

WaterStrategyMan
EVK1-CT-2001-0098

WORK PACKAGE 6

INSTRUCTIONS ON MAP AND DATA FORMAT

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1. Introduction

1.1 General

This document describes the main map and data format for the Database to be developed under Work Package 6. The main purpose is to provide guidelines to the partners concerning required and optional data, field types and descriptions.

The document is organized in four parts, according to the feature datasets (collections of feature layers) that the database consists of.

The first part refers to the *General Regional Data* dataset, which contains basic information for the region.

The second part refers to the *Water Network* dataset. This dataset contains the information that is fundamental for the Decision Support System. This part contains two chapters; the first refers to the required (**if relevant to the case study**) map layers while the second one concerns the attribute data. Attribute data structure and format is described individually for each map in the Sample Excel files that accompany the guidance document.

The third part relates to the *Natural Water Resources Maps* dataset. This part makes reference to the Guidance Document for implementing the GIS elements of the Water Framework Directive. Not all layers or fields are required; however, there may be a possibility for future use of these layers.

The fourth part relates to the *Administrative Structures* dataset. Its main purpose is to describe the regional and water competent authorities for the region.

1.2 Map and Data platforms

The database platform is Arc GIS 8.1. Since the familiarity of each partner with the Arc GIS software is not known, it is proposed that all map layers are shipped:

- In Arc View format (3.x) which is preferable or
- In Map Info (v. 6.5)

Despite the platform issue please note the following:

- ALL LAYERS SHOULD BE ON THE SAME PROJECTION. IT IS RECOMMENDED THAT THE **ETR-89** PROJECTION IS USED. HOWEVER, EACH PARTNER CAN USE WHICHEVER PROJECTION IS CONSIDERED USEFUL OR SUITABLE, AS LONG AS **IT IS THE SAME** FOR ALL LAYERS.
- SPATIAL RESOLUTION FOR ALL MAPS SHOULD BE THE SAME. THE CASE STUDY PARTNER SHOULD DECIDE ON APPROPRIATE RESOLUTION FOR EACH REGION.

Data can be categorized in the following way:

- Simple Attribute data (these are data that are stored in the map layer)
 - Descriptions are either provided in the sample Excel files (*Water Network* dataset) or in this document. For the *Water Network* dataset it is preferred that data are filled in the Excel Spreadsheets and that the map layers are
- Other Attribute Data (For the *Water Network* dataset). Samples are provided in the Excel Spreadsheets.
- Simple And Quality Time Series (For the *Water Network* dataset and the climate stations measurements). Samples are provided as above.

2. General Regional Data Dataset

2.1 Maps

A. Region Map (Polygons) - REQUIRED

B. Shoreline (Polylines) – REQUIRED

C. Roads (Polylines) – REQUIRED

Fields:

- Road Type (Required - Integer). The field should be an integer number corresponding to the following classification:

Road Description	Code
National Road	1
National Country Road	2
Country Road 1 (Major)	3
Country Road 2 (Minor)	4
Country Road 3 (...)	5
Earthy	6
Unknown	7

D. Elevation (Polygons): Areas with the same altitude range) – REQUIRED.

Fields:

- Elevation in meters (Integer)

E. Geology Type (Polygons) - REQUIRED

Fields:

- Type of Rock(Required – String)
- Percentage of Infiltration (Required – Double)

F. Soil Moisture Capacity(Polygons) - OPTIONAL

- Soil moisture capacity (Required – Double)

G. Towns (Points) – OPTIONAL

2.2 Maps and Raster Data prepared by PROGeA

The following list is the set of maps that have already been prepared by ProGeA Srl as a default basis for the DSS. These have been distributed during the Porto Project meeting. However, in case that these maps are not in the proper scale or more accurate data are available partners may provide an updated version.

- Digital elevation model (DEM), developed by USGS, at a resolution of 1 Km (GTOPO30)
- Geographic database (HYDRO1K), with 1 km resolution, developed from the DEM, including information about:
 - DEM (hydrologically correct);
 - Aspect;
 - Flow directions (FD);
 - Flow accumulations (FA);
 - Slope: (deg.);
 - Compound topographic index (CTI): $CTI = \ln[FA/\tan(\text{slope})]$;
 - Drainage basins boundaries;
 - Stream lines;
- Global land cover characteristics database (GLCC), with 1 km² resolution
 - Seasonal land cover regions
 - Global Ecosystems
 - International Geosphere Biosphere Programme Land Cover Classification
 - USGS Land Use/Land Cover System
 - Simple Biosphere Model
 - Biosphere-Atmosphere Transfer Scheme
 - Running Vegetation Lifeforms
- Water and climate atlas, with 10 arc min resolution:
 - 75% Probability precipitation [mm/month]
 - Days with rainfall [days/month]
 - Mean daily air temperature [°C]
 - Mean diurnal temperature range [°C]
 - Days with ground frost [days/month]
 - Relative humidity [%]
 - Sunlight hours [% of maximum sunlight hours]
 - Mean wind speed [m/s]
 - Hargreaves moisture availability index
 - Potential Evapo-Transpiration (Penman-Monteith) [mm/day]

- Digital soil map provided by FAO, with 5 arc min resolution;
Source: FAO's CD-ROM

3. Water Network Dataset

3.1 Maps

A. Water Uses and Requirement Nodes (Points)

- *Settlement* – it describes the civil urban population and infrastructures of a defined area, i.e. a city, a village, or a town, featured by a local administrative government - **REQUIRED**.
- *Irrigation Site* – this demand node represents the activity of cultivating land either for the survival of land owners or for commercial purposes - **REQUIRED**.
- *Industrial Site* – this node describes a productive reality producing or supplying goods, services etc. An Industrial Site can be public or private. It is also characterised by its field of application: Petrochemical, Electronics, Aerospace, Food and Beverage, Pulp and Paper, Textile etc - **REQUIRED**.
- *Animal Breeding* - it is a demand node describing the activity of animal breeding - **REQUIRED**.
- *Export node* – it represents the amount of water to be exported to a neighbouring area - **REQUIRED**.
- *Hydroelectric plant*– this node takes into account the amount of water requested by a single plant or a group of plants to generate electricity from falling or fast-flowing water - **REQUIRED**.
- *Environmental, Recreation and Navigation Demand* - it is a fictitious demand node that is created to address the minimum water requirements of rivers or the water needs for recreational purposes of municipalities - **REQUIRED**.

B. Supply Nodes (Points)

- *Renewable Groundwater* - this node represents shallow, free groundwater that is continuously recharged by the hydrological cycle. A renewable groundwater is a water source with the further roles of accumulator and end node - **REQUIRED**.
- *River Node*– the river nodes are used to schematise a part of a river. They represent special points of interest such as a point of confluence or diversion. A river node can also be a monitoring point where run-off is recorded or an abstraction point where water is withdrawn to feed water users. A river node has the roles of water source plus end node - **REQUIRED**.
- *Reservoir (Storage + Small + Natural Lake)* – this node represents three kinds of reservoir: a man-made storage reservoir fed either by a natural water course or by pipelines, a small artificial reservoir built to collect rainfall or a natural surface lake. A reservoir is a water source with the further roles of accumulator and end node - **REQUIRED**.
- *Importing* - it represents the amount of water coming from a neighbouring area. As a supply node it has the role of water source - **REQUIRED**.

- *Fossil Groundwater* – this node represents deep, confined groundwater that is not recharged by the hydrological cycle. Fossil groundwater is a water source but not an accumulator or an end node because it has a of null recharge - **REQUIRED**.

C. Treatment Plant Nodes (Points)

- *Drinking Water Treatment Plant* - this node represents a plant treating water in order to make it safe and acceptable for human use - **REQUIRED**.
- *Wastewater Treatment Plant* – this node represents a plant treating water in order to remove or at least abate pollutants' concentration before water is re-used or discharged into a body of surface water - **REQUIRED**.
- *Desalination* – this node represents a plant removing dissolved salts from seawater, brackish waters of inland seas or highly mineralized groundwater - **REQUIRED**.

D. Other Nodes (Points)

- *Network Reservoir* – It represents a physical reservoir of very small capacity which is used to serve the needs of settlements, tourist sites etc. Its contribution in the water allocation is not significant at the monthly time scale used within the WSM simulations. However, as a part of the infrastructure, it has costs for construction, operation etc. that are accounted for.

E. LINKS - It is an **polyline or line** object representing a connection between two nodes (points) in the network.

- *Canal* - it is a supply link carrying water through a open-air artificial waterway. It can connect rivers to agricultural sites - **REQUIRED**.
- *Pipeline* - it is a supply link representing long pressure pipes conveying water from reservoirs or rivers to demand nodes or treatment plants - **REQUIRED**.
- *Groundwater Link* - it carries recharges to or discharges from aquifers - **REQUIRED**.
- *Return Flow Link* – it carries water outgoing the demand sites and wastewater treatment plants - **REQUIRED**.

3.2 Data

In order to facilitate data entry for the water network objects, sample spreadsheets are provided for each type of object that contain all related information. The first type of information is always directly associated with the map layer (simple attribute data). The partners have however the option to complete the spreadsheet according to data availability and relevance to the case study.

4. Natural Water Resources Maps Dataset (Adapted from the Guidance Document on Implementing the GIS Elements of the WFD)

4.1 Maps

A. River Basins (Polygons) – REQUIRED (if existing)

Fields:

- NATIONAL CODE (INTEGER - REQUIRED)
- EUROPEAN CODE (INTEGER – REQUIRED)

B. Catchment Areas (Polygons) - REQUIRED

C. River Water Bodies (Polylines) – REQUIRED

Fields:

- EUROPEAN CODE (STRING – OPTIONAL)
- MSCODE (STRING - OPTIONAL)

D. Lake Water Bodies (Polygons) – REQUIRED

Fields:

- EUROPEAN CODE (STRING – OPTIONAL)
- MSCODE (STRING - OPTIONAL)

E. Coastal Waters (Polygons) – OPTIONAL

F. Transitional Waters (Polygons) – OPTIONAL

G. Ecoregions (Polygons) – OPTIONAL

H. Protected Areas (Polygons) – OPTIONAL

Fields:

- DESCRIPTION (STRING)

I. Monitoring Points (Points) - OPTIONAL

- a. Surface Monitoring Points**
- b. Groundwater Monitoring Points**
- c. Climate Stations - REQUIRED**

4.2 Time Series Data

Templates are provided in "*Monitoring Points.xls*"

5. Administrative Structures Dataset

5.1 Maps

A. First Level Administration (Polygons) – OPTIONAL

Polygons corresponding to the first administration level in the region (e.g. prefectures)

Fields:

- NAME (STRING - REQUIRED)

B. Second Level Administration (Polygons) – OPTIONAL

Polygons corresponding to the second administration level in the region (e.g. municipalities)

Fields:

- NAME (STRING - REQUIRED)

C. Water Competent Authorities (Polygons) – REQUIRED

Fields:

- COMPETENTAUTHORITYID (INTEGER) - REQUIRED
- NAME (STRING)
- DESCRIPTION (STRING)

D. River Basin Districts (Polygons) – REQUIRED

Polygons corresponding to the river basin districts (if any) in the region

Fields:

- NAME (STRING)
- MSCODE (STRING)
- EUROPEAN CODE (STRING)
- DESCRIPTION (STRING)