project partner countries as well as of neighbouring countries, in the approximate scales of 1:200,000 (Lithuanian data set source), 1:1,000,000 (Russian data set source). The scale of the Latvian data set source is unknown. The layer is defined as the Marine coastline and represented as a line. Official names of the countries are included as attribute information.

Layer: International boundaries

This GIS data set provide a representation of the international boundaries of the DatabasiN project partner countries as well as of neighbouring countries, in the approximate scales of 1:200 000 (Lithuanian data set source), 1:500 000 (Belarusian data set source), 1:1,000,000 (Russian data set source) and Latvian data of unknown scale. The layer is defined as the international borders and represented as seven polygons. Official names of the countries are included as attribute information.

Layer: Sub-national boundaries level 1

These GIS data sets provide a representation of administration units of the 1st level within the Daugava and Nemunas river basin districts, in the approximate scales of 1:200,000 (Lithuanian data set source), 1:500,000 (Belarusian data set source), 1:1,000,000 (Russian data set source). The scale of the Latvian data set source is unknown. The layer is defined as administration units of the first level and represented as 27 (Daugava) and 15 (Nemunas) polygons respectively. Names, unique identification codes and areas of the administration units are included as attribute information.

Layer: Sub-national boundaries level 2

These GIS data sets provide a representation of administration units of the 2nd level within the Daugava and Nemunas river basin districts, in the approximate scales of 1:200,000 (Lithuanian data set source), 1:500,000 (Belarusian data set source), 1:1,000,000 (Russian data set source) and Latvian data of unknown scale The scale of the Russian data set source is unknown. The layer is defined as administration units of the second level and represented as 326 (Daugava) and 94 (Nemunas) polygons respectively. Names, unique national identification codes and areas of the administration units are included as attribute information, as well as identification codes and names of administration units of the 1st level.

Layer: Settlements

These GIS data sets contain locations, as points, for 355 (in Daugava RBD) and 272 (in Nemunas RBD) settlements. Names, identification codes, population and size classification (very small, small, medium, and large) are included as attribute information.

Theme: Population

Layer: Population

The GIS data set contains population density information for the DatabasiN project area. The data set is in ESRI Grid format. Data was obtained from Socioeconomic data and applications center, CIESIN's Global Rural-Urban Mapping Project (GRUMP).

Theme: Land Cover
Layer: Land Cover
The data set contains land cover classification for the region covered by the transboundary Daugava/Nemunas GIS database. The nine classes are: Artificial surfaces, Open land, Wetlands, Water bodies, Agricultural land, Seminatural land, Coniferous forest, Deciduous forest and Clouds. "Clouds" is not actually a land cover class but it was assigned to areas where the actual land cover could not be determined due to cloud cover in the satellite imagery

Theme: Pedology & Topography
Layer: Soil Types and Proportions
This data layer contains harmonised soil profile data in 1:2.5 million scale, compiled following the SOTER principles, for the region covered by the transboundary Daugava/Nemunas database. Attributes contain information about soil fractions classified using the FAO soil classification system.
Layer: Digital Elevation Data
This data layer contains elevation information for the region covered by the transboundary Daugava/Nemunas GIS database. The primary purpose for preparing the data set was to provide elevation data for visualization and for use in obtaining derived products such as slope.

All layers are made available as ESRI shapefiles and ESRI Grids. Data description below is a brief summary of the comprehensive metadata attached to the data itself.
Full description of the database structure, sources and layers is presented in the detailed report (see *Attachment 9*) , available on CD-ROM and the Internet as well as the final database, downloadable from the project web-site.

3.4 Activity D. Development of Internet resource

3.4.1 Activity D1. Technical working group meeting to discuss and propose how the Internet system should be managed (host, data flows etc.), and to develop a specification for the system.

The Techncal working group meeting II has been organized on May 4, 2007 in the form of the web conference. Among issues discussed were:
the status review on the progress and specifics of the data aggregation and harmonisation. The status report was circulated before the meeting, progress on the pressure layers and the hydro chemical monitoring data, the final activities for the project, final meeting, outreach and reporting. The minutes (*Attachment 10*) were posted on Technical group wiki site. The discussion of the Internet system management was combined with the Steering committee meeting II.

3.4.2 Activity D2. Steering committee meeting II (combined with activities C and D1).

The steering committee meeting was held back-to-back with Technical group meeting II.
In particular, the Internet presentation of the data was discussed. The project web-site contents were determined to include:

- General project information
- The database
- Interactive maps
- Downloadable maps
- Guide on public participation

- Project documentation and reports
- Links to complementary information sources

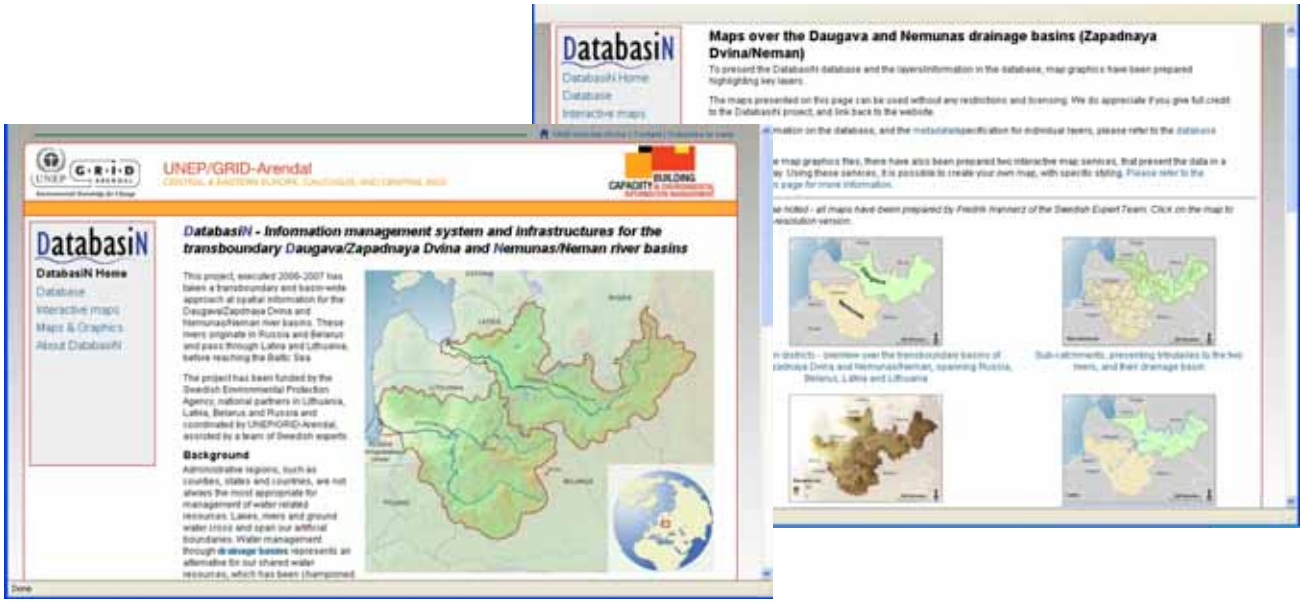
The internet resource was provided by implementing agency UNEP/GRID-Arendal on its server at the address: http://enrin.grida.no/databasin/index.cfm .The site construction was assigned to UNEP/GRID-Arendal specialists.

3.4.3 Activity D3. Training in the use of interactive GIS Internet systems (WebGIS) for information management and decision-making.

The training was provided in the starting and closing workshops (see relevant items)

3.4.4 Activity D4. Development of the Internet system.

The Internet system was developed on the web resource at http://enrin.grida.no/databasin/ in English and Russian.
The website presents the resulting spatial/GIS database (including data for download).



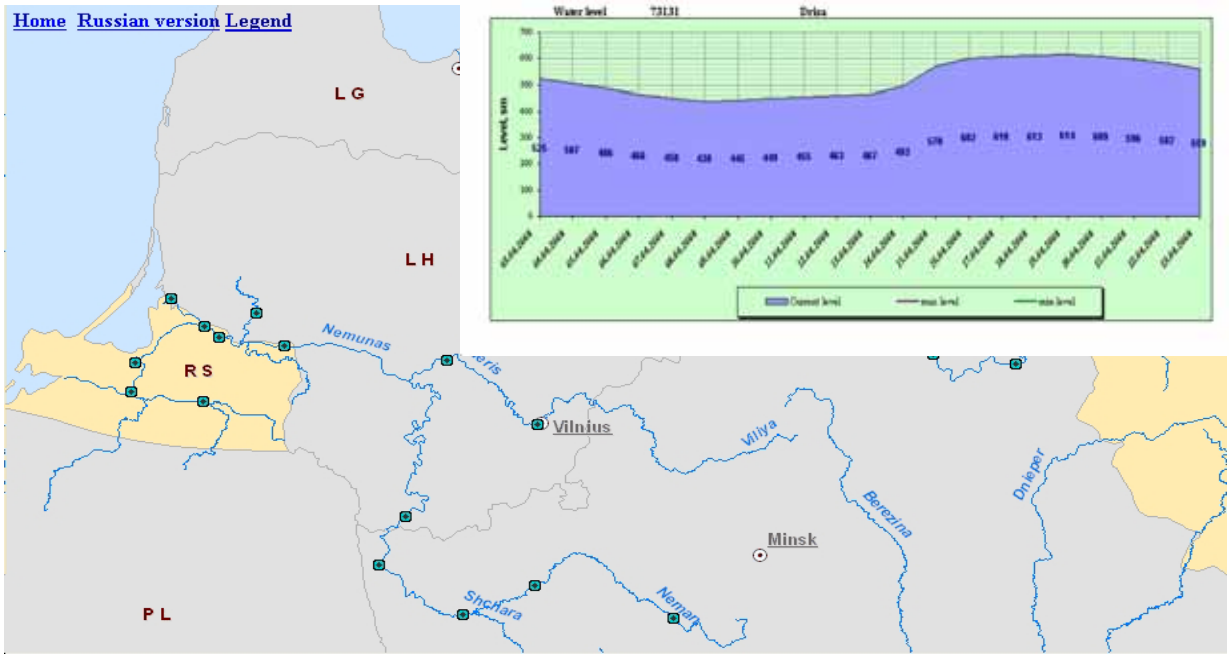
To present the DatabasiN database and the layers/information in the database, two interactive map services have been set up. The layers and the map view can be tailored to create custom maps, or explore and browse the Daugava/Zapadnaya Dvina and Nemunas/Neman databases.

Supplementary interactive web-resource in English and Russian has been developed by the Russian counterparts, presenting 24 water monitoring stations in both river basins and data on the water level in respective water bodies for the last 20 days.

In addition to the interactive maps, there have also been prepared the series of map images have been prepared from the assembled database in a form of a set of static map graphic files, for download, printing and inclusion in reports.

3.5 Activity E. Training workshop in information management systems, GIS and its potential for water resources management

Target group of the training was local and regional state administration personnel working with water management in the basins and is aimed at giving an overview of GIS principles as well as some examples of applications via Internet on basin level. Besides improved knowledge among water managers, the training facilitated information sharing and networking between the countries at local/regional level.



3.5.1 Activity E1. Identification of training needs and key persons to be trained, and preparation of the training workshop(s).

The training needs have been identified in the preparatory workshop and Steering committee meetings I and II. It was determined that neither Lithuania nor Latvia did not need any special training, since it was provided earlier in the course of preparation of the relevant water authorities for adaptation of the FWD, so for the two Baltic countries the activity was limited to the training provided by the SET to participants of the closing seminar. Russia and Belarus identified needs for training the staff of water agencies and MNR.

3.5.2 Activities E2 and E3. Training workshop for Nemunas/Neman and Daugava/Zapadnaya Dvina river basins administrative personnel

2 workshops were carried for the designated personnel in St. Petersburg and Minsk. (See the list of participants of the workshops in the *Attachment 11*).
The seminars were targeted at the leading professionals working with the water resources at the local level. Their objectives primarily concerned the mapping of their data on water protection zones and the coastal areas, potentially dangerous sources of pollution of surface and groundwater, management of water users. Training focused on the use of GIS in presentation and management of environmental issues and in particular in integrated water resource management.
The participants were given definitions of GIS features and capabilities and the possibilities of Internet-based GIS were demonstrated. The case studies involved the creation of an information system for Specially Protected Areas in the Republic of Belarus and have been used to demonstrate the specific features of work with tabulated and attributed information on the different objects (reserves, national parks, natural objects), development of the local information system environment as the city of Pskov, using GIS technologies, modeling of spill flooding, the spread of a possible accidental pollutants in the flood zone, the development and use of transboundary GIS for lake Peipsi.
The workshop on the use of GIS-technologies "Use of GIS Technologies for the State Administration of the Objects of Natural Protection " (*Attachment 12*) in St. Petersburg on April 25, 2007. 22 representatives (See the List of participants, *Attachment 13*) of Rosprirodnadzor, department of water resources, and NGOs participated in the seminar.

3.6 Activity F. Final workshop to present and discuss project outcome and conclusions

The outcome of the project was presented at a final workshop. Based on the workshop discussions and conclusions from the steering committee a final project report was prepared.

3.6.1 Activity F1. Stakeholder workshop to discuss the outcome of the project and future recommendations for the information management system



The closing seminar on DatabasiN project was held on December 6, 2007 in Minsk, (Republic of Belarus). It gathered 17 participants from Belarus, Latvia, Lithuania, Russia and Sweden, representing Ministries: of Environment and Natural Resources, Environmental Protection and Federal Water Agencies, river basin authorities, the Swedish expert group and Belarus NGO. See the List of participants (*Attachment 14*), seminar agenda (*Attachment 15*) and proceedings on the web.

The seminar was opened by *Mr. Alexander Rachevskiy*, the head of the department of International projects of the Ministry of Natural resources and environmental protection of the Republic of Belarus. He gave a very positive valuation of the project results and level of cooperation attained in the course of its implementation. The hosting institution Central Research Institute of cumulative use of water resources (*CRICUWR), represented by its director, Mr. Mikhail Kalinin* gave a key note address, followed by presentation of project current state overview by project manager *Mr. Valentin Yemelin.*

Two products: the interactive database and project web-site were launched.

Ms. Natalia Ryabova of Ecological Educational Centre "Ecohome" presented the manual on Public participation, which was developed in the framework of the MATRA project and as it was agreed in the starting seminar to be displayed on the project web-site.

After the presentations participants assessed the implementation of the project, its objectives vs results, discussed lessons learned, identified data and knowledge gaps, made recommendation for future activities. These materials are presented in sections below.

3.6.2 Activity F2. Steering committee meeting III.

The Steering Committee III approved the launched products and regarded the project results as highly successful. It stressed that for the first time four transboundary countries, sharing two water basins, received the integrated tool for water resources management. Throughout the implementation partners from all countries showed commitment and dedication, which give hope for successful completion of the process of preparation of multilateral agreements on the basins of Daugava/Zapadnaya Dvina and Nemunas/Neman. It also recommended to start the process of the project results evaluation by national beneficiaries and reflect the countries' assessment of the project results in closing letters to be addressed to the donor and the implementation agency.

3.6.3 Activity F3. Preparation of final report

The evaluation process with the national beneficiaries has been organized. All 4 countries received the CDs with the database and designated national experts have reviewed its contents. As recommended by Steering committee closing letters were received (see *Attachment 16*, *Attachment 17*, *Attachment 18*, *Attachment 19*). Based on the findings of the closing seminar the final report has been prepared by the implementing agency.

3.7 Activity G. Marketing

Marketing of the project results have been done through channels available to partners. The starting marketing point was the Internet resource launch event at the closing seminar. A marketing plan, based on the assessment of the information channels, available to partners was prepared in the course of the last phase of the project and used for the distribution of the project results to target audiences. Appropriate national and international fora, suitable for dissemination of project result, have been determined and approached. Technical, institutional and financial issues outlined in the section 7 of the final report were developed into a draft project fiche. A preliminary assessment of current donor options was made.

3.7.1 Activity G1. Marketing of the project results

The project results were presented on the Internet, 2 CD-ROMs, and a poster.

They were marketed at the following events:

- International seminar on transboundary water basin management, 26-27 June, 2006, Minsk, Belarus,
- World Water Week, 12-18 August, 2007, Stockholm, Sweden; poster presentation in Workshop 9: Making Governance Systems Effective
- "Building bridges to the future" Environment for Europe Ministerial conference, 10-12 October, 2007, Belgrade, Serbia
- Baltic Environment Forum, 12-13 March, 2008, St. Petersburg, Russia.

3.7.2 Activity G2. Preparation of a draft project proposal for funding

1. Based on the experience gained in the course of the project implementation a detailed proposal for the information management of the transboundary basin of river Dniester has been developed and funded.

2. The future project development is planned in the framework of the UNEP GEF. The proposed medium-size project focuses on the development of a partnership among organisations, the methodology for assessment/results tracking transboundary river basin systems among the five categories of transboundary water systems under the Transboundary Waters Assessment Programme (TWAP). The periodic assessment would then be sustained in the future through the partnership of agencies and organizations of which GA has become a partner and would include data series collected by GEF IW projects that would be useful to those agencies and to the GEO process of UNEP. GA has joined the consortium and will be participating it the project working group.

4. Information gaps

Type of information	Bel	Lat	Lit	Rus
Open information				
List of monitoring points/sites (hydro-chemical and hydrological control)				
List of organizations of analytical analysis which make water sampling				
Annual average concentrations of the priority components at the selected monitoring points.				
Annual and monthly water consumption at the selected points of the stationary monitoring network				
Specific water consumption at oblast level and in the big cities located in the river basins				
Data from water treatment plants of the big cities located at the river basins (purified, discharged, % total capacity)				
Number of rural and urban population in districts, water and tributary basins				
International borders and administrative units				
Hydrological information				
Geological information - geological layers, ground waters, etc. - hydrological and geological maps, levels of pollution of ground waters				
Land use				
Topographical maps (surface – horizontal)				
Protected areas				
Hydrographical network				
Stationary sources of water pollution				
Discharge of pollutants downstream from human settlements (concentrations and volumes)				
Hydropower stations				
Information for experts (only for internal use)				
Average annual (quarterly) concentration of a large range of priority components at the selected monitoring points				
Primary data – concentrations of a large range of priority components at the transboundary monitoring points				
Data on water drainage in water-resources region and amount of pollutants according to the approved list, etc.				

Data in the database Restricted data Available, not in database Processing

The table demonstrates the existing information gaps as compared to initial planning matrix. Some data is not available for sharing (Russia, Belarus) due to information protection reasons. Some data exists, but proved to be hard to get, particularly it concerns Hydromet, which provides data on paid request basis thus making regular update non-sustainable. Some data is in processing and will be added to the DB in 2008.

5. Financial report

The project has been executed within the given budget. Deviations were made in sections Reimbursables (underspending, saving on travel) and Fees (overspending due to increased hourly rates and more labor consuming work).
The aggregated version of the financial report is presented in the table 5.1.
Detailed budget can be seen in the table 5.2

Table 5.1 Aggregated financial report

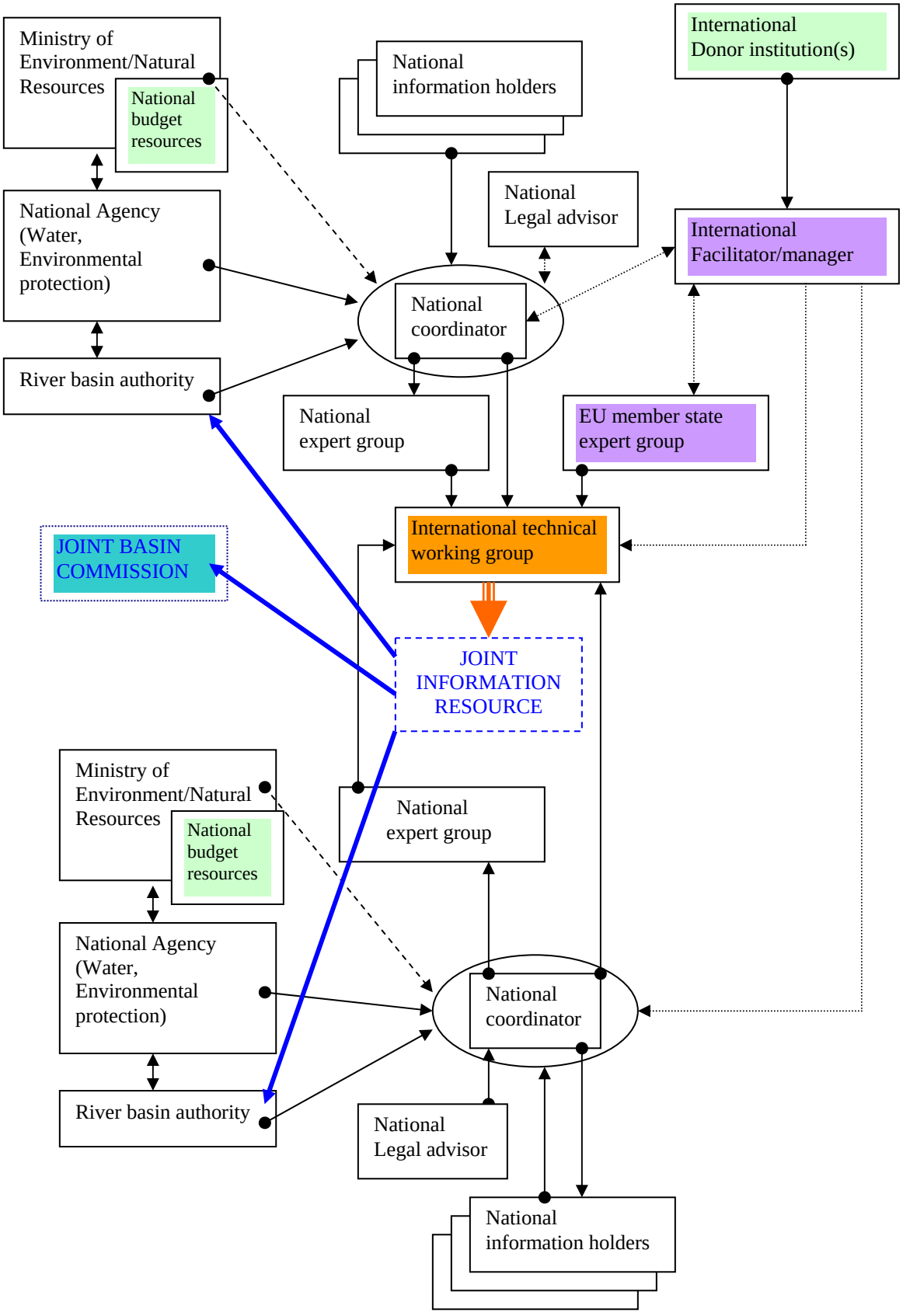
	Budget, SEK	Actual spending, SEK	Difference	Deviation %
Fees (Swedish experts)	326 400	340920	-14 520	-4
Fees (foreign experts)	884 600	1161745	-152 145	-17
Reimbursables	590 400	429023	161 377	27
Reimbursables (Swedish experts)	83 600	73911	9 689	12
Equipment/other costs	200000	202200	-2 200	-1
Sub-contracts/local experts	200000	202200	-2 200	-1
Contingency reserve	125000			
TOTAL	**2 410 000**	2409999	1	0

Table 5.2 Detailed financial report

Activity	Fees (GRID-Arendal)		Fees (swedish experts)		Reimbursables		Reserve	Sub-contracts		Equipment/other costs		Total, Activities	
	Budget	**Fact**	**Budget**	**Fact**	**Budget**	**Fact**		**Budget**	**Fact**	**Budget**	**Fact**	**Budget**	**Fact**
A1. Project mobilisation and workshop preparations	60 000	129074	0		0	0							
A2. Workshop	36 000	62469		24 800	115 000	79849							
A3. Steering committee meeting I	12 000	18676			30 000	14120							
A4. Preparation of an inception report	24 000	34278	0		0	0							
Subtotal A	**132 000**	**244497**	**0**	**24 800**	**145 000**	**93969**		**0**		**0**		**277 000**	**363266**
B. Preparation of GIS datasets													
B1. Technical working group meeting	24 000	35 040	24 000	24 520	12 000	14 312							
B2. Preparation GIS data sets.	30 000	35 040	30 000	62 800	0			50 000	50 550	25 000	25 275		
B3. Preparation of data report and CD	12 000	17 520	0	12 600	10000								
Subtotal B	**66 000**	**87 600**	**54 000**	**99 920**	**22 000**	**14 312**		**50 000**	**50 550**	**25 000**	**25 275**	**217 000**	**277657**
C. Preparation of information for the public													
C1. Technical working group meeting	12 000	28 368	10 000	12 400	6 000	0							
C2. Steering committee meeting II (combined with D2)	12 000	17 520	11 000	12 400	30 000	14 312							
C3. Preparation of GIS datasets, statistics, cartographics	30 000	35 040	30 000	32 000	0			50 000	50 550	25 000	25 275		
Subtotal C	**54 000**	**80 928**	**51 000**	**56 800**	**36 000**	**14 312**		**50 000**	**50 550**	**25 000**	**25 275**	**216 000**	**227865**
D. Development of an Internet web-site													
D1. Technical working group meeting	10 000	8 760	10 000	8 800	6 000	0							
D2. Steering committee meeting II	0		0		0	0							
D3. Training interactive GIS Internet systems (WebGIS).	30 000	43 800	30 000	32 000	32 000	13 670							
D4. Development of the Internet system	30 000	43 800	50 000	48 600	44 000	50 807		100 000	101 100	150 000	151 650		
Total D	**70 000**	**87 600**	**90 000**	**89 400**	**82 000**	**64 477**		**100 000**	**101 100**	**150 000**	**151 650**	**492 000**	**494227**

E. Training course													
E1. Preparation of the training course	30 000	35 040	30 000	15 400									
E2. Training course for Nemunas river basin	24 000	26 280	24 000	0	50 000	52 652							
E3. Training course for Daugava river basin	24 000	26 280	24 000	0	50 000	52 652							
Total E	**78 000**	**87 600**	**78 000**	**15 400**	**100 000**	**105 304**		**0**		**0**		**256 000**	**208304**
F. Final workshop and conclusions													
F1. Stakeholder workshop.	84 000	91 000	40 400	42 600	225 000	141910							
F2. Steering committee meeting III.	12 000	17 520	11 000	12 000	30 000	45 120							
F3. Preparation of final report.	60 000	70 800	0		0								
Total F	**156 000**	**179 320**	**51 400**	**54 600**	**255 000**	**187 030**		**0**		**0**		**462 400**	**420950**
G. Marketing and preparation of a draft project proposal													
G1. Marketing project results	24000	35040	0	0	12000	9990							
G2. Preparation of a draft project proposal for funding	46600	43800	0	0	0	0							
Total G	**70600**	**78840**	**0**	**0**	**12000**	**9990**		**0**		**0**		**82 600**	**88830**
H. Project management and communication													
H1. Project management	240 000	289 080	0	0	24 000	13 540							
H2. Progress reports	18 000	26 280	0	0									
Total H	**258 000**	**315 360**	**0**	**0**	**24 000**	**13 540**		**0**		**0**		**282 000**	**328900**
Contingency							**125 000**	**0**		**0**		**125 000**	
TOTAL	**884 600**	**1 161 745**	**324 400**	**340 920**	**676 000**	**502 934**	**125 000**	**200 000**	**202 200**	**200 000**	**202 200**	**2 410 000**	**2409999**

6. Infrastructure and organisation for information management and data sharing, including technical, institutional and financial issues



Commentary to the scheme:

The collection of data on transboundary water objects is organized through national ministries of environment/natural resources/ and relevant national institutions responsible for water management, (either incorporated in the structure of Ministries of environment or functioning independently on national level). Data is provided from the national network of monitoring and analytical stations, analytical centers and other relevant structures. The cooperation of all national information holders is vitally important. They may include hydrometeorological centers, research centers, analytical laboratories, sanitary-epidemiological control bodies etc.

Data collection is organized by national coordinating bodies – organizations or working groups nominated by national beneficiaries (usually Ministries of environment or federal water agencies). This work can be fully or partially funded through national budgets allocated for beneficiary institutions. Involvement of a national legal advisor is useful, because very often legal mechanisms which provide users with access to information are rather obscure and it is important to supply information seekers with legal tools for obtaining the necessary data. National coordinator works with national expert group on which determines relevance, quality and format of information. The main role of a national coordinator is to facilitate the information flow between stakeholders, in particular providing technical working group with information from stakeholders for processing.

In most cases it is beneficial to have an external international coordinator. Usually transboundary water issues are an object of controversy and sometimes conflict over upstream pollution and water extraction, so the presence of an international impartial observer/facilitator/manager helps to coordinate and mediate issues between national players. In the case of European EU-nonEU transboundary water bodies it is also useful to have an expert group from an EU member-state, which will help to harmonize the data with the FWD. In other regions it may be an intergovernmental body expert group.

Finally the data is received by an international technical working group, comprised of GIS specialists from national water agencies/expert institutions. Their role is to process and harmonize data for joint information resource and present it in a convenient format, for the use of experts, water authorities of different levels as well as making it accessible to general public. At this stage it is recommended to include specialist(s) on PR and data presentation.

7. Lessons learned

1. It is crucial to involve major stakeholders as early as possible. Ministries of Environment and in particular state agencies responsible for the management of water resources are key players. They play a major role in the data collection process, ensuring the transfer of information from different information owners to the technical working group. It is particularly relevant to non-EU countries (Russia, Belarus). Their management structure is cumbersome. The commitment of partners on the stage of application-writing appeared to be absolutely essential. The feasibility study seminar organized for this purpose in the pre-start phase played an important role.
2. An assessment of needs for a transboundary region has to be made prior to the start of the project. The form of a questionnaire proved to be optimal. Stakeholders should be consulted on the issue and a joint prioritization exercise has to be conducted, determining issues which need to receive most attention. For ensuring the ownership of products by partners it is crucial that they are involved in proposal writing.
3. The commitment to the implementation of the project has to be documented in a form of official letters from state bodies responsible for national water management. An agreement on participation signed by information owners is helpful.
4. It is important to determine areas of consensus and disagreement between national partners on the early stage of the project, highlighting the first and carefully work on the latter in the course of implementation.
5. Security issues have to be handled with care, partners can not be pressed for extracting sensitive information. There are cases when information is available in agencies subcontracted to do the data processing work, however they may be put in jeopardy if they provide with classified information. It is

always necessary to check with their supervisors. For example information on industrial pollution and hazardous sources could not be obtained from Belarus and Russia.

6. Involvement of technical experts from an EU country, who have access to EU databases proved to be very useful. Evaluation of open sources on global/EU scale helped to determine components of the database which could be used as foundation blocks, saving time and resources for countries to produce harmonized and EU-standartized data.
7. Joint work with the Swedish expert team and experts from GA helped to build capacities of national experts. It is important to put efforts into team-building on an early stage. The language issue has to be addressed. English was the working language, but it presented certain problems in communication and required involvement of GA managers also in facilitating communication.
8. Establishing a good working communication on an early stage is vital. It is advisable to set up a working area on the Internt (wiki), provide with working instructions and keep it updated.
9. Phone and videoconferencing help to reduce costs and should be generally recommended, but they had certain inconveniences, in particular with the quality of connection, maximal number of communicators etc.
10. It is necessary to give a trial period for partners to test the product. Their feedback is crucial for improvements.
11. In time planning (for data collection in particular) a project manager ought to be realistic and double the planned time to cover inevitable delays. The more project partners – the more delays occur and the time is needed. Time resources should also be allocated for red-tape, in particular in countries with cumbersome hierarchic structure of management (Russia).
12. EU partners also require financial resources for implementation, in particular new member states. They usually experience problems of understaffed and have to hire private consultants to do the job.
13. It is important to remember that in-kind project activities have to be budgeted in the appropriate budgeting periods. If a project starts after the approval of budgets of partner institutions, it is extremely difficult to squeeze in non-planned activities. See item 1.
14. Harmonization of data is of high importance. It has to be done by a specialist who is familiar with EU standards.
15. Some data, even if stated as available by partners, is hard to obtain. It particularly concerns Belarus and Russia, where restrictions on sharing information exist. It relates primarily to data on concentration of pollutants, coordinates of the sources of pollution etc. The data can be obtained through legal mechanisms of multi-lateral or bilateral agreements on information sharing or through the general agreement on management of a transboundary river basin.
16. Coordination with other donors is useful, it helps to find synergies extending the scope of the project and covering other areas.

7. Conclusion

The project has been successfully implemented and delivered on its planned outputs. At its present stage the project confirms many of the known difficulties in developing joint GIS databases for transboundary river basins as noted elsewhere, but also demonstrates that if a pragmatic approach is being taken important steps towards the aim of the project can be taken. The deliverables included:

- List of identified prioritised transboundary water issues and end-users needs,
- Summary of existing data with attribution to information-holders.
- Accessible information for national water management authorities and general public in the form of maps, graphics and GIS database.
- An Internet based user-friendly interactive system that supports the exchange of data between the countries, public access to information and interaction with stakeholders.

- 3 training workshops on the use GIS databases for decision making for the Government administration officials in Belarus and Russia.
- 2 international seminars
- A summary of the experience gained, identification of data and knowledge gaps, recommendation for future activities and a proposal for infrastructure and organisation for information management and data sharing, including technical, institutional and financial issues.

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UNEP/GRID-Arendal,

April, 2008