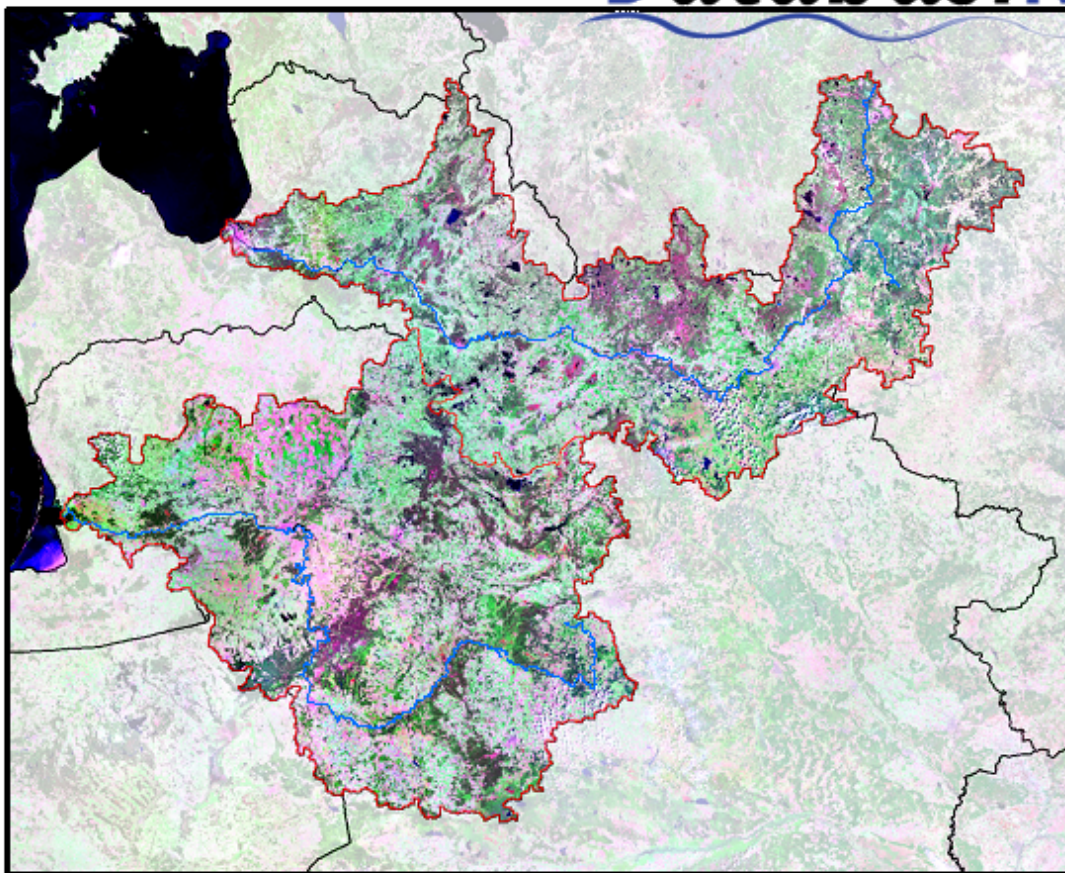


**Preparation of a Pilot Multi-thematic GIS Database  
covering the Transboundary Daugava/Zapadnaya Dvina  
and Nemunas/Neman River Basin Districts in the  
Framework of the DatabasiN Project**

**DatabasiN**



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*ABSTRACT:*

This report documents 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. The overall purpose of the pilot GIS database is to serve as a basis for building up a complete GIS database (including “bottom-up” layers), which in turn is intended to support strategic water quality and transboundary river basin assessment, reporting and decision-making. Intended users are project partners, existing and planned river basin management structures and the environmental agencies of the countries that share the river basin districts. 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.

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# 1. INTRODUCTION

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This report documents the development of a pilot Geographic Information Systems (GIS) database within the DatabasiN Project. The overall objective of the project is to develop a sustainable transboundary information management system and infrastructure for the Daugava/Zapadnaya Dvina and Nemunas/Neman river basins with the purpose of supporting joint assessment and management of water resources.

The objective of the development of the pilot GIS database is to create a multi-thematic (socio-economic and environmental) GIS database composed of 26 thematic layers covering the transboundary Daugava/Zapadnaya Dvina and Nemunas/Neman river basin districts. It is intended that the final GIS database will be relevant for assessment and strategic decision-making by partners in the DatabasiN project, existing management structures within the riparian countries and, to a certain extent, the general public.

This report describes the development of and documents the pilot GIS database. The database is intended to serve as the initial GIS data input for the Daugava/Zapadnaya Dvina and Nemunas/Neman river basin district GIS applications to be developed within the DatabasiN project. The pilot GIS database described here is essentially comprised of the “top-down” ready GIS data layers that were available from various sources and/or in the public domain and chosen on the basis of information prioritized by the project partners. “Bottom-up” layers, which may be more detailed or constructed by the country partners themselves, will be provided by the project partners and added to the database in the future.

More specifically, the pilot GIS database is intended to aid with (Langaas, 2006):

- Meeting many of the information needs of the project partners, especially in regard to technical Water Framework Directive (WFD) reporting;
- Facilitating policy-making in international water resources management in the concerned region;
- Characterization of the river basins to support the River Basin Management Plan according to the WFD;
- Water quality issues: surface water quality monitoring data (point and non-point sources of pollution) and pollutants from industries, agriculture and urban waste water treatment plants;
- Cooperation on transboundary protected areas;
- Hydromorphological alterations: dams, hydropower plants, etc.

In essence, the content and qualities of this multi-thematic GIS database are oriented towards strategic-level, transboundary assessment, decision-making and awareness raising applications by those concerned with water quality, use and related environmental problems in the region of the Daugava and Nemunas river basins. The database contains a total of 26 layers organized in six thematic groups: Administration (7 layers); Hydrology (13 layers); Land cover (1 layer); Pedology and Topography (2 layers); Population (2 layers); and Satellite Imagery (1 layer).

This report starts with a brief description of the methodology used in the development of the GIS database and then moves into discussion and information about the content of the GIS database, in terms of overall characteristics, data sources, themes and layers.

## 2. METHODOLOGY

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### 2.1. Introduction

The development of the pilot GIS database followed in principle the steps outlined below. The process was in reality perhaps not quite as direct as the section headings would suggest. This was partly the result of periodic discussions with and input from different parties involved in the project and to allow periods of time for consideration/selection of database options. The extent of work also reflects the fact that set up of the pilot database was conducted within the scope of a short-term contract (two months) with little possibility to develop the database extensively.

### 2.2. Main Steps

#### 2.2.1. User needs and requirements

Ultimately, the DatabasiN GIS database is intended to serve several purposes for several different target groups, such as national governmental agencies responsible for water resources management, local/regional state administrations dealing with water issues, future river basin commissions and other stakeholders, such as other national and local institutions, the international community, researchers and the public (Naturvårdsverket, 2006). Choices for content of the pilot database were, however, based almost solely on project partner data priorities, which were principally communicated at the kick-off meeting of the DatabasiN project in St. Petersburg in June 2006. User needs beyond those of partners (and the draft GIS layer specification for the WFD) could not easily be identified at this stage, but will most likely be taken up in the future, as the database is expanded.

Based on the needs of the project partners, the following top-down spatial data layers were prioritized for the pilot database:

- International borders and administrative units;
- Hydrological information;
- Geological/soil information;
- Land use/land cover;
- Population distribution;
- Elevation model.

Bottom-up layers that are also prioritized and will likely be added to the database in the future include:

- Protected areas;
- Hydrographical network;
- Water monitoring network;
- Water quality monitoring data;
- Pollution points.

In addition, some basic spatial infrastructure information, such as major roads and cities, as well as satellite imagery, was recognized as useful for potential users of the GIS database.

#### 2.2.2. Inventory of data sources and acquisition of data sets

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.

In short, 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

### 2.2.3. Interlayer geodetic harmonization

Data harmonization can take on several different forms (see Table 1), and is essentially the process by which data with different characteristics (thematic, geodetic or temporal) are modified in order to contain the same or at least comparable variables. To harmonize data that is not harmonized is by definition rather difficult, but depends on the type of harmonization in question. Concerning the geodetic reference system for this GIS database, all geodetic harmonisation procedures were carried out using ArcGIS 9 (ArcMap/ArcCatalog) software. First, data were projected into the database projection system. Secondly, if specific data source covered a larger area than the database area, it was clipped according to the defined database boundaries. Raster files were resampled 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.

Table 1. Different types of data harmonization

Type of Harmonisation	Description
Intralayer harmonisation	Harmonisation of data within a single data layer.
Interlayer harmonisation	Harmonisation of data between data layers
Thematic harmonisation	Intra- and interlayer harmonisation with respect to thematic content. Optimally all data in a layer should have the same attributes, be measured in the same way with the same measurement interval and with the same uncertainties etc.
Geodetic harmonisation	Intra- and interlayer harmonisation with respect to the geodetic reference. A common reference system and projection should be applied to the data.
Temporal harmonisation	Intra- and interlayer harmonisation with respect to the temporal dimension of the data. Optimally, to be fully comparable, all data should originate from the same point in time.

Source: Hannerz et al., 2002, A multi-thematic GIS database of the transboundary Narva River / Lake Peipsi catchment in support of strategic science and management applications, p. 13.

In the case of transboundary GIS databases, data originating from different countries most often has varying thematic and temporal content, as well as geodetic reference systems. The more difficult task of thematically harmonizing the layers was not undertaken here, but could be taken up at a later date, especially when “bottom-up” data layers from project partners are added to the database. This could involve harmonizing the several different national and international coding systems and definitions found in the acquired data, reflecting varying approaches and instruments used in their preparation. Interlayer harmonisation as it applies to geographic objects common to several layers, such as coastlines, lakes and international boundaries, was not conducted in this initial set-up of the database. It will likely be necessary in future, however, especially when layers originating from national sources are added. Temporal harmonisation could also be undertaken at a later stage. For set-up of this pilot database, publicly available source options were limited and the most recent available information for the various layers was selected, usually centering around the year 2000.

#### **2.2.4. Database structure**

The priorities of the project partners are reflected to a high degree in the structure of the pilot database. Yet the structure is also modelled on the GIS database created for the transboundary Narva River / Lake Peipsi catchment, which in turn aimed at following the structure given in the draft GIS specification for the WFD. (Hannerz et al., 2002)

#### **2.2.5. Documenting the database**

The preparation of easily accessible metadata is an important task of any GIS database development work aimed towards establishing transboundary river basin GIS databases, since metadata is very useful if not crucial to the further use of the data for various application areas.

As the pilot GIS database data sets were being prepared, metadata for each layer was researched and formatted using the ArcCatalog metadata tool. The metadata description created by this tool follows the US Federal Geographic Data Committee standard.

### 3. DATABASE DESCRIPTION: COMMON ASPECTS

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#### 3.1. Overall Characteristics

The multi-thematic GIS database covering the transboundary Daugava/Zapadnaya Dvina and Nemunas/Neman river basins is essentially a collection of geodetically harmonized, recycled GIS data acquired from a wide variety of primary sources. This is therefore a database with variable interlayer characteristics and qualities. As described earlier, it has been developed to suit principal user (project partner) priorities.

#### 3.2. Map coordinate system, projection and geodetic information

The database is in World Geodetic System 1984 (WGS 1984) geographic coordinate system (GCS). The GCS parameters and geodetic model are the following:

##### **GEOGRAPHIC COORDINATE SYSTEM**

Geographic Coordinate System Name: GCS\_WGS\_1984

Latitude Resolution: 0.000000

Longitude Resolution: 0.000000

Geographic Coordinate Units: Decimal degrees

##### **GEODETTIC MODEL**

Horizontal Datum Name: D\_WGS\_1984

Ellipsoid Name: WGS\_1984

Semi-major Axis: 6378137.000000

Denominator of Flattening Ratio: 298.257224

No map projection system is used in this database. However, some display maps using data sets from the various themes were created and saved as JPEG files in the database. These are in Lambert Azimuthal Equal Area (LAEA) projection. Information for the LAEA projection is as follows:

Map Projection Name: Lambert Azimuthal Equal Area

Longitude of Projection Center: 9.000000

Latitude of Projection Center: 48.000000

False Easting: 0.000000

False Northing: 0.000000

##### **GEODETTIC MODEL**

Horizontal Datum Name: D\_WGS\_1984

Ellipsoid Name: WGS\_1984

Semi-major Axis: 6378137.000000

Denominator of Flattening Ratio: 298.257224

### 3.3. Geographic Coverage

The bounding coordinates (in decimal degrees) for the Databasin pilot GIS database are the following:

West Bounding Coordinate: 20.50  
East Bounding Coordinate: 34.50  
North Bounding Coordinate: 58.50  
South Bounding Coordinate: 52.00

This region covers the whole of Latvia and Lithuania, the Pskov and Leningrad oblast in Russia, significant parts of Belarus, Estonia, Poland and Russia and a small part of Ukraine. Some GIS data layers, such as elevation data and mixed soils cover the whole region. Others, such as the land cover data, cover most of, but not this entire region. This map view extent is referred to as the “overview” (ov) extent in the database, since it provides an overview of both the Daugava/Zapadnaya Dvina and Nemunas/Neman river basin districts.

Likewise, the Daugava (dg) map view extent covers the Daugava/Zapadnaya Dvina river basin district region. The bounding coordinates for this extent (in decimal degrees) are as follows:

West Bounding Coordinate: 23.60  
East Bounding Coordinate: 34.10  
North Bounding Coordinate: 58.00  
South Bounding Coordinate: 54.00

And in turn the Nemunas (nem) map view extent covers the Nemunas/Neman river basin district region. The bounding coordinates for this extent (in decimal degrees) are:

West Bounding Coordinate: 21.00  
East Bounding Coordinate: 28.20  
North Bounding Coordinate: 56.30  
South Bounding Coordinate: 52.40

### 3.4. Naming Convention

The naming convention used in the pilot database is as follows:

DatabaseName.ThematicGroup\_Theme\_Extent\_Source

An example of this convention in use is demonstrated below with the coastline layer:

sde\_databasin.hydro\_coastline\_daugava\_vmap0

This convention was chosen for its transparency and with the aim that the user would have a good idea of what the layer contains before opening it. Please note that the last part of the naming convention (“source”) is only used if clarification is necessary, i.e. if there is more than one source for a series of layers with the same thematic content. If a series of layers with the same theme only have one source, then their names end simply with the “extent”, for example, sde\_databasin.hydro\_rbds\_overview.

There is a name length restriction in the SDE database on UNEP/GRID-Arendal's server that houses the pilot database, thus certain abbreviations were used. These are listed below:

<b>Abbreviation</b>	<b>Full word</b>
admin	Administration
admareas	Administrative areas
barth	Bartholomew's
dg	Daugava
dem	Digital elevation model
dens	Density
hydro	Hydrology
lc	Land cover
lge	Large
med	Medium
mjr	Major
nem	Nemunas
ov	Overview
pedo	Pedology
pop	Population
RBD	River basin district
sat	Satellite imagery
sml	Small
topo	Topography

### 3.5. Data Quality Issues

It is difficult to be specific on the qualities of this pilot multi-thematic GIS database. The database is based upon a wide variety of primary data sources, most of which are well documented. The sources had to be freely available and fairly unrestricted in terms of possible uses. Given this constraint, the best quality data sources were chosen and used. But as might be expected, the data quality varies. This is exemplified by the variety of scales (resolutions) to be found within the database. As the data sets are based on a variety of data sources (which often have different resolutions), the resolutions of the data sets in the database also vary. For more specific considerations regarding the data quality of each data set, the reader is advised to consult the descriptions in section 4 or the metadata accompanying the layers.

## 4. DATABASE DESCRIPTION: SOURCES, THEMES AND LAYERS

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### 4.1. Introduction

This pilot GIS database contains 26 layers, arranged according to six thematic groups: Administration; Hydrology; Land Cover; Pedology and Topography; Population; and Satellite Imagery. The layers are all presented in section 4.2, which contains extracted information from the metadata. The metadata itself that accompanies each layer (and can also be found as a separate text file in the database) is more informative, especially concerning more technically related information. All data sets are in ESRI shape or raster format and can be accessed directly from the CD ROM or saved to a local directory.

A description of the data sources upon which the layers are based is presented immediately below. A description of the themes and layers in the database then follows starting in section 4.2.

### 4.2. Data Sources

#### 4.2.1. BALANS Land Cover Data, Version 3.0

Publisher: Metria Miljöanalys

Data generated: 2001

Data originates mainly from the 1999 growing season, with few exceptions.

Media: CD-ROM and internet download

Resolution: 150 meters

A thorough description of the data including classification procedure and some accuracy assessments can be found at <http://www.grida.no/baltic/htmls/related.htm>.

The BALANS project was planned to be a step towards the establishment of a sustainable land information system for those organisations. The data set was developed in co-operation between the project co-ordinator, Metria Miljöanalys, the Finnish Environment Institute, GRID-Arendal, GRID-Warsaw, Novosat Oy and the Swedish Meteorological and Hydrological Institute. It was developed by a large group of people and institutions with various interests and needs, but yet with environmental focus. Input satellite imagery primarily originated from IRS-1C/D WiFS data. Images were in first hand selected from the 1999-growing season and preferably from the time of the year when the broad-leaf forest had leaves. Where WiFS data were missing, primarily due to cloud cover, MODIS data with maximum resolution 250 m at nadir were used. The product is not simply the result from the classification of satellite data but also from the integration of different sources of reference data. The main reference datasets used were the Swedish Terrain Type classification, the Finnish National Land Use and Forest Classification and CORINE Land Cover. The first two datasets have a high resolution (25 m) and were assumed to have a high accuracy, while other datasets with lower resolution were given lower priority and were only used if other reference data were non-existent and WiFS data missing. The BALANS classification system was decided to be directly comparable to CORINE land cover level 1.

A more "rough" version of the database, covering the whole Baltic Sea drainage basin is freely available from <http://www.grida.no/baltic>, including the land cover classes: artificial surfaces, forest, water, wetlands, snow/ice and other open lands. The minimum mapping unit is 10 hectares for water and 25 hectares for the remaining classes. The original database has more detailed classes and a minimum mapping unit of 150x150 metres.

#### Use Constraints

UNEP/GRID-Arendal has full permission to use the data in all its projects. There is no right of redistribution however.

#### **4.2.2. CCM River and Catchment Database for Europe, Version 1.0**

Publisher: European Commission, Joint Research Centre (JRC) - Institute for Environment and Sustainability (IES) - Inland and Marine Waters unit (IMW)

Publication date: 2003

Publication place: Italy

Contact institution: Joint Research Centre

Media: Internet download following request and registration

Scale: 1:250,000

CCM stands for Catchment Characterisation and Modelling. CCM was part of JRC EuroLandscape project until December 2003 and is now part of JRC Agri-Environment Action.

The data were processed in raster format with a 250 meter grid-cell size and geo-referenced in a Lambert Equal Area Azimuthal projection (definition see above) for its equal area properties. The datasets were subsequently transferred to vector data without alteration of the pixel size. Thus any line represents the heart line of a pixel of 250 meters and has therefore a precision to a maximum of 125 meters. The main input data being digital elevation models implies that the rivers derived from these can never have a georeferencing better than these elevation data. A thorough description of the data can be found at <http://agrienv.jrc.it/activities/catchments/ccm.html>

##### **Use Constraints**

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CCM River and Catchment Database JRC/IES © European Commission - JRC, 2003

#### **4.2.3. CIESIN's Gridded Population of the World, Version 3 (GPWv3)**

Publisher and contact institution: Center for International Earth Science Information Network (CIESIN), Columbia University; and Centro Internacional de Agricultura Tropical (CIAT).

Publication date: 2005

Publication place: Palisades, NY: Socioeconomic Data and Applications Center (SEDAC), Columbia University

Media: Internet download

Resolution: 2.5 arc-minutes

Gridded Population of the World, Version 3 (GPWv3) consists of estimates of human population for the years 1990, 1995, and 2000 by 2.5 arc-minute grid cells and associated datasets dated circa 2000. The data products include population count grids (raw counts), population density grids (per square km), land area grids (actual area net of ice and water), mean administrative unit area grids, centroids, a national identifier grid, national boundaries, and coastlines. These products vary in GIS-compatible data formats and geographic extents (global, continent [Antarctica not included], and country levels). A proportional allocation gridding algorithm, utilizing more than 300,000 national and sub-national administrative units, is used to assign population values to grid cells. GPWv3 is produced by the Columbia University Center for International Earth Science Information Network (CIESIN) in collaboration with Centro Internacional de Agricultura Tropical (CIAT).

For this project, the GPWv3 Population Grid and Population Density Grid for the year 2000 (adjusted to UN totals) were used as sources.

The Population Grid archive contains population counts, both UN-adjusted and unadjusted, in ArcInfo GRID format. The raster data are at 2.5 arc-minutes resolution and contain the following data:

- p00g population counts in 2000, unadjusted;

- p00ag population counts in 2000, adjusted to match UN totals.

The Population Density Grid archive contains population densities, both UN-adjusted and unadjusted, in ArcInfo GRID format. The raster data are at 2.5 arc-minutes resolution and contain the following data:

- ds00g population densities in 2000, unadjusted, persons per square km;
- ds00ag population densities in 2000, adjusted to match UN totals, persons per square km.

All densities are in persons per square kilometer.

#### **Use Constraints**

The Trustees of Columbia University in the City of New York and the Centro Internacional de Agricultura Tropical (CIAT) hold the copyright of this dataset.

Users are prohibited from any commercial, non-free resale, or redistribution without explicit written permission from CIESIN or CIAT. Users should acknowledge CIESIN and CIAT as the source used in the creation of any reports, publications, new data sets, derived products, or services resulting from the use of this data set. CIESIN and CIAT also request reprints of any publications and notification of any redistributing efforts.

### **4.2.4. EuroMaps on CD-Rom, Bartholomew Digital Map Data**

Publisher: Bartholomew

Publication date: 1996

Publication place: England

Media: CD-ROM

Access constraints: Copyright in the data belongs to Bartholomew (which no longer exists on its own).

Contact institution: unknown

Scale: around 1:1,000,000

Bartholomew Euro maps on CD-ROM contains virtually the entire vector data set that was used to produce printed maps such as road atlases, at scales of around 1:1m (approximately 16 miles to the inch) at the time of publication in April 1996. It is appropriate for viewing on a computer screen at scales of up to 1:250 000 or so.

The objects in the vector data set include attributes, such as the name of a town or the nature of a tourist site. This version of the product does not include road numbers, but it does contain indexed names for more than 77,000 towns, 3,000 mountain peaks and passes, 60 countries and 730 administrative divisions.

The various types of feature are organized into some forty separate layers, so more detail can be revealed progressively as one zooms in to a larger scale. The data set generally extends from 13°W (the Atlantic Ocean) to 47°E (the Caspian Sea) and from 35°N (the Mediterranean) to 72°N (the Barents Sea). Iceland is also included, as well as Madeira, the Canary Islands and the Azores. To the South-East corner of this extent, especially beyond the Black Sea, some features in this version of the data set are incomplete.

#### **Use Constraints**

© Bartholomew 1996. It is not permitted to sell, rent, lease, sublicense, lend, assign, time-share, or transfer, in whole or in part, or provide unlicensed Third Parties access to the data.

Bartholomew is an imprint of HarperCollinsPublishers.

In 1991 Bartholomew, Geographia and Nicholson were amalgamated with Collins under the group name of HarperCollins and a large cartographic publishing operation was created. The Collins Bartholomew website was first introduced in 1997 (the year after Euro-maps was released) as [www.bartholomewmaps.com](http://www.bartholomewmaps.com) and has been designed as a selling medium for their digital mapping services.

EuroMaps on CD-Rom is not listed among the Collins Bartholomew products on their website (see <http://bartholomewmaps.com/barts.asp?pid=1200>). The applications of the license for this product are therefore unclear since the institution that created it no longer lists or sells it on their website. However, it is always possible to inquire here:

**Custom Mapping/Rights and Permissions** (World and European Maps)

Kathryn Kelly, Tel: +44(0)141 306 3752, E-mail: [kathryn.kelly@harpercollins.co.uk](mailto:kathryn.kelly@harpercollins.co.uk)

#### 4.2.5. FAO Soil and Terrain Database

Official name: FAO Soil and Terrain Database, Land Degradation Status and Soil Vulnerability Assessment for Central and Eastern Europe.

Publisher: FAO (UN Food and Agriculture Organization)

Publication date: 2000

Publication place: Rome, Italy

Media: CD-ROM

Scale: 1:2,500,000

The FAO Soil and Terrain Database presents the spatial and attribute databases and the technical reports produced during the execution of the Mapping of Soil and Terrain Vulnerability in Central and Eastern Europe (SOVEUR) project (GCP/RER/107/NET) between February 1997 and April 2000. The project activities were implemented under a contractual service agreement with the International Soil Reference and Information Centre (ISRIC), which included letters of agreement with national institutes in the participating countries. The project was technically backstopped by the Land and Plant Nutrient Management Service (AGLL). The spatial and attribute databases contain:

- a harmonized soil and terrain database for 13 countries in eastern Europe at 1:2.5 million scale, compiled following the SOTER principles, including georeferenced soil profile data;
- a database and associated maps on the status of soil degradation in the region including an evaluation of the extent, type, severity, causes and trends;
- a database and associated maps on the vulnerability to pollution, in particular by 11 metals: Cd, Mn, Ni, Co, Zn, Cu, Cr, Pb, Hg, Fe and Al.

##### Use Constraints

All rights reserved. Reproduction and dissemination of material in this information product for educational or other non-commercial purposes are authorized without any prior written permission from the copyright holders provided the source is fully acknowledged. Reproduction of material in this information product for resale or other commercial purposes is prohibited without written permission of the copyright holders. Applications for such permission should be addressed to the Chief, Publishing and Multimedia Service, Information Division, FAO, Viale delle Terme di Caracalla, 00100 Rome, Italy or by e-mail to [copyright@fao.org](mailto:copyright@fao.org).

#### 4.2.6. GEOnet Names Server (GNS)

Publisher and contact institution: National Geospatial-Intelligence Agency (NGA)

Publication date: 2004

Publication place: USA

Media: Internet download

GEOnet Names Server files contain geographic names information for the world (excluding the United States and Antarctica). The files are not in customary gazetteer format, but are in a special format amenable to input into geographic information systems, databases and spreadsheets. Toponymic information is based on the Geographic Names Data Base, containing official standard names approved by the United States Board on Geographic Names and Maintained by the National Geospatial-Intelligence Agency. More information is available at <http://earth-info.nga.mil/gns/html/index.html>.

##### Use constraints

There are no licensing requirements or restrictions in place for the use of the GNS data. However, it is recommended that one use the following citation to identify the GNS as a source:

Toponymic information is based on the Geographic Names Data Base, containing official standard names approved by the United States Board on Geographic Names and Maintained by the National Geospatial-Intelligence Agency. More information is available at the Maps and Geodata link at [www.nga.mil](http://www.nga.mil). The National Geospatial-Intelligence Agency name, initials and seal are protected by 10 United States Code Section §445.

#### 4.2.7. KTH European River Basin Districts Shapefile

Publisher: Susanna Nilsson, Department of Land and Water Resources Engineering, Royal Institute of Technology KTH, Stockholm

Publication date: 2005

Publication place: KTH, Stockholm, Sweden

Scale: 1:1,000,000

The creation of the data set was based on official analogue maps of RBDs from countries implementing the WFD; that is, EU member states, candidate countries except Turkey, and Norway. The maps were collected from web pages or provided by informants well acquainted with its own country's implementation of the WFD. Italy, Greece and Croatia have, as per 30 June 2005, neither identified RBDs nor appointed competent authorities, and they were therefore not included. In Norway and Spain there have not, as per 30 June 2005, yet been decisions concerning RBDs and competent authorities, but as proposals exist they were included in the register. Groundwater and coastal waters are not incorporated in the register.

The input data used was a data set in the scale of 1:1 million on river basins draining into the sea, provided by EU's scientific and technical research laboratory the Joint Research Centre (2003). By using the collected analogue map material on RBDs as reference material, all river basins belonging to one district were selected, unified into one polygon and given a unique id number. Thus, the borders of the RBDs were defined based upon the borders of the river basins in the input data set. For international districts, the following delineation logic was applied: For RBDs shared between member states and/or candidate countries information from all countries was compared, matched and combined for delineating the borders of the district. This means that an international district shared by two or more countries only has been counted once, even though each country may have defined the part of the district lying within its own territory as a separate district. For districts with river basins shared with countries outside the union, the borders of the international river basin(s) were used to denote the borders of the district. Because of the restrictions and interpretations outlined above, it should be stressed that the created register does not represent an official map of RBDs; instead, it should be regarded as an output from a scientific effort of making an overview of RBDs established.

##### Use Constraints

There are no constraints on use of this data; however, the source should be cited.

#### 4.2.8. Landsat GeoCover 2000/ETM+ Edition Mosaics

Distributor: Global Land Cover Facility

Author: MDA Federal

Publication date: 2004

Publisher: U.S. Geological Survey

Citation: MDA Federal 2004. Landsat GeoCover 2000/ETM+ Edition Mosaics; Tiles: N-34-50, N-34-55, N-35-50, N-34-55, N-36-50, N-36-55. Sioux Falls, South Dakota: USGS.

Version: 1.0

Media: Internet download

First launched in 1972, the Landsat satellite series constitutes one of the longest continuous records in Earth observation. The objective of the Landsat program has always been to provide multispectral imagery of the Earth's land areas at moderate resolution (30-90 meter horizontal resolution) to support resource assessment, land-cover mapping, and to track inter-annual changes in the environment.

Applications of Landsat data are quite diverse, comprising Earth Science, commercial applications, and government/military use. A few examples include mapping land-cover change (forest change, urbanization, etc), monitoring agricultural productivity, monitoring wetland health, mapping geologic resources, and targeting habitats for vector-borne disease eradication. Landsat is a cornerstone of NASA's Earth Observing System (EOS), providing a moderate-resolution counterpart to other EOS sensors such as MODIS and MISR.

Cloud Cover: "Clouds cover about 60 percent of the land surface at any given time (Rossow and Schiffer, 1999). Although it would be desirable to use only cloud-free Landsat scenes, this is impossible to do in many parts of the

world due to persistent cloudiness. The percentage of cloud cover was approximated by scene from the meta-data produced by the EROS Data Center, and priority was given to those scenes that had the least cloud cover. All candidate imagery was visually examined, and the best scenes were chosen. In cases where multiple scenes had similar cloud cover, a decision based on cloud location and vegetation phenology was made. Multiple scenes for some areas were also acquired and processed where those scenes together provided supplementary information missed by only selecting one scene or the other.” (Citation from NASA’s Global Orthorectified Landsat Data Set, [http://glcf.umiacs.umd.edu/pdf/PERSMarch\\_04\\_313-322.pdf](http://glcf.umiacs.umd.edu/pdf/PERSMarch_04_313-322.pdf))

#### Sensor

**Enhanced Thematic Mapper Plus (ETM+):** The ETM+ instrument currently flying on Landsat-7 is similar to the earlier TM, but adds an extra 15-meter resolution panchromatic band, and improved resolution for the thermal-infrared band (60-meters).

#### Use Constraints

Source: As a courtesy, please credit the Global Land Cover Facility (GLCF) as the source for this dataset in some manner. Suggestion: Source for this dataset was the Global Land Cover Facility, <http://www.landcover.org>.

Intellectual Property Rights: USGS & NASA; use is free to all; The U.S. Government holds the ultimate ownership.

### 4.2.9. Shuttle Radar Topography Mission (SRTM) 90m Digital Elevation Data

Publisher: CGIAR Consortium for Spatial Information

Publication date: 2004

Resolution: 3 arc seconds / approximately 90 meters

Media: Internet download

This source dataset (Version 2) was produced based on the "Unfinished" 3 arc-second SRTM data released by NASA and distributed by the U.S. Geological Survey through ftp access (<ftp://edcsgs9.cr.usgs.gov/pub/data/srtm/version1/>). The original data came with data voids, where insufficient contrast was available in the radar data to extract the elevation. These data voids tend to occur over water bodies (lakes and rivers), areas with snow cover and in mountainous regions. The CGIAR-CSI SRTM dataset has undergone post-processing of the NASA data to "fill in" the no data voids through interpolation techniques (see the Data Processing and Methodology page for detailed description). The result is seamless, complete coverage of elevation for the globe. A thorough description of the data can be found at <http://srtm.csi.cgiar.org/>

#### Use Constraints

The data has been generated by not-for-profit institutions with the objective of supplying accessible and useful information to developing country organizations. CGIAR-CSI actively encourages use of these products for scientific purposes. This is not, however, the case for commercial purposes. The entire dataset is available for commercial use at a modest cost, but permission must be sought. Commercial sectors interested in using this data should contact Dr. Andy Jarvis ([a.jarvis@cgiar.org](mailto:a.jarvis@cgiar.org)).

This dataset should be cited as follows: Void-filled seamless SRTM data V2, 2005, International Centre for Tropical Agriculture (CIAT), available from the CGIAR-CSI SRTM 90m Database: <http://srtm.csi.cgiar.org>

### 4.2.10. Vector Map Level 0 (VMAP0)

Publisher: National Imagery and Mapping Agency (NIMA)

Contact institution: National Geospatial-Intelligence Agency (NGA)

Publication date: 1998

Publication place: USA

Media: Internet download

Scale: 1:1,000,000

Vector Map (VMap) Level 0 is an updated and improved version of the National Imagery and Mapping Agency (NIMA) Digital Chart of the World (DCW®). The VMap Level 0 database provides worldwide coverage of vector-

based geospatial data which can be viewed at 1:1,000,000 scale, i.e. 1cm=10km. Technical documentation and original data of VMAP0 continental databases in Geographic coordinates (WGS84 datum) are published on mapAbility.com server.

Unfortunately, a thorough search of existing metadata for VMAP0 has failed to reveal what time period the data is relevant for (time period for which the data corresponds to ground conditions).

### **Use Constraints**

The data is Public Domain: "As an agency of the United States government, NIMA makes no copyright claim under Title 17 of the United States Code with respect to any copyrightable material compiled in these products, nor requires compensation for their use."

When incorporating the NIMA maps into other products, it is requested that one include the following:

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With respect to any advertising, promoting or publicizing of this product, NIMA requires that one refrain from using the agency's name, seal, or initials.

## **4.3. Theme: Administration**

### **4.3.1. Layer: International Boundaries (admin\_countries\_ov/dg/nem\_barth/vmap0)**

These datasets contain the country borders that intersect the database area from two data sources. The attributes included are country name, province, area and perimeter. The data set is in shapefile format and can be accessed directly from the CD ROM or saved to a local directory. The purpose of including the data set is to enable statistics extraction from the database and for visualizing political boundaries against a backdrop of other data layers. The database is transboundary and henceforth logically handles international boundaries. However, all statistics, e.g. population data or agricultural figures, are based on other administrative units than the drainage basin. To be able to extract and add information from/to the database it is therefore necessary to include traditional administrative boundaries.

The data sets are based upon the following data sources:

- Bartholomew's Euromaps (see 4.2.4)
- VMAP0 (see 4.2.10)

The source data sets were projected and clipped to fit the database projection and boundaries.

### **4.3.2. Layer: Sub-national Boundaries (admin\_admareas\_ov/dg/nem\_barth/vmap0)**

The sub-national boundaries layers contain the boundaries of the administrative units on first level below national according to two sources. Attributes contain information about the following: name of the administrative unit, country, area and perimeter. The data set is in shapefile file format and can be assessed directly from the CD ROM or saved to a local directory.

The data sets are based upon the following data sources:

- Bartholomew's Euromaps (see 4.2.4)
- VMAP0 (see 4.2.10)

The source data sets were projected and clipped to fit the database projection and boundaries.

### **4.3.3. Layer: Place Names (admin\_placenames\_Belarus/Latvia/Lithuania/Russia)**

These database and accompanying layer files contain geographic names information (points and associated place names) of various features in Belarus, Latvia, Lithuania and Russia. The data sets are in database file format and can be assessed directly from the CD ROM or saved to a local directory.

The data sets are based upon the following data source:

- GEOnet Names Server (see 4.2.6)

The country information selections from the data source were edited to contain only information relevant to the database extent.

#### **4.3.4. Layer: Cities – Large and Medium (admin\_lge/medcities\_ov/dg/nem)**

These layers contain information about large (population 100,000 - 2,000,000) and medium (population 10,000 - 100,000) cities/towns located within the database region. The main purpose is cartographic. Information in the attribute table gives the name of the city and whether or not it is a capital. The data sets are in shapefile file format and can be assessed directly from the CD ROM or saved to a local directory.

The data set is based upon the following data source:

- Bartholomew's Euromaps (see 4.2.4)

The source data sets were projected and clipped to fit the database projection and boundaries.

#### **4.3.5. Layer: Major and Main Roads (admin\_mjr/mainroads\_ov/dg/nem)**

These layers contain information about the dual (major) and single (main) carriageway roads in the database region. These data sets were included for information and cartographic purposes. The attribute tables contain information about road types and characteristics. The data sets are in shapefile file format and can be accessed directly from the CD ROM or saved to a local directory.

The layers are based upon the following data source:

- Bartholomew's Euromaps (see 4.2.4)

The source data sets were projected and clipped to fit the database projection and boundaries.

## **4.4. Theme: Hydrology**

### **4.4.1. Layer: River Basin Districts (hydro\_rbds\_ov/dg/nem)**

This GIS data layer contains the river basin districts located in the region covered by the transboundary Daugava/Nemunas database. Attributes contain information about the river basin district polygons. The primary purpose for preparing the data set was to provide a map of the river basin districts contained within the DatabasiN region. The data set is in shapefile format and can be accessed directly from the CD ROM or saved to a local directory.

The data set is based upon the following data source:

- RBDs shapefile, KTH (see 4.2.7)

The source data set was clipped to fit the database boundaries.

### **4.4.2. Layer: Marine Coastline (hydro\_coastline\_ov/dg/nem\_barth/vmap0)**

These GIS data layers contain coastline information from two sources for the region covered by the transboundary Daugava/Nemunas database. Attributes contain information about coastline polygons. The primary purpose for preparing the datasets was to illustrate the coastline along the two river basin districts. The datasets are in vector format and can be accessed directly from the CD ROM or saved to a local directory.

The data sets are based upon the following data sources:

- Bartholomew's Euromaps (see 4.2.4)
- VMAP0 (see 4.2.10)

The source data sets were projected to the database projection system and clipped to fit the various spatial extents of the database.

#### **4.4.3. Layer: Watercourses (hydro\_watercourses\_ov/dg/nem)**

These layers contain information on watercourses for the region covered by the transboundary Daugava/Nemunas database. Attributes contain information about watercourse characteristics. The primary purpose for preparing the datasets was to illustrate the watercourses contained within the database region. The datasets are in vector format and can be accessed directly from the CD ROM or saved to a local directory.

The data set is based upon the following data source:

- VMAP0 (see 4.2.10)

The source data set was projected and clipped to fit the database projection and boundaries.

#### **4.4.4. Layer: Inland Waters (hydro\_inlandwaters\_ov/dg/nem)**

These layers contain information on inland water bodies for the region covered by the transboundary Daugava/Nemunas database. Attributes contain information about inland water body characteristics. The primary purpose for preparing the datasets was to illustrate the inland waters that exist within the database region. The datasets are in shapefile format and can be accessed directly from the CD ROM or saved to a local directory.

This data set is based upon the following data source:

- VMAP0 (see 4.2.10)

The source data set was projected and clipped to fit the database projection and boundaries.

#### **4.4.5. Layer: Small/Medium/Large Lakes (hydro\_sml/med/lgelakes\_ov/dg/nem)**

These layers contain information on lakes of various sizes within the region covered by the transboundary Daugava/Nemunas database. Attributes contain information about the type of lake. The primary purpose for preparing the datasets was to illustrate the lakes that exist within the database region. The datasets are in shapefile format and can be accessed directly from the CD ROM or saved to a local directory.

This data set is based upon the following data source:

- Bartholomew's Euromaps (see 4.2.4)

The source data set was projected and clipped to fit the database projection and boundaries.

Note: there is no large lakes dataset for the Nemunas extent because the source large lakes data set does not contain any large lakes in that area.

#### **4.4.6. Layer: Small/Medium/Large Rivers (hydro\_sml/med/lgerivers\_ov/dg/nem)**

These layers contain information on rivers of various sizes within the region covered by the transboundary Daugava/Nemunas database. Attributes contain information about the type of river. The primary purpose for preparing the datasets was to illustrate the lakes that exist within the database region. The datasets are in shapefile format and can be accessed directly from the CD ROM or saved to a local directory.

This data set is based upon the following data source:

- Bartholomew's Euromaps (see 4.2.10)

The source data set was projected and clipped to fit the database projection and boundaries.

Note: No attribute table definitions accompanied the source data for these layers.

#### **4.4.7. Layer: Catchments (hydro\_catchments\_ov/dg/nem)**

This GIS data layer contains catchment areas for the region covered by the transboundary Daugava/Nemunas database. Attributes contain information about catchment polygons. The primary purpose for preparing the data set was to provide information on the catchment areas in the Daugava and Nemunas river basin districts. The data set is in shapefile format and can be accessed directly from the CD ROM or saved to a local directory.

The data set is based upon the following data source:

- CCM, JRC (see 4.2.2)

The source data set was projected and clipped to fit the database projection and boundaries.

#### **4.4.8. Layer: River Segments (hydro\_riversegments\_ov/dg/nem)**

This GIS data layer contains river segments for the region covered by the transboundary Daugava/Nemunas database. Attributes contain information about river segment characteristics and coding. The primary purpose for preparing the data set was to provide information on the river segments in the Daugava and Nemunas river basin districts. The data set is in vector format and can be accessed directly from the CD ROM or saved to a local directory.

This data set is based upon the following data sources:

- CCM, JRC (see 4.2.2)

The source data set was projected and clipped to fit the database projection and boundaries.

#### **4.4.9. Layer: River Basins (hydro\_riverbasins\_ov/dg/nem)**

This GIS data layer contains river basin polygons for the region covered by the transboundary Daugava/Nemunas database. Attributes contain information about sea outlet regions built up of first order catchment geometries. The primary purpose for preparing the data set was to provide information on river basins and regions that drain to the sea in the Daugava and Nemunas river basin districts. The data set is in shapefile format and can be accessed directly from the CD ROM or saved to a local directory.

This data set is based upon the following data source:

- CCM, JRC (see 4.2.2)

The source data set was projected and clipped to fit the database projection and boundaries.

### **4.5. Theme: Land Cover**

#### **4.5.1. Layer: Land Cover (landcover\_ov/dg/nem)**

This data set contains land cover classification for the region covered by the transboundary Daugava/Nemunas GIS database. The primary purpose for preparing the data set was to provide information on land cover and land use. The nine classes identified 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. The data set is in raster format and can be accessed directly from the CD ROM or saved to a local directory.

This data set is based upon the following data source:

- BALANS land cover data version 3.0 (see 4.2.1)

The source data set was projected to the database projection system and clipped to fit the spatial extent of the database.

### **4.6. Theme: Pedology & Topography**

#### **4.6.1. Layer: Soil Types and Proportions (pedo\_soiltypes\_ov/dg/nem)**

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. The primary purpose for preparing the data set was to provide information on soil types and proportions occurring within the Daugava/Nemunas river basin districts. The data set is in shapefile format and can be accessed directly from the CD ROM or saved to a local directory.

This data set is based upon the following data source:

- FAO Soil and Terrain Database (See 4.2.5)

The data set was prepared in the following manner:

The database files with relevant soil information were joined to the two halves of the FAO soil map (coverages). These were then projected, appended to one another and clipped to fit the database boundaries.

#### **4.6.2. Layer: Digital Elevation Data (topo\_dem\_ov/dg/nem)**

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. The data set is in raster format and can be accessed directly from the CD ROM or saved to a local directory.

This data set is based upon the following data source:

- SRTM 90m (see 4.2.9)

The data set was prepared in the following manner:

The regionally relevant ASCII files were converted to raster format and then mosaicked to form one raster dataset. This dataset was then projected and clipped to fit the database projection and boundaries.

### **4.7. Theme: Population**

#### **4.7.1. Layer: Population Count (pop\_count\_ov/dg/nem)**

This GIS data set contains population count information adjusted to match UN totals for the year 2000 in the DatabasiN region. The primary purpose for preparing the data set was to provide population count information for extraction of statistics based on the Daugava and Nemunas river basin districts. The data set is in raster format and can be accessed directly from the CD ROM or saved to a local directory.

This data set is based upon the following data source:

- CIESIN's GPWv3 (see 4.2.3)

The source data set was clipped to fit the database boundaries.

#### **4.7.2. Layer: Population Density (pop\_dens\_ov/dg/nem)**

This GIS data set contains population density information adjusted to match UN totals for the year 2000 in the DatabasiN region. The primary purpose for preparing the data set was to provide database area population density information for the extraction of statistics. The data set is in raster format and can be accessed directly from the CD ROM or saved to a local directory.

This data set is based upon the following data source:

- CIESIN's GPWv3 (see 4.2.3)

The source data set was clipped to fit the database boundaries.

### **4.8. Theme: Satellite Imagery**

#### **4.8.1. Layer: Landsat Satellite Imagery (sat\_ov/dg/nem)**

This data layer contains satellite imagery for the region covered by the transboundary Daugava/Nemunas GIS database. The primary purpose for preparing the data set was cartographic (visualization). The data set is in raster format and can be accessed directly from the CD ROM or saved to a local directory.

This data set is based upon the following data source:

- Landsat GeoCover 2000/ETM+ Edition Mosaics (see 4.2.8)

The data set was prepared in the following manner:

The regionally relevant TIFF files were mosaicked to form one raster dataset. This dataset was then projected and clipped to fit the database projection and boundaries.

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