Provision of interoperable datasets to open GI to EU communities

Deliverable D-3.3 Common Data Model: Hydrography

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as editor

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RESUME

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Table 1 - Document classification resume

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1 Summary

The GIS4EU project aims at providing base cartography datasets (administration units, hydrography, transportation networks and elevation themes) for Europe, and to ensure its cross-scale, cross-language and cross-border interoperability and accessibility according to International Standards and INSPIRE requirements.

The focus of this document is to compare GIS4EU Data providers' datasets with INSPIRE Data Model in order to identify the subset of features and attributes that will conform GIS4EU common data model for Hydrography theme. It has been obtained performing a matching between each GIS4EU dataset and the INSPIRE Data model, which is extremely useful to fulfil the objectives of the GIS4EU project.

Furthermore, a critical analysis of INSPIRE Data Model and harmonization process has been carried out aiming to identify possible elements missed in INSPIRE data model, elements of INSPIRE data model that might be not relevant and to report problems found at this stage.

In order to fulfil GIS4EU project's deadlines it has been necessary to refer to available early versions of the INSPIRE data models, which were taken into account when editing version 1.09 of the present deliverable.

Since the second draft of INSPIRE data models are ready and available, and because of the decision taken in GIS4EU project to contribute to INSPIRE testing phase, this new version of the present deliverable is now proposed (see appendix 10.6 for changes from version 1 to version 2 of the deliverable). In it GIS4EU Data providers' datasets are compared with INSPIRE Data Model, 2nd draft. Results and conclusions derived from the mentioned analysis will be reported by GIS4EU project (INSPIRE LMO) during the INSPIRE Testing Phase.

Regarding the structure, the document is divided in five main parts:

- Section 3 justifies the adoption of INSPIRE Data Model in the context of GIS4EU.
- Section 4 gives an overview of the Hydrography INSPIRE Data Model.
- In section 6 the comparative and critical analysis are carried out.

- In sections 7 and 8 the assessment of the main results of the comparison process is made, and
- Finally, section 9 is devoted to the conclusions of this document.

2 Document Scope

This document is aimed to define a GIS4EU common data model for the Hydrography Theme, based on a subset of elements from the INSPIRE Consolidated UML Model 2nd draft, revision 386. This is accomplished by identifying the relationships between GIS4EU datasets and the data models developed by INSPIRE Thematic Working Groups (TWGs).

The comparison of the data models and the definition of the common data model are done at a conceptual level. However, the definition of a physical model is not part of the scope of this document.

3 Introduction about adopting INSPIRE data model

The European Commission has led the development of data models common to each theme in Annex I of the INSPIRE directive. The INSPIRE data models define a set of spatial and non spatial object types (feature types) commonly used in datasets of each theme. The development of the data models was required under the following text of the directive:

> *The Commission should also be empowered to adopt implementing rules laying down technical arrangements for the interoperability and harmonisation of spatial data sets and services, rules governing the conditions concerning access to such sets and services, as well as rules concerning the technical specifications and obligations of network services. Since such measures are of general scope and are designed to supplement this Directive by the addition of new non-essential elements, they should be adopted in accordance with the regulatory procedure with scrutiny provided for in Article 5a of Decision 1999/468/EC. (Clause 33, INSPIRE Directive)*

As initially stated in the DoW (Description of Work) of the project, one of GIS4EU purposes was to support the INSPIRE effort by developing a set of common data models for Administrative Units, Transport Networks, Hydrography and Elevation based on the analysis and comparison of real datasets covering these themes.

By October 2008 it was clear that the INSPIRE Annex I TWGs (including Administrative Units, Transport Networks and Hydrography) would produce their 1st draft data models by December 2008. Consequently, it was decided not to duplicate the effort of these INSPIRE TWGs but instead to contribute to INSPIRE by providing a critical analysis of INSPIRE data models in relation to datasets supplied by GIS4EU data providers. Firstly, GIS4EU TWGs had to work with early versions of the INSPIRE data models (1st draft), but afterwards the content of second version of GIS4EU WP3 deliverables have been updated according to the 2nd draft of the INSPIRE models, the ones that will be analysed during the INSPIRE testing phase.

The advantage of this approach is that the GIS4EU project can provide a useful feedback to INSPIRE TWGs, since GIS4EU common data models are established taking into account existing data across Europe. The methodology involves a matching process between each dataset available for the project (source model) and the selected common data model (target model), which help evaluate two main aspects:

- The ability to map existing local data into an harmonised common schema.

- The level of compliance in obtaining the content required at European level from the existing datasets.

As a result, it is expected that the deliverables of this project contribute to the testing phase of INSPIRE draft data specifications for both transformation testing and application testing, as part of the roadmap defined by the Consolidation Team (**CT**) in order to guide the work of the Thematic Working Groups (**TWGs**) for the INSPIRE Annex I data specifications.

On the other hand, the Elevation theme is listed as an INSPIRE Annex II theme. It is currently not addressed by the INSPIRE TWGs. Therefore, the GIS4EU Elevation TWG adopted the process described in INSPIRE D2.6 *Methodology for the Development of Data Specifications* in order to develop a common data model for the Elevation theme.

In summary, it is expected that the results of the activity developed within GIS4EU project will contribute to the testing and development of the INSPIRE implementing rules and guidelines.

4 Overview of the INSPIRE data model for Hydrography

4.1 Description of the theme context

The Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) defines the Hydrography theme as:

*Hydrographic elements, including marine areas and all other water bodies and items related to them, including river basins and sub-basins. Where appropriate, according to the definitions set out in Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy *, and in the form of networks.*

** OJ L 327, 22.12.2000, p.1. Directive as amended by Decision No. 2455/2001/EC (OJ L 331, 15.12.2001, p.1.).*

According to this definition the Drafting Team "Data Specifications" (DT-DS) prepared the document D2.3 "Definition of Annex Themes and Scope" as a starting point for the development of the data specifications providing a more detailed description and scope by theme, important features and attributes and the overlaps and links with other themes.

Eventually, the Hydrography theme covers all inland water and marine areas covered by river basin districts as defined by the Water Framework Directive (Directive 2000/60/EC), excluding groundwater because is treated under the Geology theme in the Annex II.

It is foreseen that the Hydrography theme will be used by analysis and modelling applications and as a reference layer as well.

Regarding the last application mentioned, it is envisioned that this theme will be used for mapping purposes and to fulfil the reporting requirements of European directives as WFD.

4.2 Description and overview of the INSPIRE Data Model

INSPIRE data model 2nd draft has been developed by a group of experts in line with the contents of the document D2.6 "Methodology for the development of data specifications". The steps recommended by DT-DS are:

- Use case development: identification and description regarding requirements for the data model
- Identification of user requirements and spatial object types

- As-is analysis of the reference material provided by LMO and SDIC
- Gap analysis
- Data specification development of 1st draft: detailed description of the application schema and feature catalogue developed taking into account the requirements and analysis results
- Data specification development of 2nd draft: updated version of the application schema and feature catalogue according to the internal comments resolution and detailed description of metadata, quality and portrayal chapters.

4.2.1 Use cases

The INSPIRE Hydrography data model (2nd draft) in Unified Modelling Language (UML) is built around three following use cases:

- Spatial analysis and modelling

  GIS techniques are essential for the derivation of information layers for water management and planning policies and activities (characteristics of water bodies and water ecological and chemical status) based on a hydrographic network.

- Mapping

  Hydrography is a basic map reference; it includes the representation of main physical waters and related objects.

- Reporting

  The implementation of the WFD or other European directives requires the handling of spatial data for reporting to the Commission about quality (particles, pollutants etc.) and quantity of water. Hydrography theme will include the reporting units although the reporting matters will be modelled in the annex III themes as Environmental monitoring facilities, Area management/restriction/regulation zones and reporting units.

The Figure 1 shows the relations between the three use cases and the four packages of the data model.

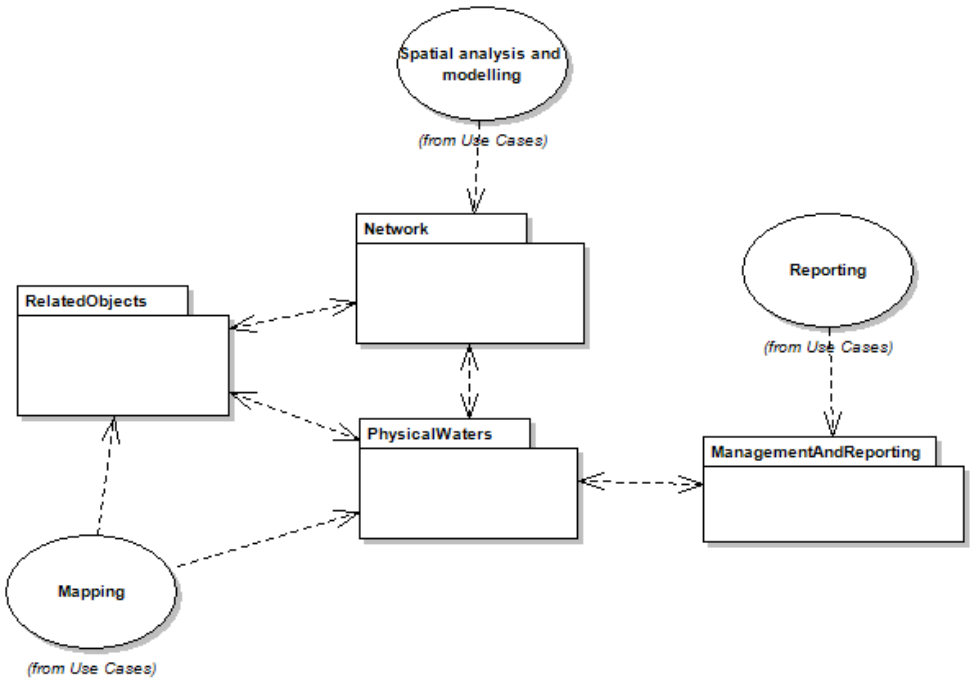


Fig. 1 - INSPIRE data model for Hydrography: Hydrography Package (source: INSPIRE portal)

4.2.2 Hydrography Model

Hydrography model is composed by 4 packages related among them:

- Network: it derives from Spatial analysis and modelling use case
- ManagementAndReporting: it derives from the Reporting use case
- PhysicaWaters: it derives from Mapping use case
- RelatedObjects: it consists of spatial objects related with one or more use cases but they can not be considered hydrographic elements

Each package could be described as follows:

Network package

Elements in networks are handled as nodes, links, aggregated links (to define routes) and areas. These elements are the same for hydrographic and transportation networks.

This package includes the abstract feature type, called NetworkElement, which has a geographical name and a unique identifier.

The NetworkElement feature type is the parent of the following feature types: Node, Link, AggregatedLink and GradeSeparatedCrossing; therefore these feature types inherit all public attributes of NetworkElement.

These abstract classes are extended, reused and specialised in various feature types within the Hydrography network data model in the same way as it has been done in the Transport Networks data model.

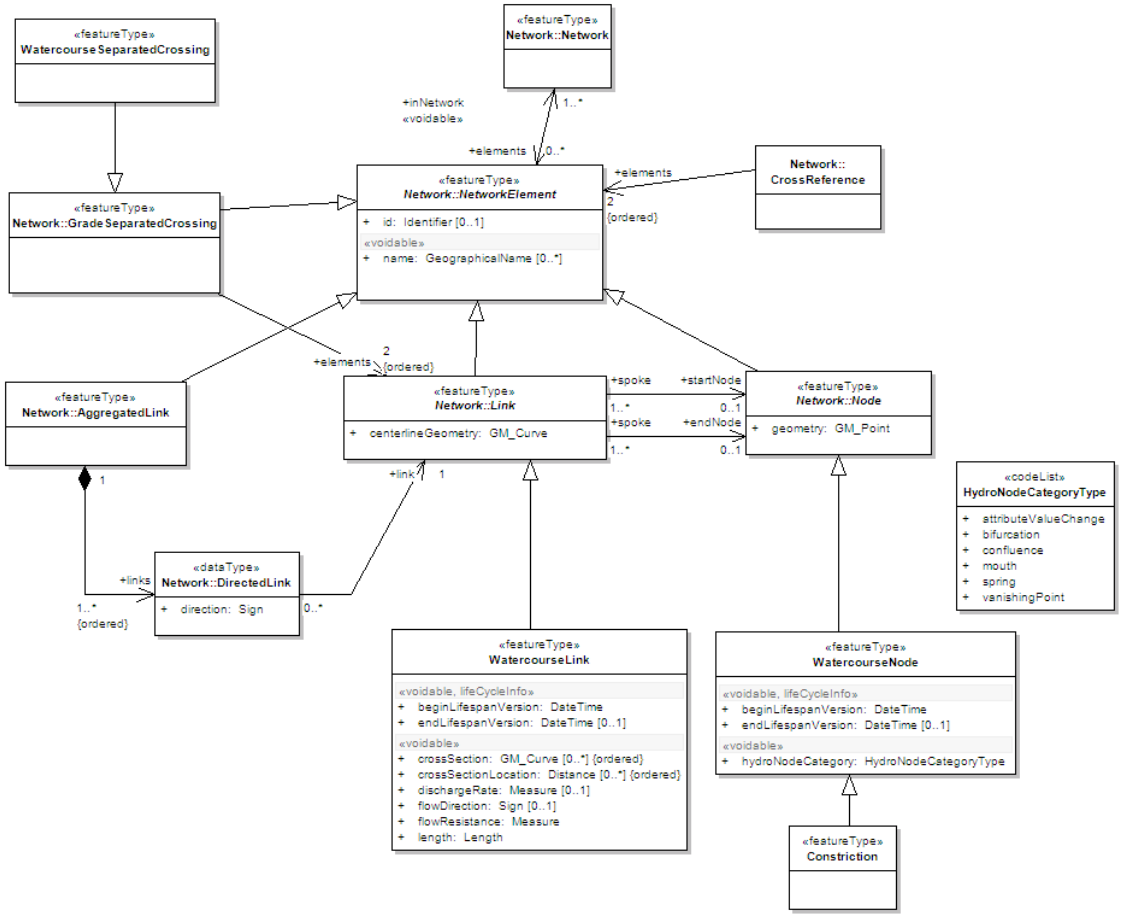


Fig. 2 - INSPIRE data model for Hydrography: Network (source: INSPIRE portal)

The Node feature type represents a significant position in the network. It is always the beginning or the end of a Link feature type. In the Hydrography model the Node feature type is the abstract parent of WatercourseNode so that it inherits the public attributes of Node and it can be characterised by the attribute HydroNodeCategoryType. It is included in the model a special WatercourseNode named Constriction to connect this package with the RelatedObjects one (see Figure 9, Figure 10 and Figure 11).

The Link feature type represents centreline segments in the network connecting two different Node features. In the hydrography model the Link feature type is the abstract parent of WatercourseLink so that it inherits the public attributes of Link.

The GradeSeparatedCrossing feature identifies pairs of elements of the network which intersects in 2D but not in 3D (crossing at a different level). In the hydrography model it is

the abstract parent of WatercourseSeparatedCrossing so that it inherits the public attributes of GradeSeparatedCrossing.

The CrossReference relationship serves to associated two different elements of the network.

ManagementAndReporting package

Package based on the WFD reporting needs to cover reporting use case.

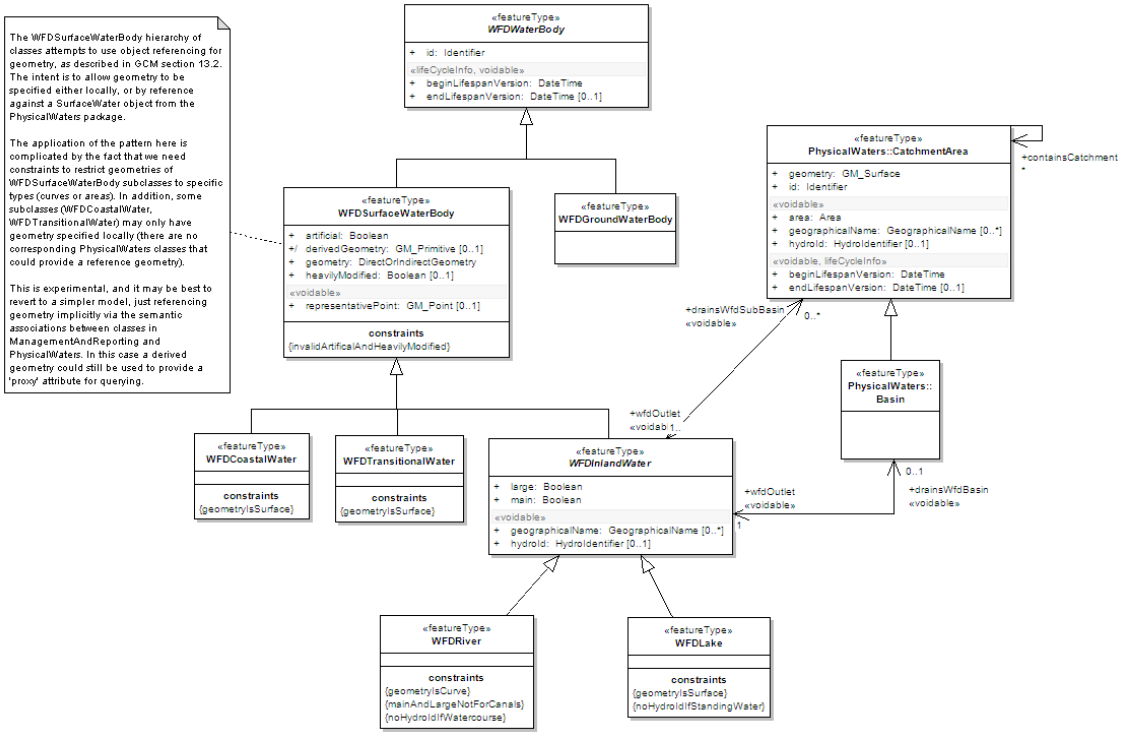


Fig. 3 - INSPIRE data model for Hydrography: ManagementAndReporting (source: INSPIRE portal)

It includes the base feature type, named WFDWaterBody, which has a unique identifier and it is the parent of WFDSurfaceWaterBody, included in the model, and WFDGroundWaterBody that should be defined in the Geology theme of Annex II.

WFDSurfaceWaterBody has attributes to distinguish its origin according to the WFD (natural, artificial or heavily modified) and a geometry that could be defined directly or by association to another object (see Figure 4). Its attributes are inherited by WFDCostalWaters, WFDTransitionalWaters and WFDInlandWaters, parent of WFDLake and WFDRiver.

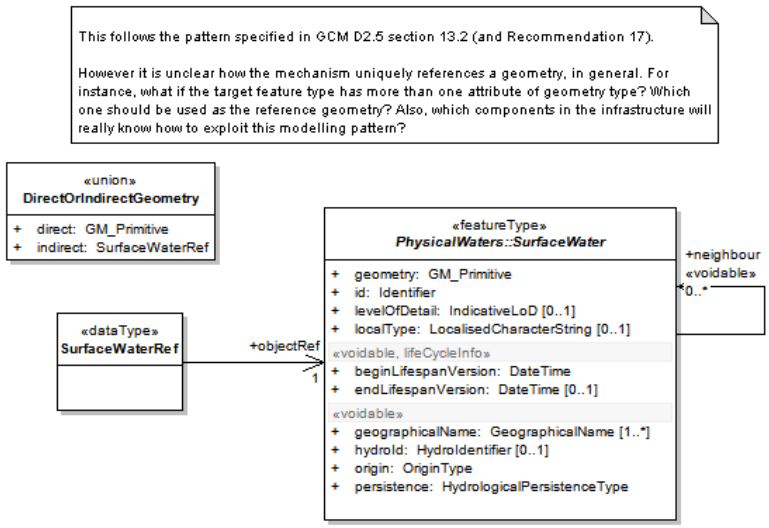


Fig. 4 - INSPIRE data model for Hydrography: data type SurfaceWaterRef (source: INSPIRE portal)

WFDInlandWaters is classified by attributes according to the WFD as large or main.

This package has apparent overlaps with the Physical Waters package but as not always reporting units are equivalent to the natural units, several relationships has been defined in the Relationships package (see Figure 16).

PhysicalWaters package

Hydrography is mapped, quite often, as an orientation elements or reference.

The PhysicalWaters package lists CatchmentArea, Basin, SurfaceWater, Watercourse, StandingWater, LandWaterBoundary, Sea, Foreshore, Riverbank, Wetland and GlacierSnowfield, detailed in Figure 5.

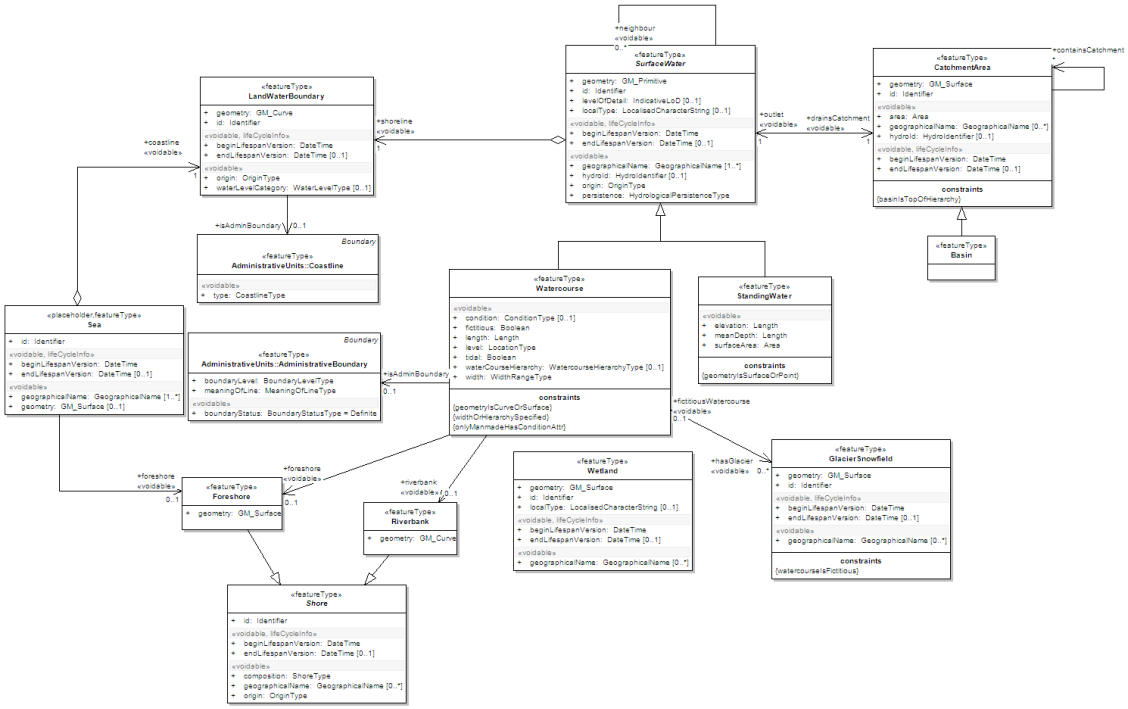


Fig. 5 - INSPIRE data model for Hydrography: PhysicalWaters (source: INSPIRE portal)

Some hydrographic elements are used to define administrative units; this overlap with the INSPIRE Administrative Units theme is modelled through the association between Watercourse and LandWaterBoundary feature types with the AdministrativeBoundary feature type from the Administrative Units theme.

RelatedObjects package

Spatial analysis of hydrographic network may be interested on flooding models or impact of water contamination; maps include elements as aqueducts, falls or geysers which are not relevant for spatial analysis or reporting. From the analysis of the use cases it makes clear that other elements are necessary although they cannot be considered properly Hydrography, they are included in this package as placeholders for objects of Annex III themes.

RelatedObjects package is subdivided in three sub-packages: HydroFacility (Figure 6), HydroPointOfInterest (Figure 7) and ManMadeObject (Figure 8).

The HydroFacility contains spatial objects corresponding to hydrographic facilities: AbstractPoint, DischargePoint, MonitoringPoint and Pipe.

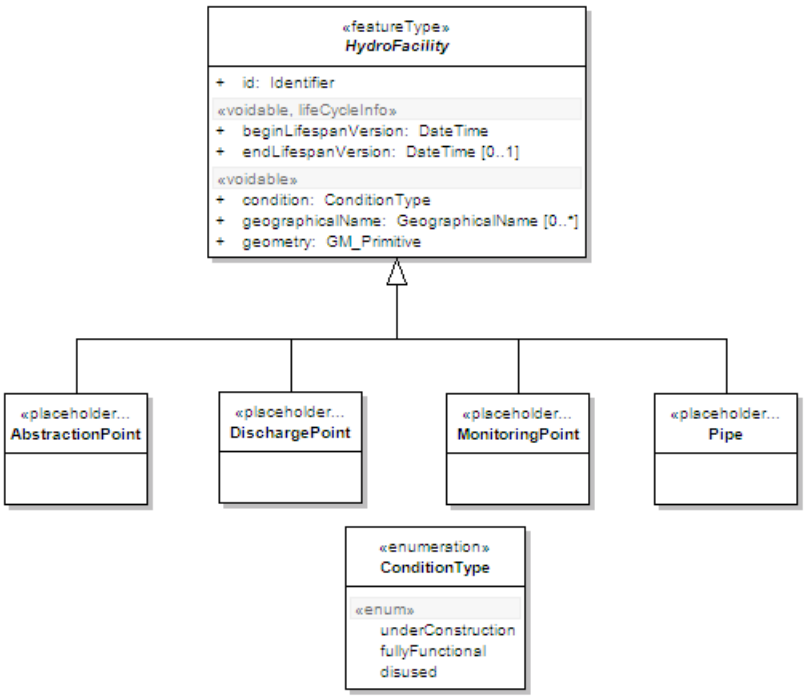


Fig. 6 - INSPIRE data model for Hydrography: HydroFacility (source: INSPIRE portal)

The HydroPointOFInterest contains spatial objects of hydrographic interest, especially for orientation purposes: SpringOrSeep, FluvialPoint –Rapids and Falls- and VanishingPoint.

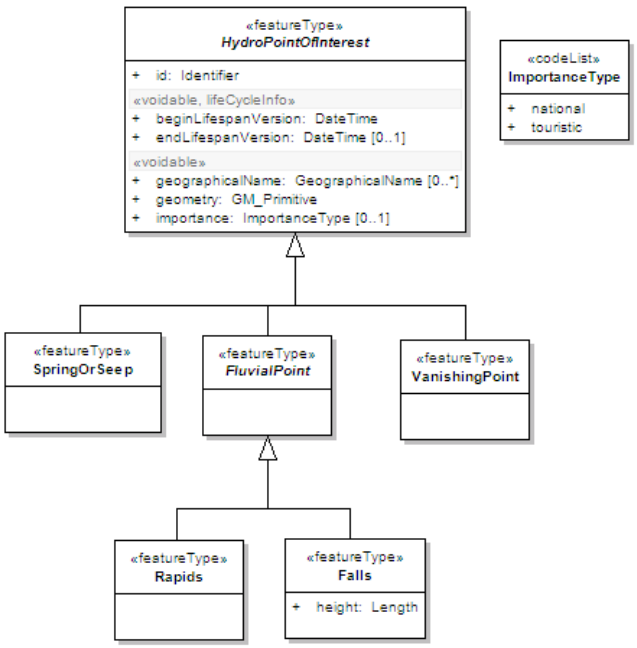


Fig. 7 - INSPIRE data model for Hydrography: HydroPointOfInterest (source: INSPIRE portal)

The ManMadeObject package contains spatial objects corresponding to man-made objects associated to the hydrographic network: Crossing –SubsurfaceCrossing and SurfaceCossing-. ShorelineConstruction, Embankment, InteriorManMadeObject -DamOrWeir, Lock, Ford and Sluice-.

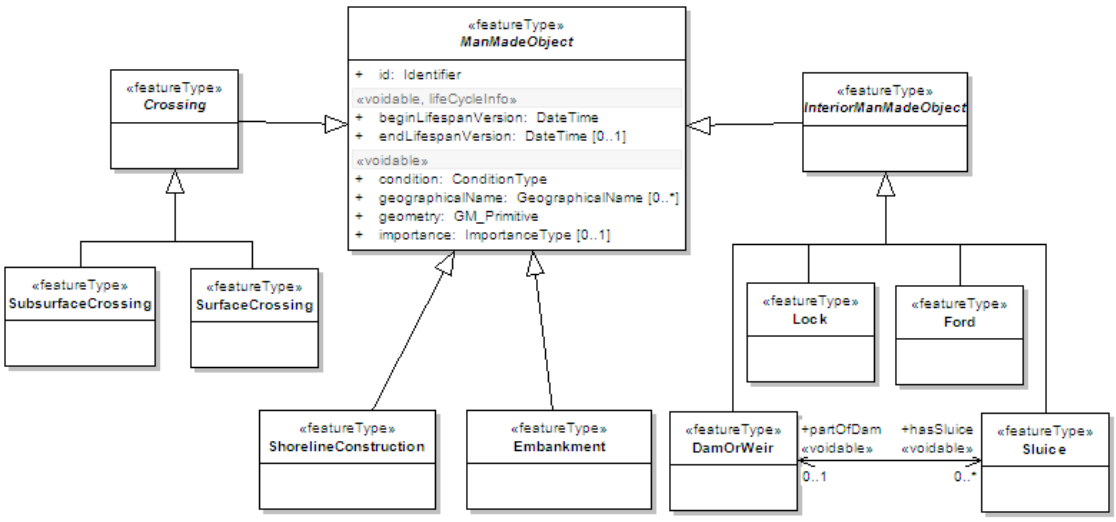


Fig. 8 - INSPIRE data model for Hydrography: ManMadeObject (source: INSPIRE portal)

Relationships package

This package contains a Group of diagrams showing the relationships between different model component packages.

As it is mentioned before RelatedObjects feature type as HydroFalicility AbstractPoint and DischargePoint, HydroPointOfInterest feature types and ManMadeObject can be considered a Constriction from the Network point of view because they point out changes on the quality or quantity of water flow.

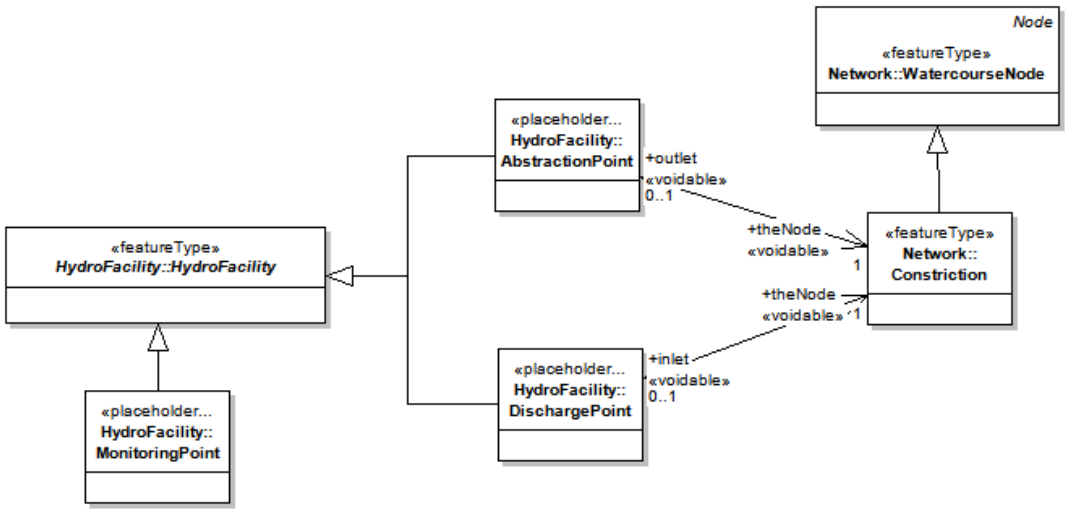


Fig. 9 - INSPIRE data model for Hydrography: HydroFacility and Network (source: INSPIRE portal)

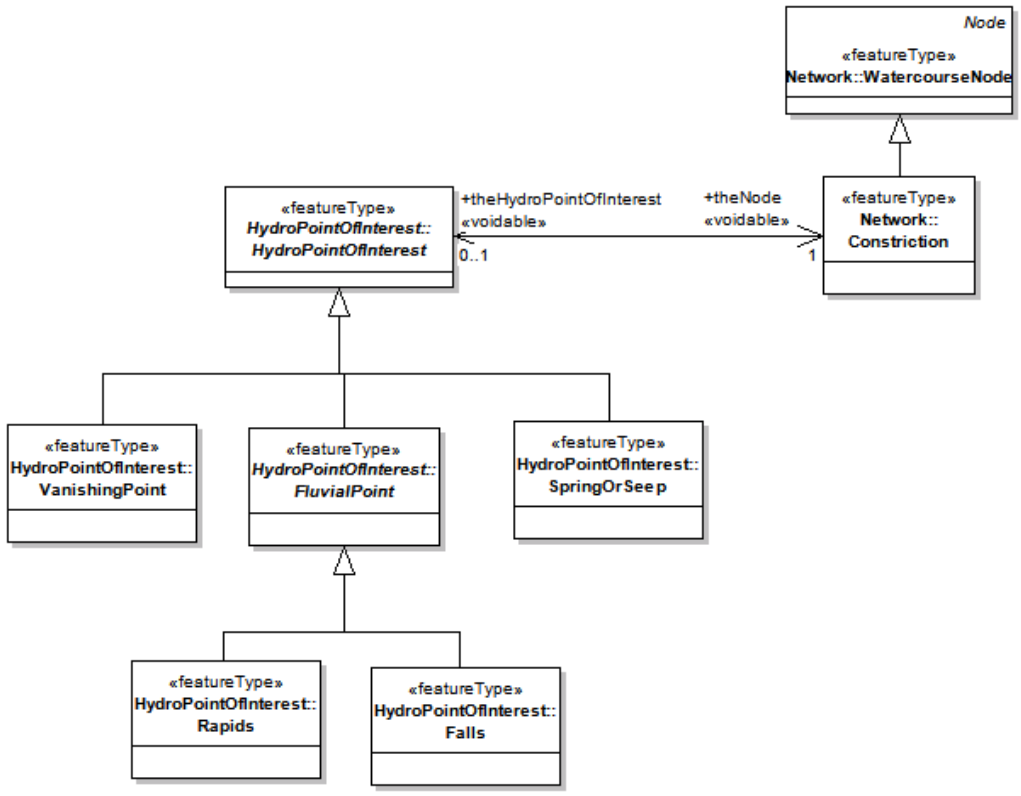


Fig. 10 - INSPIRE data model for Hydrography: HydroPointOfInterest and Network (source: INSPIRE portal)

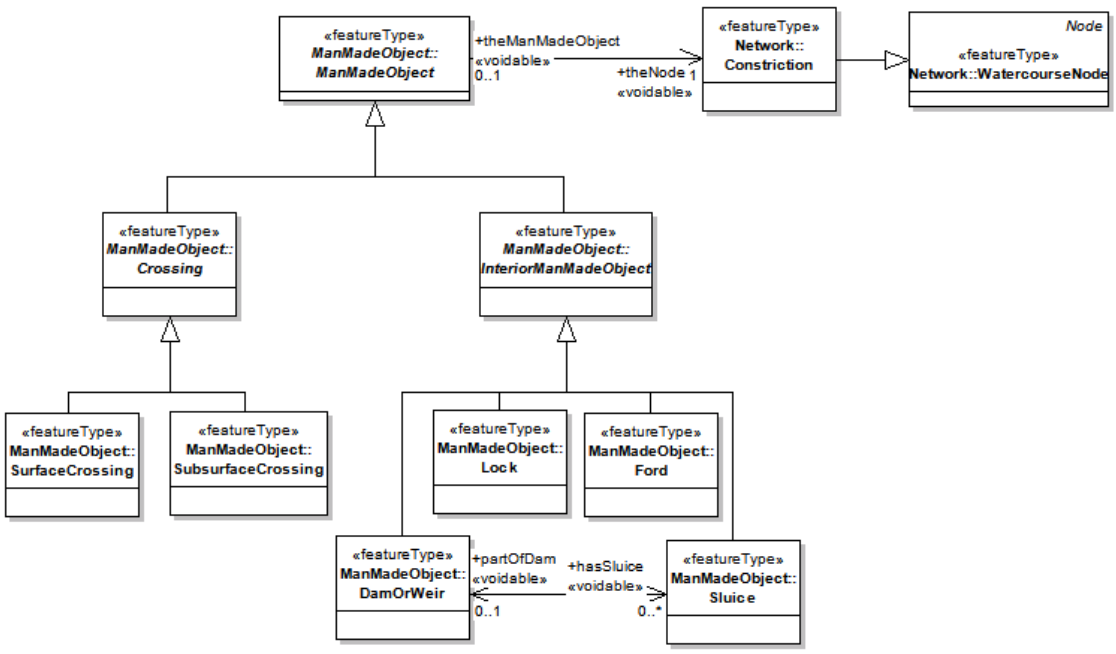


Fig. 11 - INSPIRE data model for Hydrography: ManMadeObject and Network (source: INSPIRE portal)

The PhysicalWaters feature types StandingWater and Watercourse are associated to the Network feature type WatercourseLink and the feature types Wetland, GlacierSnowfield, StandingWater, Wetland and Sea of PhysicalWaters are associated with the WatercourseNode of Network package.

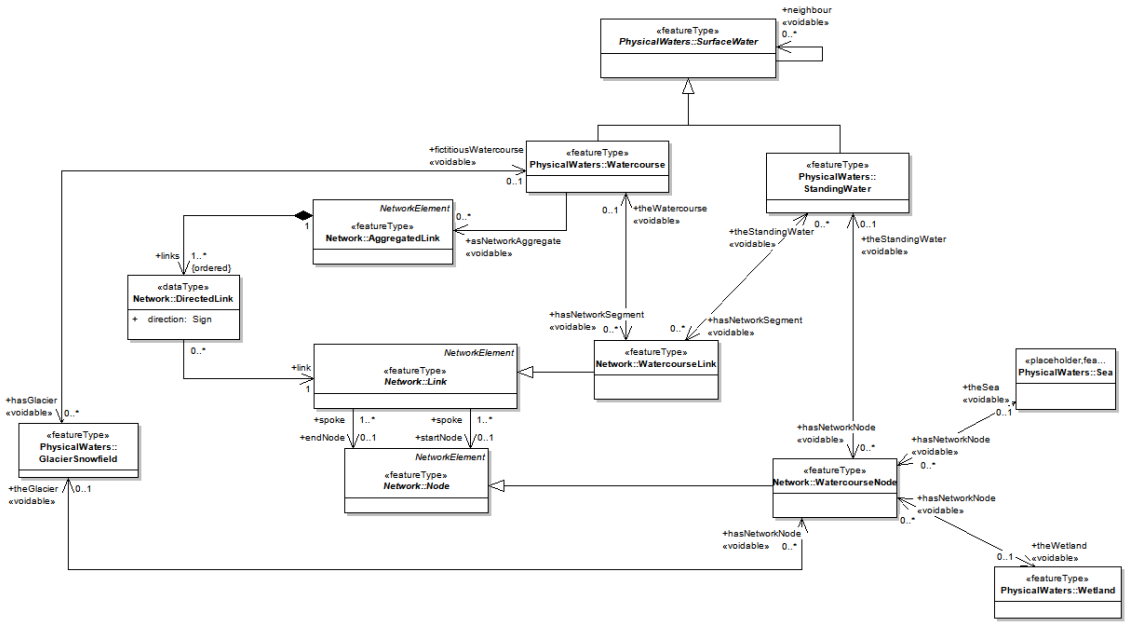


Fig. 12 - INSPIRE data model for Hydrography: PhysicalWaters and Network (source: INSPIRE portal)

The relationship between the HydroFacility feature types and the PhysicalWaters feature SurfaceWater indicates that the Hydrofacility is attached to the SurfaceWater.

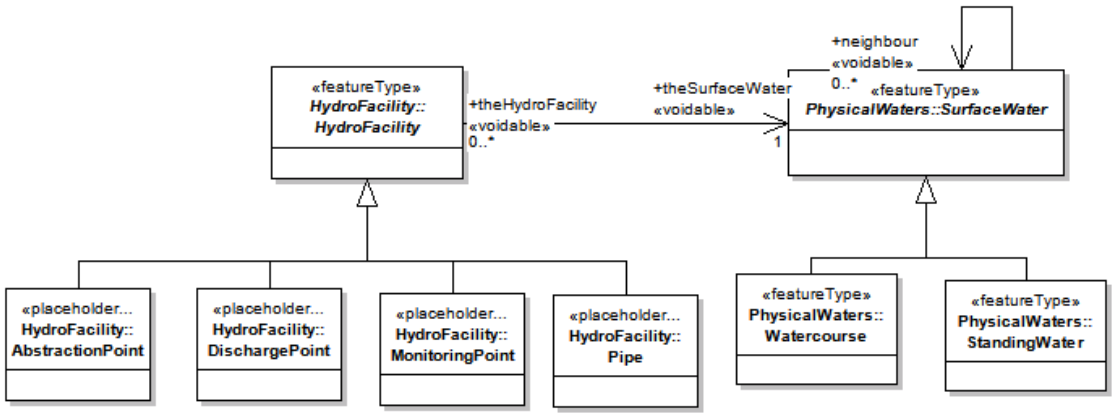


Fig. 13 - INSPIRE data model for Hydrography: HydroFacility and PhysicalWaters (source: INSPIRE portal)

The associations between the RelatedObject feature types -HydroPointOfInterest and ManMadeObject- and the PhysicalWaters feature SurfaceWater indicates reference elements near physical waters.

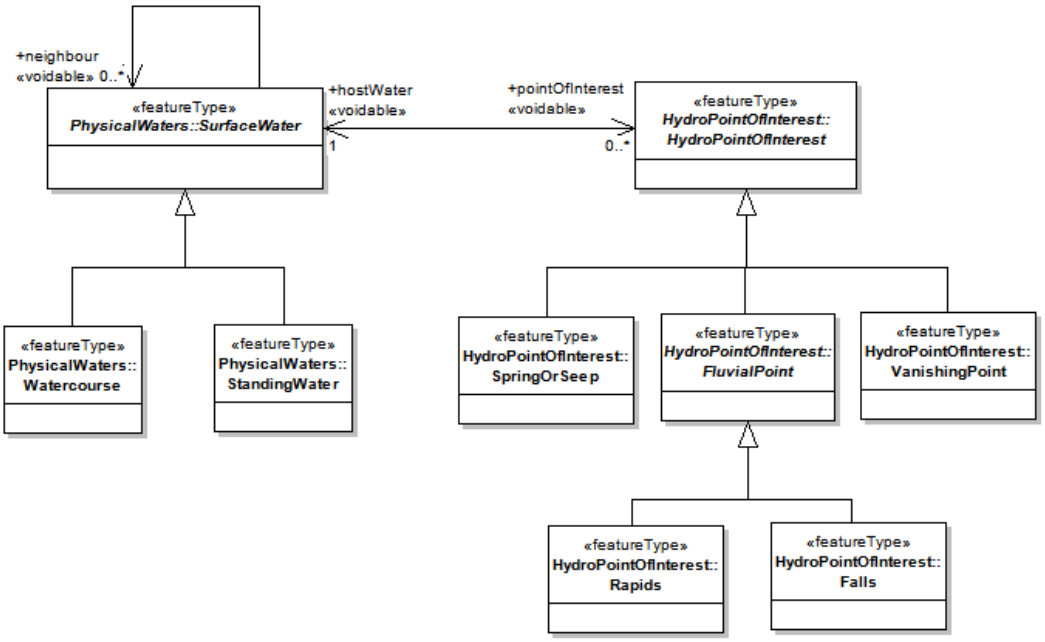


Fig. 14 - INSPIRE data model for Hydrography: HydroPointOfInterest and PhysicalWaters (source: INSPIRE portal)

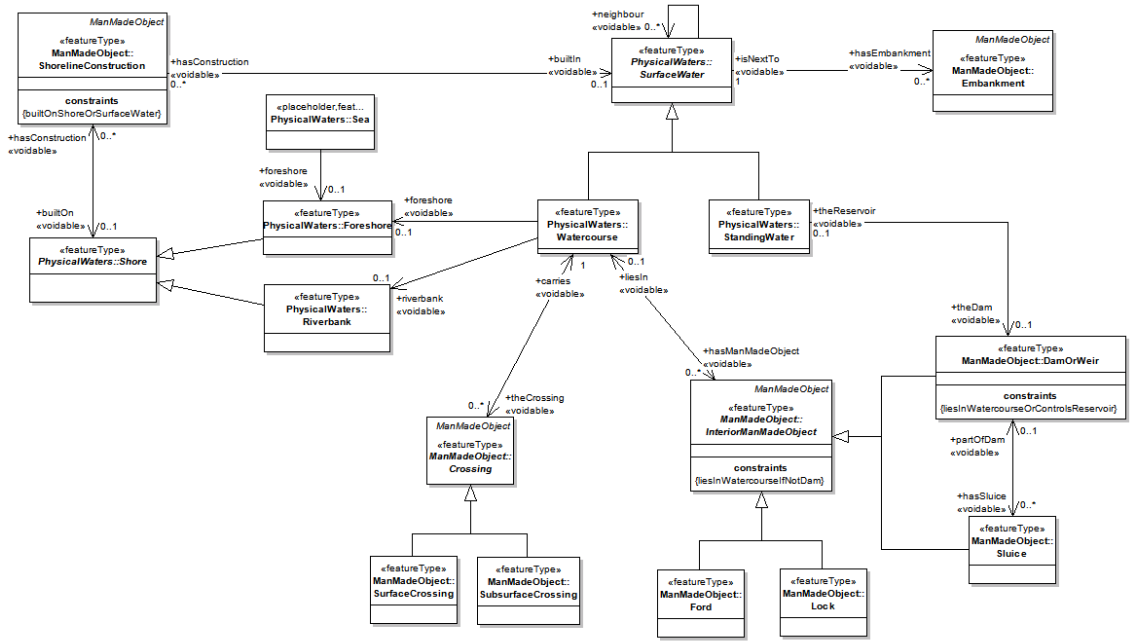


Fig. 15 - INSPIRE data model for Hydrography: ManMadeObject and PhysicalWaters (source: INSPIRE portal)

The PhysicalWaters feature types StandingWater and Watercourse are associated to the ManagementAndReporting feature types WFDLake and WFDRiver respectively. Moreover, the

feature types, Sea and Shore, of PhysicalWaters are associated to the WFDCoastalWaters and WFDTransitionalWaters of ManagementAndReporting package respectively.

There is also a relationship between WFDInlandWater of ManagamentAndReporting feature type and CatchmentArea and Basin of PhysicalWaters package.

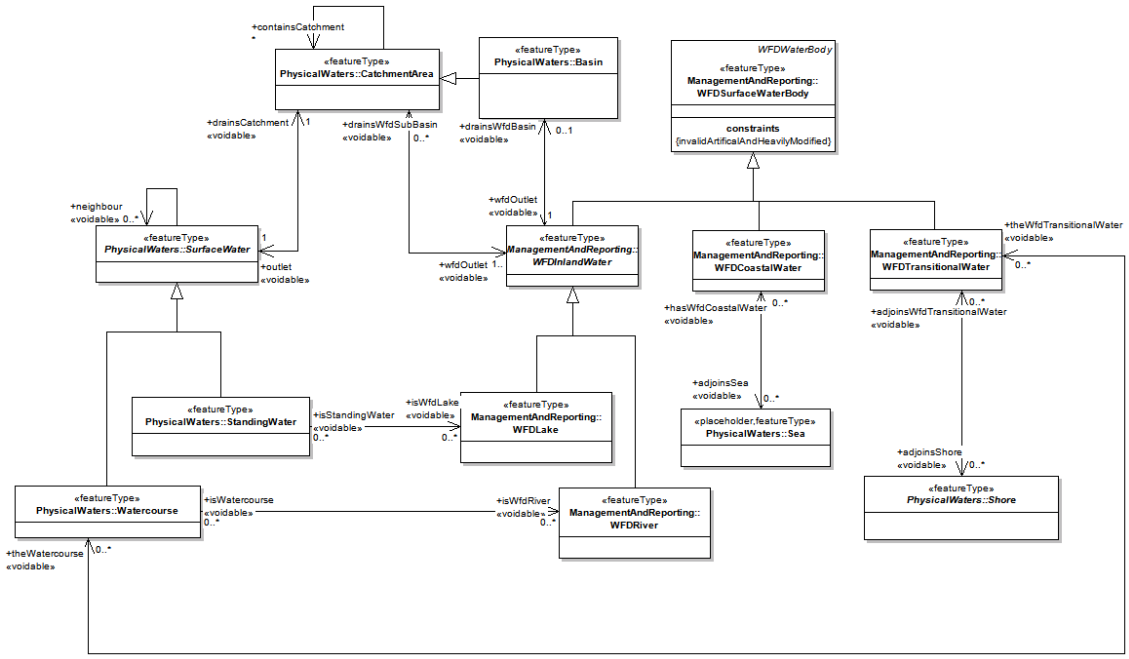


Fig. 16 - INSPIRE data model for Hydrography: PhysicalWaters and ManagementAndReporting (source: INSPIRE portal)

5 Description of the methodology used to compare GIS4EU datasets with INSPIRE data model

The goals of the comparative analysis are:

- Identify the subset of the INSPIRE data model and feature catalogue that can be completed by GIS4EU datasets.
- Find out the problems that may arise at this step of the harmonization process.
- Propose new features to the INSPIRE data model, if some new ones are identified according to INSPIRE context.
- Identify INSPIRE features/attributes that might be not relevant to INSPIRE context, if someone exists.

The analysis is carried out according to the workflow shown in figure 17.

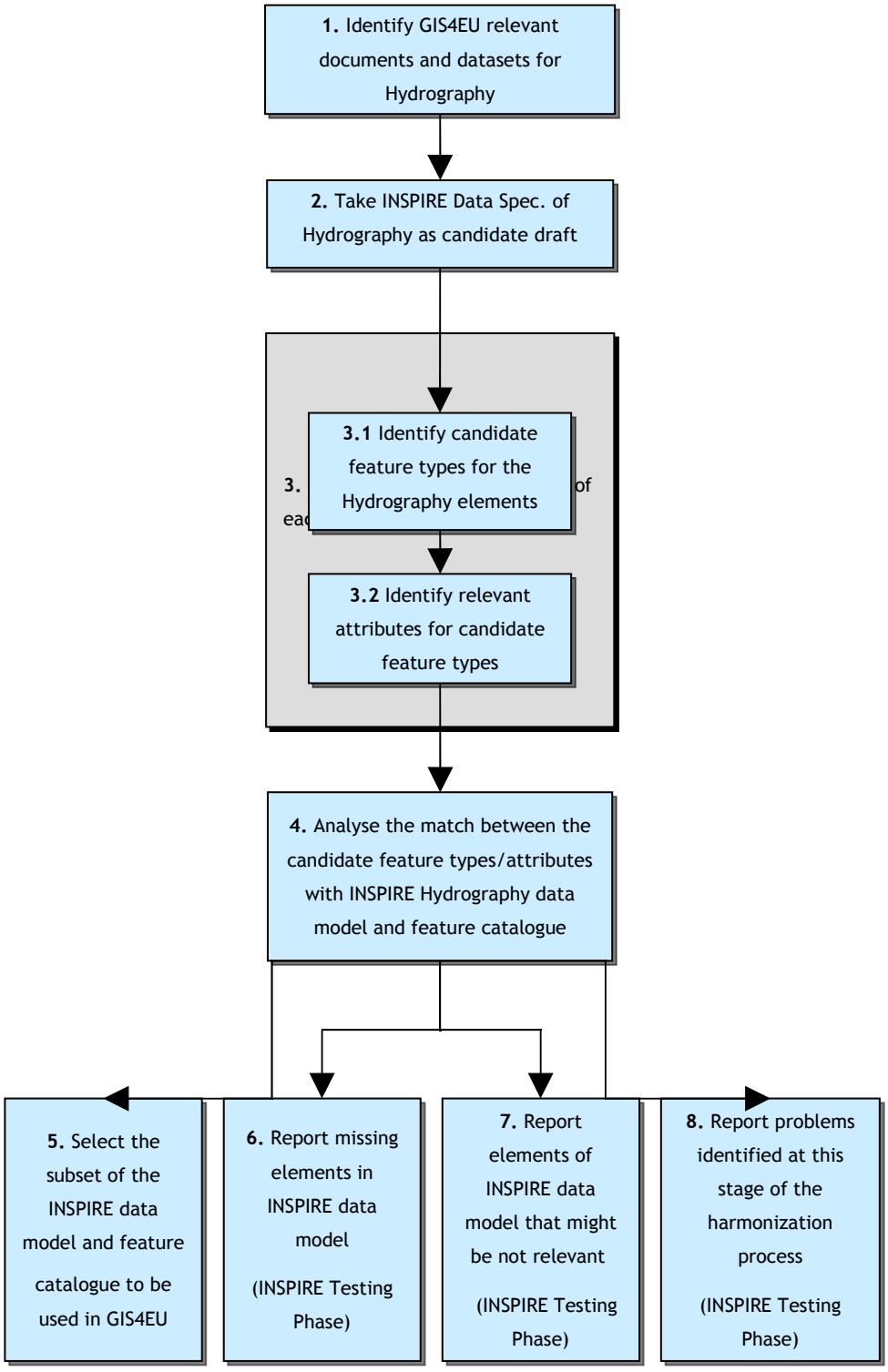


Fig. 17 - Comparative analysis workflow

The document D2.2 elaborated in the project is used to identify the GIS4EU relevant documents and datasets (step 1 of the workflow) and to analyse in detail the contents of each data providers' dataset (step 3). The INSPIRE draft Data Specifications (step 2) used corresponds to the 2nd draft, specially the INSPIRE Consolidated UML Model (INSPIRE Model, 2008) associated to this version.

The analysis of the match (step 4) between each data providers' dataset feature types/attributes with the INSPIRE data model and feature catalogue is carried out by means of a matching table. Table 16 of the Appendix 10.2 describes the structure of the table and gives the definition of each column name.

The result is the pairing up of features and attributes from both data models as well as the classification of their features and attributes according to the following categories:

Code		Matching category description
A		Features/attributes from the dataset that fit on the INSPIRE data model
	A.1	Direct match
	A.2	Match with some semantic or data capture differences which must be stressed
	A.3	Complex match
B		Features/attributes from dataset that are not included in the INSPIRE data model
	B.1	Features/attributes that could be relevant for the INSPIRE directive
	B.2	Features/attributes that could NOT be relevant for the INSPIRE directive
C		Features/attributes from INSPIRE data model that are not included in the dataset
	C.1	Features/attributes that are considered relevant for the INSPIRE directive
	C.2	Features/attributes that might be considered NOT relevant for the INSPIRE directive

Table 2 - Classification of features and attributes according to the matching

Class A features and attributes constitute the selected subset (step 5) of the INSPIRE data model and feature catalogue to be used in the project, that is to say the common GIS4EU Hydrography data model.

The features and attributes of the class B are analysed in detail in order to decide if some of them should be proposed for inclusion (step 6) in the INSPIRE data model and feature catalogue in the INSPIRE testing phase. The figure 18 describes the decision flow for Class A and Class B features and attributes.

The features and attributes of the class C are not present in the dataset analysed but they have been considered important in the INPIRE analysis. Therefore the relevance of each of them is discussed and for those that are accepted it is investigated if they might be found in other datasets known by the data provider. On the other hand, those that might be considered not important to INSPIRE context are remarked in the INSPIRE testing phase report (step 7).The figure 19 describes the decision flow for Class C features and attributes.

Finally the significant aspects and problems found at this stage of the harmonization process are summarized and reported (step 8).

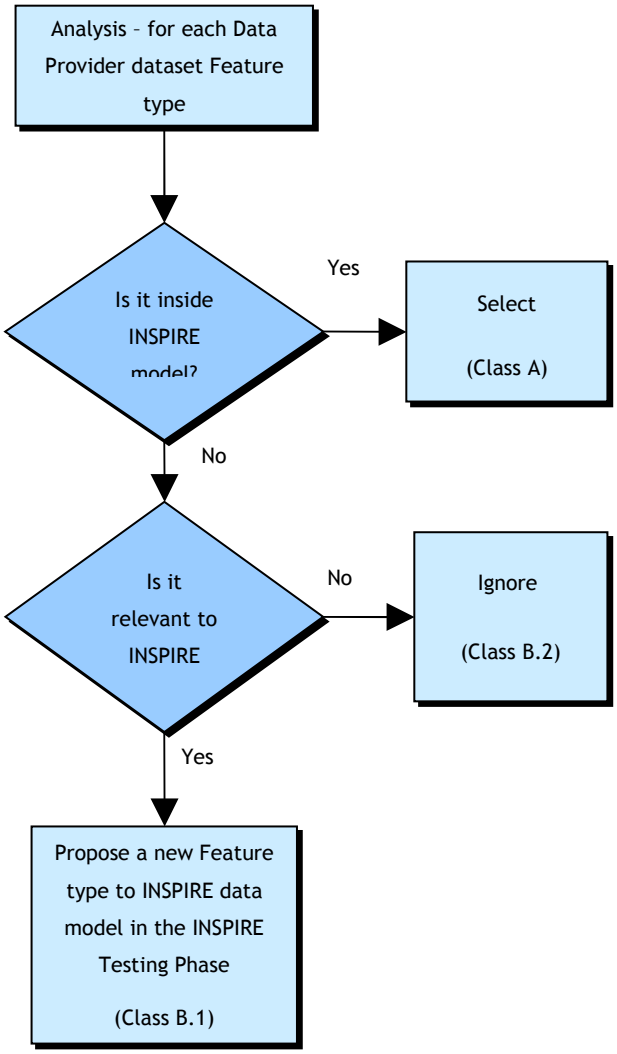


Fig. 18 - Decision flow: Class A and B features and attributes

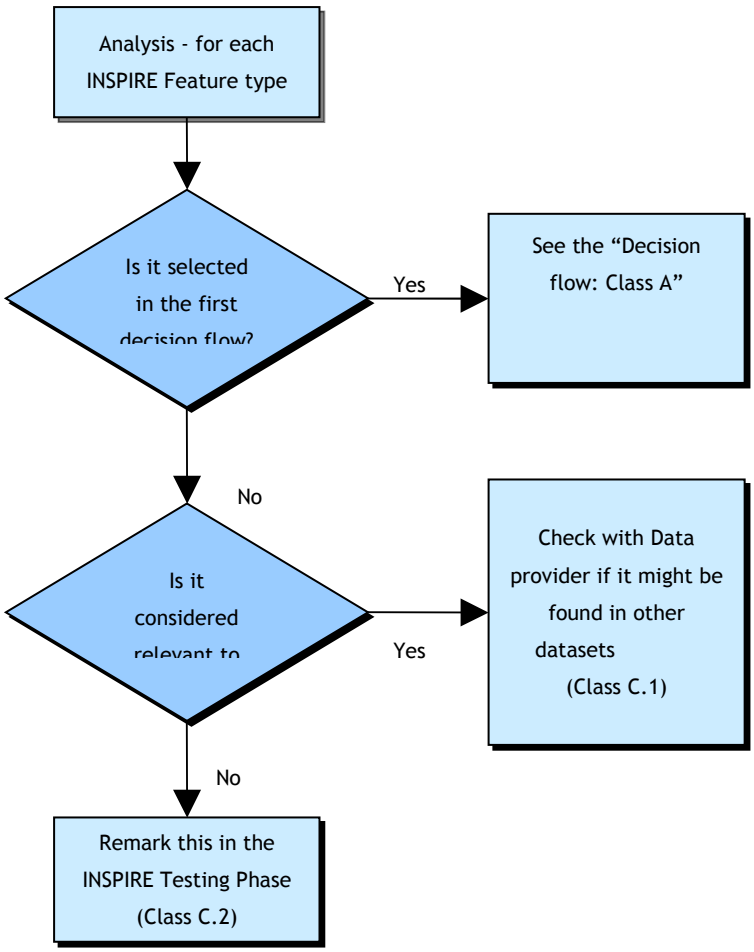


Fig. 19 - Decision flow: Class C features and attributes

6 Comparison of GIS4EU datasets with INSPIRE data model

The GIS4EU available datasets for Hydrography theme are listed in table 15 of Appendix 10.1.

Applying the previously stated methodology, first of all the candidate feature types and attributes are identified for each of the datasets with available information. Next, the match between the candidate feature types and attributes with INSPIRE Hydrography data model and feature catalogue is carried out through the matching tables. Moreover, in order to come up with a realistic and practical critical analysis and fulfil the goals of the GIS4EU Project in the INSPIRE Testing Phase, it is foreseen that data providers supply detailed information at feature and attribute level by means of comments introduced in the matching tables (see the guidelines in Appendix 10.3).

The completed tables of the comparative analysis can be reviewed through the links included in Appendix 10.4. There is one matching table for each Data provider' dataset listed in table 15 of Appendix 10.1. Columns corresponding to the description of the INSPIRE feature catalogue are filled once. Next, they are copied to the corresponding data providers' matching table and used as the target to which the candidate feature types and attributes identified for each sub-theme in each Data provider' dataset feature catalogue have to be matched.

As a summary of the results of the match, the following information is elaborated and presented in this section for each Data provider dataset:

- The table containing the subset of features and attributes from the dataset that fit on the INSPIRE data model. In the comments field there is indication of the type of match according to the types distinguished in Table 2.
- The critical analysis of the matching process. The analysis refers to features and attributes from dataset that are not included in the INSPIRE data model (particularly the identification of possible missing elements in INSPIRE data model), features and attributes from INSPIRE data model that are not included in the dataset (particularly the identification of elements of INSPIRE data model that might be not relevant) and reports the problems found at this stage of the harmonization process.

6.1 Analysis of VUGK/UNIBA SK50-Hydrography Dataset

6.1.1 Feature/attributes from the VUGK/UNIBA SK50-Hydrography Dataset that fit on the INSPIRE Hydrography data model

INSPIRE feature catalogue					UNIBA SK50-Hydrography Dataset feature catalogue				
Target model					Source model				
Feature Name	Feature Definition			Feature Geometry	Feature Name	Feature Definition			Feature Geometry
CatchmentArea				Surface	RiverBasin				Surface
Comments	Regarding the different classifications of catchments the TWG decided that no distinction could be made between catchments / subcatchments since this will vary with application.				Comments	´The area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta.”RiverBasins shall be assigned “to individual river basin districts”."			
Attribute Name	Attribute definition	Attribute type	Attribute cardinality	Possible values	Attribute Name	Attribute definition	Attribute type	Attribute cardinality	Possible values
area	Catchment area	number data type: Area	1		**AREAKM2**	River Basin area in kmxkm	number	1	
hydroid	A thematic identifier used for the object, often (but not	character	Voidable - [0..1]		**MScode**	Member state code of river basin identifier	Voidable - [0..1]	1	

INSPIRE feature catalogue					UNIBA SK50-Hydrography Dataset feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
CatchmentArea				Surface	RiverBasin				Surface
Comments	Regarding the different classifications of catchments the TWG decided that no distinction could be made between catchments / subcatchments since this will vary with application.				Comments	´The area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta.”RiverBasins shall be assigned “to individual river basin districts”."			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
area	Catchment area	number data type: Area	1		**AREAKM2**	River Basin area in kmxkm	number	1	
	specifically) a national hydrological identification code								
geographicalName	A textual identifier or code that is used to denote a feature	data type GeographicalName	Voidable - [0..1]		**Name**	Name of river basin	Voidable - [0..1]	1	

INSPIRE feature catalogue					UNIBA SK50-Hydrography Dataset feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
CatchmentArea				Surface	**RiverBasin**				Surface
Comments	Regarding the different classifications of catchments the TWG decided that no distinction could be made between catchments / subcatchments since this will vary with application.				**Comments**	´The area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta.”RiverBasins shall be assigned “to individual river basin districts”."			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
area	Catchment area	number data type: Area	1		**AREAKM2**	River Basin area in kmxkm	number	1	
Comments					**Comments**				

INSPIRE feature catalogue			UNIBA SK50-Hydrography Dataset feature catalogue		
Target model			**Source model**		
Feature Name	**Feature Definition**	**Feature Geometry**	**Feature Name**	**Feature Definition**	**Feature Geometry**
CatchmentArea		Surface	**SubBasin**		Surface

INSPIRE feature catalogue					UNIBA SK50-Hydrography Dataset feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
CatchmentArea				Surface	RiverBasin				Surface
Comments	Regarding the different classifications of catchments the TWG decided that no distinction could be made between catchments / subcatchments since this will vary with application.				Comments	´The area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta.”RiverBasins shall be assigned “to individual river basin districts”."			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
area	Catchment area	number data type: Area	1		**AREAKM2**	River Basin area in kmxkm	number	1	
Comments	Regarding the different classifications of catchments the TWG decided that no distinction could be made between catchments / subcatchments since this will vary with application.]				Comments	The area of land from which all surface run-off flows through a series of streams, rivers and, possibly, lakes to a particular point in a water course (normally a lake or a river confluence)			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
hydroid	A thematic identifier used for the object, often	character	Voidable - [0..1]		**SB_ID**	Unique code, which should link to the coding	character	Voidable - [0..1]	

INSPIRE feature catalogue					UNIBA SK50-Hydrography Dataset feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
CatchmentArea				Surface	**RiverBasin**				Surface
Comments	Regarding the different classifications of catchments the TWG decided that no distinction could be made between catchments / subcatchments since this will vary with application.				**Comments**	´The area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta.”RiverBasins shall be assigned “to individual river basin districts”."			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
area	Catchment area	number data type: Area	1		**AREAKM2**	River Basin area in kmxkm	number	1	
	(but not specifically) a national hydrological identification code					used for the river network			
geographicalName	A textual identifier or code that is used to denote a feature	data type GeographicalName	Voidable - [0..1]		**Name**	Localy name	Voidable - [0..1]	1	

INSPIRE feature catalogue					UNIBA SK50-Hydrography Dataset feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
CatchmentArea				Surface	RiverBasin				Surface
Comments	Regarding the different classifications of catchments the TWG decided that no distinction could be made between catchments / subcatchments since this will vary with application.				Comments	´The area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta.”RiverBasins shall be assigned “to individual river basin districts”."			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
area	Catchment area	number data type: Area	1		**AREAKM2**	River Basin area in kmxkm	number	1	
Comments					Comments				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	LakeWaterBody	A body of standing inland surface water			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinal**	**Possible values**

INSPIRE feature catalogue					UNIBA SK50-Hydrography Dataset feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
CatchmentArea				Surface	RiverBasin				Surface
Comments	Regarding the different classifications of catchments the TWG decided that no distinction could be made between catchments / subcatchments since this will vary with application.				Comments	´The area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta.”RiverBasins shall be assigned “to individual river basin districts”."			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
area	Catchment area	number data type: Area	1		**AREAKM2**	River Basin area in kmxkm	number	1	
								ity	
hydroid	A thematic identifier used for the object, often (but not specifically) a national hydrological identification code.	"data type HydroIndentifier"	Voidable - [0..1]		**MS_CD**	Member state code lake water body	character	Voidable - [0..1]	

INSPIRE feature catalogue					UNIBA SK50-Hydrography Dataset feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
CatchmentArea				Surface	RiverBasin				Surface
Comments	Regarding the different classifications of catchments the TWG decided that no distinction could be made between catchments / subcatchments since this will vary with application.				Comments	´The area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta.”RiverBasins shall be assigned “to individual river basin districts”."			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
area	Catchment area	number data type: Area	1		**AREAKM2**	River Basin area in kmxkm	number	1	
Comments					Comments				
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**

INSPIRE feature catalogue					UNIBA SK50-Hydrography Dataset feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
CatchmentArea				Surface	**RiverBasin**				Surface
Comments	Regarding the different classifications of catchments the TWG decided that no distinction could be made between catchments / subcatchments since this will vary with application.				**Comments**	´The area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta.”RiverBasins shall be assigned “to individual river basin districts”."			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
area	Catchment area	number data type: Area	1		**AREAKM2**	River Basin area in kmxkm	number	1	
GeographicalName	A textual identifier or code that is used to denote a feature.	data type GeographicalName	Voidable - [0..*]		**NAME**	Name of the lake	character	Voidable - [0..*]	
Comments					**Comments**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
WatercourseLink	A segment of a watercourse within a hydrographic network			Curve	**RiverSegment**	river segments are simple line features with nodes at the endpoints			line

INSPIRE feature catalogue					UNIBA SK50-Hydrography Dataset feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
CatchmentArea				Surface	RiverBasin				Surface
Comments	Regarding the different classifications of catchments the TWG decided that no distinction could be made between catchments / subcatchments since this will vary with application.				Comments	´The area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta.”RiverBasins shall be assigned “to individual river basin districts”."			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
area	Catchment area	number data type: Area	1		**AREAKM2**	River Basin area in kmxkm	number	1	
Comments					Comments				
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
id	The identity of the element	data type Identifier	1		**SEG_CD**	The unique code of the River Segment	Character	1	

INSPIRE feature catalogue					UNIBA SK50-Hydrography Dataset feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
CatchmentArea				Surface	**RiverBasin**				Surface
Comments	Regarding the different classifications of catchments the TWG decided that no distinction could be made between catchments / subcatchments since this will vary with application.				**Comments**	´The area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta.”RiverBasins shall be assigned “to individual river basin districts”."			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
area	Catchment area	number data type: Area	1		**AREAKM2**	River Basin area in kmxkm	number	1	
Comments					**Comments**				
geographicalName	The name for this element	data type GeographicalName	Voidable - [0..*]		**NAME**	The locally applicable name for the River Segment	character	Voidable - [0..*]	
Comments					**Comments**				

INSPIRE feature catalogue					UNIBA SK50-Hydrography Dataset feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
CatchmentArea				Surface	RiverBasin				Surface
Comments	Regarding the different classifications of catchments the TWG decided that no distinction could be made between catchments / subcatchments since this will vary with application.				Comments	´The area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta.”RiverBasins shall be assigned “to individual river basin districts”."			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
area	Catchment area	number data type: Area	1		**AREAKM2**	River Basin area in kmxkm	number	1	
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**

INSPIRE feature catalogue					UNIBA SK50-Hydrography Dataset feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
CatchmentArea				Surface	**RiverBasin**				Surface
Comments	Regarding the different classifications of catchments the TWG decided that no distinction could be made between catchments / subcatchments since this will vary with application.				**Comments**	´The area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta.”RiverBasins shall be assigned “to individual river basin districts”."			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
area	Catchment area	number data type: Area	1		**AREAKM2**	River Basin area in kmxkm	number	1	
flowDirection	Direction of water flow in the segment relative to digitisation of segment geometry	enumeration	Voidable - [0..1]	positive negative	FLOWDIR	Direction of water flow in the segment relative to digitisation of segment geometry	character	W,A	
Comments					**Comments**				

Table 3 - Features/attributes from the VUGK/UNIBA SK50-Hydrography Dataset that fit on the INSPIRE Hydrography data model

6.1.2 Critical analysis of the **VUGK/UNIBA SK50-Hydrography** dataset matching process for Hydrography

A. General comments to matching process: VUGK/UNIBA data model versus INSPIRE

1. Hydrological data model (VUGK/UNIBA SK50) was analysed. This data Model corresponds with WFD.

2. Feature types with correspondence to INSPIRE set were extracted from complex WFD compliant data model of data provider.

3. Thematic attributes for provider dataset were specified similar way - thematic attributes were selected which existing data.

4. WFD feature types specified in INSPIRE data model were not included in to provider data set because special coding system used for EU-CD (WFD) - ID attribute of each feature type. UNIBA tested special hierarchical coding system and it is not standard for Slovakia.

B. INSPIRE features and attributes that are not included in the relevant features in the VUGK /UNIBA datasets

CatchmentArea beginLifespanVersion
CatchmentArea endLifespanVersion
CatchmentArea id
StandingWater localType
StandingWater lod
StandingWater nationalId
StandingWater origin
StandingWater persistence
StandingWater elevation
StandingWater meanDepth
StandingWater surfaceArea
WatercourseLink beginLifespanVersion
WatercourseLink endLifespanVersion
WatercourseLink crossSection
WatercourseLink dischargeRate
WatercourseLink flowResistence
WatercourseLink length
WatercourseLink crossSectionLocation

C. Relevant features and attributes from UNIBA dataset that are included in the INSPIRE data model

RiverBasin	Area
RiverBasin	MSCode
SubBasin	SubBasinID
SubBasin	Name
LakeWaterBody	MSCode
LakeWaterBody	Name
RiverSegment	SegmentCode
RiverSegment	Name
RiverSegment	FlowDirection

D. Problems of matching process - critical analysis

INSPIRE model contains duplicate definitions of hydrological features: Standing water – WFDLake, Watercourse - WFDriver. Proposal: Insert EU_CD code content into INSPIRE ID feature attributes.

INSPIRE model does not contain ground water features, ecoregion and administrative hydrological units. Proposal: To add WFD feature classes with environmental context in the INSPIRE data model – GroundWaterBody, Ecoregion.

Relation between INSPIRE ID value domain of main hydrological features and WFD ID value domain is not explicit in INSPIRE model.

References

https://inspire-twg.jrc.it/inspire-model/

Web sources

http://gis.fns.uniba.sk/cgi-bin/mapserv?map=/home/roman/public_html/wfd.map

http://158.195.46.74/wfd

6.2 Analysis of ICC BT5M Dataset

6.2.1 Features/attributes from the **ICC BT5M** dataset that fit on the INSPIRE Hydrography data model

INSPIRE feature catalogue					**Data provider ICC (dataset BT5M)**				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
LandWaterBoundary	The line where a land mass is in contact with a body of water.			Curve	**Natural coast**	It is the line that delimits the natural contour that determines the high water level.			Line
					Water mass	Mass of water, continental or marine, natural or artificial. [Note: borders of water mass are included in the feature with line geometry]			Line, Polygon
					Quay, breakwater	Work constructed near the sea or a fluvial course to facilitate the boarding or disembarkation of people or merchandise, to be used like refuge of ships, to form a dock of defence against the waves, or constructed perpendicularly to the coast or the margin of a fluvial course, to change the current or to protect the margins. [Note: borders of quay, breakwater are included in the feature with line geometry]			Line, Polygon
					Dam and barrage	Construction of concrete or earth destined to the water retention.			Line, Polygon
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**

INSPIRE feature catalogue					Data provider ICC (dataset BT5M)				
Target model					**Source model**				
Origin	Origin of the land-water boundary	enumeration	voidable - 1	**natural** **manMade**	**Tipus_MAI**	Type of **Water mass**	Character	1	**F, E, L** **C**
waterLevelCategory	Water-level defining the LandWaterBoundary (high water, low water).	enumeration	Voidable - [0..1]	**lowWater** **highWater** **other**					
Comments	The attribute **waterLevelCategory** needs more values.				Comments	**A2** The attribute **origin** takes the value **manMade** for **Quay, breakwater** and **Dam and Barrage** and takes the value **natural** for **Natural coast;** for **Water mass** it can take both values depending on the attribute **Tipus_MAI** or spatial analysis. The attribute **waterLevelCategory** takes the **other** value.			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Sea	An area of water which normally has tidal fluctuations			Surface	**Water mass**	Mass of water, continental or marine, natural or artificial. [Note: Sea is distinguished by attributes]			Line, Polygon
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
					Tipus_MAI	Type of **Water mass**	Character	1	**M**

INSPIRE feature catalogue					Data provider ICC (dataset BT5M)				
Target model					**Source model**				
Comments					Comments	**A2** The attribute distinguishes sea from other mass of water. The sea borders came from the following feature types: **Natural coast**, **Quay, Breakwater** and **Virtual line**.			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Riverbank	The limit line between the water area of a river and the area of land.			Curve	**Riverbank**	Bed of the fluvial course that is occupied by waters at ordinary swelling.			Line, Polygon
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Origin	Origin of the feature (whether natural or man-made)	enumeration	voidable - 1	**natural** **manmade**					
Comments					Comments	**A2** The **origin** attribute is always **natural**			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**Water mass**	Mass of water, continental or marine, natural or artificial. [NOTE: Lakes and reservoirs are included]			Line, Polygon
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**

INSPIRE feature catalogue					Data provider ICC (dataset BT5M)				
Target model					**Source model**				
Origin	Origin of the feature (whether natural or man-made)	enumeration	voidable - 1	**natural** **manMade**	**Tipus_MAI**	Type of **Water mass**	Character	1	**L** **E**
Elevation	Elevation above mean sea level [based on EuroRegionalMap]	number data type: Decimal	voidable - 1						
surfaceArea	Surface area of the body of water	number data type: Area	voidable - 1						
Comments					Comments	**A2** The polygon borders came from the following feature types: **Water mass**, **Dam and Barrage**, **Quay, Breakwater** and **Virtual line**. The **origin** attribute can be **natural** for lakes and **manMade** for reservoirs according to the values of **Tipus_MAI.** The **elevation** attribute can be obtained through the z coordinate of the element for lakes but for reservoirs the coordinate given is that of maximum capacity The **surfaceArea** attribute can be obtained measuring the polygon area			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Watercourse	A natural or man-made flowing watercourse or stream.			Surface	**Water mass**	Mass of water, continental or marine, natural or artificial.			Line, Polygon

INSPIRE feature catalogue					Data provider ICC (dataset BT5M)				
Target model					**Source model**				
				Curve	**Watercourse**	Natural water current, permanent or no permanent.			Line
					Canal, irrigation ditch, irrigation channel	Opened sky construction, made of earth or concrete, destined to transport water of rivers, dams, ponds or underground conductions with irrigation purposes, navigation, drainage or industrialists.			Line
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Origin	Origin of the feature (whether natural or man-made)	enumeration	voidable - 1	**natural** **manMade**	**Tipus_MAI**	Type of **Water mass**	Character	1	**F** **C**
LevelOfDetail	An indicative 'level-of-detail' for this object: the object is relevant at scales from this level of detail and greater (i.e. objects won't normally be relevant below a certain LoD); at lower scales generalisation rules apply for portrayal and visualisation.	enumeration	[0..1]	**European** **National** **Regional** **Local**					

INSPIRE feature catalogue					Data provider ICC (dataset BT5M)				
Target model					**Source model**				
Condition	The state of planning, construction, repair, and/or maintenance of the structures and/or equipment comprising a facility and/or located at a site. Only relevant for man-made watercourse	enumeration	voidable - 1	**underConstruction** **fullyFunctional** **Disused**					
Fictitious	An indication that the geometry of the feature is not well defined, e.g. an underground watercourse	boolean	voidable - 1		**Entorn_MAI**	Situation of **Water mass**	Character	1	**X** **G, X**
					Entorn_FLU	Situation of **Watercourse**	Character	1	**T,M,U,X** **G, X**
					Entorn_CAN	Situation of **Canal, irrigation ditch, irrigation channel**	Character	1	**M,U,X** **G,X**
Level	Vertical location of Watercourse relative to surrounding area	enumeration	voidable - 1	**onGround** **aboveGround** **belowGround**	**Entorn_CAN**	Situation of **Canal, irrigation ditch, irrigation channel**	Character	1	**C**

<table>
<tr><th colspan="3">INSPIRE feature catalogue</th><th colspan="3">Data provider ICC (dataset BT5M)</th></tr>
<tr><th colspan="3">Target model</th><th colspan="3">Source model</th></tr>
<tr><td>Comments</td><td colspan="2">The fictitious attribute could also be: virtual network segment in coastal water area; real underground network segment (pipeline or natural network section); virtual network segment in lake area; virtual network segment in river to connect tributary; virtual network segment in transitional water area</td><td>Comments</td><td colspan="2">A2

Rivers wider than 10m are polygons (Water mass) if not, are lines (Watercourse); Canals wider than 3 m are described by borders and centreline (Water mass) if not they are lines (Canal, irrigation ditch, irrigation channel).

The polygon borders came from the following feature types: Water mass, Dam and Barrage, Quay, Breakwater and Virtual line.

The origin attribute is manMade for Canal, irrigation ditch, irrigation channel; is natural for Watercourse and depending on the Tipus_MAI attribute for Water mass. Watercourses heavily modified are classified as natural.

The levelOfDetail attribute derives from the metadata

The condition attribute is always fullyFunctional

The fictitious attribute is false if Entorn_MAI, Entorn_FLU or Entorn_CAN take the value G; if they take the value X, it means the element is under a bridge (25m).

The level attribute values aboveGround or belowGround can be obtained, in general terms, by spatial analysis (bridge Z) except channels narrower than 3 m that are identified by the attribute.</td></tr>
<tr><th>Feature Name</th><th>Feature Definition</th><th>Feature Geometry</th><th>Feature Name</th><th>Feature Definition</th><th>Feature Geometry</th></tr>
</table>

INSPIRE feature catalogue					Data provider ICC (dataset BT5M)				
Target model					**Source model**				
Wetland	A poorly drained or periodically flooded area where the soil is saturated with water, and vegetation is supported.			Surface	**Land cover, element of**	Area of the territory with a specific cover of the ground.			Line, Polygon
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
					Tipus_COB	Type of **Land cover, element of**	Character	1	**A**
Comments					**Comments**	**A2** The attribute distinguishes wetland from other land cover			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
WatercourseNode	A node within the hydrographic network - may represent a physical confluence, bifurcation/confluence/vanishing point etc, or it may be associated with a hydrographic point of interest or facility.			Point					
Comments					**Comments**	**A3** Instances may be got by spatial analysis.			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
WatercourseLink	A segment of a watercourse within a hydrographic network.			Curve	**Watercourse**	Natural water current, permanent or no permanent.			Line

<table>
<tr><td colspan="5">INSPIRE feature catalogue</td><td colspan="5">Data provider ICC (dataset BT5M)</td></tr>
<tr><td colspan="5">Target model</td><td colspan="5">Source model</td></tr>
<tr><td></td><td colspan="3"></td><td></td><td>Canal, irrigation ditch, irrigation channel</td><td colspan="3">Opened sky construction, made of earth or concrete, destined to transport water of rivers, dams, ponds or underground conductions with irrigation purposes, navigation, drainage or industrialists.</td><td>Line</td></tr>
<tr><td>Attribute Name</td><td>Attribute definition</td><td>Attribute type</td><td>Attribute cardinality</td><td>Possible values</td><td>Attribute Name</td><td>Attribute definition</td><td>Attribute type</td><td>Attribute cardinality</td><td>Possible values</td></tr>
<tr><td>flowDirection</td><td>Direction of water flow in the segment relative to digitisation of segment geometry</td><td>enumeration</td><td>Voidable - [0..1]</td><td>“+”
“-”</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Length</td><td>Length of segment</td><td>number
Data Type: Length</td><td>Voidable - 1</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Comments</td><td colspan="4"></td><td>Comments</td><td colspan="4">A2
FlowDirection attribute can be known by the order of curve points.
Length attribute can be calculated</td></tr>
<tr><td>Feature Name</td><td colspan="2">Feature Definition</td><td colspan="2">Feature Geometry</td><td>Feature Name</td><td colspan="3">Feature Definition</td><td>Feature Geometry</td></tr>
<tr><td>AbstractPoint</td><td colspan="2">Point along a watercourse where water is abstracted from the watercourse
NOTE: Includes cistern or tank</td><td colspan="2">Point
Curve
Surface</td><td>Area of Water</td><td colspan="3">Artificial water enclosure, constructed or excavated, with irrigation purposes, industrialists, of consumption, ornamental or for swimmers (like for example, artificial pond, swimming pool or uncovered tank)</td><td>Line, Polygon</td></tr>
</table>

INSPIRE feature catalogue			Data provider ICC (dataset BT5M)		
Target model			**Source model**		
Comments			Comments	Covered tanks are not included because water tanks are not distinguished from the other ones.	
Feature Name	**Feature Definition**	**Feature Geometry**	**Feature Name**	**Feature Definition**	**Feature Geometry**
DischargePoint	Point along a watercourse where water is discharged into the watercourse NOTE: Includes well	Point Curve Surface	**Well**	Construction for the underground water extraction	Line, Polygon
Comments			Comments	**A2** Other possible objects are not considered	
Feature Name	**Feature Definition**	**Feature Geometry**	**Feature Name**	**Feature Definition**	**Feature Geometry**
Pipe	A tube for the conveyance of solids, liquids or gases.	Point Curve Surface	**Pipe**	Construction destined to the transport and the distribution of a fluid.	Line
Comments			Comments	**A1** It includes all kind of pipes by photointerpretation	
Feature Name	**Feature Definition**	**Feature Geometry**	**Feature Name**	**Feature Definition**	**Feature Geometry**
VanishingPoint	Location where a watercourse disappears into the terrain or vanishes due to anthropization.	Point Curve Surface			Line
Comments			Comments	**A3** It can be obtained by spatial analysis.	

INSPIRE feature catalogue					Data provider ICC (dataset BT5M)				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
SubsurfaceCrossing	An object allowing the passage of water beneath an obstacle: culvert or siphon.			Point Curve Surface	**Bridge**	Constructions that allow the crossing to different levels from communication paths, channels, fluvial courses or canalizations			Line
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
					Tipus_PON	Type of **Bridge**	Character	1	**A**
Comments					**Comments**	**A2** It is a small bridge (culvert)			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
SurfaceCrossing	An object allowing the passage of water above an obstacle: aqueduct or bridge.			Point Curve Surface	**Bridge**	Constructions that allow the crossing to different levels from communication paths, channels, fluvial courses or canalizations			Line
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
					Tipus_PON	Type of **Bridge**	Character	1	**P**
Comments					**Comments**	**A1**			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**

INSPIRE feature catalogue					Data provider ICC (dataset BT5M)				
Target model					**Source model**				
ShorelineConstruction	A fixed (not afloat) artificial structure attached to the land. NOTE: Shoreline constructions are normally used for berthing and protection. Includes breakwater/groyne/ wharf; but has more flexibility - also applies to inland waters.			Point Curve Surface	**Quay, breakwater**	Work constructed near the sea or a fluvial course to facilitate the boarding or disembarkation of people or merchandise, to be used like refuge of ships, to form a dock of defence against the waves, or constructed perpendicularly to the coast or the margin of a fluvial course, to change the current or to protect the margins. [Note: borders of quay, breakwater are included in the feature with line geometry]			Line, Polygon
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
					Caigua_MOL	The contour of **Quay, breakwater** is in contact with water	Character	1	**S**
condition	The state of planning, construction, repair, and/or maintenance of the structures and/or equipment comprising a facility and/or located at a site. Only relevant for man-made watercourse	enumeration	voidable - 1	**underConstruction** **fullyFunctional** **Disused**	**Estat_MOL**	State of **Quay, breakwater**	Character	1	**C** **G**

<table>
<tr><td colspan="5">INSPIRE feature catalogue</td><td colspan="5">Data provider ICC (dataset BT5M)</td></tr>
<tr><td colspan="5">Target model</td><td colspan="5">Source model</td></tr>
<tr><td>Comments</td><td colspan="4"></td><td>Comments</td><td colspan="4">A2
The attribute condition match with the atribute Estat_MOL although the value Disused is not considered</td></tr>
<tr><td>Feature Name</td><td colspan="3">Feature Definition</td><td>Feature Geometry</td><td>Feature Name</td><td colspan="3">Feature Definition</td><td>Feature Geometry</td></tr>
<tr><td>DamOrWeir</td><td colspan="3">A permanent barrier across a watercourse used to impound water or to control its flow [DIGEST]
Dam if associated to a StandingWater; or weir if associated to a Watercourse.</td><td>Point
Curve
Surface</td><td>Dam and barrage</td><td colspan="3">Construction of concrete or earth destined to the water retention</td><td>Line,
Polygon</td></tr>
<tr><td>Attribute Name</td><td>Attribute definition</td><td>Attribute type</td><td>Attribute cardinality</td><td>Possible values</td><td>Attribute Name</td><td>Attribute definition</td><td>Attribute type</td><td>Attribute cardinality</td><td>Possible values</td></tr>
<tr><td>condition</td><td>The state of planning, construction, repair, and/or maintenance of the structures and/or equipment comprising a facility and/or located at a site. Only relevant for man-made watercourse</td><td>enumeration</td><td>voidable - 1</td><td>underConstruction
fullyFunctional
Disused</td><td>Estat_PRE</td><td>State of Dam and Barrage</td><td>Character</td><td>1</td><td>C
G</td></tr>
<tr><td>Comments</td><td colspan="4"></td><td>Comments</td><td colspan="4">A2
The attribute condition match with the atribute Estat_PRE although the value Disused is not considered</td></tr>
</table>

INSPIRE feature catalogue			Data provider ICC (dataset BT5M)		
Target model			**Source model**		
Feature Name	**Feature Definition**	**Feature Geometry**	**Feature Name**	**Feature Definition**	**Feature Geometry**
Ford	A shallow part of a watercourse suitable for crossing by people or vehicles	Point Curve Surface			
Comments			**Comments**	**A3** The more important can be obtained by spatial analysis	

Table 4 - Features/attributes from the ICC BT5M Dataset that fit on the INSPIRE data model

6.2.2 Critical analysis of the **ICC BT5M** dataset matching process for Hydrography

The BT-5M dataset provided by Institut Cartogràfic de Catalunya (ICC) correspond to a 2.5D topographic database which aims are to provide basic reference data for spatial applications and to produce maps. As such, it contains basic topographic data of several themes, as for example hydrography, roads, buildings or relief. The features and attributes present in the database describe the real world from a topographic point of view.

From the point of view of features from both data models that match (matching class A, defined in Appendix 10.3), the INSPIRE features of PhysicalWaters package “Watercourse”, “StandingWater”, Wetland”, “Sea”, “LandWaterBoundary” and “Riverbank” match, more o less, with some features of BT-5M, but as can be seen in the matching table, there are attributes that cannot be matched. It happens, often, that INSPIRE features are so general that more than one BT-5M feature is necessary, although INSPIRE “Sea” is a part of BT-5M “Water mass”.

The INSPIRE “WatercourseLink” matches directly with several features of BT-5M but the “WatercourseNode” instances can be got by spatial analysis.

The INSPIRE feature “DamOrWeir” match directly with the BT-5M feature “Dam and Barrage”. Nevertheless other BT-5M features match with a part of INSPIRE features of RelatedObjects.

There are some attributes in BT-5M that are not present in INSPIRE data model (class B2), however they are not considered relevant to INSPIRE context.

On the other hand, there are some features and a great number of attributes from INSPIRE data model not present in BT-5M dataset, even though most of them are considered really relevant (class C1). Nevertheless, the Environment and Housing Department of the Regional Government of Catalonia is compiling hydrographic databases at smaller scale with feature types similar to those that are not covered by ICC databases.

6.3 Analysis of ICC BT50M Dataset

6.3.1 Features/attributes from the **ICC BT50M** dataset that fit on the INSPIRE Hydrography data model

INSPIRE feature catalogue					**Data provider ICC (dataset BT50M)**				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
LandWaterBoundary	The line where a land mass is in contact with a body of water.			Curve	**Natural coast**	It is the non-contiguous line follows the natural contour that delimits the sea and the land.			Line
					Water mass	Mass of water, continental or marine, natural or artificial. [Note: borders of water mass are included in the feature with line geometry]			Line, Polygon
					Quay, breakwater	Work constructed near the sea or a fluvial course to facilitate the boarding or disembarkation of people or merchandise, to be used like refuge of ships, to form a dock of defence against the waves, or constructed perpendicularly to the coast or the margin of a fluvial course, to change the current or to protect the margins. It includes the wharves.			Line
					Dam and barrage	Construction of concrete or earth destined to the water retention.			Line
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**

INSPIRE feature catalogue					Data provider ICC (dataset BT50M)				
Target model					**Source model**				
origin	Origin of the land-water boundary	enumeration	voidable - 1	**natural** **manMade**	**Tipus_MAI**	Type of **Water mass**	Character	1	**F, E, L**
waterLevelCategory	Water-level defining the LandWaterBoundary (high water, low water).	enumeration	Voidable - [0..1]	**lowWater** **highWater** **other**					
Comments	The attribute **waterLevelCategory** needs more values.				Comments	**A2** The attribute **origin** takes the value **manMade** for **Quay, breakwater** and **Dam and Barrage** and takes the value **natural** for **Natural coast** and **Water mass**. The attribute **waterLevelCategory** takes the **other** value.			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Sea	An area of water which normally has tidal fluctuations			Surface	**Water mass**	Mass of water, continental or marine, natural or artificial. [Note: Sea is distinguished by attributes]			Line, Polygon
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
					Tipus_MAI	Type of **Water mass**	Character	1	**M**
Comments					Comments	**A2** The attribute distinguishes sea from other mass of water. The sea borders came from the following feature types: **Natural coast**, **Quay, Breakwater** and **Virtual line**.			

INSPIRE feature catalogue					Data provider ICC (dataset BT50M)				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Riverbank	The limit line between the water area of a river and the area of land.			Curve	**Riverbank**	Bed of the fluvial course that is occupied by waters at ordinary swelling.			Line, Polygon
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
origin	Origin of the feature (whether natural or man-made)	enumeration	voidable - 1	**natural** **manMade**					
Comments					**Comments**	**A2** The **origin** attribute is always **natural**			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**Water mass**	Mass of water, continental or marine, natural or artificial. [NOTE: Lakes and reservoirs are included]			Line, Polygon
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
origin	Origin of the feature (whether natural or man-made)	enumeration	voidable - 1	**natural** **manMade**	**Tipus_MAI**	Type of **Water mass**	Character	1	**L** **E**
surfaceArea	Surface area of the body of water	number data type: Area	voidable - 1						

<table>
<tr><td colspan="5">INSPIRE feature catalogue</td><td colspan="5">Data provider ICC (dataset BT50M)</td></tr>
<tr><td colspan="5">Target model</td><td colspan="5">Source model</td></tr>
<tr><td>Comments</td><td colspan="4"></td><td>Comments</td><td colspan="4">A2

The polygon borders came from the following feature types: Water mass, Dam and Barrage, Quay, Breakwater and Virtual line.

The origin attribute can be natural for lakes and manMade for reservoirs according to the values of Tipus_MAI.

The surfaceArea attribute can be obtained measuring the polygon area</td></tr>
<tr><td>Feature Name</td><td colspan="3">Feature Definition</td><td>Feature Geometry</td><td>Feature Name</td><td colspan="3">Feature Definition</td><td>Feature Geometry</td></tr>
<tr><td rowspan="4">Watercourse</td><td colspan="3" rowspan="4">A natural or man-made flowing watercourse or stream.</td><td rowspan="4">Surface

Curve</td><td>Water mass</td><td colspan="3">Mass of water, continental or marine, natural or artificial.</td><td>Line, Polygon</td></tr>
<tr><td>Watercourse</td><td colspan="3">Natural water current, of variable volume, that gathers the water of a river basin.</td><td>Line</td></tr>
<tr><td>Canal, irrigation ditch, irrigation channel</td><td colspan="3">Opened sky construction, made of earth or concrete, destined to transport water of rivers, dams, ponds or underground conductions with irrigation purposes, navigation, drainage or industrialists.</td><td>Line</td></tr>
<tr><td></td><td colspan="3"></td><td></td></tr>
<tr><td>Attribute Name</td><td>Attribute definition</td><td>Attribute type</td><td>Attribute cardinality</td><td>Possible values</td><td>Attribute Name</td><td>Attribute definition</td><td>Attribute type</td><td>Attribute cardinality</td><td>Possible values</td></tr>
<tr><td>origin</td><td>Origin of the feature (whether natural or man-made)</td><td>enumeration</td><td>voidable - 1</td><td>natural

manmade</td><td>Entorn_FLU</td><td>Situation of Watercourse</td><td>Character</td><td>1</td><td>G, M

U, A</td></tr>
</table>

INSPIRE feature catalogue					Data provider ICC (dataset BT50M)				
Target model					**Source model**				
levelOfDetail	An indicative 'level-of-detail' for this object: the object is relevant at scales from this level of detail and greater (i.e. objects won't normally be relevant below a certain LoD); at lower scales generalisation rules apply for portrayal and visualisation.	enumeration	[0..1]	**European** **National** **Regional** **Local**					
condition	The state of planning, construction, repair, and/or maintenance of the structures and/or equipment comprising a facility and/or located at a site. Only relevant for man-made watercourse	enumeration	voidable - 1	**underConstruction** **fullyFunctional** **Disused**	**Estat_CAN**	State of **Canal, irrigation ditch, irrigation channel**	Character	1	**C**
fictitious	An indication that the geometry of the	boolean	voidable - 1		**Entorn_FLU**	Situation of **Watercourse**	Character	1	**T, M, U, B** **G, A**

INSPIRE feature catalogue					Data provider ICC (dataset BT50M)				
Target model					**Source model**				
	feature is not well defined, e.g. an underground watercourse				**Entorn_CAN**	Situation of **Canal, irrigation ditch, irrigation channel**	Character	1	**M, U, C** **G**
level	Vertical location of Watercourse relative to surrounding area	enumeration	voidable - 1	**onGround** **aboveGround** **belowGround"**	**Entorn_CAN**	Situation of **Canal, irrigation ditch, irrigation channel**	Character	1	**C**

INSPIRE feature catalogue			Data provider ICC (dataset BT50M)		
Target model			**Source model**		
Comments	The **fictitious** attribute could also be: virtual network segment in coastal water area; real underground network segment (pipeline or natural network section); virtual network segment in lake area; virtual network segment in river to connect tributary; virtual network segment in transitional water area		Comments	**A2** Rivers wider than 20m are polygons (**Water mass**) if not, are lines (**Watercourse**). The polygon borders came from the following feature types: **Water mass**, **Dam and Barrage**, **Quay, Breakwater** and **Virtual line**. The **origin** attribute is **manMade** for **Canal, irrigation ditch, irrigation channel**; is **natural** for **Water mass** and depending on the **Entorn_Flu** attribute for **Watercourse**: It is **manMade** for values **A** and **U**, **natural** for values **G** and **M** and it is unknown for values **T** and **B**. The **levelOfDetail** attribute derives from the metadata. The **condition** attribute is **fullyFunctional** except when **Estat_CAN** takes the value **C** The **fictitious** attribute is false for **Water mass** for **Watercourse** when **Entorn_FLU** takes the value **G** or **A;** and for **Canal, irrigation ditch, irrigation channel** if **Entorn_CAN** takes the value **G**. The **level** attribute values **belowGround** can be obtained, in general terms, by spatial analysis except for channels that are identified by the value **C** of the attribute **Entorn_CAN**.	
Feature Name	**Feature Definition**	**Feature Geometry**	**Feature Name**	**Feature Definition**	**Feature Geometry**

INSPIRE feature catalogue					Data provider ICC (dataset BT50M)				
Target model					**Source model**				
Wetland	A poorly drained or periodically flooded area where the soil is saturated with water, and vegetation is supported.			Surface	**Land cover, element of**	Area of the territory with a specific cover of the ground.			Line, Polygon
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
					Tipus_COB	Type of **Land cover, element of**	Character	1	**A**
Comments					**Comments**	**A2** The attribute distinguishes wetland from other land cover			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
WatercourseNode	A node within the hydrographic network - may represent a physical confluence, bifurcation/confluence/vanishing point etc, or it may be associated with a hydrographic point of interest or facility.			Point					
Comments					**Comments**	**A3** Instances may be got by spatial analysis.			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
WatercourseLink	A segment of a watercourse within a hydrographic network.			Curve	**Watercourse**	Natural water current, of variable volume, that gathers the water of a river basin.			Line

INSPIRE feature catalogue					Data provider ICC (dataset BT50M)				
Target model					**Source model**				
					Canal, irrigation ditch, irrigation channel	Opened sky construction, made of earth or concrete, destined to transport water of rivers, dams, ponds or underground conductions with irrigation purposes, navigation, drainage or industrialists.			Line
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
flowDirection	Direction of water flow in the segment relative to digitisation of segment geometry	enumeration	Voidable - [0..1]	**"+"** **"-"**					
length	Length of segment	number Data Type: Length	Voidable - 1						
Comments					**Comments**	**A2** **FlowDirection** attribute can be known by the order of curve points. **Length** attribute can be calculated			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
AbstractPoint	Point along a watercourse where water is abstracted from the watercourse NOTE: Includes cistern or tank			Point Curve Surface	**Area of Water**	Artificial water enclosure, constructed or excavated, with irrigation purposes, industrialists, of consumption, ornamental or for swimmers (like for example, artificial pond, swimming pool or uncovered tank)			Line, Polygon

INSPIRE feature catalogue					Data provider ICC (dataset BT50M)				
Target model					**Source model**				
					Covered tank, Silo	Covered construction to store water, fuel, cereals and derivatives or other products			Line, Polygon
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
					Cont_DIP	Contents of the **Covered tank, Silo**	Character	1	**A**
Comments					**Comments**	**A2** It includes objects which are not located along a watercourse			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Pipe	A tube for the conveyance of solids, liquids or gases.			Point Curve Surface	**Water pipe**	Construction destined to the transport and the distribution of water.			Line
Comments					**Comments**	**A2** It includes only water pipes			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
VanishingPoint	Location where a watercourse disappears into the terrain or vanishes due to anthropization.			Point Curve Surface					Line
Comments					**Comments**	**A3** It can be obtained by spatial analysis.			

INSPIRE feature catalogue					Data provider ICC (dataset BT50M)				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
SurfaceCrossing	An object allowing the passage of water above an obstacle: aqueduct or bridge.			Point Curve Surface	Bridge	Constructions that allow the crossing to different levels from communication paths, channels, fluvial courses or canalizations			Line
Comments					Comments	**A1** It consists on two parallel lines with a minimum separation of 10 m			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
ShorelineConstruction	A fixed (not afloat) artificial structure attached to the land. NOTE: Shoreline constructions are normally used for berthing and protection. Includes breakwater/groyne/ wharf; but has more flexibility - also applies to inland waters.			Point Curve Surface	Quay, breakwater	Work constructed near the sea or a fluvial course to facilitate the boarding or disembarkation of people or merchandise, to be used like refuge of ships, to form a dock of defence against the waves, or constructed perpendicularly to the coast or the margin of a fluvial course, to change the current or to protect the margins. [Note: borders of quay, breakwater are included in the feature with line geometry]			Line
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**

INSPIRE feature catalogue					Data provider ICC (dataset BT50M)				
Target model					**Source model**				
condition	The state of planning, construction, repair, and/or maintenance of the structures and/or equipment comprising a facility and/or located at a site. Only relevant for man-made watercourse	enumeration	voidable - 1	**underConstruction** **fullyFunctional** **Disused**	**Estat_MOL**	State of **Quay, breakwater**	Character	1	**C** **G**
Comments					Comments	**A2** The attribute **condition** match with the atribute **Estat_MOL** although the value **Disused** is not considered			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
DamOrWeir	A permanent barrier across a watercourse used to impound water or to control its flow [DIGEST] Dam if associated to a StandingWater; or weir if associated to a Watercourse. voidable - 1			Point Curve Surface	**Dam and barrage**	Construction of concrete or earth destined to the water retention			Line, Polygon
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**

INSPIRE feature catalogue					Data provider ICC (dataset BT50M)				
Target model					**Source model**				
condition	The state of planning, construction, repair, and/or maintenance of the structures and/or equipment comprising a facility and/or located at a site. Only relevant for man-made watercourse	enumeration	voidable - 1	**underConstruction** **fullyFunctional** **Disused**	**Estat_PRE**	State of **Quay, breakwater**	Character	1	**C** **G**
Comments					Comments	**A2** The attribute **condition** match with the atribute **Estat_PRE** although the value **Disused** is not considered			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Ford	A shallow part of a watercourse suitable for crossing by people or vehicles			Point Curve Surface					
Comments					Comments	**A3** The more important can be obtained by spatial analysis			

Table 5 - Features/attributes from the ICC BT50M Dataset that fit on the INSPIRE data mode

6.3.2 Critical analysis of the ICC BT50M dataset matching process for Hydrography

The BT-50M dataset provided by Institut Cartogràfic de Catalunya (ICC) correspond to a 2D topographic database which aims are to provide basic reference data for spatial applications and to produce maps. As such, it contains basic topographic data of several themes, as the BT-5M dataset.

From the point of view of features from both data models that match (matching class A, defined in Appendix 10.3), the result is quite similar to the BT-5M dataset.

The INSPIRE features of PhysicalWaters package "Watercourse", "StandingWater", Wetland", "Sea", "LandWaterBoundary" and "Riverbank" match, more or less, with some features of BT-50M, but as can be seen in the matching table, there are attributes that cannot be matched. It happens, often, that INSPIRE features are so general that more than one BT-50M feature is necessary, although INSPIRE "Sea" is a part of BT-50M "Water mass".

The INSPIRE "WatercourseLink" matches directly with several features of BT-50M but the "WatercourseNode" instances can be got by spatial analysis. It can be remarked that BT-50M conforms a graph of theoretical natural drainage.

The INSPIRE feature "DamOrWeir" match directly with the BT-50M feature "Dam and Barrage". Nevertheless other BT-50M features match with a part of INSPIRE features of RelatedObjects.

There are some attributes in BT-50M that are not present in INSPIRE data model (class B2), however they are not considered relevant to INSPIRE context.

On the other hand, there are some features and a great number of attributes from INSPIRE data model not present in BT-50M dataset, even though most of them are considered really relevant (class C1). Nevertheless, the Environment and Housing Department of the Regional Government of Catalonia is compiling hydrographic databases with feature types similar to those that are not covered by ICC databases as "CatchmentArea", "Basin" and "*WFDWaterBody*" and also attributes as identifiers or hierarchic order.

6.4 Analysis of RLIG DBPrior10K-Hydrography Dataset

6.4.1 Feature/attributes from the RLIG DBPrior10K-Hydrography Dataset that fit on the INSPIRE Hydrography data model

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					Source model				
Feature Name	Feature Definition			Feature Geometry	Feature Name	Feature Definition			Feature Geometry
LandWaterBoundary				Curve	COSTA_07				Line_2D
Comments	The line where a land mass is in contact with a body of water [Eurospec]				Comments	Coastline			
Attribute Name	Attribute definition	Attribute type	Attribute cardinality	Possible values	Attribute Name	Attribute definition	Attribute type	Attribute cardinality	Possible values
Geometry	**The shape of the LandWaterBoundary, as a curve.**	GM_Curve	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
Comments					Comments	A.1			
ID	INSPIRE identifier (see GCM clause 14)	data type Identifier	1		**ID**	Identifier of element	INTEGER	1	

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Comments					Comments	A.2: the implementation of this attribute isn't like Inspire Indentifier, GCM clause 14, because the DBPRIOR10K Project was implemented before. ID is local identifier.			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
origin	Origin of the land-water boundary	enumeration	1	**natural** **manMade**	**TIPOCOSTA**	Definition of the type of coast. It specifies all the virtual part of coast due to the confluence of water bodies with the sea.	Boolean	1	T F
Comments					Comments	A .1: F = natural coastline T = manMade coastline			

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
Comments	The shape of the StandingWater either a point or surface				**Comments**	A.1 : in Rlig Dataset the geometry is only Surface, because are implemented feature with surface>= 400 m2			
ID	INSPIRE identifier (see GCM clause 14)	data type Identifier	1		**ID**	Identifier of element	integer	1	
Comments					**Comments**	A.2: the implementation of this attribute isn't like Inspire Indentifier (according to GCM clause 14) because the DBPRIOR10K Project was implemented before. ID is a local identifier.			

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
GeographicalName	A textual identifier or code that is used to denote a feature.	data type GeographicalName	Voidable - [0..*]		**name**	Main name of the lake	character	Voidable - [0..*]	
Comments					**Comments**	A.2: the attribute contain also the 'local' name for the surface water (e.g. lake)			

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
origin	Origin of the feature (whether natural or man-made)	enumeration	Voidable - 1	natural manMade heavilyModified	**natura**	Water body type	enumeration		1 lago 2 stagno-palude 3 torbiera 4 laguna-valle 5 bacini artificiali 6 non classificato

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
Comments	An enumeration type specifying a set of hydrographic 'origin' categories (natural, man-made, heavily-modified) for various hydrographic objects				**Comments**	A.2: with the alphanumeric filter NATURA = 1			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Watercourse	A natural or man-made flowing watercourse or stream			Surface Curve	**A_IDR_CORSO_ACQUA** **A_IDR_CANALE**	natural (a_idr_corso_acqua) or man-made (a_idr_canale) flowing watercourse			No feature geometry, table of toponomy

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
Comments					**Comments**	A.3.The geometry is present only in the feature ELEMENTI_IDRICI_07. The link between tables is the attribute COD. The table A_IDR_CORSO_ACQUA is for natural flowing watercourse. The table A_IDR_CANALE is for man-made flowing watercourse. In the feature ELEMENTI_IDRICI_07 the attribute ARTICIALE indicating if the water body is natural or artificial.			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
id	INSPIRE identifier (see GCM clause 14)	data type Identifier	1		**COD**	Identifier according to SINA/SIBAPO ecoding, a hierarchic method created by the Basin Authority of Po It's the link with the feature ELEMENTI_IDRICI_07	Character	1	

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
Comments					**Comments**	A.2: the implementation of this attribute isn't like Inspire Indentifier (according to GCM clause 14) because the DBPRIOR10K Project was implemented before. It's the SINA/SIBAPO code.			
Geographicalname	A textual identifier or code that is used to denote a feature.	data type GeographicalName	Voidable - [0..*]		**name**	Name of the Natural or Artificial Water Body	character	Voidable - [0..*]	

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
Comments					**Comments**	A2: the attribute contain also the 'local' name for the surface water (e.g. cannel, river...)			

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
origin	Origin of the feature (whether natural or man-made)	enumeration	Voidable - 1	natural manMade heavilyModified					

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
Comments	An enumeration type specifying a set of hydrographic 'origin' categories (natural, man-made, heavily-modified) for various hydrographic objects				**Comments**	A.3: this attribute isn't present in the Rlig feature, but the alphanumeric table A_IDR_CORSO_ACQUA is the toponomy table for natural watercourse and the alphanumeric table A_IDR_CORSO_ACQUA is the toponomy table for natural watercourse			
length	Lineal length of watercourse	number data type: Length	Voidable - 1						

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
Comments					**Comments**	A.3: this attribute is implied into the geometry feature ELEMENTI_IDRICI_07 and is derivable from this			
waterCourseHierarchy	National hierarchy (applied in the national database).	enumeration	Voidable - [0..1]	1st 2nd 3rd 4th 5th other	**gerarchia_**	Hierarchy levels according to the National SINA/SIBAPO encoding.	double	Voidable - [0..1]	

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
Comments	Enumerated list of Watercourse hierarchy levels within national classification scheme				Comments	A.2: This attribute is present only for Natural Watercouse			
fictitious	An indication that the geometry of the feature is not well defined, e.g. an underground watercourse	boolean	Voidable - 1						

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
Comments					**Comments**	A.3. This information is present in feature ELEMENTI_IDRICI_07 in the attribute TIPO_ELEMENTO			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
WatercourseNode	A node within the hydrographic network - may represent a physical confluence, bifurcation/confluence/vanishing point etc, or it may be associated with a hydrographic point of interest or facility.			Point	**nodi_idrici_07**	A point at which two or more waterlines meet. This class represents the start point and the end point of water's body or the intersection point of two or more different water bodies.			Point_2d

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
Comments					**Comments**	A.1			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
geometry		GM_Point	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
Comments					**Comments**	A.1			
id	The identity of the element	data type Identifier	1		**id**		integer	1	
Comments					**Comments**	A.2: the implementation of this attribute isn't like Inspire Indentifier, GCM clause 14, because the DBPRIOR10K Project was implemented before. ID is local identifier.			

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
hydroNodeCategory	Nature of the watercourse node	enumeration	Voidable - 1	bifurcation vanishingPoint confluence mouth attrValueMod	**tipo_nodo**	Hydrographic node type	Enumeration		inizio confluenza/biforcazione interruzione/ripresa intersezione costa/laghi intersezione confine regionale non classificato

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
Comments	Defines categories for different types of hydrographic network nodes				**Comments**	A.1			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
WatercourseLink	A segment of a watercourse within a hydrographic network			Curve	**elementi_idrici_07**	It represents the water flow's track of a river/stream or a canal, it's the segment of a watercourse in the hydrographic network			Line_2d
Comments					**Comments**	A.1			

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
centerlineGeometry		GM_Curve	1		**gdo_geometry**	Contains the implementation of geometry	line	1	
Comments					**Comments**	A.1			

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
id	The identity of the element	data type Identifier	1		**id**	Identifier of element	integer	1	
Comments					**Comments**	A.2: the implementation of this attribute isn't like Inspire Indentifier, GCM clause 14, because the DBPRIOR10K Project was implemented before. ID is local identifier.			
name	The name for this element	data type GeographicalName	Voidable - [0..*]						
Comments					**Comments**	A.3: This information is present in alphanumeric feature A_IDR_CORSO_ACQUA/A_IDR_CANALE in the attribute NAME			

INSPIRE feature catalogue					Data provider RLIG (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SPECCHI_ACQUA_07**	This feature represents the surface covered by water that is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc. Natural or artificial borderlines can delimit the water body.			Surface_2D
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry		GM_Primitive	1		**GDO_GEOMETRY**	contains the implementation of feature geometry	BLOB_BINARY	1	
length	Length of segment	number data type: Length	Voidable - 1						
Comments					**Comments**	A.3 this attribute is implied into the geometry and is derivable from this			

Table 6 - Features/attributes from the RLIG DBPrior10K-Hydrography Dataset that fit on the INSPIRE Hydrography data model vers. 2

6.4.2 Critical analysis of the RLIG dataset matching process for Hydrography

The Hydrography dataset provided by Regione Liguria (RLIG) was developed according to the project "DBPrior10K: Data Base of the prior Layers at scale 1:10000 "(Doc. INTESA/WG01 – N 1005) carried out by the national Italian Workgroup on DB topographic "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 theme was further developed in the National project Intesa Gis-DBTopo.

The Spatial Data Model of the project DBPrior10k is 2D.

This project is a national project. INSPIRE is an European project and it has many features with many fields. This is the reason because the RLIG features that match with INSPIRE features are few.

The RLIG features have been compared with the INSPIRE model 1st draft, and afterwards his publication in the middle of December 2008, also with the 2nd draft.

The RLIG features of Hydrography theme are:

COSTA_07: Vector coastline at scale 1:10000.

SPECCHI_ACQUA_07: surface covered by water which is characterised by a slow refill of water. This feature includes the following water bodies: ponds, lakes, marsh, lagoons, etc.. Natural or artificial borderlines can delimit the water body at scale 1:10000.

ELEMENTI_IDRICI_07: Vector Hydrographic network at scale 1:10000. It represents the water flow's track of a river/stream or a canal.

NODI_IDRICI_07: the node of the hydrographic network at scale 1:10000. This class represents the start point and the end point of water's body or the intersection point of two or more different water bodies.

A_IDR_CORSO_ACQUA: Table of attribute-only. River's toponymy linked to the hydrographic network ELEMENTI_IDRICI_07.

A_IDR_CANALE: Table of attribute-only. Canal 's toponymy linked to the hydrographic graph ELEMENTI_IDRICI_07.

The INSPIRE features matching with RLIG features are (as can be seen in the matching table):

"LandWaterBoundary"

"Standing Water"

"WaterCourse"

"WaterCourseNode"

"WaterCourseLink".

The Feature **"StandingWater"** matches with RLIG feature **"SPECCHI_ACQUA_07"** with a alphanumeric filter on the attribute NATURE (A.2 in the matching table).

For the feature **"StandingWater"** the changes between Inspire Model 1st draft and 2nd draft are:

- the rename of attribute Name (vers.1) into geographicalName (vers.2)
- the rename of attribute Lod (vers.1) into levelofDetail (vers.2)
- the attribute NationalId, present in vers.1, isn't present in vers.2.

The feature **"LandWaterBoundary"** matches directly with **"COSTA_07".**

The feature **"WaterCourseNode"** matches directly with **"NODI_IDRICI_07".**

The feature **"WaterCourseLink"** matches directly with **"ELEMENTI_IDRICI_07".**

For these feature there are attribute of category B.2. These attribute are only relevant in the RLIG context and not in the INSPIRE context.

The feature **"WaterCourse"** matches with **"A_IDR_CORSI_ACQUA"** (alphanumeric feature, without attribute geometry) by the join "ELEMENTI_IDRICI_07.cod = A_IDR_CORSI_ACQUA.COD where ELEMENTI_IDRIC_07.ARTIFICIALE = 'F' ".

The feature **"WaterCourse"** matches with **"A_IDR_CANALE"** (alphanumeric feature, without attribute geometry) by the join "ELEMENTI_IDRICI_07.cod = A_IDR_CORSI_ACQUA.COD where ELEMENTI_IDRIC_07.ARTIFICIALE = 'T' ".

For the feature **"WaterCourse"** the changes between 1st draft and 2nd draft are:

the rename of attribute Name (1st draft) into geographicalName (2nd draft)

the rename of attribute Lod (1st draft) into levelofDetail (2nd draft)

the attribute NationalId, present in 1st draft, isn't present in 2nd draft.

For the feature **"WaterCourseLink" ("WaterCourseSegment"** in 1st draft**)** was added the attribute CrossSectionlocation.

In all INSPIRE features analized are present the attributes “BeginLifespanVersion” and “EndLifespanVersion” for the multitemporal feature. The RLIG does not implement the multitemporal features, but only monotemporal features, so these attributes aren’t relevant for RLIG dataset, but are considered relevant for INSPIRE directive (C.1 in the matching table).

RLIG manage the multitemporal aspect with different layers and not with attributes.

6.5 Analysis of RPIE DBPrior10K-Hydrography Dataset

6.5.1 Feature/attributes from the RPIE DBPrior10K-Hydrography Dataset that fit on the INSPIRE Hydrography data model

INSPIRE feature catalogue					Data provider RPIE (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**laghi**				
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
geometry		GM_Primitive	1		**shape**		shape 2D		
Comments	The shape of the StandingWater either a point or surface				**Comments**	A2			
id	INSPIRE identifier (see GCM clause 14)	data type Identifier	1		**fid**		character		
Comments					**Comments**	A2 (the attribute can't be "like INSPIRE" because the dataset was organized before)			

INSPIRE feature catalogue					Data provider RPIE (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
localType	Provides 'local' name for the surface water (e.g. canal, channel, ditch, ...).	data type LocalisedCharacterString	[0..1]		**codice**		number		
Comments					Comments	A2(the attribute is included in the table that contains the name)			
geographicalName	A textual identifier or code that is used to denote a feature.	data type GeographicalName	Voidable - [0..*]		**nome**		character		
Comments					Comments	A2(the attribute is included in the table that contains the local type)			
origin	Origin of the feature (whether natural or man-made)	enumeration	Voidable - 1	natural manMade	**natura**		number		1 lake 5 artificial basin
Comments	An enumeration type specifying a set of hydrographic 'origin' categories (natural, man-made, heavily-modified) for various hydrographic objects				Comments	A2			
elevation	Elevation above mean sea level [based on EuroRegionalMap]	number data type:Lenght	Voidable - 1						
Comments					Comments	A3 (spatial analisys using DTM)			

INSPIRE feature catalogue					Data provider RPIE (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
surfaceArea	Surface area of the body of water	number data type: Area	Voidable - 1		**area**		number		
Comments					Comments	A1			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Watercourse	A natural or man-made flowing watercourse or stream			Surface Curve	**corsinat/canali**	natural (corsinat) or man-made (canali) flowing watercourse			
Comments					Comments	A3 (the geometry is present only in the feature "elemidri" and we have two different class for natural and man-made watercourse)			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
id	INSPIRE identifier (see GCM clause 14)	data type Identifier	1		**eid**	ID used to join the watercourse segment	number		
Comments					Comments	A2 (the attribute can't be "like INSPIRE" because the dataset was organized before)			
hydroid	A thematic identifier used for the object, often (but not specifically) a national hydrological identification code.	Data type	Voidable - [0..1]		**cod**	SIBAPO encoding = a hierarchic method from valley to upriver created by the Basin Authority of Po	character		

INSPIRE feature catalogue					Data provider RPIE (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Comments					Comments	A2			
localType	Provides 'local' name for the surface water (e.g. canal, channel, ditch, ...).	data type LocalisedCharacterString	[0..1]						
Comments	Range [0..1]				Comments	A2(the attribute is included in the table that contains the name)			
geographicalName	A textual identifier or code that is used to denote a feature.	data type GeographicalName	Voidable - [0..*]		**nome**		character		
Comments					Comments	A2(the attribute is included in the table that contains the local type)			
hydroid	A thematic identifier used for the object, often (but not specifically) a national hydrological identification code.	data type HydroIndentifier	Voidable - [0..1]		**cod**	SIBAPO encoding = a hierarchic method from valley to upriver created by the Basin Authority of Po	character		
Comments					Comments	A2			

INSPIRE feature catalogue					Data provider RPIE (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
origin	Origin of the feature (whether natural or man-made)	enumeration	Voidable - 1	natural manMade					
Comments	An enumeration type specifying a set of hydrographic 'origin' categories (natural, man-made, heavily-modified) for various hydrographic objects				Comments	A3(this attribute is present in the "elemidri"class)			
length	Lineal length of watercourse	number data type: Length	Voidable - 1						
Comments					Comments	A3(this attribute is implied into the geometry and is derivable from this)			
waterCourseHierarchy	National hierarchy (applied in the national database).	enumeration	Voidable - [0..1]	1st 2nd 3rd 4th 5th other					
Comments	Enumerated list of Watercourse hierarchy levels within national classification scheme				Comments	A3 (this attribute can be derived from the "cod" of the "corsinat.dbf" table)			

INSPIRE feature catalogue					Data provider RPIE (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
WatercourseNode	A node within the hydrographic network - may represent a physical confluence, bifurcation/confluence/vanishing point etc, or it may be associated with a hydrographic point of interest or facility.			Point	**nodoidri**	node within hydrographyc network			point
Comments					**Comments**	A1			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
geometry		GM_Point	1		**shape**		point 2D		
Comments					**Comments**	A1			
id	The identity of the element	data type Identifier	[0..1]		**fid**		character		
Comments					**Comments**	A1			

INSPIRE feature catalogue					Data provider RPIE (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
hydroNodeCategory	Nature of the watercourse node	enumeration	Voidable - 1	bifurcation confluence mouth spring vanishingPoint	**tipo**		number		1 start 2 confluence or fork 3 holdup or restart 5 intersection with regional boundary 11 intersection with a standing water boundary 12 change of element typology 13 standing water without outlet
Comments	Defines categories for different types of hydrographic network nodes				Comments	A2			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
WatercourseLink	A segment of a watercourse within a hydrographic network			Curve	**elemidri**	segment of a watercourse within a hydrographic network			polyline 2D

INSPIRE feature catalogue					Data provider RPIE (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Comments					Comments	A1			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
centerlineGeometry		GM_Curve	1		**shape**		polyline 2D		
Comments					Comments	A1			
id	The identity of the element	data type Identifier	0..1		**fid**	Unique ID of feature	number		
Comments					Comments	A1			
flowDirection	Direction of water flow in the segment relative to digitisation of segment geometry	enumeration	Voidable - [0..1]	positive negative					
Comments	A enumeration of sign, usually used in an algebraic system to distinguish between a positive value and a negative value, or between a base orientation or a reversal of a base orientation. These are commonly represented by a single character such as "+" or "-" but may sometimes carry an integer 1 for emphasis such as "+1", or "-1" -- there is no semantic difference between these two presentations objects.				Comments	A3(this attribute is implied into the geometry and is derivable from this)			
length	Length of segment	number data type: Length	Voidable - 1						

INSPIRE feature catalogue					Data provider RPIE (datasetDBPrior10K-Hydrography) feature catalogue				
Target model					**Source model**				
Comments					Comments	A3(this attribute is implied into the geometry and is derivable from this)			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
WFDSurfaceWaterBody	Body of surface water: means a discrete and significant element of surface water such as a lake, a reservoir, a stream, river or canal, part of a stream, river or canal, a transitional water or a stretch of coastal water. The surface water bodies shall be identified as falling within either one of the following surface water categories - rivers, lakes, transitional waters or coastal waters - or as artificial surface water bodies or heavily modified surface water bodies. [Source: WFD]			Curve Surface	**elemidri**				
Comments					Comments	A3 (the geometry is present only in the feature "elemidri" as a line and not as a surface_ waterbody is defined joining water segment with the same "t_codice")			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
id	INSPIRE identifier for the WFD object	data type Identifier	1		**t_codice**	Coding of the decree that acknowledge the FWD	Integer		

INSPIRE feature catalogue		Data provider RPIE (datasetDBPrior10K-Hydrography) feature catalogue	
Target model		**Source model**	
Comments	Local part of identifier follows national code as follows: A unique alphanumeric identifier at the European level. "Unique [...] identifier are provided in the following format MS#1#2?#22 where MS = a 2 character Member State identifier, in accordance with ISO 3166-1-Alpha-2 country codes, and - #1#2?#22 = an up to 22 character feature code that is unique within the Member State. (symbol # = wildcard character (a wildcard character can be used to substitute for any other character or characters in a string)) The maximum total length of the code will be 24 characters."	Comments	A1 ("t_codice" belongs to table "idroarpa.dbf"

Table 7 - Features/attributes from the RPIE DBPrior10K-Hydrography Dataset that fit on the INSPIRE Hydrography data model

6.5.2 Critical analysis of the RPIE DBPrior10K-Hydrography dataset matching process for Hydrography

The dataset provided by Piedmont Region consists of the regional network and the lakes.

They have been compared with the INSPIRE model 1st draft, and afterwards his publication in the middle of December 2008, also with the 2nd draft.

The features that match with Inspire are not much, because Inspire features are related to a lot of information.

Features and attributes classed as A1 are not much, while the A2 and A3 classifications are more numerous. However the processes used to retrace A2 and A3 to INSPIRE context are easy.

It is worth to point out that, at the moment, there isn't a lot of matches with the WFD, but the intent of the Regional Body is to comply with the WFD requests.

It's possible to identify two macro categories among Inspire features that don't match with the RPIE dataset but could be relevant in the Inspire context (C1): the first one groups the RPIE data but belongs to other thematic datasets not used in GIS4EU project and the second one joins together relevant data that will be insert into the new datasets.

The matching process has driven to class as C2 (feature that could not be relevant in the Inspire context) the Inspire features (or attributes) of which, at the moment, we can't understand the real use.

Regarding the RPIE dataset features that don't match with the Inspire context there aren't relevant features or attributes (B1). The features that could not be relevant in the Inspire context (B2) correspond to attributes holding a specific role within the themes for which they were created. However there aren't features/attributes, classed as B2, worthy to entry into a hypothetical GIS4EU data model.

It may be useful make clear that carrying out the comparison with the 2nd draft of the INSPIRE modeling the major changes don't concern the most feature of RPIE dataset that match with those of INSPIRE.

As a matter of fact the feature "shore" that becomes an abstract feature, and the new feature "WatercourseSeparatedCrossing" are classed for RPIE as C1 and like that remain.

Similarly the new attribute "crossSectionLocation" of the feature "Watercourse Link" and all the new attribute "geometry" for the twelve feature involved are classed C1 and haven't changes.

In regard to the deleted attribute “nationalId” for the feature “StandingWater” it hasn’t found match in the 1st draft.

The only perceptible change regards the type of the attribute “hydroid” of the “WaterCourse” feature that becomes a data type. In the 1st draft this attribute hasn’t found match in the RPIE DATASET but in the 2nd draft the removal of the attribute “nationalId” for the feature “WaterCourse” and the new comments for attribute “hydroid” bring to some changes in the matching table: the RPIE attribute “cod” that in the 1st draft matched directly with “nationalId” now matches with “hydroid” but with some semantic differences and then the class A1 becomes A2.

The matching table comments and the concepts explained in this paragraph are the result of a critical analysis based on the current level of comprehension of the Inspire context and the particular knowledge of own data.

6.6 Analysis of CGE Dataset

6.6.1 Features/attributes from the **CGE** dataset that fit on the INSPIRE Hydrography data model

INSPIRE feature catalogue					**Data provider CGE (dataset CTC1000/CTC2000)**				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
LandWaterBoundary	The line where a land mass is in contact with a body of water.			Curve	**Linea di costa (Coastline)**	The line were the sea is in contact with the land.			Curve
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
id	INSPIRE identifier (see GCM clause 14)	"data type Identifier"	1		**Progressivo (Progressive code)**	The identity of the element;It is the id of the map & counter objects in map. It doesn't change during the life of the object	varchar	1	

INSPIRE feature catalogue					Data provider CGE (dataset CTC1000/CTC2000)				
Target model					**Source model**				
origin	Origin of the land-water boundary	enumeration	voidable - 1	**Natural** **manMade**	**Tipo di costa (Coastline type)**	Type of the coastline	Enumerated		**1 Scogliera naturale (natural coast)** **2 Scogliera artificiale (manmade coast)** **3 Spiaggia (beach)** **4 Opere portuali (port structures)** **5 Foce (mouth)**
Comments					Comments	A1 for the **id** attribute. Coastline **type**: Scogliera naturale + Spiaggia = Natural (A2); Scogliera artificiale + Opere portuali = Man made (A2); foce is related to the watercourseNode in INSPIRE model (A3)			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Riverbank	The limit line between the water area of a river and the area of land.			Curve	**Fiume, torrente, rio (River, stream)**	A couple of linear elements that represents the border of the water at the moment of the survey			Curve

INSPIRE feature catalogue					Data provider CGE (dataset CTC1000/CTC2000)				
Target model					**Source model**				
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
id	INSPIRE identifier (see GCM clause 14)	"data type Identifier"	1		**Progressivo (Progressive code)**	The identity of the element;It is the id of the map & counter objects in map. It doesn't change during the life of the object	varchar	1	
GeographicalName	A textual identifier or code that is used to denote a feature	data type GeographicalName	voidable – [0…*]		**Descrizione (Description)**	The name of the river	Varchar		
Comments					**Comments**	A1 for the **id** and the geographic name attributes			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**Lago (Lake)**	A body of fresh water entirely surrounded by land			Surface
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**

INSPIRE feature catalogue					Data provider CGE (dataset CTC1000/CTC2000)				
Target model					**Source model**				
id	INSPIRE identifier (see GCM clause 14)	"data type Identifier"	1		**Progressivo (Progressive code)**	The identity of the element;It is the id of the map & counter objects in map. It doesn't change during the life of the object	varchar	1	
GeographicalName	A textual identifier or code that is used to denote a feature	data type GeographicalName	voidable – [0…*]		**Descrizione (Description)**	Toponimous name	Varchar		
Elevation	Elevation above mean sea level [based on E uroRegionalMap]				**Not present as attribute in the database. It is directly available from the elevation data of the CGE geographic dataset**				
surfaceArea	Surface area of the body of the water	Number Data type: Area	Voidable - 1		**Superficie (Surface area)**	Surface area of the body of the water	Number		
					Perimetro (Perimeter)	Perimeter of the body of the water	Number		
Comments					Comments	A1 for the **id** and **surface** attributes. A3 for the **elevation** attribute and B1 for the **perimeter** one The **description** field exists but is filled only when the size of the standing waters located in the CGE territory are identificated with a name.			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**

INSPIRE feature catalogue					Data provider CGE (dataset CTC1000/CTC2000)				
Target model					**Source model**				
Watercourse	A natural or man-made flowing watercourse or stream			Surface Curve	**Letto di fiume (River bed)**	It is the river boundary represented by dikes, walls…represented by a surface			Surface
					Canale (Canal)	Construction with artificial banks destined to transport water. It has to be more than 50 cm width. It is represented by a couple of parallel straight lines.			Curve (line)
					Fosso di scolo (Drainage ditch)	Natural stream of small size. Is represented by its axis			Curve (line)
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
id	INSPIRE identifier (see GCM clause 14)	"data type Identifier"	1		**Progressivo (Progressive code)**	The identity of the elements;It is the id of the map & counter objects in map. It doesn't change during the life of the object	varchar	1	
localType	Provides 'local' name for the surface water (e.g. canal, channel, ditch, ...).	data type LocalisedCharacterString	[0..1]		It's included in the CGE feature description				

INSPIRE feature catalogue					Data provider CGE (dataset CTC1000/CTC2000)				
Target model					**Source model**				
GeographicalName	A textual identifier or code that is used to denote a feature	data type GeographicalName	voidable – [0…*]		Descrizione (Description)	Toponimous name of the river bed entity	Varchar		
Origin	Origin of the feature (whether natural or man-made)	enumeration data type OriginType	Voidable - 1		It's included in the different features definition for Canale				
Persistence	The degree of persistence of water	enumeration	Voidable - 1		It's included in the different features definition - Letto di Fiume = Torrential, Fosso di scolo = seasonal; Canale = perennial				
Fictiotious	An indication that the geometry of the feature is not well defined.	boolean	Voidable - 1		This information is available in the feature "asata idrica". May be tranferred with a spatial query between the 'asta fluviale' and these features				
Lenght	Lineal lenght of watercourse	number data type: Length	Voidable - 1		This information is available in the feature "asata idrica". May be tranferred with a spatial query between the 'asta fluviale' and these features				
Width	Width of watercourse (as a range) along its lenght	data type WidthRangeType	Voidable - 1		This attribute is implied into the geometry features				
Comments					Comments	A1 for the id and the geographical name attributes. A2 for the local type, origin, persistence and width attributes. A3 for the fictitious, lenght and level attributes.			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**

INSPIRE feature catalogue					Data provider CGE (dataset CTC1000/CTC2000)				
Target model					**Source model**				
Watercourse node	A node within the hydrographic network - may represent a physical confluence, bifurcation/confluence/vanishing point etc, or it may be associated with a hydrographic point of interest or facility.			Point	**Nodo idrico (Hydro node)**	Beginning and ending points of each hydro segments			Point
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
id	The identity of the element	"data type Identifier"	1		**Progressivo (Progressive code)**	The identity of the elements;It is the id of the map & counter objects in map. It doesn't change during the life of the object	varchar	1	

INSPIRE feature catalogue					Data provider CGE (dataset CTC1000/CTC2000)				
Target model					**Source model**				
HydroNodeCategory	Nature of the watercourse node	enumeration	Voidable - 1		**Tipo (Type)**	Nature of the watercourse node	enumeration		**1 Inizio (Beginning)** **2 Confluenza (Confluence)** **3 Fine (End)** **4 Bordo carta (Map boundary)** **5 Presa d'acqua (structures destined to get water from natural sources)**
Comments					Comments	A1 for the **id** attributes. **Type**: A1 values 1 (it could mean *spring*), 2, 3 (it could mean *mouth*); B2 for value 4 (It is a specific attribute definition of the CGE geographic database); B1 for value 5 (it is a man-made infrastructure for water capture. See Monitoring point of Inspire feature catalogue).			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**

INSPIRE feature catalogue					Data provider CGE (dataset CTC1000/CTC2000)				
Target model					**Source model**				
Constriction	A network node unrelated to the network topology per se, but associated with a hydrographic point of interest or facility, or a man-made object, that affects the network flow			Point	**Ponte, viadotto autostradale, ferroviario…(Bridge, motorway viaduct, railway viaduct…)**				Surface
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
id	The identity of the element	"data type Identifier"	1		**Progressivo (Progressive code)**	The identity of the elements;It is the id of the map & counter objects in map. It doesn't change during the life of the object	varchar	1	
					Struttura (Structure)	Fabric of the structure	Enumeration		1 Cemento armato o muratura (Reinforced concrete or masonry) 2 Ferro (Iron) 3 Legno (Wood)

INSPIRE feature catalogue					Data provider CGE (dataset CTC1000/CTC2000)				
Target model					**Source model**				
					Tipo (Type)	Type of the bridge/viaduct	Enumeration		1 Autostradale (Motorway bridge) 2 Stradale (Road bridge) 3 Ferroviario (Railway bridge) 4 Pedonale (Pedestrian bridge)
Comments					Comments	The feature is available with a spatial query between the 'asta fluviale' and the 'ponte' features (A3). B1 for the values of **structure** and **type** attributes.			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Watercourse link	A segment of a watercourse within a hydrographic network			Curve	**Asta idrica (Hydro segment)**	Representation of the water flow direction. It is represented by a line positioned in the middle of the river bed.			Curve (line)
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**

INSPIRE feature catalogue					Data provider CGE (dataset CTC1000/CTC2000)				
Target model					**Source model**				
id	The identity of the element	"data type Identifier"	1		**Progressivo (Progressive code)**	The identity of the elements; It is the id of the map & counter objects in map. It doesn't change during the life of the object	varchar	1	
Name	The name for this element	data type GeographicalName	voidable – [0…*]		**Not present as attribute in the database. The information is available with a spatial query between the 'asta fluviale' and the 'letto di fiume' features**				
FlowDirection	Direction of water flow in the segment relative to digitisation of segment geometry	enumeration data type Sign	Voidable - [0..1]		**Da nodo (From node)**	Code of the node at the beginning of the segment	Number		
					A nodo (To node)	Code of the node at the end of the segment	Number		
Length	Length of segment	number data type: Length	Voidable - 1		**Not present as attribute in the database. This attribute is implied into the geometry of the feature.**				
Comments					Comments	A1 for the id attributes. A3 for the **name** attribute. A2 for**length** attribute. The number of the nodes at the beginning and at the end of the segments are progressives according to the flow direction (A2)			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**

INSPIRE feature catalogue					Data provider CGE (dataset CTC1000/CTC2000)				
Target model					**Source model**				
Abstract Point	Point along a watercourse where water is abstracted from the watercourse NOTE: Includes cistern or tank			Point Curve Surface	**Silos, serbatoio, gasometro, cisterna fuori terra (Silo, tank, gas tank, cistern)**	Silo, tank, gas tank, cistern			Surface
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
id	The identity of the element	"data type Identifier"	1		**Progressivo (Progressive code)**	The identity of the elements; It is the id of the map & counter objects in map. It doesn't change during the life of the object	varchar	1	
					Tipo (Type)	Type of the abstract point	Enumeration		**1 Silos (Silo)** 2 Serbatoio (Tank) **3 Gasometro (gas tank)** **4 Cisterna (Cistern)**
					Superficie (Surface area)	Surface area of the element	Number		

INSPIRE feature catalogue					Data provider CGE (dataset CTC1000/CTC2000)				
Target model					**Source model**				
					Perimetro (Perimeter)	Perimeter area of the element	Number		
Comments					Comments	A1 for the **id** attributes. The **surface** and **perimeter** attributes are relevants only at a local scale (B2). The *silo* and the *gasometro* values are not water tans (B2)			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Discharge Point	Point along a watercourse where water is discharged into the watercourse. NOTE: Includes well			Point Curve Surface	**Pozzo, neviera (Well, ancient constructions to conserve ice)**	Point along a watercourse where water is discharged into the watercourse			Point
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
id	The identity of the element	"data type Identifier"	1		**Progressivo (Progressive code)**	The identity of the elements; It is the id of the map & counter objects in map. It doesn't change during the life of the object	varchar	1	
					Tipo (Type)	Type of the discharge point	Enumeration		**1 Pozzo (Well)** 2 Neviera
Comments					Comments	A1 for the **id** attributes and the *well* value of the of the **type** attribute. The *neviera* is not properly an hydrological feature (B2)			

INSPIRE feature catalogue					Data provider CGE (dataset CTC1000/CTC2000)				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Monitoring Point	A facility used for hydrographic monitoring			Point Curve Surface	**Nodo idrico (Hydro node)**	Beginning and ending points of each hydro segments			Point
Comments					**Comments**	Only the nodo_idrico elements with attribute "Tipo" = 5- Presa d'acqua (structures destined to get water from natural sources) (A3)			
Pipe	A tube for the conveyance of solids, liquids or gases.			Point Curve Surface	**Conduttura (Pipe)**	A tube for the conveyance of solids, liquids or gases			Curve
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
id	The identity of the element	"data type Identifier"	1		**Progressivo (Progressive code)**	The identity of the elements; It is the id of the map & counter objects in map. It doesn't change during the life of the object	varchar	1	

INSPIRE feature catalogue					Data provider CGE (dataset CTC1000/CTC2000)				
Target model					**Source model**				
					Tipo (Type)	Type of the pipe	Enumeration		1 Acquedotto (Acqueduct) 2 Gasdotto (gas pipeline) 3 Elettrodotto (Electric pipeline) 4 Oleodotto (Oil pipeline) 5 Incerta (uncertain)
Comments					Comments	A1 for the **id** attributes and for the values 1 of the **type** attribute. The *gasdotto*, *elettrodotto* and *oleodotto* values of the **type** attribute are not relevant in Hydro theme (C2). The *incerta* value is related at those entities impossible to classify during ordinary survay (B2)			
Feature Name	**Feature Definition**		**Feature Geometry**		**Feature Name**	**Feature Definition**			**Feature Geometry**
Vanishing Point	Location were a watercourse disappears into the terrain or vanishes due to anthropization.		Point Curve Surface						Point
Comments					Comments	The information is available with a spatial query between the 'asta idrica' and 'Letto di Fiume' or 'Fosso di scolo' features			

INSPIRE feature catalogue					Data provider CGE (dataset CTC1000/CTC2000)				
Target model					**Source model**				
Spring or Seep	A natural outflow of water from below the ground surface..			Point Curve Surface	**Sorgente (Spring)**	A natural outflow of water, also without capture structures			Point
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
id	The identity of the element	"data type Identifier"	1		**Progressivo (Progressive code)**	The identity of the elements; It is the id of the map & counter objects in map. It doesn't change during the life of the object	varchar	1	
Comments					**Comments**	A1			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
ShorelineConstruction	A fixed (not afloat) artificial structure attached to the land. NOTE: Shoreline constructions are normally used for berthing and protection. Includes breakwater/groyne/ wharf; but has more flexibility - also applies to inland waters.			Point Curve Surface	**Pontile, scalo (Wharf, a ramp to ground boats)**	A fixed (not afloat) artificial structure or ramp attached to the land			Curve
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**

INSPIRE feature catalogue					Data provider CGE (dataset CTC1000/CTC2000)				
Target model					**Source model**				
id	The identity of the element	"data type Identifier"	1		**Progressivo (Progressive code)**	The identity of the elements; It is the id of the map & counter objects in map. It doesn't change during the life of the object	varchar	1	
					Tipo (Type)	Type of the shoreline construction	Enumeration		1 Pontile (Wharf) 2 Scalo (Ramp)
Comments					**Comments**	A1 for the **id** attributes and for the value 1 of the **type** attribute. Value 2 of the **type** attribute has not hydro relevance (B2)			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
DamOrWeir	A permanent barrier across a watercourse used to impound water or to control its flow. NOTE: Dam if associated to a StandingWater; or weir if associated to a Watercourse.			Point Curve Surface	**Muro (wall)**	Dry stone wall, supporting wall, partition wall, dike			Curve
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**

INSPIRE feature catalogue					Data provider CGE (dataset CTC1000/CTC2000)				
Target model					**Source model**				
id	The identity of the element	"data type Identifier"	1		**Progressivo (Progressive code)**	The identity of the elements; It is the id of the map & counter objects in map. It doesn't change during the life of the object	varchar	1	
					Tipo (Type)	Type of the wall	Enumeration		Briglia (dike)
Comments					Comments	This feature may be obtained by an attribute query of feature "muro" (A2). The value *briglia* is the unicle one for hydro theme (A3). A1 for the **id** attribute.			

Table 8 – Features/attributes from the CGE Dataset that fit on the INSPIRE data model

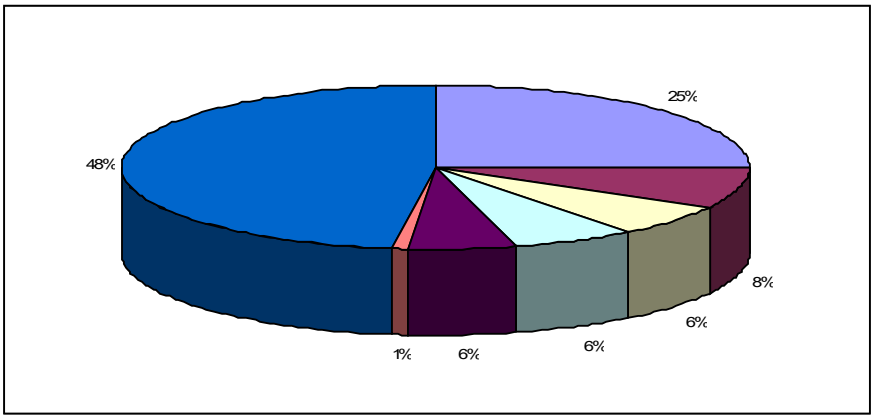
6.6.2 Critical analysis of the CGE dataset matching process for Hydrography

The CTC1000/cCTC2000 dataset provided by the Municipality of Genoa (CGE) correspond to a topographic database and for this reason it contains basic topographic features of the following main categories:

- buildings
- handworks
- road network
- railway network
- hydrography
- technological systems
- relief
- culture and vegetation
- toponomastic
- special usage areas

Each of this category contains a certain number of objects whose instances create the topographic maps.

In general, the matching process, as regards Inspire feature classes of Hidrography theme, presents the following pattern:



A1 and C2 classes are the most representatives and this means that the CGE geographic database matches well with the INSPIRE feature classes but it presents also particular aspects due to the detailed scale of its content, not considered in the general model.

Specific features, e.g. basin, or attributes, e.g. discharge rate of the watercourse link feature, are usually contained in thematic maps for specific studies.

Matching of some attribute (i.e. "origin" of feature Watercourse) may be obtained by grouping different values of attributes of the CGE features (A2)

Some information may be contained in CGE Dataset, but structured in different way (i.e.: Feature "watercourse", attribute "flowdirection", for inspire is a single field related to geometric information of the feature. In CGE dataset ther are two fields "from node" and "to node that togheter have the same meaning of flowdirection attribute. (A2)

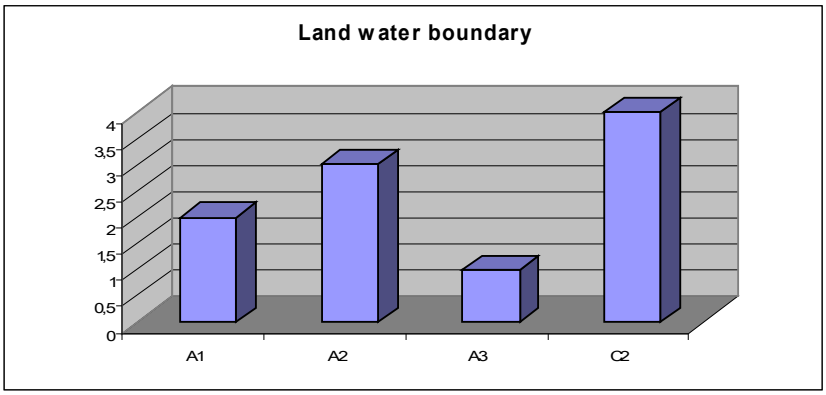
Some Inspire features may be obtained by an attribute filter of CGE features (i.e. DamOrWeir in CGE dataset is the "Muro" feature with tipo value "briglia") (A2)

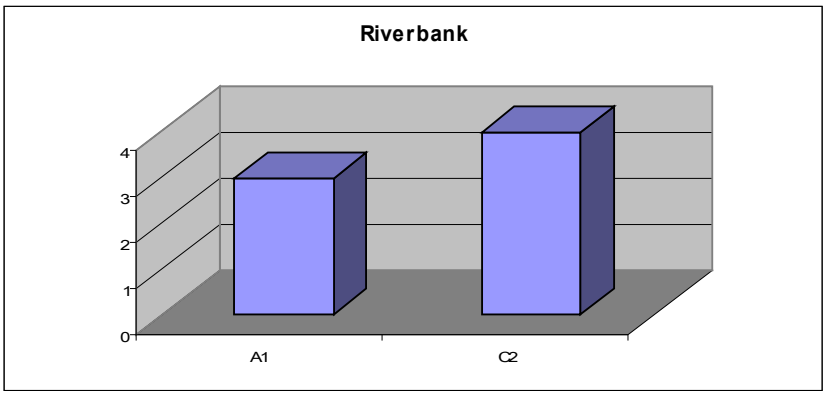
Some inspire features / attributes may be obtained by spatial query between two CGE features (i.e.:Constriction is obtained by spatial query between the 'asta fluviale' and the 'ponte' features) (A3)

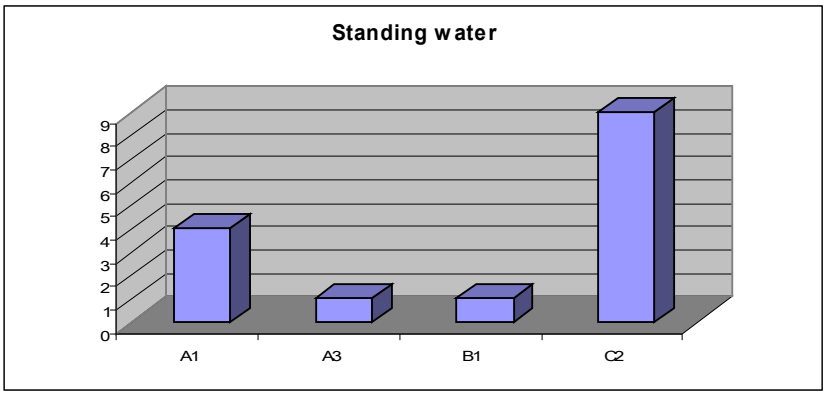
The B1 classes are related to values considered meaningful also in general context,while the B2 classes are relative to local entities (too local to be considered meaningful at a global scale) or to features not properly related to the hydrologic topic.

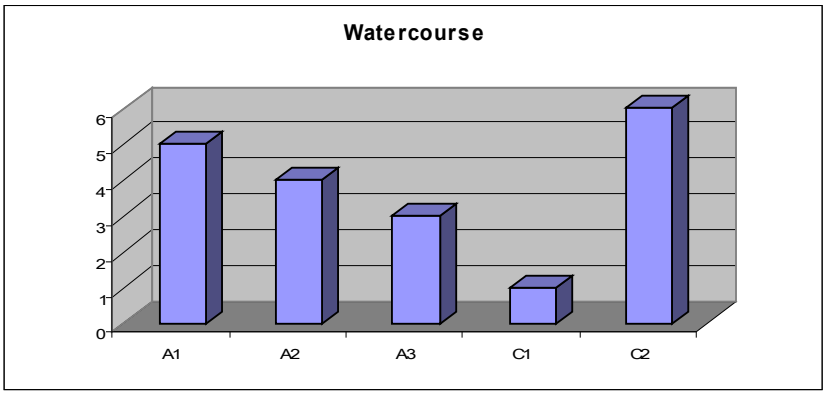
The meaning of the C1 and C2 classes is relative to the CGE context. This means that it has sense to acquire those features or attributes identified as C1 while it has no one for the C2 features or attributes. It is a relative evaluation in both cases

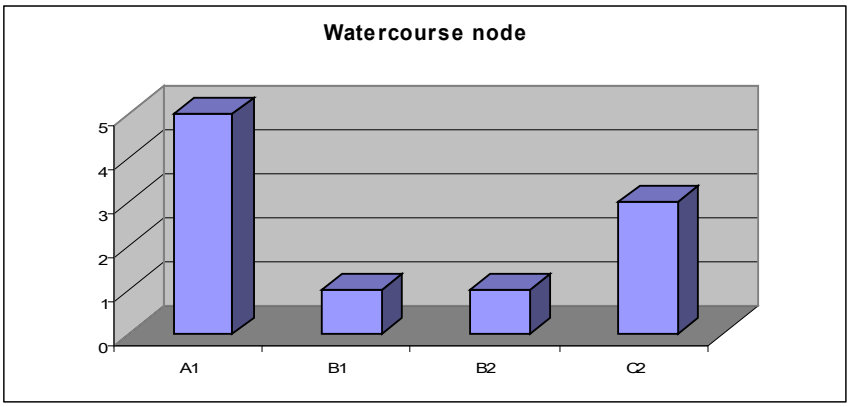
The following diagram shows the detailed pattern for each feature object (in ordinary the corrisponding number of each classes).

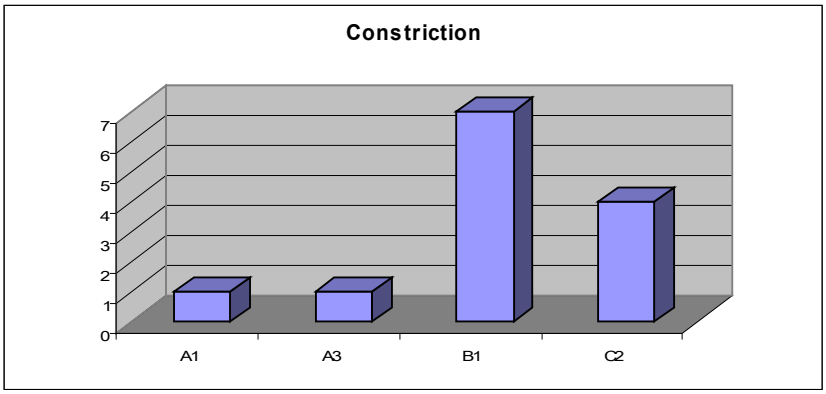

Land water boundary
4
3,5
3
2,5
2
1,5
1
0,5
0
A1
A2
A3
C2

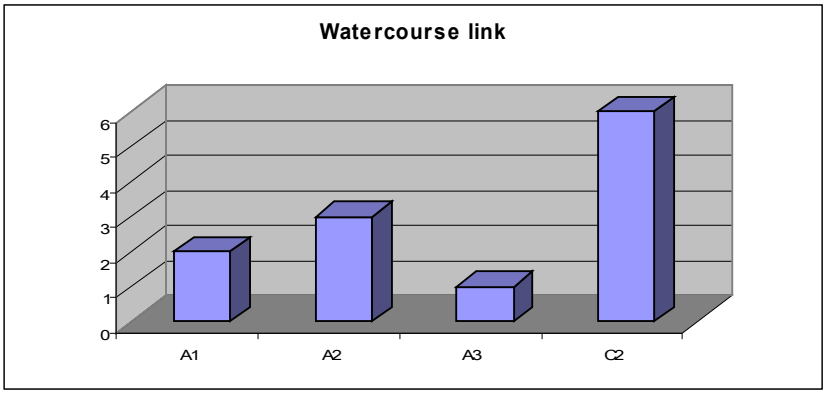

Riverbank
4
3
2
1
0
A1
C2

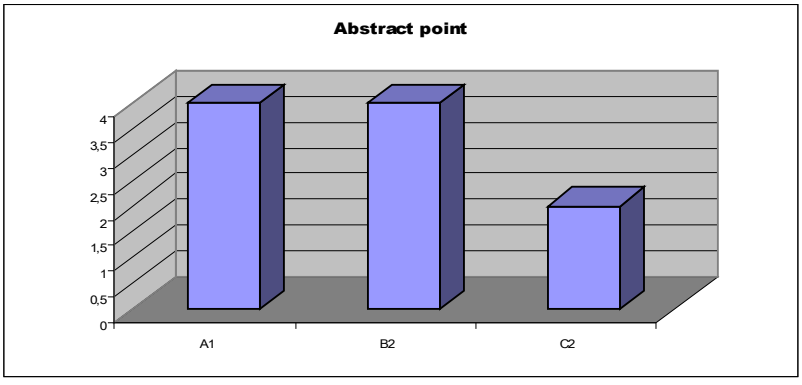

Standing water
9
8
7
6
5
4
3
2
1
0
A1
A3
B1
C2

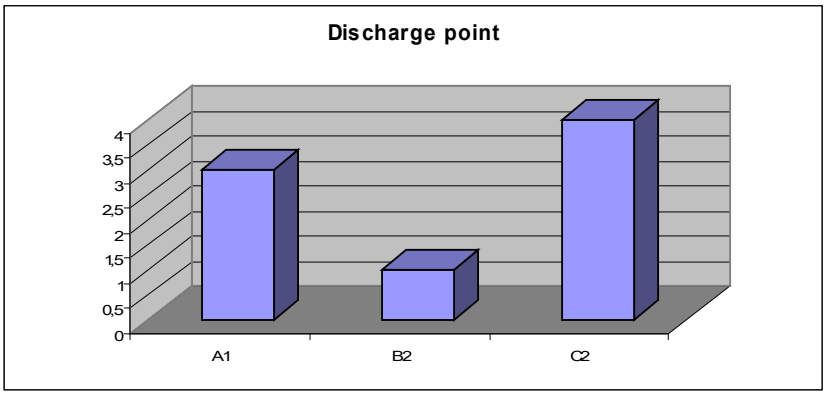

Watercourse
6
5
4
3
2
1
0
A1
A2
A3
C1
C2

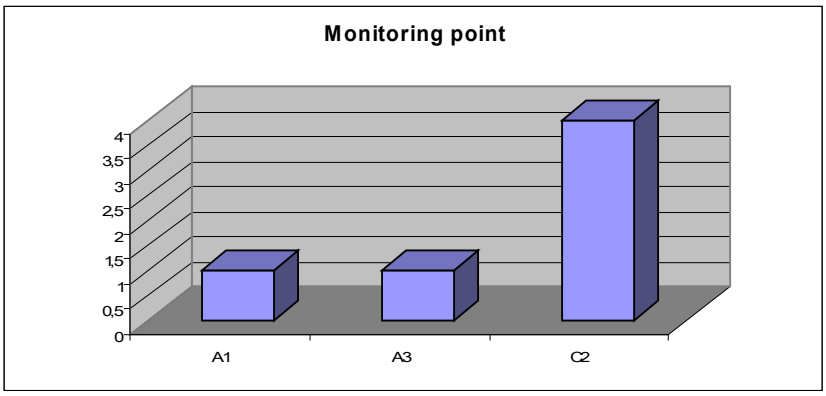

Watercourse node
5
4
3
2
1
0
A1
B1
B2
C2

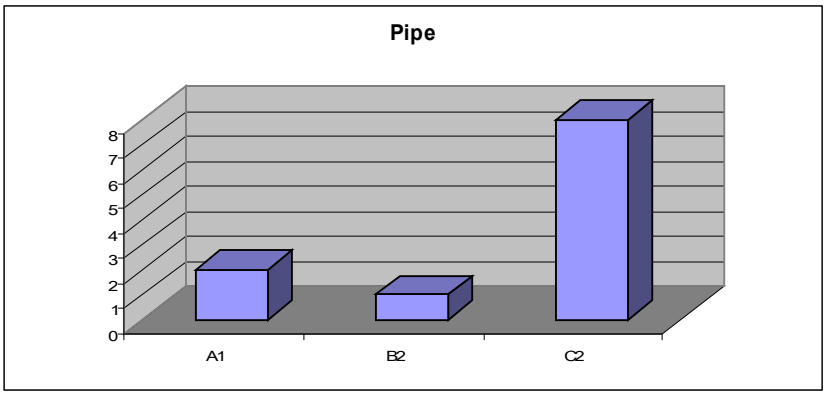

Constriction
7
6
5
4
3
2
1
0
A1
A3
B1
C2

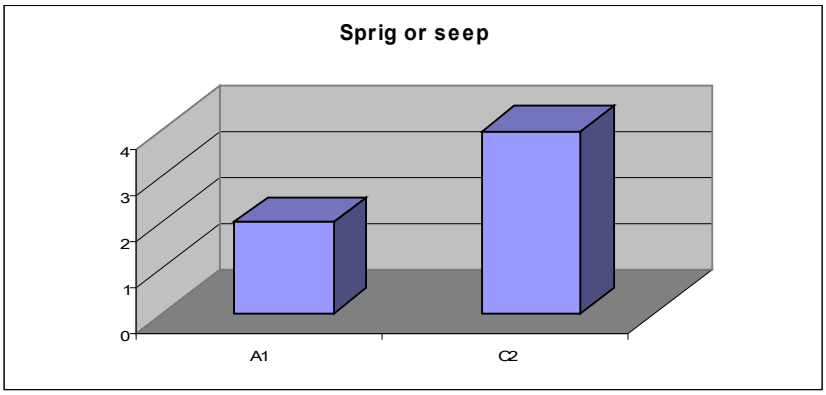

Watercourse link
6
5
4
3
2
1
0
A1
A2
A3
C2

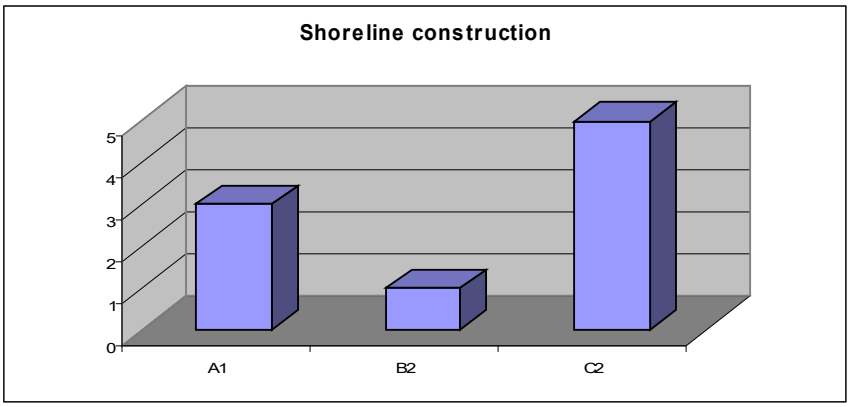

Abstract point
4
3,5
3
2,5
2
1,5
1
0,5
0
A1
B2
C2

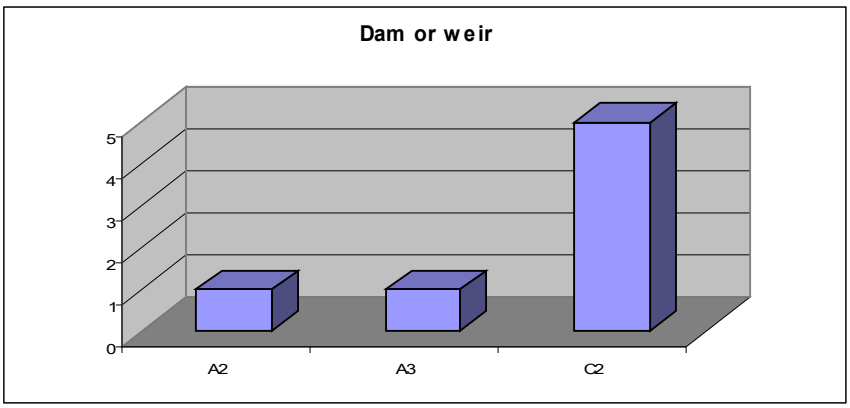

Discharge point
4
3,5
3
2,5
2
1,5
1
0,5
0
A1
B2
C2


Monitoring point
4
3,5
3
2,5
2
1,5
1
0,5
0
A1
A3
C2


Pipe
8
7
6
5
4
3
2
1
0
A1
B2
C2


Sprig or seep
4
3
2
1
0
A1
C2


Shoreline construction
5
4
3
2
1
0
A1
B2
C2


Dam or weir
5
4
3
2
1
0
A2
A3
C2

6.7 Analysis of IGP EuroGlobalMapPT Dataset

6.7.1 Features/attributes from the **IGP EuroGlobalMapPT** dataset that fit on the INSPIRE Hydrography data model

INSPIRE feature catalogue			**Data provider IGP (dataset EuroGlobalMapPT)**		
Target model			**Source model**		
Feature Name	**Feature Definition**	**Feature Geometry**	**Feature Name**	**Feature Definition**	**Feature Geometry**
Foreshore	That part of the shore or beach which lies between the low water mark and the coastline/shoreline. The same condition may exist in non-contiguous off-shore areas.	Surface	**Foreshore**	That part of the shore or beach which lies between the low water mark and the coastline/shoreline.	Polygon
Comments			Comments	A1	
StandingWater	A body of water entirely surrounded by land	Surface Point	**Lake,Pond**	A body of water surrounded by land.	Polygon
Comments			Comments	A1	
StandingWater	A body of water entirely surrounded by land	Surface Point	**Reservoir**	A man-made enclosure or area formed for the storage of water.	Polygon
Comments			Comments	A1	
Watercourse	A natural or man-made flowing watercourse or stream	Surface Curve	**River**	A natural flowing watercourse.	Arc

INSPIRE feature catalogue					Data provider IGP (dataset EuroGlobalMapPT)				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
geographicalName	*A textual identifier or code that is used to denote a feature.*	data type GeographicalName	Voidable - [0..*]		**NAMA1**	Name in first national language	Character	1	
Comments					**Comments**	A1			
DamOrWeir	A permanent barrier across a watercourse used to impound water or to control its flow [DIGEST] Dam if associated to a StandingWater; or weir if associated to a Watercourse.			Point Surface Curve	**Dam, Weir**	A permanent barrier across a watercourse used to impound water or to control its flow.			Arc
Comments					**Comments**	A1			

Table 9 – Features/attributes from the IGP EuroGlobalMapPT Dataset that fit on the INSPIRE data model

6.7.2 Critical analysis of the **IGP EuroGlobalMapPT** dataset matching process for Hydrography

As a result of the different use cases used to define the INSPIRE Hydrographic data model, overall, the INSPIRE dataset includes more hydrographic features than the EGM_PT dataset. However, in general the features defined in the dataset under analysis have much more attributes than the corresponding features in the INSPIRE data model. Thus, features in the EuroGlobalMapPT (EGM_PT) dataset are characterised in a more detailed way.

There is a number of features in both datasets sharing the same definition as a result of the dataset being the result of a data harmonization effort including several national data producers and the adoption of the FACC (Feature and Attribute Coding Catalogue) from DIGEST.

The hydrographic features in the dataset EuroGlobalMapPT are organised in three layers:

damwe: containing “Dam/Weir” features (FC=BI020) with geometric type arc,

ficri: containing “River” features (FC=BH140) with geometric type arc,

water: containing features with geometric type polygon with several feature codes, namely: “Foreshore” (FC=BA020), “Island” (FC=BA030), “Lake” (FC=BH080), “Reservoir” (FC=BH130) and the rivers whose size allows a polygon representation (FC=BH140).

It is possible to find exact matches for all the features present in the dataset with features in the INSPIRE data model with the exception of the feature “Island” (FC=BA030) that doesn't exist in the INSPIRE data model.

The feature “StandingWater” from the INSPIRE data model can be matched with two features of this dataset (EGM_PT), namely, “Lake, Pond” (FC=BH080) and “Reservoir” (FC=BH130).

6.8 Analysis of IGP EuroRegionalMapPT Dataset

6.8.1 Features/attributes from the **IGP EuroRegionalMapPT** dataset that fit on the INSPIRE Hydrography data model

INSPIRE feature catalogue					**Data provider IGP (dataset EuroRegionalMapPT)**				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
LandWaterBoundary	The line where a land mass is in contact with a body of water.			Curve	**Coastline**	The line where a land mass is in contact with a body of water.			Arc
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
origin	Origin of the land-water boundary	enumeration data type OriginType	voidable - 1	**natural** **manMade**	**HOC**	Hydrographical Origin Category	Coded integer	1	**Unknown** **Man-made** **Natural** **Jetty** **Breakwater / groyne** **Seawall**
Comments					**Comments**	A1			

INSPIRE feature catalogue					Data provider IGP (dataset EuroRegionalMapPT)				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Foreshore	That part of the shore or beach which lies between the low water mark and the coastline/shoreline. The same condition may exist in non-contiguous off-shore areas.			Surface	**Foreshore**	That part of the shore or beach which lies between the low water mark and the coastline/shoreline.			Polygon
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
geographicalName	Geographic name of foreshore or riverbank area	data type GeographicalName	Voidable - [0..*]		**NAMA1**	Name in first national language	Character	1	
Comments					**Comments**	A1			
StandingWater	A body of water entirely surrounded by land			Surface Point	**Lake,Pond**	A body of water surrounded by land.			Polygon
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
hydroid	A thematic identifier used for the object, often (but not specifically) a national hydrological identification code.	data type HydroIndentifier	Voidable - [0..1]		**NHI**	National hydrological identification code	Character		

INSPIRE feature catalogue					Data provider IGP (dataset EuroRegionalMapPT)				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
geographicalName	A textual identifier or code that is used to denote a feature.	data type GeographicalName	Voidable - [0..*]		**NAMA1**	Name in first national language	Character	1	
Comments					**Comments**	A1			
StandingWater	A body of water entirely surrounded by land			Surface Point	**Reservoir**	A man-made enclosure or area formed for the storage of water.			Polygon
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
hydroid	A thematic identifier used for the object, often (but not specifically) a national hydrological identification code.	data type HydroIndentifier	Voidable - [0..1]		**NHI**	National hydrological identification code	Character		
geographicalName	A textual identifier or code that is used to denote a	data type GeographicalName	Voidable - [0..*]		**NAMA1**	Name in first national language	Character	1	

INSPIRE feature catalogue					Data provider IGP (dataset EuroRegionalMapPT)				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
	feature.								
Comments					**Comments**	A1			
Watercourse	A natural or man-made flowing watercourse or stream			Surface Curve	**Watercourse**	A natural or man-made flowing watercourse or stream.			Arc Polygon
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
hydroid	The name for this element	data type HydroIndentifier	Voidable - [0..1]		**NHI**	National Hydrological Identification Code	Character	1	
geographicalName	A textual identifier or code that is used to denote a feature.	data type GeographicalName	Voidable - [0..*]		**NAMA1**	Name in first national language	Character	1	
tidal	Identifies whether the Watercourse is affected by tidal water	boolean	voidable - 1		**TID**	Tidal/Non-Tidal Category	Integer		

INSPIRE feature catalogue					Data provider IGP (dataset EuroRegionalMapPT)				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Comments					Comments	A1			
Wetland	A poorly drained or periodically flooded area where the soil is saturated with water, and vegetation is supported.			**Surface**	**Wetland**	A poorly drained or periodically flooded area where the soil is saturated with water, and vegetation is supported, e.g. marsh/swamp, bog/moor			**Polygon**
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Comments					Comments	A1			
SpringOrSeep	A natural outflow of water from below the ground surface.			**Point** **Curve** **Surface**	**Spring / Water Hole**	A natural outflow of water from below the ground surface			**Point**
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Comments					Comments	A1			
ShorelineConstruction	A fixed (not afloat) artificial structure attached to the land. NOTE: Shoreline constructions are normally used for berthing and protection. Includes breakwater/groyne/ wharf; but has more flexibility - also applies to inland waters			**Point** **Curve** **Surface**	**Pier/Wharf/Quay**	A structure primarily used as berthing places for vessels.			**Arc**

INSPIRE feature catalogue					Data provider IGP (dataset EuroRegionalMapPT)				
Target model					Source model				
Feature Name	Feature Definition			Feature Geometry	Feature Name	Feature Definition			Feature Geometry
Attribute Name	Attribute definition	Attribute type	Attribute cardinality	Possible values	Attribute Name	Attribute definition	Attribute type	Attribute cardinality	Possible values
Comments					Comments	A1			
Embankment	A raised long mound of earth or other material. NOTE: Including retaining walls, harbours, dikes.			**Point** **Curve** **Surface**	Embankment / Fill	A raised long mound of earth or other material.			**Arc**
Comments					Comments	A1			
DamOrWeir	A permanent barrier across a watercourse used to impound water or to control its flow. NOTE: Dam if associated to a StandingWater; or weir if associated to a Watercourse.			**Point** **Curve** **Surface**	Dam / Weir	A permanent barrier across a watercourse used to impound water or to control its flow.			**Point, Arc**
Comments					Comments	A1			
Sea	An area of water which normally has tidal fluctuations.			**Surface**	Sea	An area of water that normally has tidal fluctuations.			**Polygon**
Comments					Comments	A1			

Table 10 – Features/attributes from the IGP EuroRegionalMapPT Dataset that fit on the INSPIRE data model

6.8.2 Critical analysis of the **IGP EuroRegionalMapPT** dataset matching process for Hydrography

As a result of the different use cases used to define the INSPIRE Hydrographic data model, overall, the INSPIRE dataset includes more hydrographic features than the ERM dataset. However, in general the features defined in the dataset under analysis (EuroRegionalMapPT – ERM_PT) have much more attributes than the corresponding features in the INSPIRE data model. Thus, features in the ERM_PT dataset are characterised in a more detailed way.

There is a number of features in both datasets sharing the same definition as a result of the dataset being the result of a data harmonization effort including several national data producers and the adoption of the FACC (Feature and Attribute Coding Catalogue) from DIGEST.

There are 12 different hydrographic features in the dataset EuroRegionalMapPT and for 10 of them it is possible to establish a direct correspondence (match) with the features defined in the INSPIRE data model. The features for which it is possible to find a match with iNSPIRE data model features are: “Coastline/Shoreline” (FC=BA010, geometry=Line), “Foreshore” (FC=BA020, geometry=Polygon), “Lake/Pond” (FC=BH080, geometry=Polygon), “Reservoir” (FC=BH130, geometry=Polygon), “Watercourse” (FC=BH502, geometry=Line, Polygon), “Wetland” (FC=ED010, geometry=Polygon), “Spring/Water Hole” (FC=BH170, geometry=Point), “Dam/Weir “(FC=BI020, geometry=Point, Line), “Embankment/Fill” (FC=DB090, geometry=Line), “Pier/Wharf/Quay” (FC=BB190, geometry=Line) and “Sea” (FC=BA040, geometry=Polygon).

The only feature in the EuroRegionalMapPT dataset for which it was not possible to find a match in the INSPIRE data model is “Island” (FC=BA030, geometry=Polygon) (see the critical analysis of the EuroGlobalMapPT dataset in this document where the lack of this feature in the INSPIRE data model was also pointed out).

6.9 Analysis of *INSIEL Dbprior_0203_Corso_acqua dataset*

6.9.1 Features/attributes from INSIEL Dbprior_0203_Corso_acqua dataset that fit on the INSPIRE Hydrography data model

INSPIRE feature catalogue					**Data provider INSIEL (Dbprior_0203_Corso_acqua)**				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Watercourse	A natural or man-made flowing watercourse or stream			Curve	**Dbprior_0203_Corso_acqua**	It is the line that delimits the natural contour that determines the high water level.			Line
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
geometry	Origin of the land-water boundary	GM_Primitive	1		**Geometry1**	field Geometry			
Comments					**Comments**	A1			
id	INSPIRE identifier (see GCM clause 14)	data type Identifier	1		**ID_CORSOACQUA**	Unique code of the stream	String		
Comments					**Comments**	A1			
name	A textual identifier or code that is used to denote a feature.	data type GeographicalName	Voidable - [0..*]		**DENOMINAZIONE**	Official name of the stream	String		
Comments					**Comments**	A1			

INSPIRE feature catalogue					Data provider INSIEL (Dbprior_0203_Corso_acqua)				
Target model					**Source model**				
origin	Origin of the feature (whether natural or man-made)	enumeration	Voidable - 1	**natural** **manMade** **heavilyModified**	**TIPOLOGIA and TIPOLOGIA_esteso**	**Defines if the water stream is natural (code 01) or artificial (code 02)**	String		**View notes**
Comments					Comments	A3: attribute match only for a subset of values The attribute “tipologia” contain the code number (01,02) and the attribute “tipologia_esteso” the decodificated string (natural, artificial).			
persistence	The degree of persistence of water	enumeration	Voidable - 1	**dry** **intermittent** **perennial** **seasonal** **tidal** **torrential**	**PORTATA_NULLA**	Field Yes/No; shows if the water channel has a null capacity for a period of 120 days/year, in a medium hydrological year (refered to the Decreto del Ministero dell’Ambiente -Decree of the Environment Ministry in date 19th august 2003). This field isn’t complete yet, because of the absence of the exhaustive information on the hydrological trend of the water bodies	Boolean		
Comments					Comments	A2: Inspire model contain 6 values of classification, Insiel’s dataset only shows if the water channel has a null capacity			

INSPIRE feature catalogue					Data provider INSIEL (Dbprior_0203_Corso_acqua)				
Target model					**Source model**				
length	Lineal length of watercourse	number data type: Length	Voidable - 1		**LUNGHEZZA**	Lenght of the element	Number		
Comments					Comments	A1			
level	Vertical location of Watercourse relative to surrounding area	enumeration	Voidable - 1	**onGround** **aboveGround** **belowGround**	**NATURA and NATURA_esteso**	Defines if the water stream is superficial (code 01), an overflow (code 02), mixed (code 03) or vector if the stream comes from a basin and finishes in another (code 04) (we have to clarify that such streams don't have a gulp basin)	Number		**View comments**
Comments					Comments	A3: attribute match only for a subset of values The attribute "natura" contain the code number (01,02, 03) and the attribute "natura_esteso" the decodificated string (natural, artificial).			

INSPIRE feature catalogue					Data provider INSIEL (Dbprior_0203_Corso_acqua)				
Target model					**Source model**				
waterCourseHierarchy	National hierarchy (applied in the national database).	enumeration	Voidable - [0..1]	**1st** **2nd** **3rd** **4th** **5th** **other**	**ORDINE**	To the main sections decreasing to the sea level was assigned the order 1; to the water bodies (to the natural or artificial sections of order 1 was assigned order 2 e so on; to the water bodies without an assigned basin, because of it's role of only transfering of capacity from a sample water channel to a collecting basin (named vector water bodies) and to all the artificial channels with a mechanical draw was assigned an order of 0; to all the water streams finishing in as many water channels of 0 order, was assigned the order 0	Number		

Table 11 – Features/attributes from the INSIEL Dbprior_0203_Corso_acqua dataset that fit on the INSPIRE data model

6.9.2 Critical analysis of the **INSIEL Dbprior_0203_Corso_acqua** dataset matching process for HYDROGRAPHY

Analysis of relevant features and attributes from dataset that are not included in the INSPIRE data model.

There are some attributes in Dbprior_0203_Corso_acqua that are not present in INSPIRE data model (class B). All attribute are considered not relevant to INSPIRE context, excepts:

- GESTORE: that it the authority responsible for maintenance.

Attribute Name	**Attribute type**	**Attribute definition**	Code Matching
NOME_CTR	Alphanumeric String	Name as in the CTRN Carta tecnica regionale numerica (Regional Technic Map) in scale 1:5000	**B2**
NOME_RD	Alphanumeric String	Name from the correspondent list of the Public Streams, made after the implementation of the R.D. 1775/1933 (only for the booked in streams). That quality has an approximate value	**B2**
NOME_FORESTE	Alphanumeric String	Name given from the Direzione centrale delle risorse agricole, naturali, forestali e montagna (Agricultural, Natural, Forest and Mountain Central Management)	**B2**

NOME_1	Alphanumeric String	Other possibile names found in various sources, included, sometimes, the inhabitants of the area (toponomastic noun, dialectic or hystorical version...)	**B2**
NOME_2	Alphanumeric String	Other possibile names found in various sources, included, sometimes, the inhabitants of the area (toponomastic noun, dialectic or hystorical version...)	**B2**
NOME_3	Alphanumeric String	Other possibile names found in various sources, included, sometimes, the inhabitants of the area (toponomastic noun, dialectic or hystorical version...)	**B2**
CODICE_PT	Alphanumeric String	Code assigned by the 4th explicative circular of the (Regional Law) L.R. 19/11/1991, n. 52 which identifies the streams arbitrated to the areas of special planning control	**B2**
CODICE_RD	Alphanumeric String	Code assigned in the lists of the Public Streams made after the implementation of the Regio Decreto (Royal Decree) n. 1775/1933 (only for the booked in streams). We have to consider the conditions written before as	**B2**

		nome_RD	
CODICE_FORESTE	Alphanumeric String	Code assigned by the Direzione centrale delle risorse agricole, naturali, forestali e montagna (Agricultural, Natural, Forest and Mountain Central Management)	**B2**
CODICE_FVG	Alphanumeric String	Code assigned by the Direzione centrale ambiente e lavori pubblici (Environment and Public Works Central Management) based on the Decreto Ministeriale (Ministerial Decree) of the 19/08/2003 better illustrated in the previous chapter. Such codification was adopted and officialized with a deliberation of the Committee n. 3349 dd. 23rd december 2005. The code counts 7 characters: two letters identifiing the main section; two digit identifiing the order of the section (crescent beginning from the outfall); progressive number of three digits assigned by the length of the section (decrescent order)	**B2**

COD_APPL	Alphanumeric String	Application code equivalent to the SINA code, concatenate with the FVG code	**B2**
ID_INIZIO	Alphanumeric String	Initial node	**B2**
ID_FINE	Alphanumeric String	Final node	**B2**
GESTORE	Alphanumeric String	Name of the Administrator Agency	**B1**: that it the authority responsible for maintenance
ORIGINE	Alphanumeric String	Origin of the data	**B2**
CODICE_SINA_BACINO and COD_BACINO_RAFVG	String	CODICE_SINA_BACINO:Is the identify code of the own basin, as roled by the Decreto del Ministero dell'Ambiente - Decree of the Environmental Ministry in date 19th august 2003. That code was adupted and officialized by the deliberation of the Committee n. 3349 dd. 23rd december 2005; COD_BACINO_RAFVG :Code of the basins	**B2**
BACINO and SOTTOBACINO	String	BACINO:Is the name of the main hydrological basin, in which relapses the water channel. To notice that for the "vector" streams, which cross the basins with a null draw (Magredi Occidentali,	**B2**

		Magredi Centrali, Magredi Orientali, Lavie Occidentali, Lavie Orientali), the field of the basin remains empty.SOTTOBACINO:Is the name of the second grade hydrological basin	

6.10 Analysis of RVEN DBPrior10K-Hydrography Dataset

6.10.1 Features/attributes from the **RVEN Hydrography** dataset that fit on the INSPIRE Hydrography data model

INSPIRE feature catalogue					**Data provider RVEN (Hydrography dataset) feature catalogue**				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
StandingWater	A body of water entirely surrounded by land			Surface Point	**SpecchioAcqua**				
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
geometry		GM_Primitive	1		**shape**		shape 2D		
Comments	The shape of the StandingWater either a point or surface				**Comments**	A2			
id	INSPIRE identifier (see GCM clause 14)	data type Identifier	1		**id**		character		
Comments					**Comments**	A2 (the attribute can't be "like INSPIRE" because the dataset was organized before)			

INSPIRE feature catalogue					Data provider RVEN (Hydrography dataset) feature catalogue				
Target model					**Source model**				
geographicalName	A textual identifier or code that is used to denote a feature.	data type GeographicalName	Voidable - [0..*]		**NOME**		character		
Comments					Comments	A2(the attribute is included in the table that contains the local type)			
origin	Origin of the feature (whether natural or man-made)	enumeration	Voidable - 1	natural manMade	**NATURA**		enum		1)Lake 2)Pool/Swamp 3)Peat bog 4)Lagoon/valley 5)Artificial Basin
Comments	An enumeration type specifying a set of hydrographic 'origin' categories (natural, man-made, heavily-modified) for various hydrographic objects				Comments	A2 partial match. The SpecchioAcqua has to contain a minimum square of 20 m of			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**

INSPIRE feature catalogue					Data provider RVEN (Hydrography dataset) feature catalogue				
Target model					**Source model**				
Watercourse	A natural or man-made flowing watercourse or stream			Surface Curve	**Idrografia**	natural or man-made flowing watercourse			
Comments					Comments	A3 (the geometry is present only in the feature "Elementoildrico")			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
id	INSPIRE identifier (see GCM clause 14)	data type Identifier	1		**OBJECTID**	ID used to join the watercourse segment	number		
Comments					Comments	A2 (the attribute can't be "like INSPIRE" because the dataset was organized before)			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
hydroid	A thematic identifier used for the object, often (but not specifically) a national hydrological identification code.	Data type	Voidable - [0..1]		**LIVELLO**	SIBAPO encoding = a hierarchic method from valley to upriver created by the Basin Authority of Po river	character		
Comments					Comments	A2			

INSPIRE feature catalogue					Data provider RVEN (Hydrography dataset) feature catalogue				
Target model					**Source model**				
localType	Provides 'local' name for the surface water (e.g. canal, channel, ditch, ...).	data type LocalisedCharacterString	[0..1]						
Comments	Range [0..1]				Comments	A2(the attribute is included in the table that contains the name)			
geographicalName	A textual identifier or code that is used to denote a feature.	data type GeographicalName	Voidable - [0..*]		**NOME**	Geographical name	character		
Comments					Comments	A2(the attribute is included in the table that contains the local type)			
hydroid	A thematic identifier used for the object, often (but not specifically) a national hydrological identification code.	data type HydroIndentifier	Voidable - [0..1]		**LIVELLO**	SIBAPO encoding = a hierarchic method from valley to upriver created by the Basin Authority of Po	character		
Comments					Comments	A2			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**

INSPIRE feature catalogue					Data provider RVEN (Hydrography dataset) feature catalogue				
Target model					**Source model**				
origin	Origin of the feature (whether natural or man-made)	enumeration	Voidable - 1	natural manMade	**TIPO_C**	Typology of the element (natural or man made)	Enum		Natural, Artificial, Indefinite
Comments	An enumeration type specifying a set of hydrographic 'origin' categories (natural, man-made, heavily-modified) for various hydrographic objects				Comments	A1			
length	Lineal length of watercourse	number data type: Length	Voidable - 1						
Comments					Comments	A3(this attribute is implied into the geometry and is derivable from this)			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
waterCourseHierarchy	National hierarchy (applied in the national database).	enumeration	Voidable - [0..1]	1st 2nd 3rd 4th 5th other					

INSPIRE feature catalogue					Data provider RVEN (Hydrography dataset) feature catalogue				
Target model					**Source model**				
Comments	Enumerated list of Watercourse hierarchy levels within national classification scheme				Comments	A3 (this attribute can be derived from the "LIVELLO" attribute of the "Idrografia" feature class)			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
WatercourseNode	A node within the hydrographic network - may represent a physical confluence, bifurcation/confluence/vanishing point etc, or it may be associated with a hydrographic point of interest or facility.			Point	**NodoIdrico**	node within hydrographyc network			point
Comments					Comments	A1			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
geometry		GM_Point	1		**shape**		point 2D		
Comments					Comments	A1			

INSPIRE feature catalogue					Data provider RVEN (Hydrography dataset) feature catalogue				
Target model					**Source model**				
id	The identity of the element	data type Identifier	[0..1]		**ID_NODO**		character		
Comments					Comments	A1			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**

INSPIRE feature catalogue					Data provider RVEN (Hydrography dataset) feature catalogue				
Target model					**Source model**				
hydroNodeCategory	Nature of the watercourse node	enumeration	Voidable - 1	bifurcation confluence mouth spring vanishingPoint	**TIPO_NODO**	Node typology	number		1 start 2 confluence or bifurcation 3 holdup or restart 4 intersection with regional boundary 5 intersection with a standing water boundary 6 change of element 7 standing water without outlet 8) virtual (only for bend)
Comments	Defines categories for different types of hydrographic network nodes				**Comments**	A2 partial match			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
WatercourseLink	A segment of a watercourse within a hydrographic network			Curve	**Elementoldrico**	segment of a watercourse within a hydrographic network			polyline 2D

INSPIRE feature catalogue					Data provider RVEN (Hydrography dataset) feature catalogue				
Target model					**Source model**				
Comments					Comments	A1			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
centerlineGeometry		GM_Curve	1		**shape**		polyline 2D		
Comments					Comments	A1			
id	The identity of the element	data type Identifier	0..1		**ID_ELEM**	Unique ID of feature	char		
Comments					Comments	A1			
flowDirection	Direction of water flow in the segment relative to digitisation of segment geometry	enumeration	Voidable - [0..1]	positive negative					
Comments	A enumeration of sign, usually used in an algebraic system to distinguish between a positive value and a negative value, or between a base orientation or a reversal of a base orientation. These are commonly represented by a single character such as "+" or "-" but may sometimes carry an integer 1 for emphasis such as "+1", or "-1" -- there is no semantic difference between these two presentations objects.				Comments	A3(this attribute is implied into the geometry and is derivable from this)			

INSPIRE feature catalogue					Data provider RVEN (Hydrography dataset) feature catalogue				
Target model					**Source model**				
length	Length of segment	number data type: Length	Voidable - 1						
Comments					Comments	A3(this attribute is implied into the geometry and is derivable from this)			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
LandWaterBoundary	The line where a land mass is in contact with a body of water.			Curve	**LineaCosta**	Shoreline, coastline			Polyline
Comments					Comments	A1			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Geometry	The shape of the LandWaterBoundary, as a curve.	GM_Curve	1		**shape**		Polyline 2D		
Comments					Comments	A1			

Table 12 – Features/attributes from the RVEN-Hydrography Dataset that fit on the INSPIRE Hydrography data model.

6.10.2 Critical analysis of the **RVEN** dataset matching process for Hydrography

The INSPIRE Hydrography theme is composed by the following feature classes:

- CatchmentArea
- Basin
- GlacierSnowfield
- LandWaterBoundary
- Sea
- Foreshore
- Riverbank
- StandingWater
- Watercourse
- Wetland
- WatercourseNode
- Constriction
- WatercourseLink
- WatercourseSeparatedCrossing
- AbstractPoint
- DischargePoint
- MonitoringPoint
- Pipe
- Falls
- Rapids
- VanishingPoint
- SpringOrSeep
- SubsurfaceCrossing
- SurfaceCrossing
- ShorelineConstruction
- Embankment
- DamOrWeir
- Lock
- Ford
- Sluice
- WFDSurfaceWaterBody
- WFDCoastalWater
- WFDTransitionalWater
- WFDRiver
- WFDLake

The RVEN dataset provided by “Regione del Veneto” corresponds to a topographic database which aim is to provide basic reference data for spatial applications. As such, it contains basic topographic data of several themes.

RVEN dataset has been realized in accordance with Intesa GIS specifications, vers. 2004, which are less detailed then the INSPIRE model.

The theme was afterwards developed by the National project Intesa GIS-DBTopo.

The RVEN Dataset is constituted by the following features class:

<table>
<tr><td>ElementoIdrico</td><td>This feature contains all the watercourses as a unique level of curve (detecting the centreline of the flows), from node to node, or from intersection to intersection, or from start to intersection, or from start to end.

The hydrographic elements are organized to set up a graph (Hydrographic Network) connected and oriented; each hydrographic element is represented by a line with the direction towards the flow of the water or with a conventional direction when is impossible to determine it.</td></tr>
<tr><td>NodoIdrico</td><td>At the end of each curve there is a level of points, derived from the coverage of curves that are coincident with the start points and the end points of the Hydrographic elements.</td></tr>
<tr><td>Idrografia</td><td>This is a DBF file containing the references to the curves useful for the setting of the watercourses. Referring to the INTESA GIS specifications the model is modified.

<table><tr><th>INTESAGIS MODEL</th><th>RVEN MODEL</th></tr><tr><td>Canale (water channel)</td><td rowspan="2">Idrografia</td></tr><tr><td>CorsoAcqua (watercourse)</td></tr></table>
The model is modified because there is a difficulty to identify the natural water courses from the man made one especially in the valley of Veneto Region. Anyway It was maintained the feature attribute TIPO_C in which we can find the information.</td></tr>
<tr><td>SpecchioAcqua</td><td>The Standing water is the represented by the area covered from the water of a water body that has a slow change or standing water: it could be natural or man made.</td></tr>
<tr><td>Limite di Costa marina</td><td>It is a curve file of shorelines.</td></tr>
</table>

The result of the match with INSPIRE data model can be seen in table 12. The main differences are:

StandingWater	This feature class is represented in RVEN data model with the feature class **SpecchioAcqua** : All the RVEN dataset feature/attributes match the INSPIRE model

	with some semantic or data capture differences which must be stressed (class A2 of the Table 2 section 5 of this document), some attribute as the ID can't be like INSPIRE because the dataset was organized before.
WaterCourse	This feature class is represented in RVEN data model with the feature class **Idrografia**: On this feature we have only one attribute of class A1 ("origin" matched with "TIPO_C", and all the other are represented in the class A2 and A3 (this is a complex match because the geometry is present only in ElementoIdrico. The attribute "hydroid" in the INSPIRE model 2nd draft match RVEN attribute LIVELLO with some semantic differences (class A2).
WaterCourseNode	This feature class is represented in RVEN data model with the feature class **NodoIdrico:** This feature is well matched by RVEN dataset with the most of A1 class, one A2 (hydroNodeCategory -> TIPO_NODO) with a partial match with the possible values, and two attributes in class C1 (BeginLifespanVersion and EndLifespanVersion)
WatercourseLink	This feature class is represented in RVEN data model with the feature class **ElementoIdrico:** This feature is well matched by RVEN dataset in class A1 and two attributes in class A3 (because the attribute is implied into the geometry and is derivable from this) some attribute in class C1 are considered very relevant: crossSection, crossSectionLocation, dischargeRate, and flowResistence.
LandWaterBoundary	This feature class is represented in RVEN data model with the feature class **LineaCosta:** This feature is matched by RVEN in class A1 in "Geometry" attribute with the shape in RVEN, some attribute in RVEN are not present in ISPIRE model, the most not relevant for it (B2), two considered in class B1.

In all INSPIRE features analyzed are present the attributes "BeginLifespanVersion" and "EndLifespanVersion" for the multitemporal feature. The RVEN does not implement the multitemporal features, so these attributes aren't relevant for RVEN dataset, but are considered relevant for INSPIRE directive (C.1 in the matching table).

Finally we can say that the feature that match with INSPIRE are not many, because Inspire features are related to several information.

Attributes classified as A1 are not much, while the A2 and A3 classification are more numerous.

On the other hand, there are many features and attributes from INSPIRE data model not present in RVEN dataset, even though most of them are considered really relevant. This is the case of the follow feature class that was classified as C1: CatchmentArea, Basin, GlacierSnowfield, Sea, Foreshore, Riverbank, Wetland, Constriction,

WatercourseSeparatedCrossing, AbstractPoint, DischargePoint, MonitoringPoint, Pipe, Falls, Rapids, VanishingPoint, SpringOrSeep, SubsurfaceCrossing, SurfaceCrossing, ShorelineConstruction, Embankment, DamOrWeir, Lock, Ford, Sluice, WFDSurfaceWaterBody, WFDCoastalWater, WFDTransitionalWater, WFDRiver, WFDLake.

6.11 Analysis of MAV GD010IDROLAGL1 Dataset

6.1.1 Features/attributes from the MAV GD010IDROLAGL1 dataset that fit on the INSPIRE Hydrography data model

INSPIRE feature catalogue					**Data provider MAV (dataset GD010IDROLAGL1)**				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Watercourse	A natural or man-made flowing watercourse or stream			Surface Curve	**idrografia_lagunare_a**	A natural or man-made flowing watercourse or stream that assure the exchange between lagoon and sea			Area
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
geometry		GM_Primitive	1		Geometry1		Area Geometry		
Comments	The shape of the StandingWater either a point or surface				**Comments**	A1			
beginLifespanVersion	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.	DataTime	Voidable - 1		Data_agg	date of the insert of the object	Long Integer		
Comments	NOTE 1 If life-cycle information is not maintained as part of the spatial data set, provide a void value with a reason of "unknown". NOTE 2 The attribute specifies the begin of the lifespan of the version in the spatial data set itself, which is different				**Comments**	A2 = Our Data Time format id a long integer (YYYYMMDD) and not a official data time format			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**

INSPIRE feature catalogue					Data provider MAV (dataset GD010IDROLAGL1)				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Watercourse	A natural or man-made flowing watercourse or stream			Surface Curve	**idrografia_lagunare_a**	A natural or man-made flowing watercourse or stream that assure the exchange between lagoon and sea			Area
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
endLifespanVersion	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.	DataTime	Voidable - [0..1]		Data_modifica	date of the last update of the object	Long Integer		
Comments	NOTE See notes in the documentation of attribute "beginLifespanVersion". These apply for this attribute, too				**Comments**	A2 = Our Data Time format id a long integer (YYYYMMDD) and not a official data time format			
id	INSPIRE identifier (see GCM clause 14)	data type Identifier	1		ID		Autonumber		
Comments					**Comments**	A2 = The attribute ID is the PK of the object (attribute management)			
geographicalName	A textual identifier or code that is used to denote a feature.	data type GeographicalName	Voidable - [0..*]		Toponomastica	Full name of the ship canal	Alphanumeric String		
Comments					**Comments**	A1			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**

INSPIRE feature catalogue					Data provider MAV (dataset GD010IDROLAGL1)				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Watercourse	A natural or man-made flowing watercourse or stream			Surface Curve	**idrografia_lagunare_a**	A natural or man-made flowing watercourse or stream that assure the exchange between lagoon and sea			Area
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Watercourse	A natural or man-made flowing watercourse or stream			Surface Curve	**Canali_valli_da_pesca**	Generaly man-made flowing watercourse or stream inside fish farm			Area
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
geometry		GM_Primitive	1		Geometry1		Area Geometry		
Comments	The shape of the StandingWater either a point or surface				**Comments**	A1			
beginLifespanVersion	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.	DataTime	Voidable - 1		Data_agg	date of the insert of the object	Long Integer		

INSPIRE feature catalogue					Data provider MAV (dataset GD010IDROLAGL1)				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Watercourse	A natural or man-made flowing watercourse or stream			Surface Curve	**idrografia_lagunare_a**	A natural or man-made flowing watercourse or stream that assure the exchange between lagoon and sea			Area
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Comments	NOTE 1 If life-cycle information is not maintained as part of the spatial data set, provide a void value with a reason of "unknown". NOTE 2 The attribute specifies the begin of the lifespan of the version in the spatial data set itself, which is different				**Comments**	A2 = Our Data Time format id a long integer (YYYYMMDD) and not a official data time format			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
endLifespanVersion	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.	DataTime	Voidable - [0..1]		Data_modifica	date of the last update of the object	Long Integer		
Comments	NOTE See notes in the documentation of attribute "beginLifespanVersion". These apply for this attribute, too				**Comments**	A2 = Our Data Time format id a long integer (YYYYMMDD) and not a official data time format			
id	INSPIRE identifier (see GCM clause 14)	data type Identifier	1		ID		Autonumber		

INSPIRE feature catalogue					Data provider MAV (dataset GD010IDROLAGL1)				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Watercourse	A natural or man-made flowing watercourse or stream			Surface Curve	**idrografia_lagunare_a**	A natural or man-made flowing watercourse or stream that assure the exchange between lagoon and sea			Area
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Comments					**Comments**	A2 = The attribute ID is the PK of the object (attribute management)			
geographicalName	A textual identifier or code that is used to denote a feature.	data type GeographicalName	Voidable - [0..*]		Toponomastica	Full name of the ship canal	Alphanumeric String		
Comments					**Comments**	A1			
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Watercourse	A natural or man-made flowing watercourse or stream			Surface Curve	**Ghebbi**	Smaller channels branch off main channels to become smaller and smaller and ever more winding; these are the so-called tidal creeks which cross salt marshes to finish in rainwater ponds, which are composed of brackish rainwater.			Area
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
geometry		GM_Primitive	1		Geometry1		Area Geometry		

INSPIRE feature catalogue					Data provider MAV (dataset GD010IDROLAGL1)				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Watercourse	A natural or man-made flowing watercourse or stream			Surface Curve	**idrografia_lagunare_a**	A natural or man-made flowing watercourse or stream that assure the exchange between lagoon and sea			Area
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
Comments	The shape of the StandingWater either a point or surface				**Comments**	A1			
beginLifespanVersion	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.	DataTime	Voidable - 1		Data_agg	date of the insert of the object	Long Integer		
Comments	NOTE 1 If life-cycle information is not maintained as part of the spatial data set, provide a void value with a reason of "unknown". NOTE 2 The attribute specifies the begin of the lifespan of the version in the spatial data set itself, which is different				**Comments**	A2 = Our Data Time format id a long integer (YYYYMMDD) and not a official data time format			
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**

INSPIRE feature catalogue					Data provider MAV (dataset GD010IDROLAGL1)				
Target model					**Source model**				
Feature Name	**Feature Definition**			**Feature Geometry**	**Feature Name**	**Feature Definition**			**Feature Geometry**
Watercourse	A natural or man-made flowing watercourse or stream			Surface Curve	**idrografia_lagunare_a**	A natural or man-made flowing watercourse or stream that assure the exchange between lagoon and sea			Area
Attribute Name	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**	**Attribute Name**	**Attribute definition**	**Attribute type**	**Attribute cardinality**	**Possible values**
endLifespanVersion	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.	DataTime	Voidable - [0..1]		Data_modifica	date of the last update of the object	Long Integer		
Comments	NOTE See notes in the documentation of attribute "beginLifespanVersion". These apply for this attribute, too				**Comments**	A2 = Our Data Time format id a long integer (YYYYMMDD) and not a official data time format			
id	INSPIRE identifier (see GCM clause 14)	data type Identifier	1		ID		Autonumber		
Comments					**Comments**	A2 = The attribute ID is the PK of the object (attribute management)			
geographicalName	A textual identifier or code that is used to denote a feature.	data type GeographicalName	Voidable - [0..*]		Toponomastica	Full name of the ship canal	Alphanumeric String		
Comments					**Comments**	A1			

Table 13 – Features/attributes from the MAV GD010IDROLAGL1 Dataset that fit on the INSPIRE data model

6.11.1 Critical analysis of the MAV GD010IDROLAGL1 dataset matching process for Hydrography

Features Idrografia_lagunare_a, Canali_valli_da_pesca and Ghebbi in MAV GD010IDROLAGL1 dataset

Analysis of relevant features and attributes from dataset that are not included in the INSPIRE data model

The follow attributes of the MAV GD010IDROLAGL1 dataset are not include in the Inspire model:

Cod_CTR	Reference number in the CTR (Carta Tecnica Regionale)
Sottocod_CTR	Sub-reference number in the CTR (Carta Tecnica Regionale)
Operatore	code operator
Nome_originale	Code for describing the origin of data
Liv_agg	says if it's the update geometry
Data_rilevamento	date of the original data
Giurisd	Specification of the administrative responsibility, in particular for the port authorities
Uso_canale	
Competenza	Specification of the administrative responsibility, in particular for the port authorities
velocita	Speed limit (Km/h) with the engine boat
Cod_perizia	Attribute management

Analysis of relevant features and attributes from INSPIRE data model that are not included in the dataset

The follow attributes of the INSPIRE data model are not include in the MAV GD010IDROLAGL1 dataset :

hydroid	A thematic identifier used for the object, often (but not specifically) a national hydrological identification code.

localType	Provides 'local' name for the surface water (e.g. canal, channel, ditch, ...).
levelOfDetail	An indicative 'level-of-detail' for this object: the object is relevant at scales from this level of detail and greater (i.e. objects won't normally be relevant below a certain LoD); at lower scales generalisation rules apply for portrayal and visualisation.
nationalId	National hydrological identification code. The 2 first characters are the 2-character country code.
origin	Origin of the feature (whether natural or man-made)
persistence	The degree of persistence of water
condition	The state of planning, construction, repair, and/or maintenance of the structures and/or equipment comprising a facility and/or located at a site. Only relevant for man-made watercourse
fictitious	An indication that the geometry of the feature is not well defined.
length	Lineal length of watercourse
level	Vertical location of Watercourse relative to surrounding area
tidal	Identifies whether the Watercourse is affected by tidal water
waterCourseHierarchy	National hierarchy (applied in the national database).
width	Width of watercourse (as a range) along its length.

Report of the problem

The following attributes, include in the original MAV dataset, are attributes for our internal procedures management: Operatore, Nome_originale, Liv_agg, Data_rilevamento, Data_modifica Uso_canale, Cod_perizia and thus are not significant for the INSPIRE structure.

Speed limits (velocita) and jurisdiction (Giurisd) are attributes of our dataset, although INSPIRE included this attributes in the Transport Network. Why not in the hydrography model, at least for the jurisdiction?

INSPIRE provides the attribute *tidal* to identify *whether* the Watercouse is affected by tidal water. Our feature by definition is a tidal creek.

The concatenation of our attributes Cod_ctr and *Sottocod_CTR* are referred to a Regional identification code, and not National and thus we haven't connect it with the INSPIRE attribute *nationalId.*

The INSPIRE attribute *length* is present in our Transport model.

The *Ghebbi* and *Canali_valli_da_pesca* features are so specific of the Venice Lagoon that we propose to not insert them in the INSPIRE structure.

7 The GIS4EU Hydrography subset of the INSPIRE Data Model

The purpose of this section is to assess, based on the results of the matching process reported in the tables of section 6, the subset of the INSPIRE features that is possible to find in the datasets analysed in this document.

The features of the INSPIRE data model that were matched with features from the GIS4EU datasets are listed according to the INSPIRE package to which they can be classified into. The data providers of each dataset did the matching process once they have the best knowledge available of their own data.

First we begin by presenting a listing of the INSPIRE features matched by package for each GIS4EU dataset and finally we present a table with the final global result, that is, the INSPIRE features for which it was possible to find a match in any of the datasets (one or more).

For the Network package the INSPIRE feature “WatercourseLink” is matched with features belonging to the datasets SK50, BT5M, BT50M, RLIG, RPIE and RVEN (see table 15 for a list of the datasets identificators). The INSPIRE feature “WatercourseNode” is matched with features belonging to the datasets BT5M, RLIG, RPIE and RVEN

The attributes of the feature “WatercourseLink” matched with any of the attributes of the features in the project datasets are: id, geographicalName, flowDirection, Length and centerlineGeometry. The attributes of “WatercourseNode” matched are geometry, id and hydroNodeCategory.

For the ManagementAndReporting package the only match reported by the data providers is for the RPIE dataset: “WFDSurfaceWaterBody” and the only attribute matched is id.

For the RelatedObjects package the matches found are:

DamOrWeir: (attribute: condition), Datasets: BT5M, BT50M, EGM_PT and ERM_PT.

SpringOrSeep: (No attributes matched), Dataset: ERM_PT.

Embankment: (No attributes matched), Dataset: ERM_PT.

ShorelineConstruction: (No attributes matched), Datasets: BT5M, BT50M and ERM_PT.

AbstractPoint: (No attributes matched), Datasets: BT5M and BT50M.

DischargePoint: (No attributes matched), Dataset: BT5M.

Pipe: (No attributes matched), Datasets: BT5M and BT50M.

Ford: (No attributes matched), Datasets: BT5M and BT50M.

SubsurfaceCrossing: (No attributes matched), Dataset: BT5M.

SurfaceCrossing: (No attributes matched), Datasets: BT5M and BT50M.

VanishingPoint: (No attributes matched), Datasets: BT5M and BT50M.

Finally, the matchings for the features in the PhysicaWaters package are:

StandingWater: (attributes: hydroid, geographicalName, Origin, Elevation, surfaceArea, Geometry, ID and localType), Datasets: SK50, BT5M, BT50M, RLIG, RPIE, RVEN, EGM_PT and ERM_PT.

Watercourse: (attributes: beginLifespanVersion, endLifespanVersion, Origin, Condition, Fictitious, Level, id, geographicalName, length, LevelOfDetail, waterCourseHierarchy, localType, geometry and persistence), Datasets: BT5M, BT50M, RLIG, RPIE, RVEN, EGM_PT, ERM_PT, INSIEL and MAV.

LandWaterBoundary: (attributes: Origin, waterLevelCategory, Geometry and id), Datasets: BT5M, BT50M, RLIG, RVEN and ERM_PT.

Sea: (no attributes matched), Datasets: BT5M, BT50M and ERM_PT.

Foreshore: (attribute: geographicalName), Datasets: EGM_PT and ERM_PT.

Wetland: (no attributes matched), Datasets: BT5M, BT50M, ERM_PT.

CatchmentArea: (attributes: area, hydroid and geographicalName), Dataset: SK50.

The INSPIRE features matched with one or more GIS4EU features are listed in the next table that intends to summarise the results of the matching process.

Package	Matched feature types
Network	WatercourseLink, WatercourseNode
ManagementAndReporting	WFDSurfaceWaterBody
PhysicalWaters	StandingWater, Watercourse, LandWaterBoundary, Sea, Foreshore, Wetland, Riverbank, CatchmentArea
RelatedObjects	DamOrWeir, Embankment, ShorelineConstruction, DischargePoint, SpringOrSeep, Pipe, Ford, AbstractPoint, VanishingPoint, SubsurfaceCrossing, SurfaceCrossing

Table 14 – INSPIRE features matched with GIS4EU datasets' features.

Finally, the Appendix 10.5 shows (highlighted in yellow colour) the GIS4EU selected subset of features and attributes in top the INSPIRE UML class model for each sub-theme.

8 Critical analysis of the matching process

8.1 Missing elements in INSPIRE data model

Feature "Island" that appears in the IGP EuroGlobalMapPT and EuroRegionalMapPT datasets is not present in the INSPIRE data model and should be incorporated into it because this feature cannot be replaced/matched with "Shore" or a similar feature once the definitions are not equivalent (semantic differences).

From the analysis of the matchings between the VUGK/UNIBA SK50-Hydrography dataset and the INSPIRE data model it was found that the INSPIRE model does not contain the ground water features "ecoregion" and "administrative hydrological units". Thus, we recommend to add WFD feature classes with environmental context in the INSPIRE data model – "GroundWaterBody", "Ecoregion". Also, the relation between INSPIRE ID value domain of main hydrological features and WFD ID value domain is not explicit in the INSPIRE data model.

It was also reported that in the case of the Venice lagoon dataset (MAV GD010IDROLAGL1 dataset) the INSPIRE data model does not include the attributes "Speed limit" and "jurisdiction" in the hydrography theme but only for Transportation Network features and, at least in this case, these attributes are used and are needed in the hydrography theme.

8.2 Problems identified at the present stage of the harmonization process

For most of the features in the INSPIRE PhysicalWaters package for which it was possible to find matches with the project datasets' features there are attributes that cannot be matched.

Often the INSPIRE features are so general that more than one feature from one of these datasets can be matched, that is, their meaning is more general. However the opposite also occurs and there are features in BT5M and BT50M whose meaning is more general than INSPIRE feature (e.g. INSPIRE "Sea" is a part of BT5M "Water mass").

There are some attributes in BT5M that are not present in INSPIRE data model (class B2), however they are not considered relevant to INSPIRE context. The opposite also occurs and there are some features, and a great number of attributes, from INSPIRE data model not present in the datasets and most of them are considered really relevant (class C1).

In some cases the INSPIRE features can be derived from a dataset by spatial analysis. It is the case for the feature “WatercourseNode” In the datasets BT5M and BT50M.

In some cases, the INSPIRE model contains duplicate definitions of hydrological features, namely, the features “Standing water” from the PhysicaWaters package and “WFDLake” from the ManagementAndReporting package or features “Watercourse” and “WFDriver” from the same packages.

In general the datasets based on the DbPrior10K specifications (RVEN, RPIE, RLIG and INSIEL) have a limited number of hydrographic features and thus the number of features directly matched (match type A1) is small, for instance the dataset provided by RPIE only includes the hydrography network and lakes and the dataset from INSIEL only the match between “Watercourse” and the feature “Dbprior_0203_Corso_acqua” can be found. In this dataset (INSIEL-Dbprior1) there are some attributes of Dbprior_0203_Corso_acqua that are not present in INSPIRE data model (class B). These attributes are considered not relevant to INSPIRE context, except: GESTORE: that is, the authority responsible for maintenance.

For the features matched in the RLIG DbPrior10K there are attributes that can be classified in category B.2, that is, attributes only relevant in the RLIG context and not in the INSPIRE context. The INSPIRE feature “Watercourse” can be obtained by spatial analysis (as a result of queries involving attributes of the feature “ELEMENTI_IDRICI_07”).

In all INSPIRE features analyzed the attributes “BeginLifespanVersion” and “EndLifespanVersion” are present for the multitemporal feature. The datasets analysed typically do not implement multitemporal features, so these attributes aren’t relevant for the GIS4EU datasets, but are considered relevant for INSPIRE directive (C.1 in the matching table).

9 Conclusion

The global results of the matching process show that, for two INSPIRE packages few features can be matched with features of the available project datasets. These INSPIRE packages are the ManagementAndReporting package where only one feature could be matched and the Network package where only two features could be matched (see Table 14). The reasons for so few matchings have to be found in the very different purposes that were at the basis of the definition of the data models of the analysed datasets and to the resolution (scale) inherent to the datasets being matched. These two factors have a decisive influence on the features and respective attributes that are defined in each dataset being analysed to model the reality. In fact most, if not all, the project datasets fall into the Mapping Use Case used in INSPIRE which only has connections to the PhysicalWaters and RelatedObjects packages (see chapter 4). These two packages are in fact those for which more matchings were found.

It was possible to find matchings for most of the features in the datasets EuroGlobalMapPT and EuroRegionalMapPT and for a large number of features in the datasets BT5M and BT50M with features belonging to the packages PhysicalWaters and RelatedObjects. For instance, it is possible to find exact matches for all but one in each (feature “Island”) of the hydrographic features present in the datasets EuroGlobalMapPT and EuroRegionalMapPT. The reasons for such a large agreement between the data models have to be found either on the fact that the data models of these datasets were used as a reference during the development of the INSPIRE data model for the theme hydrography or because the general purpose and resolution of these datasets is more similar to the ones adopted by the INSPIRE data model than those for the other datasets analysed.

10 Appendix

10.1 List of GIS4EU Datasets involved in the process

Data provider	Data Provider level	Dataset	Scale	Dataset Identificator
03_VUGK	National	UNIBA-SK50	1:50000	SK50
05_ICC	Regional	BT-5M	1:5000	BT5M
		BT-50M	1:50000	BT50M
08_RLIG	Regional	DBPrior10K	1:10000	RLIG
09_RPIE/17_CSI	Regional	DBPrior10K	1:10000	RPIE
11_CGE	Local	CTC1000/CTC2000	1:1000/1:2000	CGE
14_IGP	National	EuroRegionalMapPT	1:250000	ERM_PT
		EuroGlobalMapPT	1:1000000	EGM_PT
16_INSIEL	Regional	Dbprior_0203_Corso_acqua	1:5000(?)	INSIEL
20_RVEN	Regional	DBPrior10K	1:10000	RVEN
21_MAV	Local	GD010IDROLAGL1	1:5000	MAV

Table 15 - GIS4EU datasets for the Hydrography theme analysed in this document.

10.2 Structure of the matching tables

Column name	Definition
INSPIRE feature catalogue Target model	Description of the characteristics defining the logical structure of the INSPIRE Consolidated UML Model (INSPIRE Model, 2008), known here as *Target Model*.
Feature Name	Name of a specific feature type in the target model.
Feature code	Code assigned to the feature type in the target model.
Feature definition	Definition of the feature type in the target model.
Feature Geometry	Geometry type defined for the feature type in the target model.
Attribute Name – Data Type Hierarchy	Name of a specific attribute in the target model. Description any complex data type hierarchy followed to arrive to the simple attribute level in the target model.
Attribute code	Code assigned to the attribute in the target model.
Attribute type	Data type defined for the attribute in the target model.
Attribute Cardinality	Number or range of possible instances that could exist for the attribute in the target model.
Possible values	Enumeration of the possible values (names) defined in the domain of the attribute in the target model.
Attribute definition	Definition of the attribute in the target model.
Abstract class	Indicates if it is forbidden instantiate the class / feature type in the target model (yes / not).
Comments	Relevant notes about the feature / attribute of the target model.
Data provider XX (dataset YY) feature catalogue Source model	Description of the characteristics defining the logical structure of the GIS4EU dataset model, known here as *Source Model*.
Feature Name	Name of a specific feature type in the source model.
Feature code	Code assigned to the feature type in the source model.
Feature definition	Definition of the feature type in the source model.

Feature Geometry	Geometry type defined for the feature type in the source model.
Attribute Name	Name of a specific attribute in the source model.
Attribute code	Code assigned to the attribute in the source model.
Attribute type	Data type defined for the attribute in the source model.
Possible values	Enumeration of the possible values (names) defined in the domain of the attribute in the source model.
Attribute definition	Definition of the attribute in the source model.
Abstract class	Indicates if it is forbidden instantiate the class / feature type in the source model (yes / not).
Comments	Relevant notes about the matching of a feature / attribute of the source model with a feature / attribute of the target model.

Table 16 – Description of the matching table structure

10.3 Guidelines to provide comments about the matching

The agreed table of contents of deliverables D3.2-4 includes critical analysis sections for the match between each GIS4EU datasets model and the INSPIRE data model, at dataset and also at theme level.

In order to come up with a realistic and practical critical analysis and fulfil the goals of the GIS4EU Project in the INSPIRE Testing Phase, it is crucial the data providers supply detailed information at feature and attribute level by means of clear comments introduced in the matching tables. This will help to evaluate how they match with the INSPIRE Model elements.

The goal of these guidelines is to give an outline that helps to write the comments where they could be necessary, but it does not mean that for every feature and attribute it is mandatory to give some comment.

Specific Comments

Please, for the following cases (A, B and C), based on the classification defined in table 2, consider the recommendations and example questions proposed as guidance below:

A. For the specific features / attributes from the GIS4EU Dataset which somehow match with any INSPIRE feature / attribute.

Describe in which grade they match with the INSPIRE Model, trying to categorise each element in one of the following cases:

A.1 ***Direct match***

Add any comment you consider relevant regarding the matching of these features / attributes.

A.2 ***Match with some semantic or data capture differences which must be stressed***

Add any comment you consider relevant regarding the matching of these features / attributes.

Example questions:

- Do the features matching have important definition differences in both models?
- What data capture differences exist between the GIS4EU dataset feature and the corresponding one in the INSPIRE Model?

- Do the attributes matching have important definition differences in both models?
- Does the feature in the GIS4EU dataset include other real world entities different from those that were envisioned in the corresponding data specifications? (i.e. instances of cog railway and funicular transport elements are included in a "Cog Railway" feature).
- Does the attribute in the GIS4EU dataset include other real world entities different from those that were envisioned in the corresponding data specifications? (i.e. cog railway and funicular entities are included within the same value "Cog Railway" of a "Transport Type" attribute)

A.3 *Complex match*

The match apparently seems not possible, but features / attributes of the INSPIRE model could be somehow derived from the features / attributes of the GIS4EU dataset by performing additional operations

Add any comment you consider relevant regarding the matching of these features / attributes.

Example of operations:

- Matching is feasible by filtering or grouping (aggregating) features / attributes, or performing more complex alphanumeric operations.

  Example 1 – An INSPIRE attribute match with a dataset attribute, but only for a subset of values. The match is possible by selecting these values with an alphanumeric operation.

  Example 2 – A group of GIS4EU dataset attribute values matches with a INSPIRE feature or attribute value. The match is possible by aggregating these values with an alphanumeric operation.

  Indicate any issues derived from this situation that you could appreciate.

- Matching is feasible by performing complex spatial analyses.

  Example 3 – Extracting the centreline of a road feature (which is the element considered within the INSPIRE "RoadLink" feature) from the road borders captured during the production of the GIS4EU dataset by spatial analysis operations.

B. For the specific features / attributes from the GIS4EU Dataset which do not match with any INSPIRE feature / attribute in any of the previously mentioned ways (A.1, A.2, A3.1, A3.2):

Think about if they could be important in the context of INSPIRE, trying to categorise each element in one of the following cases:

B.1 ***Feature/attribute that could be relevant in the INSPIRE context***

B.2 ***Feature/attribute that could NOT be relevant in the INSPIRE context***

For both cases (Yes/Not), explain why you think this by providing specific reasons.

C. For the specific features / attributes from the INSPIRE Model that do not match with any feature / attribute of the GIS4EU Dataset:

Think about if some of they might be considered not important in the context of INSPIRE, trying to categorise each element in one of the following cases:

C.1 ***Feature/attribute that is considered relevant in the INSPIRE context***

C.2 ***Feature/attribute that might be considered NOT relevant in the INSPIRE context***

For both cases (Yes/Not), explain why you think this by providing specific and clear reasons.

In case of considering a specific feature / attribute as relevant to INSPIRE context, does any Organisation in your country / region produce or maintain it?

General Comments

As a conclusion, write a brief summary of the matching process you have done, explaining the major problems found and giving your personal opinion.

10.4 Matching tables of GIS4EU Datasets

Link to datasets matching tables
03_VUGK - UNIBA-SK50 Hydrography
05_ICC - BT-5M
05_ICC - BT-50M
08_RLIG - DBPrior10K
09_RPIE/17_CSI - DBPrior10K
11_CGE - CTC1000/CTC2000
14_IGP - ERM-EuroRegionalMapPT
14_IGP - EGM-EuroGlobalMapPT
16_INSIEL - Dbprior_0203_Corso_acqua
20_RVEN - DBPrior10K
21_MAV - GD010IDROLAGL1

Table 17 – Links to the matching tables of the analysed datasets.

10.5 Identification of GIS4EU features and attributes in INSPIRE Hydrography data model

Network package

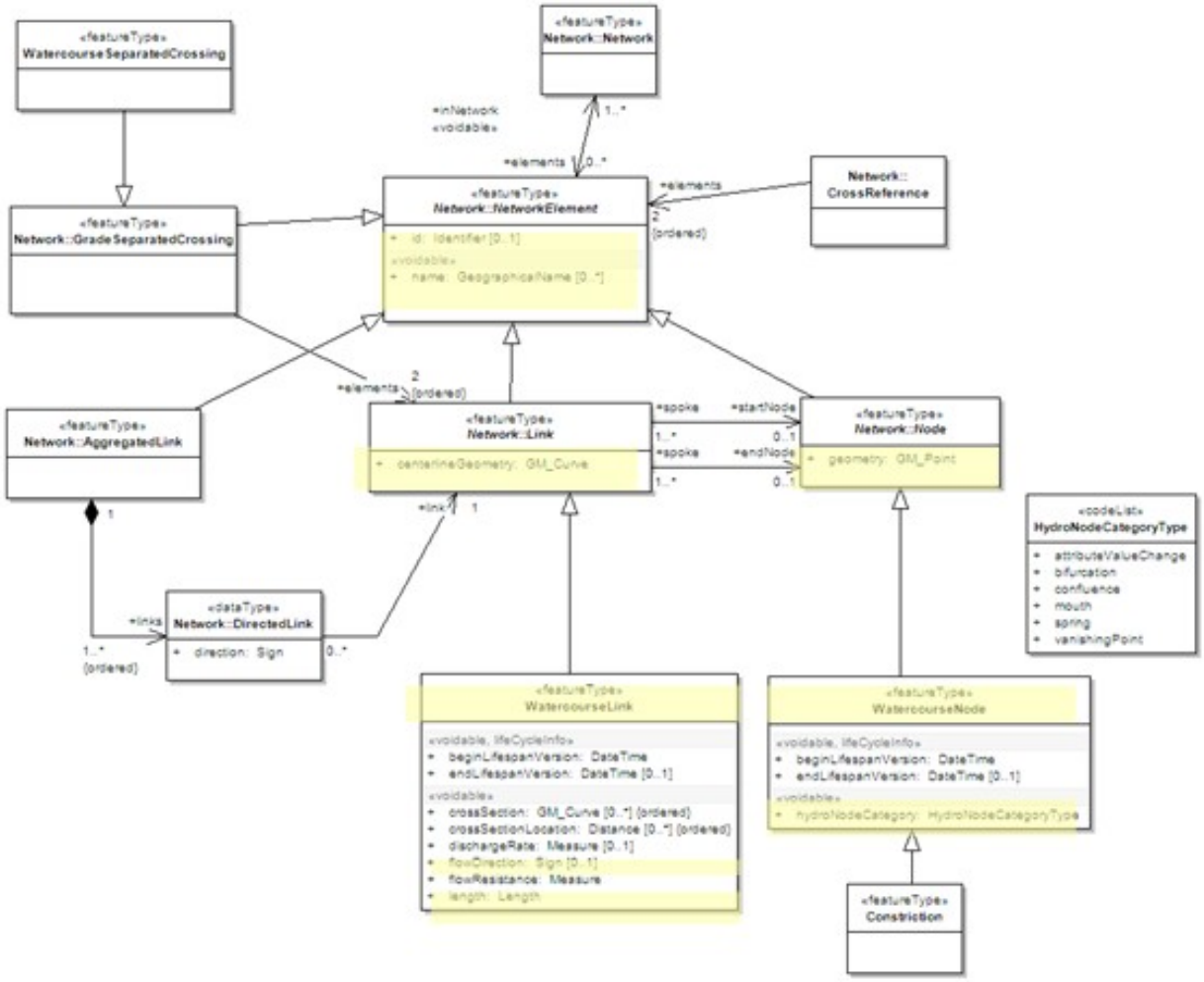


Fig. 20 - Identification of GIS4EU features and attributes in Network package.

ManagementAndReporting package

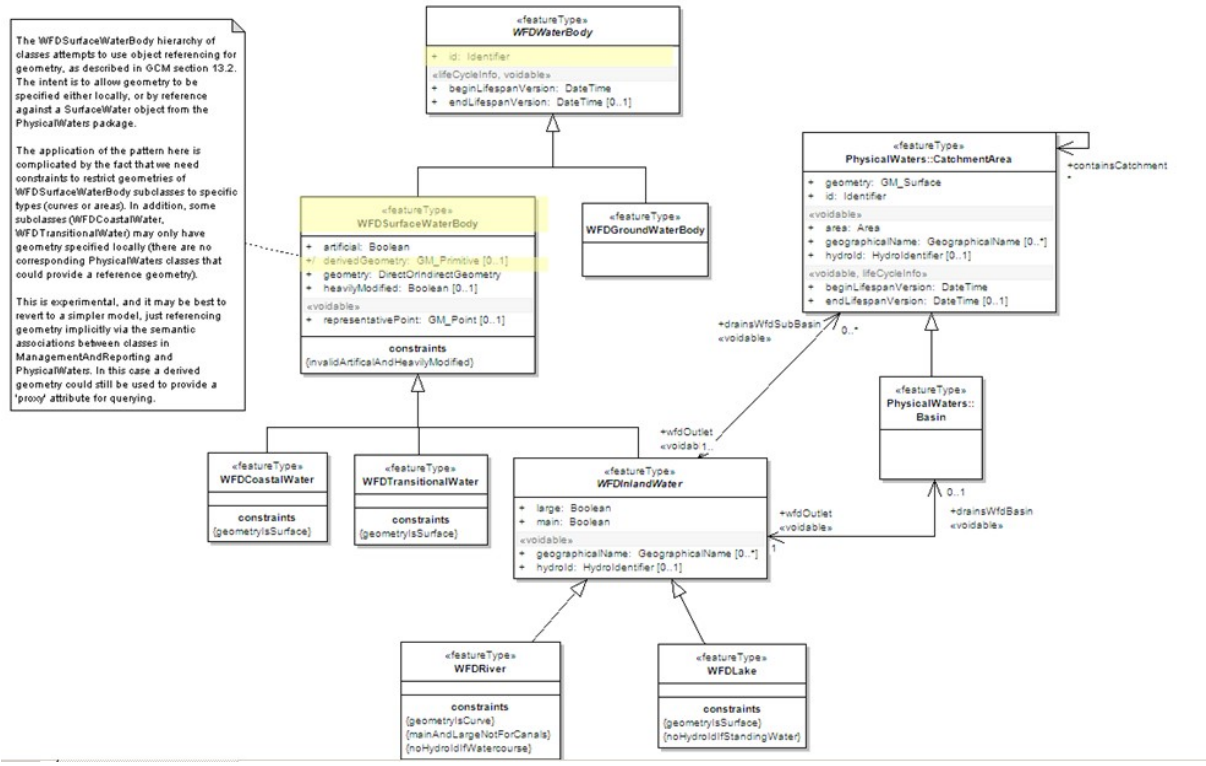


Fig. 21 - Identification of GIS4EU features and attributes in ManagementAndReporting package.

PhysicalWaters package

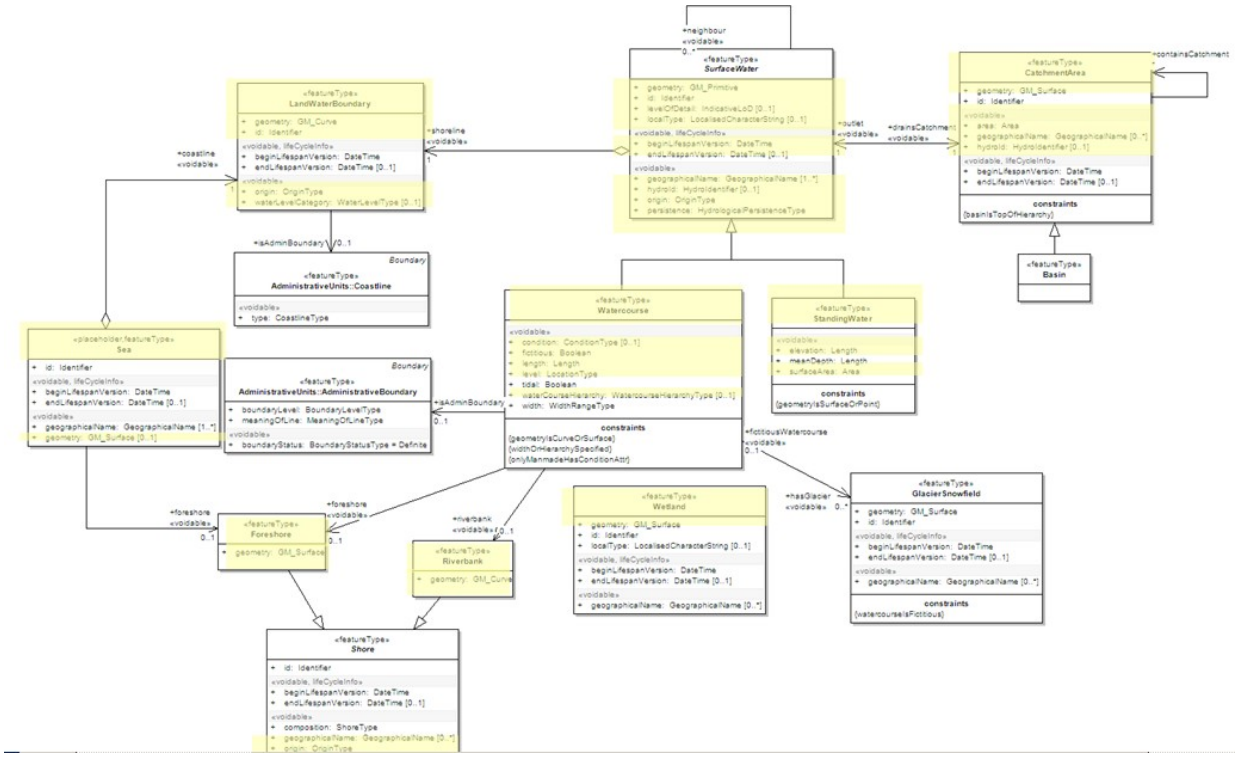


Fig. 22 - Identification of GIS4EU features and attributes in PhysicalWaters package.

RelatedObjects packages

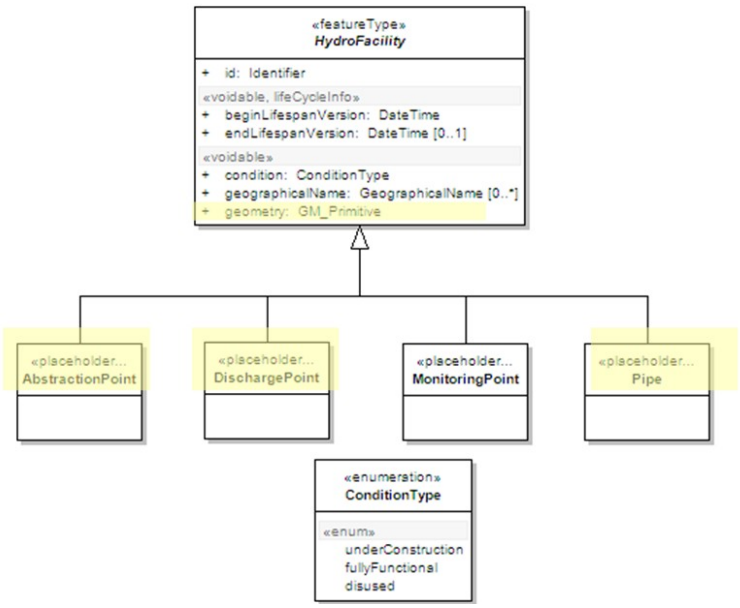


Fig. 23 - Identification of GIS4EU features and attributes in RelatedObjects packages: HydroFacility sub-package.

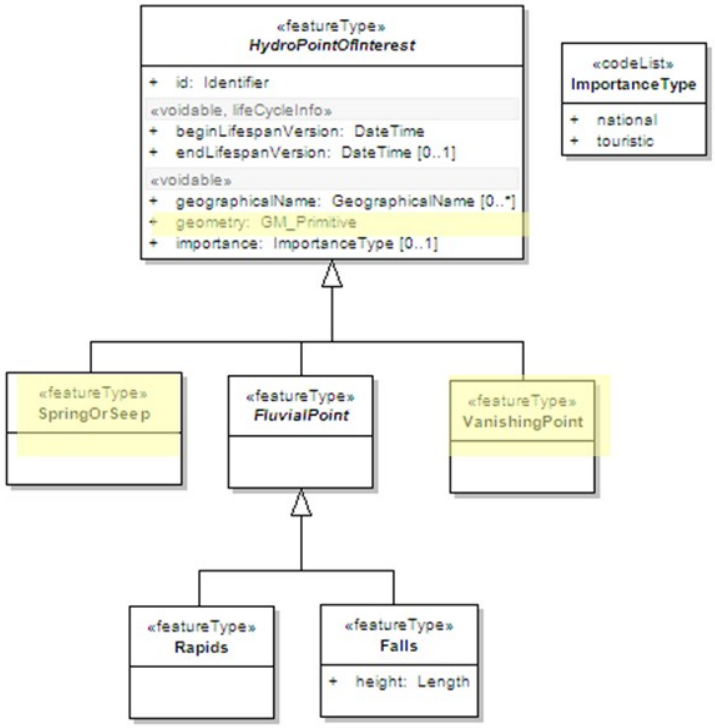


Fig. 24 - Identification of GIS4EU features and attributes in RelatedObjects packages: HydroPointOfInterest sub-package.

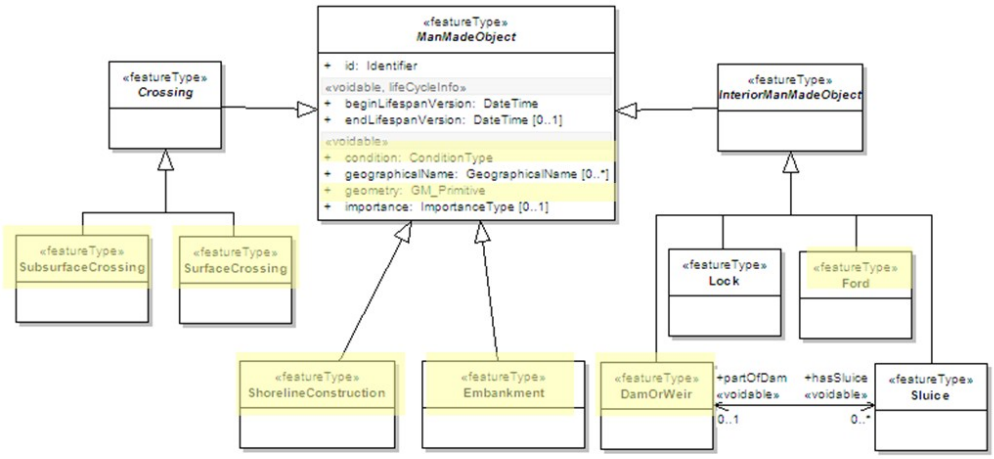


Fig. 25 - Identification of GIS4EU features and attributes in RelatedObjects packages: ManMadeObject sub-package.

10.6 Overview of changes from version 1 to version 2 of the document D3.3

Chapter	Title
	Overview of changes introduced in version 2
1	**Summary**
	It has been introduced a justification for the updating of the current document to INSPIRE Consolidated UML Model 2nd draft, revision 386. The description of the document structure has been slightly modified as well. This has been done in consonance with GIS4EU TWG-DM Transportation Networks D3.4.
2	**Document Scope**
	The scope has been updated clarifying that the matching process described by the current document refers to INSPIRE Consolidated UML Model 2nd draft, revision 386. This has been done in consonance with GIS4EU TWG-DM Transportation Networks D3.4.
3	**Introduction about adopting INSPIRE data model**
	This chapter has been modified by doing a harmonisation between D3.3 and D3.4 in order to provide a common content. References to INSPIRE Consolidated UML Model have been updated to its 2nd draft, revision 386.
4	**Brief overview of the INSPIRE data model**
	The description of the INSPIRE Consolidated UML Model has been rewritten to make an overview of its 2nd draft, revision 386.
5	**Description of the methodology used to compare GIS4EU datasets with INSPIRE data model**
	This chapter has not been modified from D3.3 v1.09.
6	**Comparison of GIS4EU datasets with INSPIRE data model**

	All the matching tables and critical analyses included in this deliverable have been updated taking into account INSPIRE Consolidated UML Model 2nd draft, revision 386.
7	**The GIS4EU Hydrography subset of the INSPIRE Data Model**
	The subset of features and attributes forming the final GIS4EU data model have been updated taking into account INSPIRE Consolidated UML Model 2nd draft, revision 386.
8	**Critical analysis of the matching process at theme level**
	The critical analysis at theme level has been rewritten taking into account the new content of the previous chapter.
9	**Conclusions**
	The final conclusions have been revised taking in consideration the new content of chapters 6, 7 and 8.
Appendix	**Appendix**
	Appendix 10.4 has been updated with the inclusion of the links to the new matching tables. Appendix 10.5 was introduced and reflects graphically the GIS4EU Hydrography subset of the INSPIRE Data Model, described in chapter 7. Appendix 10.6 (this appendix) now refers to the changes introduced in this deliverable with respect to its previous version (v1.09). Appendixes 10.10 and 10.11 have been revised to include updated figures and tables.

10.7 Abbreviations

DIGEST	Digital Geographic Information Exchange Standard
DT	Drafting Team
DT-DS	Drafting Team "Data Specifications"
DT-DS TWG HYDROGRAPHY	Drafting Team "Data Specifications" Thematic Working Group on Hydrography
DTI	Draft Implementing Rules
EC	European Commission
FACC	Feature and Attribute Coding Catalogue
GCM	Generic Conceptual Model
GNM	Generic Network Model
IHO	International Hydrographic Organization
IRs	Implementing Rules
INSPIRE	INfrastructure for SPatial InfoRmation in Europe
LMO	Legally Mandate Organisation
LoD	Level of Detail
SDIC	Spatial Data Interest Communities
TWG	Thematic Working Group
UML	Unified Modelling Language
WFD	Water Framework Directive

Table 18 - Abbreviation list of document content

10.8 Glossary

Term	Definition
Application data	Data in support of user requirements
Application schema	Conceptual schema for data required by one or more applications [ISO 19101:2002(E)]
Class	Description of a set of objects that share the same attributes, operations, methods, relationships, and semantics [ISO 19107:2003(E)]
Code list	Value domain including a code for each permissible value [N1784]
Conceptual model	Model that defines concepts of a universe of discourse [ISO 19101:2002(E)]
Conceptual schema	Formal description of a conceptual model [ISO 19101:2002(E)] Note: ISO 19107 contains a formal description of geometrical and topological concepts using the conceptual schema language UML.
Conceptual schema language	Formal language based on a conceptual formalism for the purpose of representing conceptual schemas [ISO 19101:2002(E)] Notes: UML, EXPRESS, ORM and INTERLIS are examples of conceptual schema language
Coordinate reference system	Coordinate system that is related to the real world by a datum [ISO 19111:2003(E) – Modified] Note: ISO19111 defines coordinate reference system as coordinate system that is related to the real world by a datum 2: Following ISO19111, temporal reference systems are understood as covered by the term coordinate reference systems as well. Examples are: ETRS89 and any formally defined national coordinate system such as the ITM (Irish Transverse Mercator).
Coverage	Spatial objects that acts as a function to return values from its range for any direct position within its spatial, temporal or spatiotemporal domain. [ISO 19123:2005(E) – Modified] Examples are Orthoimage, digital elevation model (as grid or TIN), point grids etc
Data	Reinterpretable representation of information in a formalized manner suitable for communication, interpretation, or processing [ISO/IEC 2382-1]. Note 1: Data can be any form of information whether on paper or in electronic form. Data may refer to any electronic file no matter what the format: database data, text, images, audio and video. Everything read and written by the computer can be considered data except for instructions in a program that are executed (software). Note 2: Services can provide things like WMS (a picture of a map), WFS (GML) and WCS (an image). Then there are services where a user supplies a coordinate and the service transforms it to another coordinate, or a user supplies an image and the service transforms or performs image processing. These are all something that can be read and written by the computer and are in accord with note 1 data.

Data harmonization	Providing access to data through network services in a representation that allows for combining it with other harmonized data in a coherent way by using a common set of data product specifications this includes agreements about coordinate reference systems, classification systems , application schemas etc.
Data interchange	Delivery, receipt and interpretation of data [ISO 19118].
Data model	A model that defines in an abstract way how data is represented in an information system or a database management system
data product specification	Detailed description of a dataset or dataset series together with additional information that will enable it to be created, supplied to and used by another party [ISO/DOS 19131].
Data specification	Data product specification that describes datasets of a specific theme in a harmonized way [N1786].
Data transfer	Movement of data from one point to another over a medium [ISO 19118].
Dataset	Identifiable collection of data [ISO 19115:2003(E)].
Dataset series	Collection of datasets sharing the same product specification [ISO 19115].
Discovery metadata	The minimum amount of information that needs to be provided to convey to the inquirer the nature and content of the data resource Note: The above definition falls into broad categories which answer the ”what, why, when, who, where and how” questions about spatial data.
e-Government	Application of information and communication technology to enhance the effectiveness of a legislature, judiciary or administration, either to improve efficiency or to change the relationship between citizen and government, or both
Encoding	Conversion of data into a series of codes [ISO 19118].
Entity	Real-world phenomenon
ESDI	European Spatial Data Infrastructure as built and based on the INSPIRE framework directive]
Evaluation	Providing sufficient information to enable an inquirer to ascertain that data fit for a given purpose exists, to evaluate its properties, and to reference some point of contact for more information (adapted from GSDI Cookbook). Note: metadata include those properties required to allow the prospective end user to know whether the data will meet the general requirements of a given problem.
Exchange format	Structured representation of data in a document for exchange between systems In most cases, a machine readable schema will document the structure of the data in the exchange document. Example: GML encodes

	the application schema in XML schema
EXONYM	Name used in a specific language for a spatial object situated outside the area where that language is spoken, and differing in its form from the name used in an official or well-established language of that area where the geographical feature is located UNGEGN Glossary of Terminology: http://unstats.un.org/unsd/geoinfo/glossary.pdf - Modified
EXTERNAL [OBJECT] IDENTIFIER	A unique [object] identifier which is published by the responsible body, which may be used by third parties to reference the spatial object
FEATURE	Abstraction of a real-world phenomena. Note: The term "(geographic) feature" as used in the ISO 19100 series of International Standards and in this document is synonymous with spatial object as used in this document. Unfortunately "spatial object" is also used in the ISO 19100 series of International Standards, however with a different meaning: a spatial object in the ISO 19100 series is a spatial geometry or topology. [ISO 19101].
FEATURE CATALOGUE	Catalogue(s) containing definitions and descriptions of the feature/object types, their attributes and associated components occurring in one or more spatial data sets, together with any operations that may be applied [ISO 19110:2005(E) – modified].
FEATURE DATA DICTIONARY	Dictionary containing definitions and descriptions of feature concepts and feature-related concepts [ISO/CD 19126].
GAZETTEER	Directory of instances of a class or classes of features containing some information regarding position A gazetteer can be considered as a geographical index or dictionary of spatial objects [ISO 19112].
GENERAL FEATURE MODEL	Metamodel for spatial object types and their property types [ISO 19109]
GEOGRAPHIC FEATURE	Synonymous with spatial object
GEOGRAPHIC IDENTIFIER	Spatial reference in the form of a label or code that identifies a location [ISO 19112:2003(E)]. Example 1: Paris, [river] Rhine, Mont Blanc Example 2: Postal codes: 53115, 01009, SW1, IV19 1PZ
GEOGRAPHICAL GRID SYSTEMS	Harmonized multi-resolution grid with a common point of origin and standardized location and size of grid cells. Note: Geographical grid systems are not limited to rectified grids or grids using cell axes parallel to the meridians
GEOMETRIC PRIMITIVE	Geometric object representing a single connected, homogeneous element of space [ISO 19107].
GLOSSARY	An alphabetical list of words often defined or translated: dictionary, lexicon, vocabulary, wordbook
HOMOLOGOUS SPATIAL OBJECTS	Set of spatial objects that correspond to the same real world entity, but are represented differently according to different levels of details or

	point of views
INSPIRE APPLICATION SCHEMA	Application schema specified in the INSPIRE implementing rules
INSPIRE DATA SPECIFICATION	Data product specification for a spatial data theme from Annex I, II or III of the INSPIRE Directive
INSPIRE INFORMATION MODEL	A structured collection of components that will be documented to support the interoperability and harmonization of geographic information across Europe. Note: rules for application schema, identifier management, terminology etc are examples of the components.
INTEROPERABILITY	Possibility for spatial data sets to be combined, and for services to interact, without repetitive manual intervention, in such a way that the result is coherent and the added value of the data sets and services is enhanced.
LINEAR REFERENCE SYSTEM	Reference system that identifies a location by reference to a segment of a linear spatial object and distance along that segment from a given point [ISO 19116:2004(E) – modified]. Example: kilometer markers along a motorway or railway, references along the center line of a river object from the intersection with a bridge object. Note: synonymous with linear referencing system
METADATA	Information describing spatial data sets and spatial data services and making it possible to discover, inventory and use them [ISO 19115:2003(E)] The more general term as defined by ISO19115 is "data about data"
METADATA ELEMENT	Discrete unit of metadata [ISO 19115]
MULTICULTURAL	Multiplicity in systems of values held by different groups: ethnic, regional, or professional [Hofstede G. 1980. Culture's Consequences, Sage: London – modified].
MULTILINGUAL	In or using several languages
MULTIPLE REPRESENTATION	Representation of the relationship between homologous spatial objects
OBJECT	In this document is synonymous with spatial object
OBJECT IDENTIFIER	A unique identifier associated with a spatial object
OBJECT REFERENCING	A method of referencing thematic or other spatial objects to existing spatial objects describing their location to ensure spatial consistency across the spatial objects associated in this way in this way
PORTRAYAL	Presentation of information to humans [ISO 19117]
PRODUCT DESCRIPTION	Detailed description of a dataset or dataset series together with additional information that will enable it to be created, supplied to and used by another party [ISO 19113].

PROFILE	Set of one or more base standards, and, where applicable, the identification of chosen clauses, classes, options and parameters of those base standards, that are necessary for accomplishing a particular function. A profile is derived from base standards so that by definition, conformance to a profile is conformance to the base standards from which it is derived [ISO 19106].
REFERENCE DATA	Spatial objects that are used to provide location information in object referencing
REFERENCE MODEL	Architectural framework for a specific context, e.g. an application or an information infrastructure
REGISTER	Set of files containing identifiers assigned to items with descriptions of the associated items [ISO 19135].
RESOURCE	Asset or means that fulfills a requirement Example: dataset, service, document, person or organisation.
SERVICE	Distinct part of the functionality that is provided by an entity through interfaces [ISO 19119].
SPATIAL DATA	Any data with a direct or indirect reference to a specific location or geographic area NOTE The use of the word “spatial” in INSPIRE is unfortunate as in the everyday language its meaning goes beyond the meaning of “geographic” – which is considered by the Drafting Team as the intended scope – and includes subjects such as medical images, molecules, or other planets to name a few. However, since the term is used as a synonym for geographic in the draft Directive, this document uses the term “spatial data” as a synonym for the term “geographic information” used by the ISO 19100 series of International Standards.
SPATIAL OBJECT	An abstract representation of a real-world phenomenon related to a specific location or geographical area. NOTE It should be noted that the term has a different meaning in the ISO 19100 series. It is also synonymous with "(geographic) feature" as used in the ISO 19100 series.
SPATIAL OBJECT TYPE	Classification of spatial objects NOTE In the conceptual schema language UML a spatial object type will be described by a class with stereotype <<FeatureType>>.
SPATIAL REFERENCE SYSTEMS	System for identifying position in the real world, which does not necessarily use coordinates [ISO 19112:2003(E) -Modified]. EXAMPLE Geographic coordinates describing positions on the Earth surface (coordinate reference system), linear measurements along a river centreline from the intersection of a bridge (linear reference system), postal codes identifying the extent of postal zones (gazetteer)
SPATIAL SCHEMA	Conceptual schema of spatial geometries and topologies to be used in an application schema
TEMPORAL REFERENCE SYSTEMS	Reference system against which time is measured [ISO 19108;2002(E)].

THEMATIC APPLICATION SCHEMA	INSPIRE application schema for an INSPIRE theme
THEMATIC DATA	Synonymous to application data
THEMATIC IDENTIFIER	A descriptive identifier applied to spatial objects in a defined information theme EXAMPLE an administrative code for administrative area objects in the administrative units theme, a parcel code for parcel objects in the cadastre theme
THEME	Grouping of spatial data according to Annex I, II and III of the INSPIRE Directive
TRANSFER PROTOCOL	Common set of rules for defining interactions between distributed systems [ISO 19118]
UNIQUE OBJECT IDENTIFIER	A piece of data, usually in the form of printable characters, that unequivocally identifies a spatial object
UNITS OF MEASUREMENT	Defined quantity in which dimensioned parameters are expressed [ISO/TC211/N1791].
USE	Information required to access, transfer, load, interpret, and apply the data in the end application where it is exploited (adapted from GSDI Cookbook). Note: This class of metadata often includes the details of a data dictionary, the data organization or schema, projection and geometric characteristics, and other parameters that are useful to human and machine in the proper use of the spatial data.
VERSION	A particular form of something differing in certain respects from other forms of the same type of thing
VERSIONING	Applying a process to ensure that one version of something can be distinguished from another
XML SCHEMA	Means for defining the structure, content and semantics of XML documents

Table 19 - Table of abbreviations

10.9 References

10.9.1 Paper references

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10.9.2 Web reference

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  https://inspire-twg.jrc.it/inspire-model/

10.10 List of figures

10.11 List of Tables

10.12 Partner list

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Vyskumny ustav geodezie a kartografie v Bratislave	VUGK	Slovakia
Universitat de Girona	UDG	Spain
Institut Cartogràfic de Catalunya	ICC	Spain
Geographical Information Systems International Group	GISIG	Italy
Földmérési és Távérzékelési Intézet	FÖMI.	Hungary
Regione Liguria	RLIG	Italy
Regione Piemonte	RPIE	Italy
University of Nottingham	UNOTT	United Kingdom
Comune di Genova	CGE	Italy
University Of Rome "La Sapienza"	UNISAP	Italy
Intergraph Polska sp. z o. o.	INGR	Poland
Instituto Geográfico Português	IGP	Portugal
Institut National des Sciences Appliquées de Lyon	INSA	France
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