Transforming GIS4EU data models into the INSPIRE data model: the case of hydrography

Introduction

This text describes the process of matching the data models available in the GIS4EU project with the INSPIRE data model for the theme hydrography and lists the main results. Finally, we draw some conclusions about the process.

Available Data for testing

The available data for testing consisted of eleven datasets from 9 providers with very different characteristics to be classified in:

- Local data at large scales

  - At scales 1/1000, 1/2000, provided by CGE (Comunitá di Genova) In densely urbanised areas, data is compiled at 1/1 000 scale and at 1/2000 scale in other areas. Data is the generic name of "Carta Tecnica Numerica in Scala 1:1000 /1:2000 con Integrazione Topografica" and is stored in Ora-

cle Spatial.

  - and at scale 1/5 000 provided by MAV (Magistrato Alle Acque di Venezia). This data covers the 550 square kilometres of the Venice lagoon eco-system and hydrographic data corresponds to the hydrographic channel of the lagoon. This data was created originally from data digitized from the Carta Tecnica Regionale dating from 1984 that was later subject to periodic updating using aerial photographs, satellite images (Ikonos, 2004) and bathymetric data. The data also includes the centrelines of the hydrographic transportation network

- Data using the DBPrior10k specifications

  - provided by regional data providers: RLIG (Regione Liguria), RPIE/CSI (Regione Piemonte), RVEN (Regione del Veneto), INSIEL(Regione Friuli Venezia Giulia). These data, at 1/10

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000 scale, follows the technical specifications DBPrior10K developed by the "Gruppo di Lavoro sulle Specifiche per i Data Base Topografici all'interno dell'Intesa Stato - Regioni - Enti Locali per la realizzazione di banche dati di interesse generale". This project has a national scope and includes seven themes, namely, Transportation Network, Buildings, Addresses, Hydrography, Administrative Units, Morphology and Toponymy.

▪ Data used for reporting in the context of the WFD

   o A dataset at 1/50 000 scale was provided by VUGK (Research Institute of Geodesy and Cartography of Bratislava) from Slovakia. This dataset only recently was made available to the project and it is being used for reporting to the EC in the context of the WFD (Water Framework Directive).

▪ Generic mapping data

   o from ICC (Cartographic Institute of Catalonia) at scales 1/5 000 and 1/50 000. Data at 1/5 000 scale was compiled by stereo-restitution and data at 1/50 000 scale by screen digitizing and ortophoto interpretation followed by cartographic generalisation. The technical specifications for these datasets (BT-5M and BT-50M) are available in the ICC web page. Data is checked as to its positional accuracy, semantic accuracy, logical consistency and completeness.

   o from IGP (Portuguese Geographic Institute) at the scales 1/250 000 and 1/1 000 000. IGP data was produced following the technical specifications of Eurogeographics corresponding to the Portuguese contribution to Euroregional-Map and EuroGlobalMap, respectively. These datasets were produced using data from

previously existing datasets at larger scales followed by quality control and consistency checking along the boundary between different countries with discrepancies solved by agreement between the involved countries.

Brief Characterization of the INSPIRE Data Model

The INSPIRE data model was developed by a group of experts using the methodology defined in the document "DS-D2.6: Methodology for the development of data specifications". The version of the data model used was the second draft, available online since December 2008.

Table 1 – GIS4EU datasets available for testing.

Data provider	Level	Dataset	Scale
VUGK	National	UNIBA-SK50	1:50 000
ICC	Regional	BT-5M	1:5 000
		BT-50M	1:50 000
RLIG	Regional	DBPrior10K	1:10 000
RPIE/CSI	Regional	DBPrior10K	1:10 000
CGE	Local	CTC1000/CTC2000	1:1 000/1:2 000
IGP	National	ERMPT	1:250 000
		EGMPT	1:1 000 000
INSIEL	Regional	Dbprior_0203_Corso_acqua	1:10 000
RVEN	Regional	DBPrior10K	1:10 000
MAV	Local	GD010IDROLAGL1	1:5 000

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The INSPIRE data model for hydrography was developed around three use cases, namely:

1. Spatial Analysis and Modelling: they incorporate those cases of using GIS techniques to derive the information needed to the management of water and for planning policies and activities based on the hydrographic network.

2. Mapping: In this use case hydrography is understood as a cartographic reference including the main water bodies and related objects.

3. Reporting: In this use case the theme hydrography includes the units for reporting in the context of the WFD.

These use cases were used to define four UML packages where their elements are related between themselves:

▪ Network - derived from the use case "Spatial Analysis and Mod-

Package	Matched feature types	Not matched
Network	WatercourseLink, WatercourseNode (2)	4
ManagementAndReporting	WFDSurfaceWaterBody (1)	5
PhysicalWaters	StandingWater, Watercourse, LandWaterBoundary, Sea, Foreshore, Wetland, Riverbank, CatchmentArea (8)	3
RelatedObjects	DamOrWeir, Embankment, ShorelineConstruction, DischargePoint, SpringOrSeep, Pipe, Ford, AbstractPoint, VanishingPoint, SubsurfaceCrossing, SurfaceCrossing (11)	13

Table 2 – INSPIRE features matched with GIS4EU datasets' features

elling"

- ManagementAndReporting - derived from the use case "Reporting"
- PhysicalWaters - derived from the use case "Mapping"
- RelatedObjects –it includes those spatial elements related with one or more use cases that cannot be considered proper hydrographic elements (e.g. dam, etc)

Results

The results of the matching process are summarised in the following two tables, the first summarising the matching of INSPIRE features with the features of the available datasets in the project and the second table summarises the matching of attributes in the matched features with the attributes in the features of the GIS4EU datasets.

Conclusions

The main conclusions of the matching process for hydrography are:

- It was possible to find matchings for all features but one in two datasets
- It was possible to find matchings for most of the features for another two datasets
- Other datasets have a more limited number of matchings
  - RLIG, RPIE, RVEN: each with 5 features matched
  - DBPrior10K, CGE, MAV, VUGK: no features from RelatedObjects package matched
- Some packages have almost no matchings:
  - ManagementAndReporting package: 1 match
  - Network package: 2 matches
- Most of the matchings are with the features of the packages derived from the Mapping use case (PhysicalWaters & RelatedObjects packages).
- Some data providers reported

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the need for specific features types (e.g. MAV=speed limit).

- No GIS4EU dataset has full INSPIRE feature catalogue.

- Finally, we conclude by raising the following question:

- Which features are mandatory for a dataset to be considered INSPIRE compliant?

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INSPIRE Attributes Matched	

• Network package:
  – WatercourseLink
     • id,
     • geographicalName,
     • flowDirection ,
     • centerlineGeometry,
     • Length
  – WatercourseNode
     • id,
     • hydroNodeCategory
	• PhysicalWaters package:
	  – StandingWater
	     • hydroid ,
	     • id,
	     • geographicalName,
	     • Origin,
	     • Elevation,
	     • surfaceArea,
	     • localType

• PhysicalWaters package:
  – Watercourse
     • beginLifespanVersion,
     • endLifespanVersion,
     • Origin,
     • Condition,
     • Fictitious,
     • Level,
     • id,
     • geographicalName,
     • length,
     • LevelOfDetail ,
     • localType,
     • waterCourseHierarchy,
     • persistence
	• PhysicalWaters package:
	  – LandWaterBoundary
	     • Origin,
	     • waterLevelCategory,
	     • id
	  – CatchmentArea
	     • area,
	     • hydroid,
	     • geographicalName
	  – Foreshore
	     • geographicalName
	  – Sea
	  – Wetland

• RelatedObjects:
  – DamOrWeir
     • condition
  – SpringOrSeep
  – Embankment
  – ShorelineConstruction
  – AbstractPoint
  – DischargePoint
  – Pipe
  – Ford
  – SubsurfaceCrossing
  – SurfaceCrossing
  – VanishingPoint
	• ManagementAndReporting:
	  – WFDSurfaceWaterBody
	     • id

Table 3 – INSPIRE attributes matched with GIS4EU datasets' attributes

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