

## INSPIRE CONCEPT AND DIGITAL DATA MODELS

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***Summary:** Access to spatial data and services constitutes an important basis for environmental policies for all public authorities and is therefore a central aspect of the Infrastructure for spatial information in the European Community. Since the Community institutions and bodies in most cases have to integrate and assess spatial information from all the Member States, INSPIRE recognizes the need to be able to gain access to and use spatial data and spatial data services in accordance with an agreed set of harmonized conditions. The INSPIRE Directive lays down a number of rights and obligations regarding the sharing of spatial data sets and services between all levels of government.*

*Article 17(8) of INSPIRE Directive requires the development of implementing rules to regulate the provision of access to spatial data sets and services from Member States to the institutions and bodies of the Community. Principles for sharing of spatial data sets and services between public authorities within and Member States, on the other hand, are contained directly in the Directive; the definition of the concrete measures to be implemented to this end is left to the responsibility of each Member State and is not within the scope of these implementing rules. The Regulation on INSPIRE Data and Service Sharing was adopted on the 29th March 2010.*

*The INSPIRE Implementing Rules on interoperability of spatial data sets and services and the data specification guidance documents are based on the UML data models developed by the INSPIRE Thematic Working Groups. These data models are managed in a common UML repository, which also stores older revisions of the models.*

**Keywords:** Member States, Spatial data, Service Sharing, Implementation, Data models.

### 1. INTRODUCTION

Directive 2007/2/EC of the European Parliament and of the Council [INS DIR], adopted on 14 March 2007 aims at establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) for environmental policies, or policies and activities that have an impact on the environment. INSPIRE will make available relevant, harmonized and quality geographic information to support the formulation,

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implementation, monitoring and evaluation of policies and activities, which have a direct or indirect impact on the environment. INSPIRE is based on the infrastructures for spatial information established and operated by the 28 Member States of the European Union. The Directive addresses 34 spatial data themes needed for environmental applications, with key components specified through technical implementing rules. This makes INSPIRE a unique example of a legislative “regional” approach.

To ensure that the spatial data infrastructures of the Member States are compatible and usable in a Community and trans-boundary context, the Directive requires that common Implementing Rules (IR) are adopted in the following areas:

- Metadata;
- The interoperability and harmonization of spatial data and services for selected themes (as described in Annexes I, II, III of the Directive);
- Network Services;
- Measures on sharing spatial data and services;
- Co-ordination and monitoring measures.

The Implementing Rules are adopted as Commission Decisions or Regulations, and are binding in their entirety [1]. Data specifications are based on UML data models, XML schemas and Feature Catalogue which are developed by the INSPIRE Thematic Working groups [2].

## 2. DATA AND SERVICE SHARING

Coordination in the context of data and service sharing relates to the provision of a sustainable structure to develop, facilitate and streamline the sharing of data and services. Coordination of sharing activities is an essential step towards facilitating access and use of spatial data sets and services. Examples found of such structures often include easily accessible free discovery and view services for stakeholders and the general public as described under Article 14, and other important functions for an SDI, such as data harmonization and research and development efforts. The examples may therefore often include more than just pure coordination activities. A successful structure for co-ordination of data sharing will provide:

- A clear view of the roles of the various stakeholders, and their respective responsibilities;
- A clear view of the processes involved. The processes should provide for vertical and horizontal communication, information to potential participants on how to be included in the data sharing, and how to solve problems and conflicts.
- Planning and monitoring of the progress. Planning should include practical administrative and technical infrastructure support, for example, template licences, repositories, registries and frontline assistance such as helpdesk, hotline, and consultancy.
- Central access point to spatial data sets and services, that provides all the relevant information for access and use.

The following criteria have been considered critical for a successful structure for co-ordination of data sharing:

- A clearly defined and well-communicated policy for co-ordination
- Measures for efficient communication between the stakeholders, horizontally as well as vertically
- Clear and transparent information to existing and potential new stakeholders
- Measures for effective sharing across levels of government
- Practical support is provided
- Administrative and technical infrastructures are provided

A clearly defined and well-communicated policy for co-ordination. The policy should describe who the stakeholders are (not necessarily individual institutions) and their responsibilities, and must include planning, monitoring, problem solving and settlement of disputes. The policy should include measures such as:

- A coordinating body or other means of administrating the co-ordination, including forums and meetings with stakeholders;
- Plans for how to keep the structure efficient and make it evolve as necessary;
- Plans for financing, and means for coordination and dialogue. Measures for efficient communication both horizontally and vertically This can include setting up forums for co-operation between the data owners and other stakeholders, physical or web-based. The goal is to ensure that the public authorities are well informed and encouraged to make their data available according to this policy.

Clear and transparent information to existing and potential new stakeholders. This information should include how to obtain or provide access to data and services, and under which conditions they can do so. This information should be on-line, accessible from a central and visible access point that can be easily found and should also contain contact details for obtaining more information. Further activities to raise awareness should be present, including presentations made to other public authorities, a mailing list of key contact people in different institutions who will receive any relevant information (for example updates of use conditions or versions of the data sets) and information to key persons and authorities for making decisions on administrative frameworks and financing. Measures for effective sharing across levels of government.

Clear and smooth procedures for sharing data with other public authorities should be in place. This includes requests for access to the data sets and services being completed in a timely manner, provisions for answering any queries as to the usefulness for purpose that other public authorities may have, and provisions for responding to emergency demands for data. Practical support is provided. It should be planned how to provide practical support to the stakeholders. This support can take the form of guidelines, a helpdesk, courses, or consultancy. This could be provided by a body set up for coordinating or in another manner that is practical for the particular structure. Administrative and technical infrastructures are provided The coordinating body or structure should provide templates for general conditions and licences that all public authorities can use for sharing their data or services. Registries with available data and services should be created on the national level.

The principle of transparency is an essential part of good administration at all levels of governance, and refers to availability of all relevant information. This means that important information is readily accessible and that it is widely spread and

communicated to all stakeholders. In the context of INSPIRE data and service sharing, transparency on the data is about the Member States and their public authorities being clear on what kind of data or service is available and how the data or service can be obtained and used. The importance of transparency for data and service sharing is that the user can evaluate whether the available data or service meets his needs and requirements. This covers evaluation from the point of view of the source, technical attributes, quality levels and use conditions, in order to be able to determine whether the data and service is fit for their particular purpose. Some of this information may be available as metadata, but additional information should also be made available if requested to allow an assessment of fitness for purpose to be made. This is particularly important when the data is being used for a purpose which is different from that for which it was originally produced or collected. Clear contact details and processes for gaining further information should be arranged as part of the service. The user should be guaranteed a speedy response to requests for further information. Multilingual information offers transparency without delay to all Member States and their public authorities as well to the European Community.

These are the criteria considered vital to achieving transparency:

- Metadata is up-to-date and available
- Additional technical information can be readily made available to allow assessment for fitness for purpose
- All conditions of use are clear, complete, published online and available for the public
- Clear contact details and speedy process for acquiring further information about all aspects of the data
- Multilingual information is made available if needed (e.g. European level)
- Metadata is up-to-date and available
- Metadata is being kept up-to-date frequently and is available via the network services.
- Additional technical information can be readily made available to allow assessment for fitness for purpose

Data is often used for purposes completely different from those for which it was collected. Whilst some information is available in metadata, additional technical information on source and quality should be provided if available to allow decisions to be made on whether the data can be used for a different purpose. All use conditions are clear, complete, published online and available for the public. Any user can easily find the conditions for use on the website and can download a copy of the use conditions if he wants to. All the conditions for using the data and services are described in clear and understandable terms. The conditions are explained for all types of use. If for a particular type of use, more information is needed by the public authority in order to determine the conditions, contact details are clearly indicated [3].

### 3. REQUIREMENTS FOR SPATIAL DATA THEMES

In addition to the definitions set out in Article 2, the following definitions shall apply:

- ‘datum’ means a parameter or set of parameters that define the position of the origin, the scale, and the orientation of a coordinate system, in accordance with EN ISO 19111,
- ‘geodetic datum’ means a datum describing the relationship of a coordinate system to the Earth, in accordance with EN ISO 19111,
- ‘coordinate system’ means a set of mathematical rules for specifying how coordinates are to be assigned to points, in accordance with EN ISO 19111,
- ‘coordinate reference system’ means a coordinate system which is related to the real world by a datum, in accordance with EN ISO 19111. This definition includes coordinate systems based on geodetic or Cartesian coordinates and coordinate systems based on map projections.
- ‘map projection’ means a change of coordinates, based on a one-to-one relationship, from a geodetic coordinate system to a plane, based on the same datum, in accordance with EN ISO 19111,
- ‘compound coordinate reference system’ means a coordinate reference system using two other independent coordinate reference systems, one for the horizontal component and one for the vertical component, to describe a position, in accordance with EN ISO 19111,
- ‘geodetic coordinate system’ means a coordinate system in which position is specified by geodetic latitude, geodetic longitude and (in the three-dimensional case) ellipsoidal height, in accordance with EN ISO 19111.

For the three-dimensional and two-dimensional coordinate reference systems and the horizontal component of compound coordinate reference systems used for making spatial data sets available, the datum shall be the datum of the European Terrestrial Reference System 1989 (ETRS89) in areas within its geographical scope, or the datum of the International Terrestrial Reference System (ITRS) or other geodetic coordinate reference systems compliant with ITRS in areas that are outside the geographical scope of ETRS89. Compliant with the ITRS means that the system definition is based on the definition of the ITRS and there is a well documented relationship between both systems, according to EN ISO 19111 [4].

### 4. INSPIRE IMPLEMENTING RULES

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) was published in the official Journal on the 25th April 2007. The INSPIRE Directive entered into force on the 15th May 2007. The purpose of the infrastructure is to enable the formulation, implementation, monitoring activities and evaluation of Community environmental policies at all levels – European, national and local – and to provide public information. INSPIRE builds on the infrastructures for spatial information that have already been created by the Member States. The components of those infrastructures include: metadata, spatial data themes (as described in Annexes I,

II, III of the Directive), network services and technologies; agreements on data sharing, access and use; coordination and monitoring mechanisms, processes and procedures. The guiding principles of INSPIRE are:

- that the infrastructures for spatial information in the Member States should be designed to ensure that spatial data are stored, made available and maintained at the most appropriate level;
- that it is possible to combine spatial data from different sources across the Community in a consistent way and share them between several users and applications;
- that it is possible for spatial data collected at one level of public authority to be shared between all the different levels of public authorities;
- that spatial data are made available under conditions that do not restrict their extensive use; and,
- that it is easy to discover available spatial data, to evaluate their fitness for purpose and to know the conditions applicable to their use.

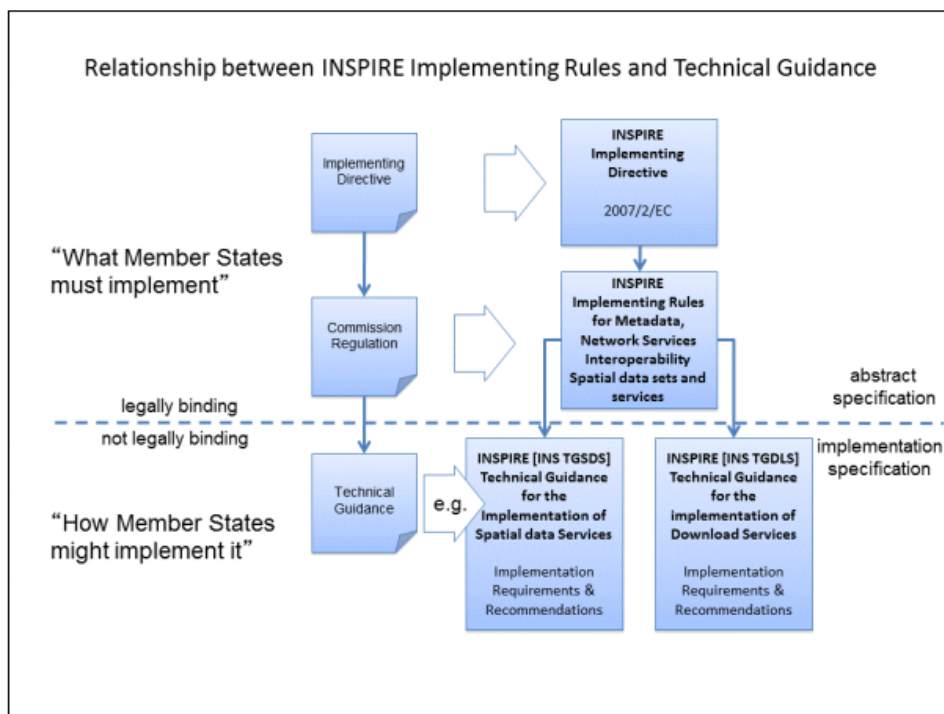


Figure 1. Relationship between the INSPIRE Implementing Rules and the associated Technical Guidance.

The technical document is intended to facilitate the implementation of Directive 2007/2/EC and is not legally binding. Any authoritative reading of the law should only be derived from Directive 2007/2/EC itself and other applicable legal texts or principles

such as the related Implementing Rules. Only the Court of Justice of the European Union is competent to authoritatively interpret Union legislation [1].

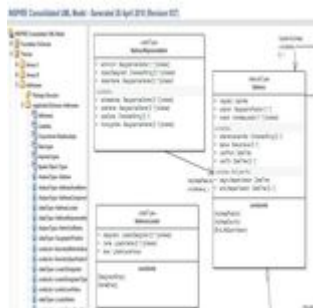
## 5. INSPIRE IMPLEMENTING RULES

This distribution contains only those data models that are contained in the amendment to the Implementing Rules for Annex II+III themes, including the updates of the Annex I data themes.



**Feature catalogue**

Informative overview of the spatial object types and data types defined in the INSPIRE data specifications, which provides an easy entry point to the INSPIRE data models and data specifications for implementers and decision makers.



**HTML view of UML models**

An interactive HTML view of the complete UML data models. This view includes detailed definitions of spatial object types, data types, enumerations and code lists and UML class diagrams.



### UML models for Enterprise Architect (EAP, XMI)

Zip archive containing the INSPIRE UML models as an EA project file and XMI exports. These can be used by developers for importing the INSPIRE data models in Enterprise Architect (EA) (or other UML modeling tools).

### UML models for Enterprise Architect (SVN)

Alternatively, developers using EA can link to the INSPIRE UML models using one of the public branches in the svn repository. Before connecting, please read the for how to connect to the repositories from EA and download the [UML profile](#) used in the INSPIRE data specification development.



### GML application schemas and code list dictionaries

The GML application schemas (xml schema documents) and code list dictionaries generated from the UML application schemas based on the default encoding rule).

### Schema repository

The GML application schemas are also available through the INSPIRE schema repository at <http://inspire.ec.europa.eu/schemas/> (Approved schemas) or <http://inspire.ec.europa.eu/draft-schemas/> (Draft schemas).



This distribution combines the data models contained in the amendment to the Implementing Rules (see above) and the extended data models contained in the data specification Technical Guidelines (but not in the IRs). Please note that the extended data models not included in the IRs should be considered as draft and therefore be used with caution [5].

## 6. CONNECTING PUBLIC INSPIRE UML USING ENTERPRISE ARCHITECT

EA has integrated functionality for working with a version control system. However, since an EA stores its models in a binary, Microsoft Access, file, it cannot simply be uploaded to a version control repository. Thus, the handling of setting up a repository and checking out/in versions is not completely straightforward. Since the EA file itself is binary, EA will allow import/export of each package in XML Metadata Interchange format (which is an ASCII-file) that will then be checked out/in of EA. This means that the packages themselves are version controlled but the EA file is not. You may also import several packages from several different version control systems in one EA file or simply have some packages which are version controlled and some which are not.

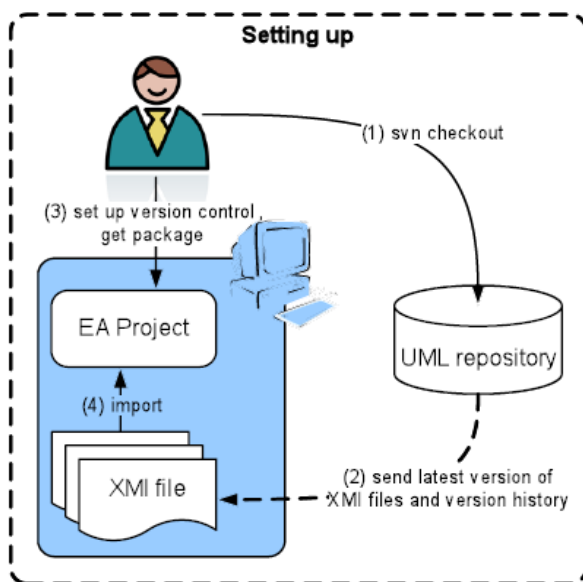


Figure 2. Schematic overview of setting up EA with the UML repository.

The public repository of the INSPIRE UML application schemas is available at <https://inspiretwg.jrc.it/svn/inspire-model/branches/public>.

Several of the INSPIRE application schemas refer to types defined in ISO TC 211 models. The ISO models are not included in our INSPIRE repository. They are located in a separate repository:

<https://inspire-twg.jrc.it/svn/iso/> (access is restricted – an open access mirror is available at <https://www.seegrid.csiro.au/mirrors/iso-harmonized-model/>).

The INSPIRE model contains a directory for the foundation packages (/foundation), which currently only contains the ISO TC211 19100 models. Furthermore, a directory for the generic conceptual model exists (/gcm) with three subdirectories: abstract, base Models, base Types. The abstract directory contains nothing for the moment but is intended for abstract models of INSPIRE. The base Models directory shall contain any cross-themes models, e.g., the Generic Network Model. The base Types directory is intended for all cross-themes data types. Finally, a /themes directory exists, which contains all the 34 INSPIRE annex I, II and III themes.

Now that your system is connected with the repository, you can set up EA to work with it. When this is done you can import each package contained in the repository into EA. It is important to mention that EA considers a file in the repository ending with .xml containing XML a UML package. To import packages from the repository you need to have an EA project file – it can be empty (newly created) or it can be an existing file already containing model/packages. EA does not care whether it imports packages from a version control system in an EA file already containing models [6].

## 7. CONCLUSION

Access to spatial data and services constitutes an important basis for environmental policies for all public authorities and is therefore a central aspect of the Infrastructure for spatial information in the European Community. INSPIRE data will start with implementation in 2019. All of these data models must be used to create first of all a model of data then schema. The most important in INSPIRE implementation is to use Feature Catalogue, HTML view of UML models, UML models for Enterprise Architect and GML applications schemas and code list dictionaries. These data models are very important to use in implementation. In this paper it was explained with details how to create and use this data models.

## REFERENCES

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Models/Data-Specifications/2892. [Accessed 5 May 2017].

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## KONCEPT INSPIRE DIREKTIVE I DIGITALNI MODELI PODATAKA

**Rezime:** *Pristup prostornim podacima i uslugama predstavlja važnu osnovu za politiku zaštite životne sredine za sve javne vlasti i zbog toga predstavlja centralni aspekt infrastrukture za prostorne informacije u Evropskoj Uniji. Pošto institucije i organi Evropske Unije u većini slučajeva moraju integrirati i procijeniti prostorne informacije iz svih država članica, INSPIRE prepoznaje potrebu da se omogući pristup i korištenje prostornih podataka i usluga prostornih podataka u skladu sa dogovorenim skupom usaglašenih uslova. INSPIRE direktiva propisuje niz prava i obaveza u pogledu djeljenja skupova prostornih podataka i usluga između svih nivoa vlasti. Član 17 (8) Direktive INSPIRE zahteva izradu pravila za sprovođenje kojim se reguliše obezbeđivanje pristupa skupovima prostornih podataka i usluga iz država članica institucijama i organima Zajednice. Principi za razmjenu skupova prostornih podataka i usluga između državnih organa unutar i država članica, s druge strane, sadržani su direktno u Direktivi; definicija konkretnih mera koje treba sprovesti u tu svrhu prepuštena je odgovornosti svake države članice i nije u okviru ovih pravila za sprovođenje. Uredba o dijeljenju podataka i usluga INSPIRE-a usvojena je 29. marta 2010. godine. Pravila za implementaciju INSPIRE-a o interoperabilnosti skupova prostornih podataka i usluga i dokumenata o smernicama za specifikaciju podataka zasnovani su na modelima podataka UML-a razvijenim od strane tematskih radnih grupa INSPIRE-a. Ovi modeli podataka se upravljaju u zajedničkom UML spremištu, koja takođe čuva starije revizije modela.*

**Ključne reči:** *Članice EU, prostorni podaci, servis za djeljenje prostornih podataka, implementacija, modeli podataka.*