INSPIRE
Infrastructure for Spatial Information in Europe

D2.8.II/III.x Data Specification on <Theme Name> – Technical Guidelines

The data specification documents

The INSPIRE data specifications template includes several parts.

The parts which are specific to a certain spatial data theme have a normal white background and should be edited in this document.

The parts which are common to all data specifications are contained in separate files in the folder "common". The content of these files is included in this document using fields. To update all document parts, choose "select all" from the menu (crtl+A) and update all fields (F9).

The common text is marked by a grey background. These should not be edited. If there is the need to edit the common parts, the text should be copied from the file in the "common" folder into this document. The text passages that are changed should be given a white background to indicate that they are not the same as in all the other data specifications.

The main document contains several blocks of instructions (such as this one). To include the instructions text, set the custom document property (see below) "instructions" to "yes". To remove them, set it to "no" (or any other value).

Document properties

The following custom document properties have been defined: "Theme Name", "Theme Short Name", "Theme Number", "Annex", "DS Version", "Publication date" and "TWG Name". These are used as fields in the text. Please change the values of these document properties (Select "File → Properties → Custom") and do not directly change the text in the document. To refresh all references press ctrl+A and F9.

Formatting conventions

In order to distinguish the INSPIRE spatial data themes from spatial object types, INSPIRE spatial data themes should be in italics and upper case.

This template contains "boilerplate" text (black)*, instructions (green italics) and placeholders* (red).

Before submitting the document for review, please make sure that all instructions (formatted in green italics) have been removed and all placeholders are replaced in the theme-specific files.

Document metadata

Make sure that the document metadata are correct.

Title	D2.8.II/III.x Data Specification on <*Theme* Name> – Technical Guidelines
Creator	INSPIRE Thematic Working Group <*Theme* Name>
Date	yyyy-mm-dd
Subject	INSPIRE Data Specification for the spatial data theme <*Theme* Name>
Publisher	INSPIRE Thematic Working Group <*Theme* Name>
Type	Text
Description	This document describes the INSPIRE Data Specification for the spatial data theme <*Theme* Name>
Contributor	Members of the INSPIRE Thematic Working Group <*Theme* Name>
Format	MS Word (doc) | Portable Document Format (pdf) *(delete as appropriate)*
Source	
Rights	Restricted to TWG members, DT DS and CT | Public *(delete as appropriate)*
Identifier	D2.8.II/III.x_vx.y(.z)
Language	En
Relation	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)
Coverage	Project duration

Foreword
How to read the document?

This document describes the *"INSPIRE data specification on <Theme Name> – Guidelines"* version x.y(.z) as developed by the Thematic Working Group (TWG) <*TWG Name*> using both natural and a conceptual schema language.

The data specification is based on a common template[1] used for all data specifications, which has been harmonised using the experience from the development of the Annex I, II and III data specifications.

This document provides guidelines for the implementation of the provisions laid down in the draft Implementing Rule for spatial data sets and services of the INSPIRE Directive. It also includes additional requirements and recommendations that, although not included in the Implementing Rule, are relevant to guarantee or to increase data interoperability.

Two executive summaries provide a quick overview of the INSPIRE data specification process in general, and the content of the data specification on <*Theme Name*> in particular. We highly recommend that managers, decision makers, and all those new to the INSPIRE process and/or information modelling should read these executive summaries first.

The UML diagrams (in Chapter 5) offer a rapid way to see the main elements of the specifications and their relationships. The definition of the spatial object types, attributes, and relationships are included in the Feature Catalogue (also in Chapter 5). People having thematic expertise but not familiar with UML can fully understand the content of the data model focusing on the Feature Catalogue. Users might also find the Feature Catalogue especially useful to check if it contains the data necessary for the applications that they run. The technical details are expected to be of prime interest to those organisations that are responsible for implementing INSPIRE within the field of <*Theme Name*>, but also to other stakeholders and users of the spatial data infrastructure.

The technical provisions and the underlying concepts are often illustrated by examples. Smaller examples are within the text of the specification, while longer explanatory examples and descriptions of selected use cases are attached in the annexes.

In order to distinguish the INSPIRE spatial data themes from the spatial object types, the INSPIRE spatial data themes are written in *italics.*

The document will be publicly available as a 'non-paper'. It does not represent an official position of the European Commission, and as such cannot be invoked in the context of legal procedures.

[1] The common document template is available in the "Framework documents" section of the data specifications web page at *http://inspire.jrc.ec.europa.eu/index.cfm/pageid/2*

Interoperability of Spatial Data Sets and Services – General Executive Summary

The challenges regarding the lack of availability, quality, organisation, accessibility, and sharing of spatial information are common to a large number of policies and activities and are experienced across the various levels of public authority in Europe. In order to solve these problems it is necessary to take measures of coordination between the users and providers of spatial information. The Directive 2007/2/EC of the European Parliament and of the Council 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 is based on the infrastructures for spatial information that are created and maintained by the Member States. To support the establishment of a European infrastructure, Implementing Rules addressing the following components of the infrastructure have been specified: metadata, interoperability of spatial data sets (as described in Annexes I, II, III of the Directive) and spatial data services, network services, data and service sharing, and monitoring and reporting procedures.

INSPIRE does not require collection of new data. However, after the period specified in the Directive[2] Member States have to make their data available according to the Implementing Rules.

Interoperability in INSPIRE means the possibility to combine spatial data and services from different sources across the European Community in a consistent way without involving specific efforts of humans or machines. It is important to note that "interoperability" is understood as providing access to spatial data sets through network services, typically via Internet. Interoperability may be achieved by either changing (harmonising) and storing existing data sets or transforming them via services for publication in the INSPIRE infrastructure. It is expected that users will spend less time and efforts on understanding and integrating data when they build their applications based on data delivered in accordance with INSPIRE.

In order to benefit from the endeavours of international standardisation bodies and organisations established under international law their standards and technical means have been utilised and referenced, whenever possible.

To facilitate the implementation of INSPIRE, it is important that all stakeholders have the opportunity to participate in specification and development. For this reason, the Commission has put in place a consensus building process involving data users, and providers together with representatives of industry, research and government. These stakeholders, organised through Spatial Data Interest Communities (SDIC) and Legally Mandated Organisations (LMO)[3], have provided reference materials, participated in the user requirement and technical[4] surveys, proposed experts for the Data Specification Drafting Team[5], the Thematic Working Groups[6] and other ad-hoc cross-thematic technical groups and participated in the public stakeholder consultations on draft versions of the data

---

[2] For all 34 Annex I,II and III data themes: within two years of the adoption of the corresponding Implementing Rules for newly collected and extensively restructured data and within 5 years for other data in electronic format still in use

[3] The current status of registered SDICs/LMOs is available via INSPIRE website: *http://inspire.jrc.ec.europa.eu/index.cfm/pageid/42*

[4] Surveys on unique identifiers and usage of the elements of the spatial and temporal schema,

[5] The Data Specification Drafting Team has been composed of experts from Austria, Belgium, Czech Republic, France, Germany, Greece, Italy, Netherlands, Norway, Poland, Switzerland, UK, and the European Environment Agency

[6] The Thematic Working Groups of Annex II and III themes have been composed of experts from Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Netherlands, Norway, Poland, Romania, Slovakia, Spain, Sweden, Switzerland, Turkey, UK, the European Commission, and the European Environment Agency

specifications. These consultations covered expert reviews as well as feasibility and fitness-for-purpose testing of the data specifications[7].

This open and participatory approach was successfully used during the development of the data specifications on Annex I, II and III data themes as well as during the preparation of the Implementing Rule on Interoperability of Spatial Data Sets and Services[8] for Annex I spatial data themes and of its amendment regarding the themes of Annex II and III.

The development framework elaborated by the Data Specification Drafting Team aims at keeping the data specifications of the different themes coherent. It summarises the methodology to be used for the development of the data specifications, providing a coherent set of requirements and recommendations to achieve interoperability. The pillars of the framework are the following technical documents[9]:

- The *Definition of Annex Themes and Scope* describes in greater detail the spatial data themes defined in the Directive, and thus provides a sound starting point for the thematic aspects of the data specification development.

- The *Generic Conceptual Model* defines the elements necessary for interoperability and data harmonisation including cross-theme issues. It specifies requirements and recommendations with regard to data specification elements of common use, like the spatial and temporal schema, unique identifier management, object referencing, some common code lists, etc. Those requirements of the Generic Conceptual Model that are directly implementable are included in the Implementing Rule on Interoperability of Spatial Data Sets and Services.

- The *Methodology for the Development of Data Specifications* defines a repeatable methodology. It describes how to arrive from user requirements to a data specification through a number of steps including use-case development, initial specification development and analysis of analogies and gaps for further specification refinement.

- The *Guidelines for the Encoding of Spatial Data* defines how geographic information can be encoded to enable transfer processes between the systems of the data providers in the Member States. Even though it does not specify a mandatory encoding rule it sets GML (ISO 19136) as the default encoding for INSPIRE.

- The *Guidelines for the use of Observations & Measurements and Sensor Web Enablement-related standards in INSPIRE Annex II and III data specification development* provides guidelines on how the "Observations and Measurements" standard (ISO 19156) is to be used within INSPIRE.

- The *Common data models* are a set of documents that specify data models that are referenced by a number of different data specifications. These documents include generic data models for networks, coverages and activity complexes.

The structure of the data specifications is based on the "ISO 19131 Geographic information - Data product specifications" standard. They include the technical documentation of the application schema, the spatial object types with their properties, and other specifics of the spatial data themes using natural language as well as a formal conceptual schema language[10].

---

[7] For Annex II+III, the consultation and testing phase lasted from 20 June to 21 October 2011.

[8] Commission Regulation (EU) No 1089/2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services, published in the Official Journal of the European Union on 8th of December 2010.

[9] The framework documents are available in the "Framework documents" section of the data specifications web page at *http://inspire.jrc.ec.europa.eu/index.cfm/pageid/2*

[10] UML – Unified Modelling Language

A consolidated model repository, feature concept dictionary, and glossary are being maintained to support the consistent specification development and potential further reuse of specification elements. The consolidated model consists of the harmonised models of the relevant standards from the ISO 19100 series, the INSPIRE Generic Conceptual Model, and the application schemas[11] developed for each spatial data theme. The multilingual INSPIRE Feature Concept Dictionary contains the definition and description of the INSPIRE themes together with the definition of the spatial object types present in the specification. The INSPIRE Glossary defines all the terms (beyond the spatial object types) necessary for understanding the INSPIRE documentation including the terminology of other components (metadata, network services, data sharing, and monitoring).

By listing a number of requirements and making the necessary recommendations, the data specifications enable full system interoperability across the Member States, within the scope of the application areas targeted by the Directive. The data specifications (in their version 3.0) are published as technical guidelines and provide the basis for the content of the Implementing Rule on Interoperability of Spatial Data Sets and Services[12]. The content of the Implementing Rule is extracted from the data specifications, considering short- and medium-term feasibility as well as cost-benefit considerations. The requirements included in the Implementing Rule are legally binding for the Member States according to the timeline specified in the INSPIRE Directive.

In addition to providing a basis for the interoperability of spatial data in INSPIRE, the data specification development framework and the thematic data specifications can be reused in other environments at local, regional, national and global level contributing to improvements in the coherence and interoperability of data in spatial data infrastructures.

[11] Conceptual models related to specific areas (e.g. INSPIRE themes)
[12] In the case of the Annex II+III data specifications, the extracted requirements are used to formulate an amendment to the existing Implementing Rule.

<Theme Name> – Executive Summary

Include the executive summary of the spatial data theme <Theme Name>.

Acknowledgements

Many individuals and organisations have contributed to the development of these Guidelines.

The Thematic Working Group <Theme Name(s)> (TWG-XX) included:
<Facilitator> (TWG Facilitator), <Editor> (TWG Editor), <Expert>, <Expert>, …, <JRC Contact Point> (European Commission contact point).

Other contributors to the INSPIRE data specifications are the Drafting Team Data Specifications, the JRC Data Specifications Team and the INSPIRE stakeholders - Spatial Data Interested Communities (SDICs) and Legally Mandated Organisations (LMOs).

Contact information
Maria Vanda Nunes de Lima
European Commission Joint Research Centre
Institute for Environment and Sustainability
Unit H06: Digital Earth and Reference Data
TP262, Via Fermi 2749
I-21027 Ispra (VA)
ITALY
E-mail: vanda.lima@jrc.ec.europa.eu
Tel.: +39-0332-7865052
Fax: +39-0332-7866325
http://ies.jrc.ec.europa.eu/
http://ec.europa.eu/dgs/jrc/
http://inspire.jrc.ec.europa.eu/

Table of contents

1 Scope 1

2 Overview 1

2.1 Name 1
2.2 Informal description 1
2.3 Normative References 1
2.4 Terms and definitions 2
2.5 Symbols and abbreviations 3
2.6 How the Technical Guidelines map to the Implementing Rules 3
2.6.1 Requirements 3
2.6.2 Recommendations 4
2.6.3 Conformance 4

3 Specification scopes 5

4 Identification information 5

5 Data content and structure 6

5.1 Application schemas – Overview 6
5.1.1 Application schemas included in the IRs 6
5.1.2 Additional recommended application schemas 7
5.2 Basic notions 7
5.2.1 Notation 8
5.2.2 Voidable characteristics 9
5.2.3 Enumerations 10
5.2.4 Code lists 10
5.2.5 Identifier management 13
5.2.6 Geometry representation 14
5.2.7 Temporality representation 14
5.2.8 Coverages 16
5.3 Application schema <application schema name> 17
5.3.1 Description 17
5.3.2 Feature catalogue 20
5.3.3 Externally governed code lists 20

6 Reference systems, units of measure and grids 22

6.1 Default reference systems, units of measure and grid 22
6.1.1 Coordinate reference systems 22
6.1.2 Temporal reference system 24
6.1.3 Units of measure 25
6.1.4 Grids 25
6.2 Theme-specific requirements and recommendations 26
6.2.1 Coordinate reference systems 26
6.2.2 Temporal reference systems 27
6.2.3 Units of measure 27
6.2.4 Grids 27

7 Data quality 28

7.1 Data quality elements 28
7.1.1 Completeness – Commission 32
7.1.2 Completeness – Omission 32
7.1.3 Logical consistency – Conceptual consistency 32
7.1.4 Logical consistency – Domain consistency 33
7.1.5 Logical Consistency – Format consistency 33
7.1.6 Logical Consistency – Topological consistency 33

7.1.7 Positional accuracy – Absolute or external accuracy....34
7.1.8 Positional accuracy – Relative or internal accuracy....34
7.1.9 Positional accuracy – Gridded data position accuracy....34
7.1.10 Thematic accuracy – Classification correctness....34
7.1.11 Thematic accuracy – Non-quantitative attribute correctness....35
7.1.12 Thematic accuracy – Quantitative attribute accuracy....35
7.1.13 Temporal quality – Accuracy of a time measurement....35
7.1.14 Temporal quality – Temporal consistency....35
7.1.15 Temporal quality – Temporal validity....35
7.1.16 Usability....36
7.2 Minimum data quality requirements....36
7.3 Recommendation on data quality....36

8 Dataset-level metadata....38

8.1 Metadata elements defined in INSPIRE Metadata Regulation....38
8.1.1 Conformity....39
8.1.2 Lineage....41
8.1.3 Temporal reference....42
8.1.4 <MD Element from MD Regulation>....42
8.2 Metadata elements for interoperability....42
8.2.1 Coordinate Reference System....43
8.2.2 Temporal Reference System....44
8.2.3 Encoding....45
8.2.4 Character Encoding....45
8.2.5 Spatial representation type....46
8.2.6 Data Quality – Logical Consistency – Topological Consistency....46
8.3 Recommended theme-specific metadata elements....46
8.3.1 Maintenance Information....47
8.3.2 Metadata elements for reporting data quality....48
8.3.3 <Name of Metadata Element>....50

9 Delivery....50

9.1 Updates....50
9.2 Delivery medium....51
9.3 Encodings....52
9.3.1 Default Encoding(s)....52
9.3.2 Recommended Encoding(s)....58
9.4 Options for delivering coverage data....58

10 Data Capture....59

11 Portrayal....60

11.1 Layers to be provided by INSPIRE view services....61
11.1.1 Layers organisation....63
11.2 Styles required to be supported by INSPIRE view services....63
11.2.1 Styles for the layer <layer name>....63
11.3 Styles recommended to be supported by INSPIRE view services....66
11.3.1 Styles for the layer <layer name>....66

Bibliography....67

Annex A (normative) Abstract Test Suite....68

A.1 Application Schema Conformance Class....72
A.1.1 Schema element denomination test....72
A.1.2 Value type test....72
A.1.3 Value test....72
A.1.4 Attributes/associations completeness test....73
A.1.5 Abstract spatial object test....73
A.1.6 Constraints test....73

A.1.7 Geometry representation test 74
A.2 Reference Systems Conformance Class 74
A.2.1 Datum test 74
A.2.2 Coordinate reference system test 74
A.2.3 Grid test 75
A.2.4 View service coordinate reference system test 75
A.2.5 Temporal reference system test 76
A.2.6 Units of measurements test 76
A.3 Data Consistency Conformance Class 76
A.3.1 Unique identifier persistency test 76
A.3.2 Version consistency test 77
A.3.3 Life cycle time sequence test 77
A.3.4 Validity time sequence test 77
A.3.5 Update frequency test 77
A.4 Data Quality Conformance Class 78
A.4.1 Data quality target results test 78
A.5 Metadata IR Conformance Class 78
A.5.1 Metadata for interoperability test 78
A.6 Information Accessibility Conformance Class 79
A.6.1 Code list publication test 79
A.6.2 CRS publication test 79
A.6.3 CRS identification test 79
A.6.4 Grid identification test 79
A.7 Data Delivery Conformance Class 80
A.7.1 Encoding compliance test 80
A.8 Portrayal Conformance Class 80
A.8.1 Layer designation test 80
A.9 Technical Guideline Conformance Class 81
A.9.1 Multiplicity test 81
A.9.1 CRS http URI test 81
A.9.2 Metadata encoding schema validation test 81
A.9.3 Metadata occurrence test 81
A.9.4 Metadata consistency test 82
A.9.5 Encoding schema validation test 82
A.9.6 Coverage multipart representation test 82
A.9.7 Coverage domain consistency test 82
A.9.8 Style test 83

Annex B (informative) Use cases 84

B.1 <Use case name> 87

Annex C (normative) Code list values 89

Annex D (informative) <Annex Heading> 90

D.1 <Annex Subsection> 90
D.1.1 <Annex Subsubsection> 90

1 Scope

This document specifies a harmonised data specification for the spatial data theme <*Theme Name*> as defined in Annex II/III of the INSPIRE Directive.

This data specification provides the basis for the drafting of Implementing Rules according to Article 7 (1) of the INSPIRE Directive [Directive 2007/2/EC]. The entire data specification is published as implementation guidelines accompanying these Implementing Rules.

2 Overview

2.1 Name

INSPIRE data specification for the theme <Theme Name>.

2.2 Informal description

Definition:

Include the theme definition form the INSPIRE Directive.

<definition> [Directive 2007/2/EC]

Description:

Based on the theme description from the Feature Concept Dictionary. The Description may include the following aspects: Data content, Spatial extent, Temporal extent, Purpose for which the data has been or shall be collected, Data sources and data production process, Maintenance of the data.

Please include references as applicable.

2.3 Normative References

[Directive 2007/2/EC] 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)

[ISO 19107] EN ISO 19107:2005, Geographic Information – Spatial Schema

[ISO 19108] EN ISO 19108:2005, Geographic Information – Temporal Schema

[ISO 19108-c] ISO 19108:2002/Cor 1:2006, Geographic Information – Temporal Schema, Technical Corrigendum 1

[ISO 19111] EN ISO 19111:2007 Geographic information - Spatial referencing by coordinates (ISO 19111:2007)

[ISO 19113] EN ISO 19113:2005, Geographic Information – Quality principles

[ISO 19115] EN ISO 19115:2005, Geographic information – Metadata (ISO 19115:2003)

[ISO 19118] EN ISO 19118:2006, Geographic information – Encoding (ISO 19118:2005)

[ISO 19123] EN ISO 19123:2007, Geographic Information – Schema for coverage geometry and functions

[ISO 19125-1] EN ISO 19125-1:2004, Geographic Information – Simple feature access – Part 1: Common architecture

[ISO 19135] EN ISO 19135:2007 Geographic information – Procedures for item registration (ISO 19135:2005)

[ISO 19138] ISO/TS 19138:2006, Geographic Information – Data quality measures

[ISO 19139] ISO/TS 19139:2007, Geographic information – Metadata – XML schema implementation

[ISO 19157] ISO/DIS 19157, Geographic information – Data quality

[OGC 06-103r4] Implementation Specification for Geographic Information - Simple feature access – Part 1: Common Architecture v1.2.1

NOTE This is an updated version of "EN ISO 19125-1:2004, Geographic information – Simple feature access – Part 1: Common architecture".

[Regulation 1205/2008/EC] Regulation 1205/2008/EC implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata

Delete any of these references if they are not used in a normative way or add further normative references as applicable. The framework documents by the DT DS (e.g., D2.5, D2.6 etc.) should ***not*** *be listed here but in the Bibliography Section at the end.*

2.4 Terms and definitions

General terms and definitions helpful for understanding the INSPIRE data specification documents are defined in the INSPIRE Glossary[13].

Specifically, for the theme <Theme Name>, the following terms are defined: (delete if no additional terms are defined)

(<running number>) <Term>
<definition>

NOTE <note> *(delete as appropriate)*

EXAMPLE <example> *(delete as appropriate)*

Example:

(11) geographic identifier
Spatial reference in the form of a label or code that identifies a location [EN ISO 19112:2005, Geographic information — Spatial referencing by geographic identifiers]

[13] The INSPIRE Glossary is available from http://inspire-registry.jrc.ec.europa.eu/registers/GLOSSARY

EXAMPLE 1 Place names: Paris, Rhine, Mont Blanc

EXAMPLE 2 Postal codes: 53115, 01009, SW1, IV19 1PZ

2.5 Symbols and abbreviations

List of abbreviations and acronyms used in the data specification

<acronym/abbreviation> <explanation>

2.6 How the Technical Guidelines map to the Implementing Rules

The schematic diagram in Figure 1 gives an overview of the relationships between the INSPIRE legal acts (the INSPIRE Directive and Implementing Rules) and the INSPIRE Technical Guidelines. The INSPIRE Directive and Implementing Rules include legally binding requirements that describe, usually on an abstract level, *what* Member States must implement.

In contrast, the Technical Guidelines define *how* Member States might implement the requirements included in the INSPIRE Implementing Rules. As such, they may include non-binding technical requirements that must be satisfied if a Member State data provider chooses to conform to the Technical Guidelines. Implementing these Technical Guidelines will maximise the interoperability of INSPIRE spatial data sets.

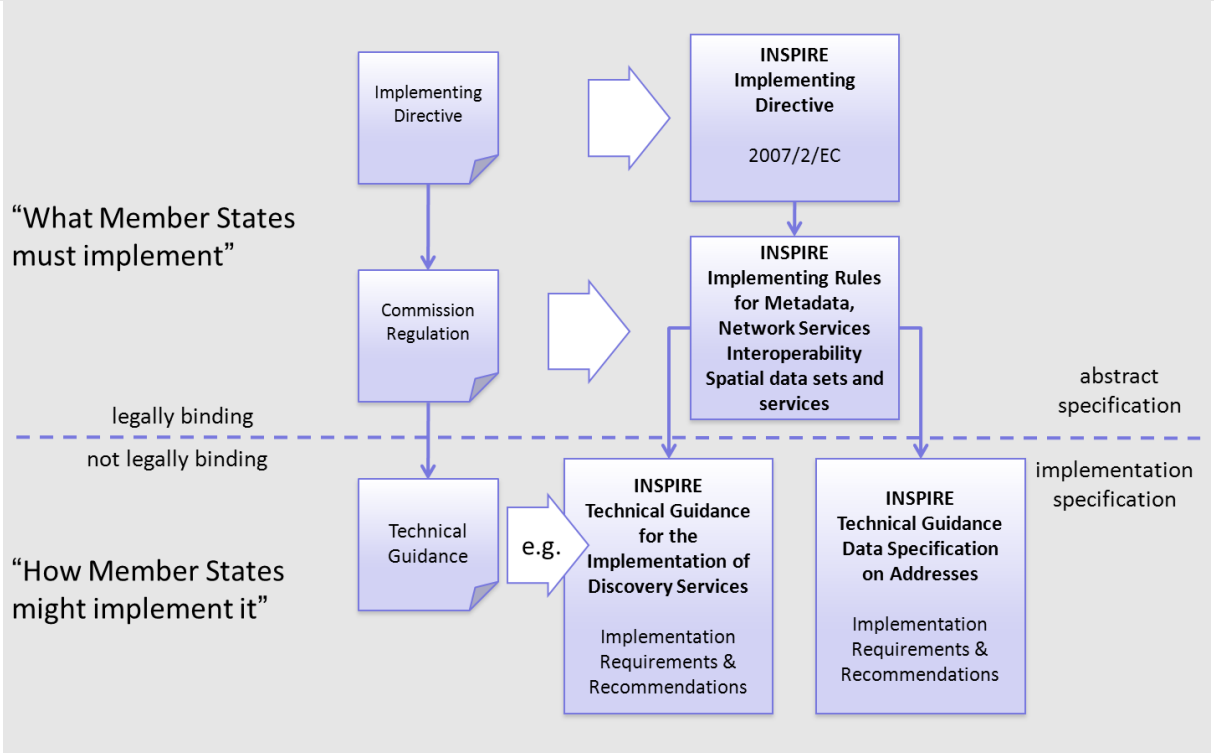


Figure 1 - Relationship between INSPIRE Implementing Rules and Technical Guidelines

2.6.1 Requirements

The purpose of these Technical Guidelines (Data specifications on <*Theme Name*>) is to provide practical guidance for implementation that is guided by, and satisfies, the (legally binding) requirements included for the spatial data theme <Theme Name> in the Regulation (Implementing

Rules) on interoperability of spatial data sets and services. These requirements are highlighted in this document as follows:

IR Requirement
Article / Annex / Section no.
Title / Heading

This style is used for requirements contained in the Implementing Rules on interoperability of spatial data sets and services (Commission Regulation (EU) No 1089/2010).

For each of these IR requirements, these Technical Guidelines contain additional explanations and examples.

NOTE The Abstract Test Suite (ATS) in Annex A contains conformance tests that directly check conformance with these IR requirements.

Furthermore, these Technical Guidelines may propose a specific technical implementation for satisfying an IR requirement. In such cases, these Technical Guidelines may contain additional technical requirements that need to be met in order to be conformant with the corresponding IR requirement *when using this proposed implementation*. These technical requirements are highlighted as follows:

TG Requirement X This style is used for requirements for a specific technical solution proposed in these Technical Guidelines for an IR requirement.

NOTE 1 Conformance of a data set with the TG requirement(s) included in the ATS implies conformance with the corresponding IR requirement(s).

NOTE 2 In addition to the requirements included in the Implementing Rules on interoperability of spatial data sets and services, the INSPIRE Directive includes further legally binding obligations that put additional requirements on data providers. For example, Art. 10(2) requires that Member States shall, where appropriate, decide by mutual consent on the depiction and position of geographical features whose location spans the frontier between two or more Member States. General guidance for how to meet these obligations is provided in the INSPIRE framework documents.

2.6.2 Recommendations

In addition to IR and TG requirements, these Technical Guidelines may also include a number of recommendations for facilitating implementation or for further and coherent development of an interoperable infrastructure.

Recommendation X Recommendations are shown using this style.

NOTE The implementation of recommendations is not mandatory. Compliance with these Technical Guidelines or the legal obligation does not depend on the fulfilment of the recommendations.

2.6.3 Conformance

Annex A includes the abstract test suite for checking conformance with the requirements included in these Technical Guidelines and the corresponding parts of the Implementing Rules (Commission Regulation (EU) No 1089/2010).

3 Specification scopes

For INSPIRE data specifications, it is recommended that only one general specification scope is applied (the default scope).

If only one specification scope is considered, include the following sentence.

This data specification does not distinguish different specification scopes, but just considers one general scope.

NOTE For more information on specification scopes, see [ISO 19131:2007], clause 8 and Annex D.

It is also possible to identify partitions in the textual descriptions, so that individual specification scopes according to ISO 19131 can be derived and transposed in a formal notation if required. (Recommendation 5 of D2.6)

ISO 19131, clause 8 Specification scopes:

> *'The specification of a data product may not be homogeneous across the whole data product, but may vary for different parts of the data. Each part shall correspond to a specification scope. The definition of a general specification can be supplemented by distinctive specifications for particular spatial extents, that either inherit or override the general case. This may reduce the redundancy of specification details and provide for different views of the data product.*
>
> *The specification scope may be defined by one or more of the following:*
> - *hierarchical level – the subset may be a hierarchical level (defined by a code or a name);*
> - *extent – the subset may be a spatial (horizontal or vertical) and/or temporal extent ;*
> - *coverage – the subset may be a set of coverages.*
>
> *The information describing the specification scope shall include:*
> - *scope identification.*
>
> *and items from the following as required to describe the scope:*
> - *level – a code identifying the hierarchical level of the data;*
> - *level name – the name of the hierarchical level of the data;*
> - *level description – a detailed description of the level of the data;*
> - *extent – the spatial, vertical and temporal extent of the data;*
> - *coverage – the coverages to which the information applies.*
>
> *A formal definition for specification scope information is given in D.1, which provides a UML model and the corresponding data definitions. The specification scope shall be identified by a Scope-ID and in the statement of that part of the specification.'*

4 Identification information

These Technical Guidelines are identified by the following URI:
http://inspire.ec.europa.eu/tg/XX/x.y(.z)

NOTE ISO 19131 suggests further identification information to be included in this section, e.g. the title, abstract or spatial representation type. The proposed items are already described in the document metadata, executive summary, overview description (section 2) and descriptions of the application schemas (section 5). In order to avoid redundancy, they are not repeated here.

5 Data content and structure

Only the following edits need to be made in this document:
- *specifiy the application schema names included in the data specification*
- *specify which of these application schemas are included in the IR and which are only recommended in the TG*
- *delete any sub-section in the 'Basic notions' section that are not relevant for this data specification.*

All other information should be edited in 5_ApplicationSchema.doc.

List all application schemas included in section 5. For each application schema, give a short summary (1 sentence) of its content and/or purpose.

5.1 Application schemas – Overview

5.1.1 Application schemas included in the IRs

Articles 3, 4 and 5 of the Implementing Rules lay down the requirements for the content and structure of the data sets related to the INSPIRE Annex themes.

IR Requirement
Article 4
Types for the Exchange and Classification of Spatial Objects

1. For the exchange and classification of spatial objects from data sets meeting the conditions laid down in Article 4 of Directive 2007/2/EC, Member States shall use the spatial object types and associated data types, enumerations and code lists that are defined in Annexes II, III and IV for the themes the data sets relate to.

2. Spatial object types and data types shall comply with the definitions and constraints and include the attributes and association roles set out in the Annexes.

3. The enumerations and code lists used in attributes or association roles of spatial object types or data types shall comply with the definitions and include the values set out in Annex II. The enumeration and code list values are uniquely identified by language-neutral mnemonic codes for computers. The values may also include a language-specific name to be used for human interaction.

The types to be used for the exchange and classification of spatial objects from data sets related to the spatial data theme <Theme Name> are defined in the following application schemas (see sections *Include cross-reference to section(s) including the applucation schemas)*):

- <ApplicationSchema1> application schema …

List all application schemas that are included in the legal act.

The application schemas specify requirements on the properties of each spatial object including its multiplicity, domain of valid values, constraints, etc.

NOTE The application schemas presented in this section contain some additional information that is not included in the Implementing Rules, in particular multiplicities of attributes and association roles.

TG Requirement 1	Spatial object types and data types shall comply with the multiplicities defined for the attributes and association roles in this section.

An application schema may include references (e.g. in attributes or inheritance relationships) to common types or types defined in other spatial data themes. These types can be found in a sub-section called "Imported Types" at the end of each application schema section. The common types referred to from application schemas included in the IRs are addressed in Article 3.

IR Requirement
Article 3
Common Types

Types that are common to several of the themes listed in Annexes I, II and III to Directive 2007/2/EC shall conform to the definitions and constraints and include the attributes and association roles set out in Annex I.

NOTE Since the IRs contain the types for all INSPIRE spatial data themes in one document, Article 3 does not explicitly refer to types defined in other spatial data themes, but only to types defined in external data models.

Common types are described in detail in the Generic Conceptual Model [DS-D2.7], in the relevant international standards (e.g. of the ISO 19100 series) or in the documents on the common INSPIRE models [DS-D2.10.x]. For detailed descriptions of types defined in other spatial data themes, see the corresponding Data Specification TG document [DS-D2.8.x].

5.1.2 Additional recommended application schemas

In addition to the application schemas listed above, the following additional application schemas have been defined for the theme <*Theme Name*> (see sections *Include cross-reference to section(s) including the applucation schemas)*):

- <ApplicationSchema1> application schema …

*List all application schemas that are **not** included in the legal act.*

These additional application schemas are not included in the IRs. They typically address requirements from specific (groups of) use cases and/or may be used to provide additional information. They are included in this specification in order to improve interoperability also for these additional aspects and to illustrate the extensibility of the application schemas included in the IRs.

List all application schemas that should not be included in the legal act in the Recommendation below.

Recommendation 1	Additional and/or use case-specific information related to the theme <*Theme Name*> should be made available using the spatial object types and data types specified in the following application schema(s): <ApplicationSchema1>, <ApplicationSchema2>, … These spatial object types and data types should comply with the definitions and constraints and include the attributes and association roles defined in this section. The enumerations and code lists used in attributes or association roles of spatial object types or data types should comply with the definitions and include the values defined in this section.

5.2 Basic notions

This section explains some of the basic notions used in the INSPIRE application schemas. These explanations are based on the GCM [DS-D2.5].

5.2.1 Notation

5.2.1.1. Unified Modeling Language (UML)

The application schemas included in this section are specified in UML, version 2.1. The spatial object types, their properties and associated types are shown in UML class diagrams.

NOTE For an overview of the UML notation, see Annex D in [ISO 19103].

The use of a common conceptual schema language (i.e. UML) allows for an automated processing of application schemas and the encoding, querying and updating of data based on the application schema – across different themes and different levels of detail.

The following important rules related to class inheritance and abstract classes are included in the IRs.

IR Requirement
Article 5
Types

(…)

2. Types that are a sub-type of another type shall also include all this type's attributes and association roles.

3. Abstract types shall not be instantiated.

The use of UML conforms to ISO 19109 8.3 and ISO/TS 19103 with the exception that UML 2.1 instead of ISO/IEC 19501 is being used. The use of UML also conforms to ISO 19136 E.2.1.1.1-E.2.1.1.4.

NOTE ISO/TS 19103 and ISO 19109 specify a profile of UML to be used in conjunction with the ISO 19100 series. This includes in particular a list of stereotypes and basic types to be used in application schemas. ISO 19136 specifies a more restricted UML profile that allows for a direct encoding in XML Schema for data transfer purposes.

To model constraints on the spatial object types and their properties, in particular to express data/data set consistency rules, OCL (Object Constraint Language) is used as described in ISO/TS 19103, whenever possible. In addition, all constraints are described in the feature catalogue in English, too.

NOTE Since "void" is not a concept supported by OCL, OCL constraints cannot include expressions to test whether a value is a *void* value. Such constraints may only be expressed in natural language.

5.2.1.2. Stereotypes

In the application schemas in this section several stereotypes are used that have been defined as part of a UML profile for use in INSPIRE [DS-D2.5]. These are explained in Table 1 below.

Table 1 – Stereotypes (adapted from [DS-D2.5])

Stereotype	Model element	Description

applicationSchema	Package	An INSPIRE application schema according to ISO 19109 and the Generic Conceptual Model.
leaf	Package	A package that is not an application schema and contains no packages.
featureType	Class	A spatial object type.
type	Class	A type that is not directly instantiable, but is used as an abstract collection of operation, attribute and relation signatures. This stereotype should usually not be used in INSPIRE application schemas as these are on a different conceptual level than classifiers with this stereotype.
dataType	Class	A structured data type without identity.
union	Class	A structured data type without identity where exactly one of the properties of the type is present in any instance.
enumeration	Class	An enumeration.
codeList	Class	A code list.
import	Dependency	The model elements of the supplier package are imported.
voidable	Attribute, association role	A voidable attribute or association role (see section 5.2.2).
lifeCycleInfo	Attribute, association role	If in an application schema a property is considered to be part of the life-cycle information of a spatial object type, the property shall receive this stereotype.
version	Association role	If in an application schema an association role ends at a spatial object type, this stereotype denotes that the value of the property is meant to be a specific version of the spatial object, not the spatial object in general.

5.2.2 Voidable characteristics

The «voidable» stereotype is used to characterise those properties of a spatial object that may not be present in some spatial data sets, even though they may be present or applicable in the real world. This does *not* mean that it is optional to provide a value for those properties.

For all properties defined for a spatial object, a value has to be provided – either the corresponding value (if available in the data set maintained by the data provider) or the value of *void.* A *void* value shall imply that no corresponding value is contained in the source spatial data set maintained by the data provider or no corresponding value can be derived from existing values at reasonable costs.

Recommendation 2 The reason for a *void* value should be provided where possible using a listed value from the VoidReasonValue code list to indicate the reason for the missing value.

The VoidReasonValue type is a code list, which includes the following pre-defined values:

- *Unpopulated*: The property is not part of the dataset maintained by the data provider. However, the characteristic may exist in the real world. For example when the “elevation of the water body above the sea level” has not been included in a dataset containing lake spatial objects, then the reason for a void value of this property would be ‘Unpopulated’. The property receives this value for all spatial objects in the spatial data set.
- *Unknown*: The correct value for the specific spatial object is not known to, and not computable by the data provider. However, a correct value may exist. For example when the “elevation of the water body above the sea level” *of a certain lake* has not been measured, then the reason for a void value of this property would be ‘Unknown’. This value is applied only to those spatial objects where the property in question is not known.
- *Withheld*: The characteristic may exist, but is confidential and not divulged by the data provider.

NOTE It is possible that additional reasons will be identified in the future, in particular to support reasons / special values in coverage ranges.

The «voidable» stereotype does not give any information on whether or not a characteristic exists in the real world. This is expressed using the multiplicity:

- If a characteristic may or may not exist in the real world, its minimum cardinality shall be defined as 0. For example, if an Address may or may not have a house number, the multiplicity of the corresponding property shall be 0..1.
- If at least one value for a certain characteristic exists in the real world, the minimum cardinality shall be defined as 1. For example, if an Administrative Unit always has at least one name, the multiplicity of the corresponding property shall be 1..*.

In both cases, the «voidable» stereotype can be applied. In cases where the minimum multiplicity is 0, the absence of a value indicates that it is known that no value exists, whereas a value of void indicates that it is not known whether a value exists or not.

EXAMPLE If an address does not have a house number, the corresponding Address object should not have any value for the «voidable» attribute house number. If the house number is simply not known or not populated in the data set, the Address object should receive a value of *void* (with the corresponding void reason) for the house number attribute.

5.2.3 Enumerations

Enumerations are modelled as classes in the application schemas. Their values are modelled as attributes of the enumeration class using the following modelling style:

- No initial value, but only the attribute name part, is used.
- The attribute name conforms to the rules for attributes names, i.e. is a lowerCamelCase name. Exceptions are words that consist of all uppercase letters (acronyms).

IR Requirement
Article 6
Code Lists and Enumerations

(…)

5) Attributes or association roles of spatial object types or data types that have an enumeration type may only take values from the lists specified for the enumeration type."

5.2.4 Code lists

Code lists are modelled as classes in the application schemas. Their values, however, are managed outside of the application schema.

5.2.4.1. Code list types

The IRs distinguish the following types of code lists.

IR Requirement
Article 6
Code Lists and Enumerations

1) Code lists shall be of one of the following types, as specified in the Annexes:
   a) code lists whose allowed values comprise only the values specified in this Regulation;
   b) code lists whose allowed values comprise the values specified in this Regulation and narrower values defined by data providers;
   c) code lists whose allowed values comprise the values specified in this Regulation and additional values at any level defined by data providers;
   d) code lists, whose allowed values comprise any values defined by data providers.

   For the purposes of points (b), (c) and (d), in addition to the allowed values, data providers may use the values specified in the relevant INSPIRE Technical Guidance document available on the INSPIRE web site of the Joint Research Centre.

The type of code list is represented in the UML model through the tagged value *extensibility*, which can take the following values:

- *none*, representing code lists whose allowed values comprise only the values specified in the IRs (type a);
- *narrower*, representing code lists whose allowed values comprise the values specified in the IRs and narrower values defined by data providers (type b);
- *open*, representing code lists whose allowed values comprise the values specified in the IRs and additional values at any level defined by data providers (type c); and
- *any*, representing code lists, for which the IRs do not specify any allowed values, i.e. whose allowed values comprise any values defined by data providers (type d).

Recommendation 3 Additional values defined by data providers should not replace or redefine any value already specified in the IRs.

NOTEThis data specification may specify recommended values for some of the code lists of type (b), (c) and (d) (see section 5.2.4.3). These recommended values are specified in a dedicated Annex.

In addition, code lists can be hierarchical, as explained in Article 6(2) of the IRs.

IR Requirement
Article 6
Code Lists and Enumerations

(…)

2) Code lists may be hierarchical. Values of hierarchical code lists may have a more generic parent value. Where the valid values of a hierarchical code list are specified in a table in this Regulation, the parent values are listed in the last column.

The type of code list and whether it is hierarchical or not is also indicated in the feature catalogues.

5.2.4.2. Obligations on data providers

IR Requirement
Article 6
Code Lists and Enumerations

(….)

3) Where, for an attribute whose type is a code list as referred to in points (b), (c) or (d) of paragraph 1, a data provider provides a value that is not specified in this Regulation, that value and its definition shall be made available in a register.

4) Attributes or association roles of spatial object types or data types whose type is a code list may only take values that are allowed according to the specification of the code list.

Article 6(4) obliges data providers to use only values that are allowed according to the specification of the code list. The "allowed values according to the specification of the code list" are the values explicitly defined in the IRs plus (in the case of code lists of type (b), (c) and (d)) additional values defined by data providers.

For attributes whose type is a code list of type (b), (c) or (d) data providers may use additional values that are not defined in the IRs. Article 6(3) requires that such additional values and their definition be made available in a register. This enables users of the data to look up the meaning of the additional values used in a data set, and also facilitates the re-use of additional values by other data providers (potentially across Member States).

NOTEGuidelines for setting up registers for additional values and how to register additional values in these registers is still an open discussion point between Member States and the Commission.

5.2.4.3. Recommended code list values

For code lists of type (b), (c) and (d), this data specification may propose additional values as a recommendation (in a dedicated Annex). These values will be included in the INSPIRE code list register. This will facilitate and encourage the usage of the recommended values by data providers since the obligation to make additional values defined by data providers available in a register (see section 5.2.4.2) is already met.

Recommendation 4 Where these Technical Guidelines recommend values for a code list in addition to those specified in the IRs, these values should be used.

NOTE For some code lists of type (d), no values may be specified in these Technical Guidelines. In these cases, any additional value defined by data providers may be used.

5.2.4.4. Governance

The following two types of code lists are distinguished in INSPIRE:

- *Code lists that are governed by INSPIRE (INSPIRE-governed code lists).* These code lists will be managed centrally in the INSPIRE code list register. Change requests to these code lists (e.g. to add, deprecate or supersede values) are processed and decided upon using the INSPIRE code list register's maintenance workflows.

  INSPIRE-governed code lists will be made available in the INSPIRE code list register at *http://inspire.ec.europa.eu/codeList/<CodeListName>*. They will be available in SKOS/RDF, XML and HTML. The maintenance will follow the procedures defined in ISO 19135. This means that the only allowed changes to a code list are the addition, deprecation or supersession of values, i.e. no value will ever be deleted, but only receive different statuses (valid, deprecated, superseded). Identifiers for values of INSPIRE-governed code lists are constructed using the pattern *http://inspire.ec.europa.eu/codeList/<CodeListName>*/<value>.

- *Code lists that are governed by an organisation outside of INSPIRE (externally governed code lists).* These code lists are managed by an organisation outside of INSPIRE, e.g. the World Meteorological Organization (WMO) or the World Health Organization (WHO). Change requests to these code lists follow the maintenance workflows defined by the maintaining organisations. Note that in some cases, no such workflows may be formally defined.

Since the updates of externally governed code lists is outside the control of INSPIRE, the IRs and these Technical Guidelines reference a specific version for such code lists.

The tables describing externally governed code lists in this section contain the following columns:

- The *Governance* column describes the external organisation that is responsible for maintaining the code list.
- The *Source* column specifies a citation for the authoritative source for the values of the code list. For code lists, whose values are mandated in the IRs, this citation should include the version of the code list used in INSPIRE. The version can be specified using a version number or the publication date. For code list values recommended in these Technical Guidelines, the citation may refer to the "latest available version".
- In some cases, for INSPIRE only a subset of an externally governed code list is relevant. The subset is specified using the *Subset* column.
- The *Availability* column specifies from where (e.g. URL) the values of the externally governed code list are available, and in which formats. Formats can include machine-readable (e.g. SKOS/RDF, XML) or human-readable (e.g. HTML, PDF) ones.

Code list values are encoded using http URIs and labels. Rules for generating these URIs and labels are specified in a separate table.

Recommendation 5 The http URIs and labels used for encoding code list values should be taken from the INSPIRE code list registry for INSPIRE-governed code lists and generated according to the relevant rules specified for externally governed code lists.

NOTE Where practicable, the INSPIRE code list register could also provide http URIs and labels for externally governed code lists.

5.2.4.5. Vocabulary

For each code list, a tagged value called "vocabulary" is specified to define a URI identifying the values of the code list. For INSPIRE-governed code lists and externally governed code lists that do not have a persistent identifier, the URI is constructed following the pattern *http://inspire.ec.europa.eu/codeList/<UpperCamelCaseName>*.

If the value is missing or empty, this indicates an empty code list. If no sub-classes are defined for this empty code list, this means that any code list may be used that meets the given definition.

An empty code list may also be used as a super-class for a number of specific code lists whose values may be used to specify the attribute value. If the sub-classes specified in the model represent all valid extensions to the empty code list, the subtyping relationship is qualified with the standard UML constraint "{complete,disjoint}".

5.2.5 Identifier management

IR Requirement
Article 9
Identifier Management

1. The data type Identifier defined in Section 2.1 of Annex I shall be used as a type for the external object identifier of a spatial object.
2. The external object identifier for the unique identification of spatial objects shall not be changed during the life-cycle of a spatial object.

NOTE 1 An external object identifier is a unique object identifier which is published by the responsible body, which may be used by external applications to reference the spatial object. [DS-D2.5]

NOTE 2 Article 9(1) is implemented in each application schema by including the attribute *inspireId* of type Identifier.

NOTE 3 Article 9(2) is ensured if the *namespace* and *localId* attributes of the Identifier remains the same for different versions of a spatial object; the *version* attribute can of course change.

The following requirement and notes shall be deleted if the spatial properties are not to be restricted to the Simple Features spatial schema as defined in ISO 19125-1:2004. If coordinates in 3-dimensional space are required, this should be specified for the relevant application schema.

5.2.6 Geometry representation

IR Requirement
Article 12
Other Requirements & Rules

1. The value domain of spatial properties defined in this Regulation shall be restricted to the Simple Feature spatial schema as defined in Herring, John R. (ed.), OpenGIS® Implementation Standard for Geographic information – Simple feature access – Part 1: Common architecture, version 1.2.1, Open Geospatial Consortium, 2011, unless specified otherwise for a specific spatial data theme or type.

NOTE 1 The specification restricts the spatial schema to 0-, 1-, 2-, and 2.5-dimensional geometries where all curve interpolations are linear and surface interpolations are performed by triangles.

NOTE 2 The topological relations of two spatial objects based on their specific geometry and topology properties can in principle be investigated by invoking the operations of the types defined in ISO 19107 (or the methods specified in EN ISO 19125-1).

If no begin/endLifespanVersion or validFrom/To attributes are used, the following section should be deleted.

5.2.7 Temporality representation

If one of the application schemas uses attributes to record the lifespan of a spatial object as shown in the example in Figure 11 of the Generic Conceptual Model [INSPIRE DS-D2.5], include the following sub-section. If no begin/endLifespanVersion attributes are used, the section should be deleted.

The application schema(s) use(s) the derived attributes "beginLifespanVersion" and "endLifespanVersion" to record the lifespan of a spatial object.

The attributes "beginLifespanVersion" specifies the date and time at which this version of the spatial object was inserted or changed in the spatial data set. The attribute "endLifespanVersion" specifies

the date and time at which this version of the spatial object was superseded or retired in the spatial data set.

NOTE 1 The attributes specify the beginning of the lifespan of the version in the spatial data set itself, which is different from the temporal characteristics of the real-world phenomenon described by the spatial object. This lifespan information, if available, supports mainly two requirements: First, knowledge about the spatial data set content at a specific time; second, knowledge about changes to a data set in a specific time frame. The lifespan information should be as detailed as in the data set (i.e., if the lifespan information in the data set includes seconds, the seconds should be represented in data published in INSPIRE) and include time zone information.

NOTE 2 Changes to the attribute "endLifespanVersion" does not trigger a change in the attribute "beginLifespanVersion".

IR Requirement
Article 10
Life-cycle of Spatial Objects

(…)

3. Where the attributes beginLifespanVersion and endLifespanVersion are used, the value of endLifespanVersion shall not be before the value of beginLifespanVersion.

NOTE The requirement expressed in the IR Requirement above will be included as constraints in the UML data models of all themes.

Recommendation 6 If life-cycle information is not maintained as part of the spatial data set, all spatial objects belonging to this data set should provide a void value with a reason of "unpopulated".

If one of the application schemas uses attributes to record the validity of the real world phenomenon represented by a spatial object, include the following sub-section. If no validFrom/To attributes are used, the section should be deleted.

5.2.7.1. Validity of the real-world phenomena

The application schema(s) use(s) the attributes "validFrom" and "validTo" to record the validity of the real-world phenomenon represented by a spatial object.

The attributes "validFrom" specifies the date and time at which the real-world phenomenon became valid in the real world. The attribute "validTo" specifies the date and time at which the real-world phenomenon is no longer valid in the real world.

Specific application schemas may give examples what “being valid” means for a specific real-world phenomenon represented by a spatial object.

IR Requirement
Article 12
Other Requirements & Rules

(…)

3. Where the attributes validFrom and validTo are used, the value of validTo shall not be before the value of validFrom.

NOTE The requirement expressed in the IR Requirement above will be included as constraints in the UML data models of all themes.

If one of the application schemas makes reference to coverages, include the following section. Else remove it.

5.2.8 Coverages

Coverage functions are used to describe characteristics of real-world phenomena that vary over space and/or time. Typical examples are temperature, elevation, precipitation, imagery. A coverage contains a set of such values, each associated with one of the elements in a spatial, temporal or spatio-temporal domain. Typical spatial domains are point sets (e.g. sensor locations), curve sets (e.g. isolines), grids (e.g. orthoimages, elevation models), etc.

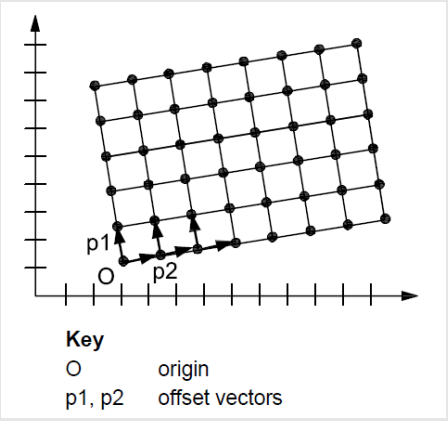
In INSPIRE application schemas, coverage functions are defined as properties of spatial object types where the type of the property value is a realisation of one of the types specified in ISO 19123.

To improve alignment with coverage standards on the implementation level (e.g. ISO 19136 and the OGC Web Coverage Service) and to improve the cross-theme harmonisation on the use of coverages in INSPIRE, an application schema for coverage types is included in the Generic Conceptual Model in 9.9.4. This application schema contains the following coverage types:

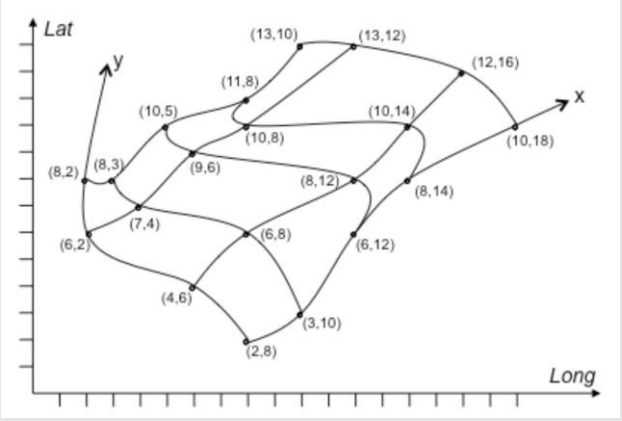
- *RectifiedGridCoverage*: coverage whose domain consists of a rectified grid – a grid for which there is an affine transformation between the grid coordinates and the coordinates of a coordinate reference system (see Figure 2, left).
- *ReferenceableGridCoverage*: coverage whose domain consists of a referenceable grid – a grid associated with a transformation that can be used to convert grid coordinate values to values of coordinates referenced to a coordinate reference system (see Figure 2, right).

In addition, some themes make reference to the types TimeValuePair and Timeseries defined in Taylor, Peter (ed.), *OGC® WaterML 2.0: Part 1 – Timeseries, v2.0.0,* Open Geospatial Consortium, 2012. These provide a representation of the time instant/value pairs, i.e. time series (see Figure 3).

Where possible, only these coverage types (or a subtype thereof) are used in INSPIRE application schemas.



(Source: ISO 19136:2007)



(Source: GML 3.3.0)

Figure 2 – Examples of a rectified grid (left) and a referenceable grid (right)

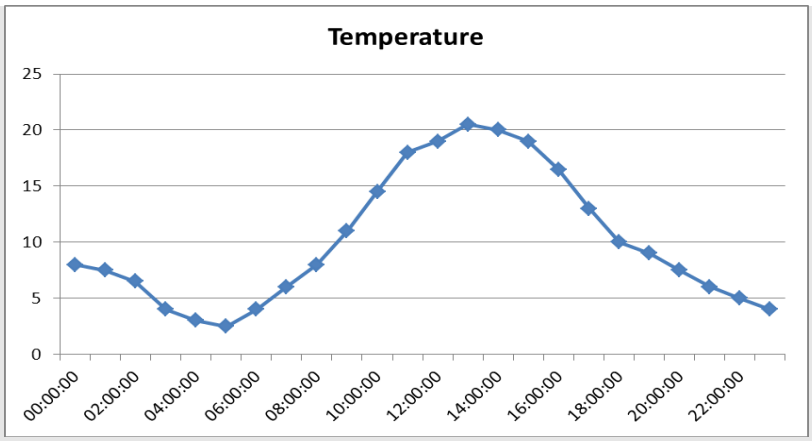


Figure 3 – Example of a time series

Include one section for each application schema. If there is more than one application schema for this theme, copy the structure of this section add further 'Application schema <application schema name>' sections at the end of this document.

5.3 Application schema <application schema name>

5.3.1 Description

5.3.1.1. Narrative description

Give an overview of the data content and structure, narrative summary of the application schema.

5.3.1.2. UML Overview

Replace figure with UML class diagram(s) of the theme described in this data specification. If the text becomes too small (as in the example below), use a page with landscape orientation for the diagram).

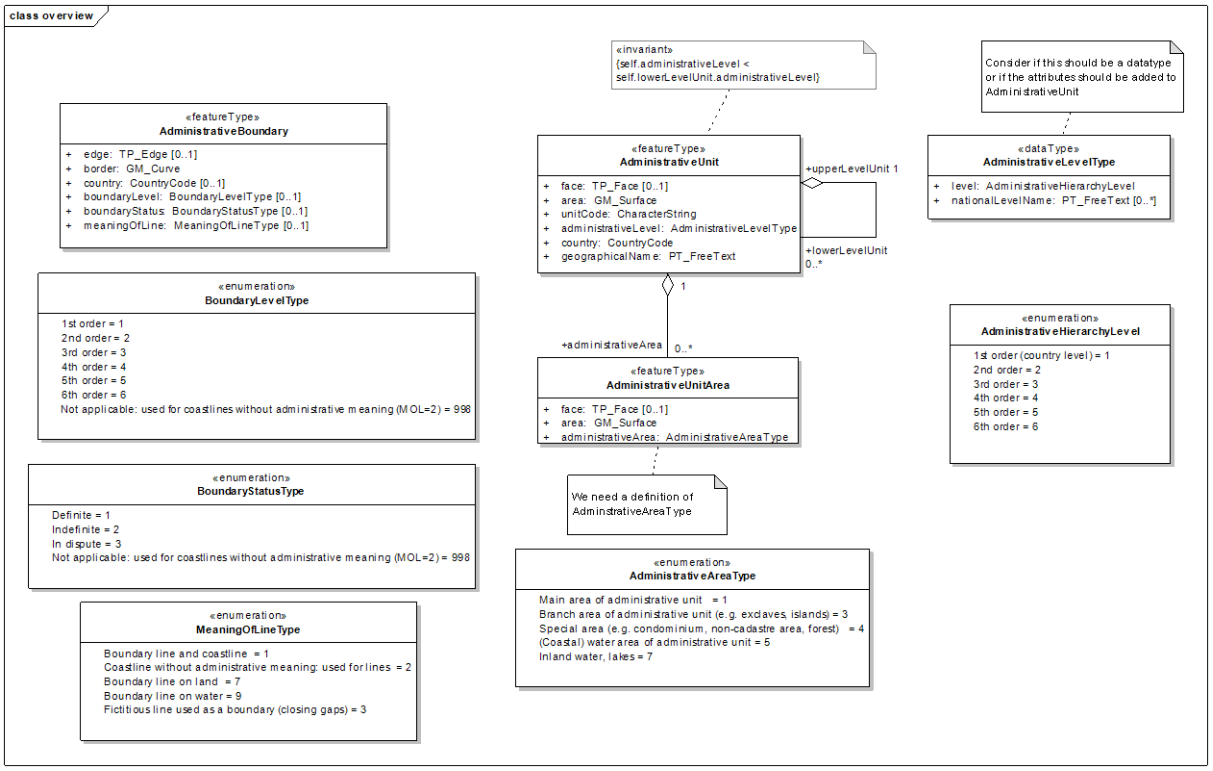


Figure 4 – UML class diagram: Overview of the <application schema name> application schema

Describe the content of the diagram(s) (including important information that is/can not be shown in the diagram). When describing elements that are part of the feature catalogue, refer to the entry in the feature catalogue (instead of including duplicate text).

Sections 5.3.1.1 and 5.3.1.2 can also be combined into one section called 'Narrative description and UML overview'.

5.3.1.3. Consistency between spatial data sets

Describe the consistency rules in natural language (complementing the description in OCL which is part of the application schema).

5.3.1.4. Identifier management

If there are any requirements and recommendations for identifier management in addition to the requirement stated in the 'Basic notions', state these here. Else remove this sub-section.

5.3.1.5. Modelling of object references

If there are any requirements and recommendations for internal and external references, state these here. Else remove this sub-section.

5.3.1.6. Geometry representation

The following requirement and notes shall only be included if the spatial properties are not to be restricted to the Simple Features spatial schema as defined in OGC 06-103r4 - otherwise it should be deleted. In case an exception from the default OGC specification is made in this section, the sub-section 'Geometry representation' in the 'Basic notions' section should be deleted.

Art. 12(1) of Regulation 1089/2010 restricts the value domain of spatial properties to the Simple Feature spatial schema as defined in the *OpenGIS® Implementation Standard for Geographic information – Simple feature access – Part 1: Common architecture, version 1.2.1*, unless specified otherwise for a specific spatial data theme or type.

If the spatial properties are not to be restricted to the Simple Features spatial schema, i.e. if any kind of geometry should not be allowed, include the following paragraphs. Else deleted them..

By way of derogation from this article, the value domain of spatial properties is not restricted to the Simple Feature spatial schema, i.e. all kinds of geometries are allowed as values of spatial properties.

IR Requirement
Annex II/III/IV, Section x
Theme-specific Requirements

(1) By way of derogation from article 12(1), the value domain of spatial properties used in the xxx package shall not be restricted.

If the spatial properties are to be restricted to the Simple Features spatial schema as defined in ISO 19125-1, i.e. if 2.5-dimensional objects should not be allowed, include the following paragraphs. Else deleted them..

By way of derogation from this article, the value domain of spatial properties is restricted to the Simple Feature spatial schema as defined in EN ISO 19125-1, which restricts the spatial schema to 0-, 1- and 2-dimensional geometric objects that exist in 2-dimensional coordinate space. Hence, it does not support the third coordinate.

IR Requirement
Annex II/III/IV, Section x
Theme-specific Requirements

(1) By way of derogation from article 12(1), the value domain of spatial properties used in the xxx package shall be restricted to the Simple Feature spatial schema as defined by EN ISO 19125-1:2006.

NOTE 1 The specification restricts the spatial schema to 0-, 1-, 2-dimensional geometries where all curve interpolations are linear.

NOTE 2 The topological relations of two spatial objects based on their specific geometry and topology properties can in principle be investigated by invoking the operations of the types defined in ISO 19107 (or the methods specified in EN ISO 19125-1).

*Specify additional generic requirements/recommendations or explanations that apply to the geometry representation of **all** spatial object types. Specific requirements for **single** spatial object types should be specified in the application schema.*

Examples:

Recommendation X: *All spatial objects should be provided at the source accuracy where possible.*

Recommendation Y: *If spatial objects are provided at different accuracies, the accuracy should be specified for each spatial object using the attribute* accuracy.

Recommendation Z: *All spatial objects should have a positional accuracy of 100 meters or better.*

5.3.1.7. Temporality representation

If there are any requirements and recommendations for the temporality representation of all spatial object types in addition to the requirement stated in the 'Basic notions', state these here. Else remove this sub-section. Specific requirements for single spatial object types should be specified in the application schema.

Example:

The INSPIRE Protected Sites Data Product Specification models temporality using a combination of the beginLifespanVersion, endLifespanVersion and objectIdentifier (which includes a version number) attributes. The beginLifespanVersion and endLifespanVersion refer to system dates, not real world dates on which a change to the Protected Area occurs. In contrast, the legalFoundationDate attribute represents a real world date, and is independent of anything that happens in any system.

The beginLifespanVersion stores the date on which the instance representing the Protected Site was first created, and the endLifespanVersion is populated when some attribute or geometry of that instance changes. At this point, an entirely new instance is created repeating all of the attributes of the instance that have not changed, and providing new values for the attributes or geometries that have changed. The new instance uses the same value for objectIdentifier.localId and objectIdentifier.nameSpace, but has a new value for objectIdentifier.version.

The temporality attributes (beginLifespanVersion and endLifespanVersion) are only included in the ProtectedAreas class. This is because all other classes in the model contain subsidiary information about instances in the main ProtectedAreas class, so they can use the temporality of the main class. When a change is required to the content in a subsidiary class, a new instance in the subsidiary class is created (without full temporality attributes), and a new instance in the ProtectedAreas class is also created, referencing the new instance in the relevant subsidiary class. This avoids the need for complicated querying to examine a range of possible instances in the subsidiary class, but still allows full temporality to be represented.

Using this method for representing temporality, all of the versions of a Protected Site can be established by looking for all the ProtectedArea instances with the same value for objectIdentifier.localID and objectIdentifier.namespace, together with instances in subsidiary classes that reference that ProtectedAreas instance. The current version of these can be established by looking only at the instance that has a null endLifespanVersion.

The system dates can also be used for incremental updates. Instances that have been added since the last update can be determined by finding instances whose beginLifespanVersion is after the date of the last update. Instances that have been changed since the last update can be determined by finding instances whose endLifespanVersion is after the date of the last update.

If you include more than one application schema, you have to modify the field below, which imports the HTML feature catalogue. Toggle the field code and change the file name.

5.3.2 Feature catalogue

The feature catalogue will be auto-generated from the UML model.

5.3.3 Externally governed code lists

The externally governed code lists included in this application schema are specified in the tables in this section.

5.3.3.1. Governance and authoritative source

Include one row in the following table per externally governed code list. Copy-paste the values from the Code_list_template.xls file as shown in the example table below.

Code list	Governance	Authoritative Source (incl. version[14] and relevant subset, where applicable)
EUCountryCode	Publications Office of the European Union	European Union Interinstitutional style guide, Luxembourg, Publications Office of the European Union

5.3.3.2. Availability

Include one row in the following table per available format, i.e. there can be several rows for each externally governed code list. Copy-paste the values from the Code_list_template.xls file as shown in the example table below.

Code list	Availability	Format
EUCountryCode	http://publications.europa.eu/code/[lc[15]]/[lc]-5000600.htm	HTML
EUCountryCode	*http://some-registry.org/EUCountryCodes.xml*	XML

Where it is difficult to access the code list values (e.g. where they are not available online), we suggest to include the values of the external list in an informative Annex and include the following sentence below. If you do not include such an Annex, remove the sentence.
The values of selected external code lists are included in Annex X for information.

5.3.3.3. Rules for code list values

Include one row in the following table per externally governed code list. Copy-paste the values from the Code_list_template.xls file as shown in the example table below.

Code list	Identifiers	Examples
EUCountryCode	Append the upper-case two-letter code in the "Code" column of Annex A6 to the URI prefix http://inspire.ec.europa.eu/codeList/CountryCode/	http://inspire.ec.europa.eu/codeList/CountryCode/DE http://inspire.ec.europa.eu/codeList/CountryCode/UK

Include one row in the following table per externally governed code list. Copy-paste the values from the Code_list_template.xls file as shown in the example table below.

Code list	Labels	Examples
EUCountryCode	Use the name in the "Country/territory" column of Annex A6 in any official EU language as the label.	"United Kingdom" (English label for UK) "Deutschland" (German label for DE)

[14] If no version or publication date are specified, the "latest available version" shall be used.
[15] lc stands for the two-letter country code, e.g. *http://publications.europa.eu/code/en/en-5000600.htm* for the English (en) version.

6 Reference systems, units of measure and grids

6.1 Default reference systems, units of measure and grid

The reference systems, units of measure and geographic grid systems included in this sub-section are the defaults to be used for all INSPIRE data sets, unless theme-specific exceptions and/or additional requirements are defined in section 6.2.

6.1.1 Coordinate reference systems

6.1.1.1. Datum

IR Requirement
Annex II, Section 1.2
Datum for three-dimensional and two-dimensional coordinate reference systems

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.

6.1.1.2. Coordinate reference systems

IR Requirement
Annex II, Section 1.3
Coordinate Reference Systems

Spatial data sets shall be made available using at least one of the coordinate reference systems specified in sections 1.3.1, 1.3.2 and 1.3.3, unless one of the conditions specified in section 1.3.4 holds.

1.3.1. Three-dimensional Coordinate Reference Systems

– Three-dimensional Cartesian coordinates based on a datum specified in 1.2 and using the parameters of the Geodetic Reference System 1980 (GRS80) ellipsoid.
– Three-dimensional geodetic coordinates (latitude, longitude and ellipsoidal height) based on a datum specified in 1.2 and using the parameters of the GRS80 ellipsoid.

1.3.2. Two-dimensional Coordinate Reference Systems

– Two-dimensional geodetic coordinates (latitude and longitude) based on a datum specified in 1.2 and using the parameters of the GRS80 ellipsoid.
– Plane coordinates using the ETRS89 Lambert Azimuthal Equal Area coordinate reference system.
– Plane coordinates using the ETRS89 Lambert Conformal Conic coordinate reference system.
– Plane coordinates using the ETRS89 Transverse Mercator coordinate reference system.

1.3.3. Compound Coordinate Reference Systems

1. For the horizontal component of the compound coordinate reference system, one of the coordinate reference systems specified in section 1.3.2 shall be used.

2. For the vertical component, one of the following coordinate reference systems shall be used:
– For the vertical component on land, the European Vertical Reference System (EVRS) shall be used to express gravity-related heights within its geographical scope. Other vertical reference systems related to the Earth gravity field shall be used to express gravity-related heights in areas that are outside the geographical scope of EVRS.

– For the vertical component in the free atmosphere, barometric pressure, converted to height using ISO 2533:1975 International Standard Atmosphere, or other linear or parametric reference systems shall be used. Where other parametric reference systems are used, these shall be described in an accessible reference using EN ISO 19111-2:2012.
– For the vertical component in marine areas where there is an appreciable tidal range (tidal waters), the Lowest Astronomical Tide (LAT) shall be used as the reference surface.
– For the vertical component in marine areas without an appreciable tidal range, in open oceans and effectively in waters that are deeper than 200 meters, the Mean Sea Level (MSL) or a well-defined reference level close to the MSL shall be used as the reference surface.

1.3.4. Other Coordinate Reference Systems

Exceptions, where other coordinate reference systems than those listed in 1.3.1, 1.3.2 or 1.3.3 may be used, are:

1. Other coordinate reference systems may be specified for specific spatial data themes in this Annex.
2. For regions outside of continental Europe, Member States may define suitable coordinate reference systems.

The geodetic codes and parameters needed to describe these coordinate reference systems and to allow conversion and transformation operations shall be documented and an identifier shall be created, according to EN ISO 19111 and ISO 19127.

6.1.1.3. Display

IR Requirement
Annex II, Section 1.4
Coordinate Reference Systems used in the View Network Service

For the display of spatial data sets with the view network service as specified in Regulation No 976/2009, at least the coordinate reference systems for two-dimensional geodetic coordinates (latitude, longitude) shall be available.

6.1.1.4. Identifiers for coordinate reference systems

IR Requirement
Annex II, Section 1.4
Coordinate Reference Systems used in the View Network Service

1. Coordinate reference system parameters and identifiers shall be managed in one or several common registers for coordinate reference systems.
2. Only identifiers contained in a common register shall be used for referring to the coordinate reference systems listed in this Section.

These Technical Guidelines propose to use the http URIs provided by the Open Geospatial Consortium as coordinate reference system identifiers (see identifiers for the default CRSs below). These are based on and redirect to the definition in the EPSG Geodetic Parameter Registry (*http://www.epsg-registry.org/*).

TG Requirement 2	The identifiers listed in Table 2 shall be used for referring to the coordinate reference systems used in a data set.

NOTE CRS identifiers may be used e.g. in:
– data encoding,
– data set and service metadata, and
– requests to INSPIRE network services.

Table 2. http URIs for the default coordinate reference systems

Coordinate reference system	Short name	http URI identifier
3D Cartesian in ETRS89	ETRS89-XYZ	*http://www.opengis.net/def/crs/EPSG/0/4936*
3D geodetic in ETRS89 on GRS80	ETRS89-GRS80h	*http://www.opengis.net/def/crs/EPSG/0/4937*
2D geodetic in ETRS89 on GRS80	ETRS89-GRS80	*http://www.opengis.net/def/crs/EPSG/0/4258*
2D LAEA projection in ETRS89 on GRS80	ETRS89-LAEA	*http://www.opengis.net/def/crs/EPSG/0/3035*
2D LCC projection in ETRS89 on GRS80	ETRS89-LCC	*http://www.opengis.net/def/crs/EPSG/0/3034*
2D TM projection in ETRS89 on GRS80, zone 26N (30°W to 24°W)	ETRS89-TM26N	*http://www.opengis.net/def/crs/EPSG/0/3038*
2D TM projection in ETRS89 on GRS80, zone 27N (24°W to 18°W)	ETRS89-TM27N	*http://www.opengis.net/def/crs/EPSG/0/3039*
2D TM projection in ETRS89 on GRS80, zone 28N (18°W to 12°W)	ETRS89-TM28N	*http://www.opengis.net/def/crs/EPSG/0/3040*
2D TM projection in ETRS89 on GRS80, zone 29N (12°W to 6°W)	ETRS89-TM29N	*http://www.opengis.net/def/crs/EPSG/0/3041*
2D TM projection in ETRS89 on GRS80, zone 30N (6°W to 0°)	ETRS89-TM30N	*http://www.opengis.net/def/crs/EPSG/0/3042*
2D TM projection in ETRS89 on GRS80, zone 31N (0° to 6°E)	ETRS89-TM31N	*http://www.opengis.net/def/crs/EPSG/0/3043*
2D TM projection in ETRS89 on GRS80, zone 32N (6°E to 12°E)	ETRS89-TM32N	*http://www.opengis.net/def/crs/EPSG/0/3044*
2D TM projection in ETRS89 on GRS80, zone 33N (12°E to 18°E)	ETRS89-TM33N	*http://www.opengis.net/def/crs/EPSG/0/3045*
2D TM projection in ETRS89 on GRS80, zone 34N (18°E to 24°E)	ETRS89-TM34N	*http://www.opengis.net/def/crs/EPSG/0/3046*
2D TM projection in ETRS89 on GRS80, zone 35N (24°E to 30°E)	ETRS89-TM35N	*http://www.opengis.net/def/crs/EPSG/0/3047*
2D TM projection in ETRS89 on GRS80, zone 36N (30°E to 36°E)	ETRS89-TM36N	*http://www.opengis.net/def/crs/EPSG/0/3048*
2D TM projection in ETRS89 on GRS80, zone 37N (36°E to 42°E)	ETRS89-TM37N	*http://www.opengis.net/def/crs/EPSG/0/3049*
2D TM projection in ETRS89 on GRS80, zone 38N (42°E to 48°E)	ETRS89-TM38N	*http://www.opengis.net/def/crs/EPSG/0/3050*
2D TM projection in ETRS89 on GRS80, zone 39N (48°E to 54°E)	ETRS89-TM39N	*http://www.opengis.net/def/crs/EPSG/0/3051*
Height in EVRS	EVRS	*http://www.opengis.net/def/crs/EPSG/0/5730*
3D compound: 2D geodetic in ETRS89 on GRS80, and EVRS height	ETRS89-GRS80-EVRS	*http://www.opengis.net/def/crs/EPSG/0/7409*

6.1.2 Temporal reference system

IR Requirement
Article 11
Temporal Reference Systems

1. The default temporal reference system referred to in point 5 of part B of the Annex to Commission Regulation (EC) No 1205/2008 ([16]) shall be used, unless other temporal reference systems are specified for a specific spatial data theme in Annex II.

NOTE 1 Point 5 of part B of the Annex to Commission Regulation (EC) No 1205/2008 (the INSPIRE Metadata IRs) states that the default reference system shall be the Gregorian calendar, with dates expressed in accordance with ISO 8601.

NOTE 2 ISO 8601 *Data elements and interchange formats – Information interchange – Representation of dates and times* is an international standard covering the exchange of date and time-related data. The purpose of this standard is to provide an unambiguous and well-defined method of representing dates and times, so as to avoid misinterpretation of numeric representations of dates and times, particularly when data is transferred between countries with different conventions for writing numeric dates and times. The standard organizes the data so the largest temporal term (the year) appears first in the data string and progresses to the smallest term (the second). It also provides for a standardized method of communicating time-based information across time zones by attaching an offset to Coordinated Universal Time (UTC).

EXAMPLE 1997 (the year 1997), 1997-07-16 (16th July 1997), 1997-07-16T19:20:30+01:00 (16th July 1997, 19h 20' 30'', time zone: UTC+1)

6.1.3 Units of measure

IR Requirement
Article 12
Other Requirements & Rules

(…)

2. All measurement values shall be expressed using SI units or non-SI units accepted for use with the International System of Units, unless specified otherwise for a specific spatial data theme or type.

If the data specification does not include any gridded data, remove the following section.

6.1.4 Grids

[16] OJ L 326, 4.12.2008, p. 12.

IR Requirement
Annex II, Section 2.2
Grids

Either of the grids with fixed and unambiguously defined locations defined in Sections 2.2.1 and 2.2.2 shall be used as a geo-referencing framework to make gridded data available in INSPIRE, unless one of the following conditions holds:

(1) Other grids may be specified for specific spatial data themes in Annexes II-IV. In this case, data exchanged using such a theme-specific grid shall use standards in which the grid definition is either included with the data, or linked by reference.

(2) For grid referencing in regions outside of continental Europe Member States may define their own grid based on a geodetic coordinate reference system compliant with ITRS and a Lambert Azimuthal Equal Area projection, following the same principles as laid down for the grid specified in Section 2.2.1. In this case, an identifier for the coordinate reference system shall be created.

2.2 Equal Area Grid

The grid is based on the ETRS89 Lambert Azimuthal Equal Area (ETRS89-LAEA) coordinate reference system with the centre of the projection at the point 52^{o} N, 10^{o} E and false easting: x_0 = 4321000 m, false northing: y_0 = 3210000 m.

The origin of the grid coincides with the false origin of the ETRS89-LAEA coordinate reference system (x=0, y=0).

Grid points of grids based on ETRS89-LAEA shall coincide with grid points of the grid.

The grid is hierarchical, with resolutions of 1m, 10m, 100m, 1000m, 10000m and 100000m.

The grid orientation is south-north, west-east.

The grid is designated as Grid_ETRS89-LAEA. For identification of an individual resolution level the cell size in metres is appended.

For the unambiguous referencing and identification of a grid cell, the cell code composed of the size of the cell and the coordinates of the lower left cell corner in ETRS89-LAEA shall be used. The cell size shall be denoted in metres (“m”) for cell sizes up to 100m or kilometres (“km”) for cell sizes of 1000m and above. Values for northing and easting shall be divided by 10^{n}, where *n* is the number of trailing zeros in the cell size value.

6.2 Theme-specific requirements and recommendations

If no exceptions at all are specified for this theme, include the following sentence:
There are no theme-specific requirements or recommendations on reference systems and grids.

Else include any additional requirements or recommendations on reference systems, units of measure or grids. If some of the default reference systems, units of measure or grids listed in the previous sections shall not be used for spatial data sets related to this theme, specify an exception (as a requirement) in the appropriate sub-section. If no theme-specific exceptions are specified, remove the relevant sub-section(s).

6.2.1 Coordinate reference systems

Specify the exception(s) and/or additional requirement(s) for coordinate reference systems.

6.2.2 Temporal reference systems

Specify the exception(s) and/or additional requirement(s) for temporal reference systems.

6.2.3 Units of measure

Specify the exception(s) and/or additional requirement(s) for units of measure.

6.2.4 Grids

If any grid shall be allowed for this theme, include the following requirement:

IR Requirement
Annex II/III/IV, Section x
Theme-specific Requirements

(1) By way of derogation from the requirements of Section 2.2 of Annex II, gridded data related to the themes Atmospheric Conditions and Meteorological Geographical Features may be made available using any appropriate grid.

If a specific grid shall be mandated for this theme, include the relevant requirement and grid specification below, e.g. as in the following example IR requirement.

IR Requirement
Annex II/III/IV, Section x
Theme-specific Requirements

(1) By way of derogation from the requirement in Section 2.2 of Annex II, any grid compatible with one of the following coordinate reference systems may be used for making gridded <Theme Name> data available:
– two-dimensional geodetic coordinates (latitude and longitude) based on a datum specified in Section 1.2 of Annex II and using the parameters of the GRS80 ellipsoid;
– plane coordinates using the ETRS89 Lambert Conformal Conic coordinate reference system;
– plane coordinates using the ETRS89 Transverse Mercator coordinate reference system.

Data Quality

This chapter is dedicated to describing data quality information.

The quality information shall be reported (quantitatively and/or qualitatively) as metadata in conformance with the requirements of DIS 19157. It shall be provided as dataset metadata (see Chapter 8) or, when data quality information is available at the level of spatial objects, modelled in the application schema (see Chapter 5). In both cases, a reference to the definitions made in this Chapter shall be included.

This Chapter specifies all data quality elements and sub-elements that are relevant and required for interoperability and should offer the users more information to evaluate the purpose and use of spatial data. Data quality information shall be provided in accordance with DIS 19157.This includes selection of appropriate default data quality elements, sub-elements: Completeness – Commission, Completeness – Omission, Logical consistency – Topological consistency (if topology is modelled), Positional accuracy – Absolute or external accuracy and Usability as well as applicable data quality measures.
Data quality information can be provided at different levels – at data set level, spatial object type or spatial object level. The level is reported using the data quality scope descriptor.

NOTE The descriptions in this Chapter exclude the description of evaluation methods and procedures. These are required in Chapter 8.

7 Data quality

This chapter includes a description of the data quality elements and sub-elements as well as the corresponding data quality measures that should be used to evaluate and document data quality for data sets related to the spatial data theme <*Theme Name*> (section 7.1).

It may also define requirements or recommendations about the targeted data quality results applicable for data sets related to the spatial data theme <*Theme Name*> (sections 7.2 and 7.3).

In particular, the data quality elements, sub-elements and measures specified in section 7.1 should be used for

- evaluating and documenting data quality properties and constraints of spatial objects, where such properties or constraints are defined as part of the application schema(s) (see section 5);
- evaluating and documenting data quality metadata elements of spatial data sets (see section 8); and/or
- specifying requirements or recommendations about the targeted data quality results applicable for data sets related to the spatial data theme <*Theme Name*> (see sections 7.2 and 7.3).

The descriptions of the elements and measures are based on Annex D of ISO/DIS 19157 Geographic information – Data quality.

7.1 Data quality elements

Table 3 lists all data quality elements and sub-elements that are being used in this specification. Data quality information can be evaluated at level of spatial object, spatial object type, dataset or dataset series. The level at which the evaluation is performed is given in the “Evaluation Scope” column.

The measures to be used for each of the listed data quality sub-elements are defined in the following sub-sections.

Delete those elements (lines from the table) that are irrelevant to <Theme Name>.

Table 3 – Data quality elements used in the spatial data theme <*Theme Name*>

Section	**Data quality element**	**Data quality sub-element**	**Definition**	**Evaluation Scope** *Specify the level at which this data quality sub-element shall be measured (Delete as appropriate in each row!)*
7.1.1	Completeness	Commission	excess data present in the dataset, as described by the scope	dataset series; dataset; spatial object type
7.1.2	Completeness	Omission	data absent from the dataset, as described by the scope	dataset series; dataset; spatial object type

7.1.3	Logical consistency	Conceptual consistency	adherence to rules of the conceptual schema	dataset series; dataset; spatial object type; spatial object
7.1.4	Logical consistency	Domain consistency	adherence of values to the value domains	dataset series; dataset; spatial object type; spatial object
7.1.5	Logical consistency	Format consistency	degree to which data is stored in accordance with the physical structure of the dataset, as described by the scope	dataset series; dataset; spatial object type; spatial object
7.1.6	Logical consistency	Topological consistency	correctness of the explicitly encoded topological characteristics of the dataset, as described by the scope	dataset series; dataset; spatial object type; spatial object
7.1.7	Positional accuracy	Absolute or external accuracy	closeness of reported coordinate values to values accepted as or being true	dataset series; dataset; spatial object type; spatial object
7.1.8	Positional accuracy	Relative or internal accuracy	closeness of the relative positions of features in the scope to their respective relative positions accepted as or being true	dataset series; dataset; spatial object type; spatial object
7.1.9	Positional accuracy	Gridded data position accuracy	closeness of gridded data position values to values accepted as or being true	dataset series; dataset; spatial object type; spatial object
7.1.10	Thematic accuracy	Classification correctness	comparison of the classes assigned to features or their attributes to a universe of discourse	dataset series; dataset; spatial object type; spatial object
7.1.11	Thematic accuracy	Non-quantitative attribute correctness	correctness of non-quantitative attributes	dataset series; dataset; spatial object type; spatial object
7.1.12	Thematic accuracy	Quantitative attribute accuracy	accuracy of quantitative attributes	dataset series; dataset; spatial object type; spatial object
7.1.13	Temporal quality	Accuracy of a time measurement	correctness of the temporal references of an item (reporting of error in time measurement)	dataset series; dataset; spatial object type; spatial object
7.1.14	Temporal quality	Temporal consistency	correctness of ordered events or sequences, if reported	dataset series; dataset; spatial object type; spatial object
7.1.15	Temporal quality	Temporal validity	validity of data specified by the scope with respect to time	dataset series; dataset; spatial object type; spatial object
7.1.16	Usability	--	degree of adherence of a dataset to a specific set of requirements	dataset series; dataset; spatial object type; spatial object

The table below refers where to find the appropriate data quality measures in ISO/DIS 19157.

Section	***Data quality element***	***Data quality sub-element***	***Chapter Measure identifiers***
7.1.1	*Completeness*	*Commission*	*D.2.1 1-4*
7.1.2	*Completeness*	*Omission*	*D.2.2 5-7*
7.1.3	*Logical consistency*	*Conceptual consistency*	*D.3.1 8-13*
7.1.4	*Logical consistency*	*Domain consistency*	*D.3.2 14-18*
7.1.5	*Logical consistency*	*Format consistency*	*D.3.3 119,19,20*
7.1.6	*Logical consistency*	*Topological consistency*	*D.3.4 21-27*
7.1.7	*Positional accuracy*	*Absolute or external accuracy*	*D.4.1 128, 28-51*
7.1.8	*Positional accuracy*	*Relative or internal accuracy*	*D.4.1.4 128, 28-53*
7.1.9	*Positional accuracy*	*Gridded data position accuracy*	*D.4.2 42-51*
7.1.10	*Thematic accuracy*	*Classification correctness*	*D.6.1 60-64*
7.1.11	*Thematic accuracy*	*Non-quantitative attribute correctness*	*D.6.2 65-67*
7.1.12	*Thematic accuracy*	*Quantitative attribute accuracy*	*D.6.3 68-73*
7.1.13	*Temporal quality*	*Accuracy of a time measurement*	*D.5.1 54-59*
7.1.14	*Temporal quality*	*Temporal consistency*	*D.5.2 159*
7.1.15	*Temporal quality*	*Temporal validity*	*D.5.2 14-18*
7.1.16	*Usability*	*--*	*D.7 101-105 (listed under the heading "Aggregation Measures")*

For each selected DQ sub-element, one or several measures should be described in the sub-sections below. The measures should be documented according to ISO/DIS 19157 using the template below. This table should be inserted for each data specification measure.

Name	**<Name of the measure, from ISO/DIS 19157>**
Alternative name	*Other recognised name for the same data quality measure. It can either be a different commonly used name or an abbreviation or a short name. More than one alias may be provided.*
Data quality element	*The name of the data quality element to which this data quality measure applies. See the appropriate column of Table 3.*
Data quality sub-element	*The name of the data quality sub-element to which this data quality measure applies. See the appropriate column of Table 3.*
Data quality basic measure	*Choose one of the listed measures and delete the others as appropriate.* *See also ISO/DIS 19157, Annex G.* 1) Counting-related data quality basic measures: Error indicator | Correctness indicator | Error count | Correct items count | Error rate | Correct items rate *2)* Uncertainty-related data quality basic measures: One-dimensional random variable, Z | Two-dimensional

	random variable X and Y | Three-dimensional random variable X, Y, Z
Definition	*Give definition from the standard or your own definition if this is a self-defined element.*
Description	*Description of the data quality measure including method of calculation with all formulae and/or illustrations needed to establish the result of applying the measure. If the data quality measure uses the concept of errors, it shall be stated how an item shall be classified as incorrect.*
Evaluation scope	*Define the scope at which the data quality is evaluated. Use one or several of the following. This is the same scope as listed in Table 3.* spatial object: <Name(s) of spatial object type(s)> spatial object type: <Name(s) of spatial object type(s)> data set data set series
Reporting scope	*Define the scope(s) at which the data quality is to be reported in the metadata. Use one or several of the following:* spatial object type: <Name(s) of spatial object type(s)> data set data set series
Parameter	*Auxiliary variable used by the data quality measure including name, definition and description. More than one parameter may be provided.*
Data quality value type	*Value type for reporting a data quality result. A data quality value type shall be provided for a data quality result. Examples include Boolean, Real, Integer, Ratio (numerator of type integer : denominator of type integer), Percentage, Measure(s) (value(s) + unit(s))*
Data quality value structure	*A data quality result may be a single value or consist of multiple values. In the latter case the data quality result shall be structured using one of the data quality value structures listed below. Use one of the following options:* Single value Bag Set Sequence Table Matrix Coverage
Source reference	*Citation of the source of the data quality measure. When a data quality measure for which additional information is provided in an external source is added to the list of standardized data quality measures, a reference to that source may be provided here. ISO/DIS 19157 is included as the default citation. Delete or add as appropriate.* ISO/DIS 19157 Geographic information – Data quality
Example	*Example of applying the data quality measure or the result obtained for the data quality measure. More than one example may be provided.*
Measure identifier	*Integer number, uniquely identifying a data quality measure. Use the identifier number from ISO/DIS 19157, Annex D.*

Specify the measures to be used for the DQ sub-elements selected in Table 3 in the sub-sections below. Delete all sub-sections that are not included in Table 3.

In some cases (e.g. with thematic and geoscientific observations), it may be impossible to express the evaluation of a data quality element in a quantitative way. A subjective evaluation of an element can then be expressed with a textual statement as a data quality descriptive result.

This descriptive result can also be used to for providing a short synthetic description of the result of the data quality evaluation, to accompany the complete quantitative result or replace it if no quantitative value can be provided.

Where a descriptive result should be used instead of quantitative DQ measures, this should also be specified in the sub-sections below.

Recommendation 7	Where it is impossible to express the evaluation of a data quality element in a quantitative way, the evaluation of the element should be expressed with a textual statement as a data quality descriptive result.

7.1.1 Completeness – Commission

Select the measure(s) for documenting this DQ sub-element from Annex D of ISO/DIS 19157. List the selected data quality measure(s) in the recommendation below.

Recommendation 8	Commission should be evaluated and documented using <Name of the measure(s), from ISO/DIS 19157> as specified in the tables below.

Insert a table for each selected data quality measure using the template included at the beginning of section 7.1 above.

7.1.2 Completeness – Omission

Select the measure(s) for documenting this DQ sub-element from Annex D of ISO/DIS 19157. List the selected data quality measure(s) in the recommendation below.

Recommendation 9	Omission should be evaluated and documented using <Name of the measure(s), from ISO/DIS 19157> as specified in the tables below.

Insert a table for each selected data quality measure using the template included at the beginning of section 7.1 above.

7.1.3 Logical consistency – Conceptual consistency

If additional theme-specific tests on conceptual consistency have been defined in the application schema concformance class, add references to the relevant tests below.

The Application Schema conformance class of the Abstract Test Suite in Annex I defines a number of tests to evaluate the conceptual consistency (tests A.1.1-A.1.9) of a data set.

Recommendation 10	For the tests on conceptual consistency, it is recommended to use the *Logical consistency – Conceptual consistency* data quality sub-element and the measure *Number of items not compliant with the rules of the conceptual schema* as specified in the table below.

Name	
Alternative name	-
Data quality element	logical consistency
Data quality sub-element	conceptual consistency
Data quality basic measure	error count
Definition	count of all items in the dataset that are not compliant with the rules of the conceptual schema
Description	If the conceptual schema explicitly or implicitly describes rules,

	these rules shall be followed. Violations against such rules can be, for example, invalid placement of features within a defined tolerance, duplication of features and invalid overlap of features.
Evaluation scope	spatial object / spatial object type
Reporting scope	data set
Parameter	-
Data quality value type	integer
Data quality value structure	-
Source reference	ISO/DIS 19157 Geographic information – Data quality
Example	
Measure identifier	10

7.1.4 Logical consistency – Domain consistency

If additional theme-specific tests on domain consistency have been defined in the application schema concformance class, add references to the relevant tests below.

The Application Schema conformance class of the Abstract Test Suite in Annex I defines a number of tests to evaluate the domain consistency (tests A1.10-A.1.12) of a data set.

Recommendation 11 For the tests on domain consistency, it is recommended to use the *Logical consistency – Domain consistency* data quality sub-element and the measure *Number of items not in conformance with their value domain* as specified in the table below.

Name	**Number of items not in conformance with their value domain**
Alternative name	-
Data quality element	logical consistency
Data quality sub-element	domain consistency
Data quality basic measure	error count
Definition	count of all items in the dataset that are not in conformance with their value domain
Description	
Evaluation scope	spatial object / spatial object type
Reporting scope	data set
Parameter	-
Data quality value type	integer

7.1.5 Logical Consistency – Format consistency

Select the measure(s) for documenting this DQ sub-element from Annex D of ISO/DIS 19157. List the selected data quality measure(s) in the recommendation below.

Recommendation 12 Format consistency should be evaluated and documented using <Name of the measure(s), from ISO/DIS 19157> as specified in the tables below.

Insert a table for each selected data quality measure using the template included at the beginning of section 7.1 above.

7.1.6 Logical Consistency – Topological consistency

Select the measure(s) for documenting this DQ sub-element from Annex D of ISO/DIS 19157. List the selected data quality measure(s) in the recommendation below.

Recommendation 13	Topological consistency should be evaluated and documented using <Name of the measure(s), from ISO/DIS 19157> as specified in the tables below.

Insert a table for each selected data quality measure using the template included at the beginning of section 7.1 above.

7.1.7 Positional accuracy – Absolute or external accuracy

Select the measure(s) for documenting this DQ sub-element from Annex D of ISO/DIS 19157. List the selected data quality measure(s) in the recommendation below.

Recommendation 14	Absolute or external accuracy should be evaluated and documented using <Name of the measure(s), from ISO/DIS 19157> as specified in the tables below.

Insert a table for each selected data quality measure using the template included at the beginning of section 7.1 above.

7.1.8 Positional accuracy – Relative or internal accuracy

Select the measure(s) for documenting this DQ sub-element from Annex D of ISO/DIS 19157. List the selected data quality measure(s) in the recommendation below.

Recommendation 16	Relative or internal accuracy should be evaluated and documented using <Name of the measure(s), from ISO/DIS 19157> as specified in the tables below.

Insert a table for each selected data quality measure using the template included at the beginning of section 7.1 above.

7.1.9 Positional accuracy – Gridded data position accuracy

Select the measure(s) for documenting this DQ sub-element from Annex D of ISO/DIS 19157. List the selected data quality measure(s) in the recommendation below.

Recommendation 17	Gridded data position accuracy should be evaluated and documented using <Name of the measure(s), from ISO/DIS 19157> as specified in the tables below.

Insert a table for each selected data quality measure using the template included at the beginning of section 7.1 above.

7.1.10 Thematic accuracy – Classification correctness

Select the measure(s) for documenting this DQ sub-element from Annex D of ISO/DIS 19157. List the selected data quality measure(s) in the recommendation below.

Recommendation 18	Classification correctness should be evaluated and documented using <Name of the measure(s), from ISO/DIS 19157> as specified in the tables below.

Insert a table for each selected data quality measure using the template included at the beginning of section 7.1 above.

7.1.11 Thematic accuracy – Non-quantitative attribute correctness

Select the measure(s) for documenting this DQ sub-element from Annex D of ISO/DIS 19157. List the selected data quality measure(s) in the recommendation below.

Recommendation 19 Non-quantitative attribute correctness should be evaluated and documented using <Name of the measure(s), from ISO/DIS 19157> as specified in the tables below.

Insert a table for each selected data quality measure using the template included at the beginning of section 7.1 above.

7.1.12 Thematic accuracy – Quantitative attribute accuracy

Select the measure(s) for documenting this DQ sub-element from Annex D of ISO/DIS 19157. List the selected data quality measure(s) in the recommendation below.

Recommendation 20 Quantitative attribute accuracy should be evaluated and documented using <Name of the measure(s), from ISO/DIS 19157> as specified in the tables below.

Insert a table for each selected data quality measure using the template included at the beginning of section 7.1 above.

7.1.13 Temporal quality – Accuracy of a time measurement

Select the measure(s) for documenting this DQ sub-element from Annex D of ISO/DIS 19157. List the selected data quality measure(s) in the recommendation below.

Recommendation 21 Accuracy of a time measurement should be evaluated and documented using <Name of the measure(s), from ISO/DIS 19157> as specified in the tables below.

Insert a table for each selected data quality measure using the template included at the beginning of section 7.1 above.

7.1.14 Temporal quality – Temporal consistency

Select the measure(s) for documenting this DQ sub-element from Annex D of ISO/DIS 19157. List the selected data quality measure(s) in the recommendation below.

Recommendation 22 Temporal consistency should be evaluated and documented using <Name of the measure(s), from ISO/DIS 19157> as specified in the tables below.

Insert a table for each selected data quality measure using the template included at the beginning of section 7.1 above.

7.1.15 Temporal quality – Temporal validity

Select the measure(s) for documenting this DQ sub-element from Annex D of ISO/DIS 19157. List the selected data quality measure(s) in the recommendation below.

Recommendation 23 Temporal validity should be evaluated and documented using <Name of the measure(s), from ISO/DIS 19157> as specified in the tables below.

Insert a table for each selected data quality measure using the template included at the beginning of section 7.1 above.

7.1.16 Usability

Usability describes the adherence to a particular application/specification or user requirements. For example, with this element a data provider can show for a specific dataset, with quantitative elements, how it fits different identified usages. In the table describing the data quality measure the application / specification / user requirements shall be referred as external source.

Select the measure(s) for documenting this DQ sub-element from Annex D of ISO/DIS 19157. List the selected data quality measure(s) in the recommendation below.

Recommendation 24 Usability should be evaluated and documented using <Name of the measure(s), from ISO/DIS 19157> as specified in the tables below.

Insert a table for each selected data quality measure using the template included at the beginning of section 7.1 above.

7.2 Minimum data quality requirements

If no minimum data quality requirements are defined, include the following sentence and remove the IR requirement and the table. Otherwise delete the sentence.
No minimum data quality requirements are defined for the spatial data theme <Theme Name>.

IR Requirement 1 For the data quality elements listed in Table 4, all data sets related to the spatial data theme <Theme Name> shall meet the specified target results.

List all data quality elements, for which minimum data quality requirements are defined in the following table, and remove all other elements.

Table 4 – Minimum data quality requirements for spatial data theme <Theme Name>

Section	**Data quality element and sub-element**	**Measure name(s)** *e.g. Rate of excess items*	**Target result(s)** *e.g. Max. 5/1000.* *If appropriate indicate also the unit of measure of the DQ measure used.*	**Condition** *If the target result shall be met only under certain conditions, specify these conditions here.* *This column should also be used if different measures or target results are used for different spatial object types within a data set.*

Insert more rows when additional requirements have been defined!

7.3 Recommendation on data quality

If no minimum data quality recommendations are defined, include the following sentence and remove the Recommendation and the table. Otherwise delete the sentence.
No minimum data quality recommendations are defined.

Recommendation 25 For the data quality elements listed in Table 5, all data sets related to the spatial data theme <*Theme Name*> should meet the specified target results.

List all data quality elements, for which minimum data quality requirements are defined in the following table, and remove all other elements.

Table 5 – Recommended minimum data quality results for spatial data theme <Theme Name>

Section	**Data quality element and sub-element**	**Measure name(s)** *e.g. Rate of excess items*	**Target result(s)** *e.g. Max. 5/1000.* *If appropriate indicate also the unit of measure of the DQ measure used.*	**Condition** *If the target result shall be met only under certain conditions, specify these conditions here.* *This column should also be used if different measures or target results are used for different spatial object types within a data set.*

Dataset-level metadata

*This section should follow the requirements of **Section 18: Metadata in D2.5, v3.0**:*

Metadata for discovery and for first level evaluation of a spatial data set or spatial data series as required by the Directive, including issues of quality, validity, and conformity are mandated by the Implementing Rule on Metadata. The text of the Metadata Implementing Rule as adopted by the INSPIRE Committee can be viewed on http://ec.europa.eu/transparency/regcomitology/searchform/CFC/Doc.cfc?Method=GetDoc&CL=en&DocID=241&AttLang=en&Version=2

Additional, theme-specific metadata elements may be specified as part of the INSPIRE data specifications as mandatory, conditional or optional metadata elements.

Requirement 61 *Where applicable, additional theme-specific metadata requirements and/or recommendations shall be specified in INSPIRE data specifications in conformance with ISO 19131 and the Implementing Rule on Metadata.*

ISO 19109 8.5.2 provides rules for metadata for features, feature attributes, and feature associations in application schemas and is referenced from Requirement 13. The rules do not place restrictions on the use of types from ISO 19115, DIS 19157 in application schemas.

Requirement 62 *For metadata, the data specification shall refer to the metadata elements from ISO 19115, DIS 19157. If the types from ISO 19115 and/or DIS 19157 need to be extended in an INSPIRE application schema, the extensions shall conform to ISO 19109 and ISO 19115, 19157.*

*In addition, the following requirement on object lifecycle rules (from **Section 14 Identifier management in D2.5, v3.0**) should be taken into account:*

Requirement 58 *The specification of every spatial object type in an INSPIRE application schema shall state which modifications (e.g. attribute changes, merging with*

another spatial object) may change the identity of a spatial object, i.e. when the existing spatial object is "retired" and a new spatial object with a new identifier is created. Where applicable, every INSPIRE data specification shall require that the life-cycle rules for spatial object types in a spatial data set are documented in the metadata of the data set.

8 Dataset-level metadata

This section specifies dataset-level metadata elements, which should be used for documenting metadata for a complete dataset or dataset series.

NOTE Metadata can also be reported for each individual spatial object (spatial object-level metadata). Spatial object-level metadata is fully described in the application schema(s) (section 5).

For some dataset-level metadata elements, in particular those for reporting data quality and maintenance, a more specific scope can be specified. This allows the definition of metadata at sub-dataset level, e.g. separately for each spatial object type (see instructions for the relevant metadata element).

8.1 Metadata elements defined in INSPIRE Metadata Regulation

Table 6 gives an overview of the metadata elements specified in Regulation 1205/2008/EC (implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata).

The table contains the following information:

- The first column provides a reference to the relevant section in the Metadata Regulation, which contains a more detailed description.
- The second column specifies the name of the metadata element.
- The third column specifies the multiplicity.
- The fourth column specifies the condition, under which the given element becomes mandatory.

Table 6 – Metadata for spatial datasets and spatial dataset series specified in Regulation 1205/2008/EC

Metadata Regulation Section	Metadata element	Multiplicity	Condition
1.1	Resource title	1	
1.2	Resource abstract	1	
1.3	Resource type	1	
1.4	Resource locator	0..*	Mandatory if a URL is available to obtain more information on the resource, and/or access related services.
1.5	Unique resource identifier	1..*	
1.7	Resource language	0..*	Mandatory if the resource includes textual information.

2.1	Topic category	1..*	
3	Keyword	1..*	
4.1	Geographic bounding box	1..*	
5	Temporal reference	1..*	
6.1	Lineage	1	
6.2	Spatial resolution	0..*	Mandatory for data sets and data set series if an equivalent scale or a resolution distance can be specified.
7	Conformity	1..*	
8.1	Conditions for access and use	1..*	
8.2	Limitations on public access	1..*	
9	Responsible organisation	1..*	
10.1	Metadata point of contact	1..*	
10.2	Metadata date	1	
10.3	Metadata language	1	

Generic guidelines for implementing these elements using ISO 19115 and 19119 are available at *http://inspire.jrc.ec.europa.eu/index.cfm/pageid/101*. The following sections describe additional theme-specific recommendations and requirements for implementing these elements.

8.1.1 Conformity

The *Conformity* metadata element defined in Regulation 1205/2008/EC requires to report the conformance with the Implementing Rule for interoperability of spatial data sets and services. In addition, it may be used also to document the conformance to another specification.

Recommendation 26 Dataset metadata should include a statement on the overall conformance of the dataset with this data specification (i.e. conformance with all requirements).

Recommendation 27 The *Conformity* metadata element should be used to document conformance with this data specification (as a whole), with a specific conformance class defined in the Abstract Test Suite in Annex A and/or with another specification.

The *Conformity* element includes two sub-elements, the *Specification* (a citation of the Implementing Rule for interoperability of spatial data sets and services or other specification), and the *Degree* of conformity. The *Degree* can be *Conformant* (if the dataset is fully conformant with the cited specification), *Not Conformant* (if the dataset does not conform to the cited specification) or *Not Evaluated* (if the conformance has not been evaluated).

Recommendation 28	If a dataset is not yet conformant with all requirements of this data specification, it is recommended to include information on the conformance with the individual conformance classes specified in the Abstract Test Suite in Annex A.

Recommendation 29	If a dataset is produced or transformed according to an external specification that includes specific quality assurance procedures, the conformity with this specification should be documented using the *Conformity* metadata element.

Recommendation 30	If minimum data quality recommendations are defined then the statement on the conformity with these requirements should be included using the *Conformity* metadata element and referring to the relevant data quality conformance class in the Abstract Test Suite.

NOTE Currently no minimum data quality requirements are included in the IRs. The recommendation above should be included as a requirement in the IRs if minimum data quality requirements are defined at some point in the future.

Recommendation 31	When documenting conformance with this data specification or one of the conformance classes defined in the Abstract Test Suite, the *Specification* sub-element should be given using the http URI identifier of the conformance class or using a citation including the following elements: - title: "INSPIRE Data Specification on <Theme Name> – Draft Guidelines – <name of the conformance class>" - date: - dateType: publication - date: yyyy-mm-dd

EXAMPLE 1: The XML snippets below show how to fill the *Specification* sub-element for documenting conformance with the whole data specification on Addresses v3.0.1.

```
<gmd:DQ_ConformanceResult>
    <gmd:specification href="http://inspire.ec.europa.eu/conformanceClass/ad/3.0.1/tg" />
    <gmd:explanation> (...) </gmd:explanation>
    <gmd:pass> (...) </gmd:pass>
</gmd:DQ_ConformanceResult>
```

or (using a citation):

```
<gmd:DQ_ConformanceResult>
    <gmd:specification>
        <gmd:CI_Citation>
            <gmd:title>
                <gco:CharacterString>INSPIRE Data Specification on <Theme Name> – Draft
Guidelines</gco:CharacterString>
            </gmd:title>
            <gmd:date>
                <gmd:date>
                    <gco:Date>yyyy-mm-dd</gco:Date>
                </gmd:date>
                <gmd:dateType>
                    <gmd:CI_DateTypeCode
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resou
rces/Codelist/ML_gmxCodelists.xml#CI_DateTypeCode"
codeListValue="publication">publication</gmd:CI_DateTypeCode>
                </gmd:dateType>
            </gmd:date>
        </gmd:CI_Citation>
    </gmd:specification>
```

```
    <gmd:explanation> (...) </gmd:explanation>
    <gmd:pass> (...) </gmd:pass>
</gmd:DQ_ConformanceResult>
```

EXAMPLE 2: The XML snippets below show how to fill the *Specification* sub-element for documenting conformance with the CRS conformance class of the data specification on Addresses v3.0.1.

```
<gmd:DQ_ConformanceResult>
    <gmd:specification href="http://inspire.ec.europa.eu/conformanceClass/ad/3.0.1/crs" />
    <gmd:explanation> (...) </gmd:explanation>
    <gmd:pass> (...) </gmd:pass>
</gmd:DQ_ConformanceResult>
```

or (using a citation):

```
<gmd:DQ_ConformanceResult>
    <gmd:specification>
        <gmd:CI_Citation>
            <gmd:title>
                <gco:CharacterString>INSPIRE Data Specification on <Theme Name> – Draft Guidelines – CRS</gco:CharacterString>
            </gmd:title>
            <gmd:date>
                <gmd:date>
                    <gco:Date>yyyy-mm-dd</gco:Date>
                </gmd:date>
                <gmd:dateType>
                    <gmd:CI_DateTypeCode
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codelist/ML_gmxCodelists.xml#CI_DateTypeCode"
codeListValue="publication">publication</gmd:CI_DateTypeCode>
                </gmd:dateType>
            </gmd:date>
        </gmd:CI_Citation>
    </gmd:specification>
    <gmd:explanation> (...) </gmd:explanation>
    <gmd:pass> (...) </gmd:pass>
</gmd:DQ_ConformanceResult>
```

If applicable, add further theme-specific recommendations or requirements for providing conformity metadata here.

8.1.2 Lineage

Recommendation 32	Following the ISO/DIS 19157 Quality principles, if a data provider has a procedure for the quality management of their spatial data sets then the appropriate data quality elements and measures defined in ISO/DIS 19157 should be used to evaluate and report (in the metadata) the results. If not, the *Lineage* metadata element (defined in Regulation 1205/2008/EC) should be used to describe the overall quality of a spatial data set.

According to Regulation 1205/2008/EC, lineage “is a statement on process history and/or overall quality of the spatial data set. Where appropriate it may include a statement whether the data set has been validated or quality assured, whether it is the official version (if multiple versions exist), and whether it has legal validity. The value domain of this metadata element is free text”.

The Metadata Technical Guidelines based on EN ISO 19115 and EN ISO 19119 specifies that the statement sub-element of LI_Lineage (EN ISO 19115) should be used to implement the lineage metadata element.

Recommendation 33 To describe the transformation steps and related source data, it is recommended to use the following sub-elements of LI_Lineage:
- For the description of the transformation process of the local to the common INSPIRE data structures, the LI_ProcessStep sub-element should be used.
- For the description of the source data the LI_Source sub-element should be used.

NOTE 1 In order to improve the interoperability, domain templates and instructions for using these free text elements (descriptive statements) may be specified here and/or in an Annex of this data specification.

If applicable, add further theme-specific recommendations or requirements for providing lineage metadata here.

8.1.3 Temporal reference

According to Regulation 1205/2008/EC, at least one of the following temporal reference metadata sub-elements shall be provided: temporal extent, date of publication, date of last revision, date of creation.

Recommendation 34 It is recommended that at least the date of the last revision of a spatial data set should be reported using the *Date of last revision* metadata sub-element.

If applicable, add further theme-specific recommendations or requirements for providing temporal reference metadata here.

If applicable, add further metadata elements from the Metadata Regulation (e.g. keywords or resource abstract) and specify theme-specific recommendations or requirements for providing this metadata. Include one subsection for each metadata element.

If no additional recommendations are given, delete the heading below.

8.1.4 <MD Element from MD Regulation>

8.2 Metadata elements for interoperability

IR Requirement
Article 13
Metadata required for Interoperability

The metadata describing a spatial data set shall include the following metadata elements required for interoperability:

1. Coordinate Reference System: Description of the coordinate reference system(s) used in the data set.

2. Temporal Reference System: Description of the temporal reference system(s) used in the data set.

   This element is mandatory only if the spatial data set contains temporal information that does not refer to the default temporal reference system.

3. Encoding: Description of the computer language construct(s) specifying the representation of data objects in a record, file, message, storage device or transmission channel.

4. Topological Consistency: Correctness of the explicitly encoded topological characteristics of the data set as described by the scope.

   This element is mandatory only if the data set includes types from the Generic Network Model and does not assure centreline topology (connectivity of centrelines) for the network.

5. Character Encoding: The character encoding used in the data set.

   This element is mandatory only if an encoding is used that is not based on UTF-8.

6. Spatial Representation Type: The method used to spatially represent geographic information.

These Technical Guidelines propose to implement the required metadata elements based on ISO 19115 and ISO/TS 19139.

The following TG requirements need to be met in order to be conformant with the proposed encoding.

TG Requirement 3	Metadata instance (XML) documents shall validate without error against the used ISO 19139 XML schema.

NOTE Section 2.1.2 of the Metadata Technical Guidelines discusses the different ISO 19139 XML schemas that are currently available.

TG Requirement 4	Metadata instance (XML) documents shall contain the elements and meet the INSPIRE multiplicity specified in the sections below.

TG Requirement 5	The elements specified below shall be available in the specified ISO/TS 19139 path.

Recommendation 35	The metadata elements for interoperability should be made available together with the metadata elements defined in the Metadata Regulation through an INSPIRE discovery service.

NOTE While this not explicitly required by any of the INSPIRE Implementing Rules, making all metadata of a data set available together and through one service simplifies implementation and usability.

8.2.1 Coordinate Reference System

Metadata element name	**Coordinate Reference System**
Definition	Description of the coordinate reference system used in the dataset.
ISO 19115 number and name	13. referenceSystemInfo
ISO/TS 19139 path	referenceSystemInfo
INSPIRE obligation / condition	mandatory

INSPIRE multiplicity	1..*
Data type(and ISO 19115 no.)	186. MD_ReferenceSystem
Domain	To identify the reference system, the referenceSystemIdentifier (RS_Identifier) shall be provided. NOTE More specific instructions, in particular on pre-defined values for filling the referenceSystemIdentifier attribute should be agreed among Member States during the implementation phase to support interoperability.
Implementing instructions	
Example	referenceSystemIdentifier: code: ETRS_89 codeSpace: INSPIRE RS registry
Example XML encoding	<gmd:referenceSystemInfo> <gmd:MD_ReferenceSystem> <gmd:referenceSystemIdentifier> <gmd:RS_Identifier> <gmd:code> <gco:CharacterString>ETRS89 </gco:CharacterString> </gmd:code> <gmd:codeSpace> <gco:CharacterString>INSPIRE RS registry</gco:CharacterString> </gmd:codeSpace> </gmd:RS_Identifier> </gmd:referenceSystemIdentifier> </gmd:MD_ReferenceSystem> </gmd:referenceSystemInfo>
Comments	

8.2.2 Temporal Reference System

Metadata element name	**Temporal Reference System**
Definition	Description of the temporal reference systems used in the dataset.
ISO 19115 number and name	13. referenceSystemInfo
ISO/TS 19139 path	referenceSystemInfo
INSPIRE obligation / condition	Mandatory, if the spatial data set or one of its feature types contains temporal information that does not refer to the Gregorian Calendar or the Coordinated Universal Time.
INSPIRE multiplicity	0..*
Data type(and ISO 19115 no.)	186. MD_ReferenceSystem
Domain	No specific type is defined in ISO 19115 for temporal reference systems. Thus, the generic MD_ReferenceSystem element and its reference SystemIdentifier (RS_Identifier) property shall be provided. NOTEMore specific instructions, in particular on pre-defined values for filling the referenceSystemIdentifier attribute should be agreed among Member States during the implementation phase to support interoperability.
Implementing instructions	
Example	referenceSystemIdentifier: code: GregorianCalendar codeSpace: INSPIRE RS registry

Example XML encoding	<gmd:referenceSystemInfo> <gmd:MD_ReferenceSystem> <gmd:referenceSystemIdentifier> <gmd:RS_Identifier> <gmd:code> <gco:CharacterString>GregorianCalendar</gco:CharacterString> </gmd:code> <gmd:codeSpace> <gco:CharacterString>INSPIRE RS registry</gco:CharacterString> </gmd:codeSpace> </gmd:RS_Identifier> </gmd:referenceSystemIdentifier> </gmd:MD_ReferenceSystem> </gmd:referenceSystemInfo>
Comments	

8.2.3 Encoding

Metadata element name	**Encoding**
Definition	Description of the computer language construct that specifies the representation of data objects in a record, file, message, storage device or transmission channel
ISO 19115 number and name	271. distributionFormat
ISO/TS 19139 path	distributionInfo/MD_Distribution/distributionFormat
INSPIRE obligation / condition	mandatory
INSPIRE multiplicity	1
Data type (and ISO 19115 no.)	284. MD_Format
Domain	See B.2.10.4. The property values (name, version, specification) specified in section 5 shall be used to document the default and alternative encodings.
Implementing instructions	
Example	name: <Application schema name> GML application schema version: version x.y(.z) specification: D2.8.II/III.x Data Specification on <Theme Name> – Technical Guidelines
Example XML encoding	<gmd:MD_Format> <gmd:name> <gco:CharacterString>SomeApplicationSchema GML application schema</gco:CharacterString> </gmd:name> <gmd:version> <gco:CharacterString>x.y(.z)</gco:CharacterString> </gmd:version> <gmd:specification> <gco:CharacterString>D2.8.II/III.x Data Specification on <Theme Name> – Technical Guidelines</gco:CharacterString> </gmd:specification> </gmd:MD_Format>
Comments	

8.2.4 Character Encoding

Metadata element name	**Character Encoding**
Definition	The character encoding used in the data set.

ISO 19115 number and name	
ISO/TS 19139 path	
INSPIRE obligation / condition	Mandatory, if an encoding is used that is not based on UTF-8.
INSPIRE multiplicity	0..*
Data type (and ISO 19115 no.)	
Domain	
Implementing instructions	
Example	-
Example XML encoding	<gmd:characterSet> <gmd:MD_CharacterSetCode codeListValue="8859part2" codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codelist/ML_gmxCodelists.xml#CharacterSetCode">8859-2</gmd:MD_CharacterSetCode> </gmd:characterSet>
Comments	

8.2.5 Spatial representation type

Metadata element name	**Spatial representation type**
Definition	The method used to spatially represent geographic information.
ISO 19115 number and name	37. spatialRepresentationType
ISO/TS 19139 path	
INSPIRE obligation / condition	Mandatory
INSPIRE multiplicity	1..*
Data type (and ISO 19115 no.)	B.5.26 MD_SpatialRepresentationTypeCode
Domain	
Implementing instructions	Of the values included in the code list in ISO 19115 (vector, grid, textTable, tin, stereoModel, video), only vector, grid and tin should be used. NOTE Additional code list values may be defined based on feedback from implementation.
Example	-
Example XML encoding	
Comments	

8.2.6 Data Quality – Logical Consistency – Topological Consistency

See section 8.3.2 for instructions on how to implement metadata elements for reporting data quality.

8.3 Recommended theme-specific metadata elements

Recommendation 36 The metadata describing a spatial data set or a spatial data set series related to the theme <*Theme Name*> should comprise the theme-specific metadata elements specified in Table 7.

The table contains the following information:

- The first column provides a reference to a more detailed description.
- The second column specifies the name of the metadata element.
- The third column specifies the multiplicity.

Add additional metadata elements here that are recommended for this theme.

*These should include all data quality (sub-)elements defined in chapter 7. For these, no additional specification table should be included, but instead the reference should be to s*ection 8.3.2 (which gives general instructions for reporting on data quality.

The first 3 elements (maintenance information, conceptual and domain consistency) should be included by all themes.

All elements should have a multiplicity of 0..1 or 0...*

Table 7 – Optional theme-specific metadata elements for the theme <*Theme Name*>

Section	Metadata element	Multiplicity
8.3.1	Maintenance Information	0..1
8.3.2	Logical Consistency – Conceptual Consistency	0..*
8.3.2	Logical Consistency – Domain Consistency	0..*
8.3.2	<Other DQ element from chapter 7>	0..1 | 0..*
8.3.3	<Name of Metadata Element>	0..1 | 0..*

Recommendation 37 For implementing the metadata elements included in this section using ISO 19115, ISO/DIS 19157 and ISO/TS 19139, the instructions included in the relevant sub-sections should be followed.

8.3.1 Maintenance Information

Metadata element name	Maintenance information
Definition	Information about the scope and frequency of updating
ISO 19115 number and name	30. resourceMaintenance
ISO/TS 19139 path	identificationInfo/MD_Identification/resourceMaintenance
INSPIRE obligation / condition	optional
INSPIRE multiplicity	0..1
Data type(and ISO 19115 no.)	142. MD_MaintenanceInformation
Domain	This is a complex type (lines 143-148 from ISO 19115). At least the following elements should be used (the multiplicity according to ISO 19115 is shown in parentheses): – maintenanceAndUpdateFrequency [1]: frequency with which changes and additions are made to the resource after the initial resource is completed / domain value: MD_MaintenanceFrequencyCode: – updateScope [0..*]: scope of data to which maintenance is applied / domain value: MD_ScopeCode – maintenanceNote [0..*]: information regarding specific requirements for maintaining the resource / domain value: free text
Implementing instructions	
Example	
Example XML encoding	

Comments	

8.3.2 Metadata elements for reporting data quality

Recommendation 38 For reporting the results of the data quality evaluation, the data quality elements, sub-elements and (for quantitative evaluation) measures defined in chapter 7 should be used.

Recommendation 39 The metadata elements specified in the following sections should be used to report the results of the data quality evaluation. At least the information included in the row “Implementation instructions” should be provided.

The first section applies to reporting quantitative results (using the element DQ_QuantitativeResult), while the second section applies to reporting non-quantitative results (using the element DQ_DescriptiveResult).

Recommendation 40 If a dataset does not pass the tests of the Application schema conformance class (defined in Annex A), the results of each test should be reported using one of the options described in sections 8.3.2.1 and 8.3.2.2.

NOTE 1 If using non-quantitative description, the results of several tests do not have to be reported separately, but may be combined into one descriptive statement.

NOTE 2 The sections 8.3.2.1 and 8.3.2.2 may need to be updated once the XML schemas for ISO 19157 have been finalised.

The scope for reporting may be different from the scope for evaluating data quality (see section 7). If data quality is reported at the data set or spatial object type level, the results are usually derived or aggregated.

Recommendation 41 The scope element (of type DQ_Scope) of the DQ_DataQuality subtype should be used to encode the reporting scope.

Only the following values should be used for the level element of DQ_Scope: Series, Dataset, featureType.

If the level is featureType the levelDescription/MDScopeDescription/features element (of type Set< GF_FeatureType>) shall be used to list the feature type names.

NOTE In the level element of DQ_Scope, the value featureType is used to denote spatial object type.

8.3.2.1. Guidelines for reporting quantitative results of the data quality evaluation

Metadata element name	**See chapter 7**
Definition	See chapter 7
ISO/DIS 19157 number and name	3. report
ISO/TS 19139 path	dataQualityInfo/*/report
INSPIRE obligation / condition	optional
INSPIRE multiplicity	0..*
Data type (and ISO/DIS 19157 no.)	Corresponding DQ_xxx subelement from ISO/DIS 19157, e.g. 12. DQ_CompletenessCommission

Domain	Lines 7-9 from ISO/DIS 19157 7. DQ_MeasureReference (C.2.1.3) 8. DQ_EvaluationMethod (C.2.1.4.) 9. DQ_Result (C2.1.5.)
Implementing instructions	39. nameOfMeasure NOTE This should be the name as defined in Chapter 7. 42. evaluationMethodType 43. evaluationMethodDescription NOTE If the reported data quality results are derived or aggregated (i.e. the scope levels for evaluation and reporting are different), the derivation or aggregation should also be specified using this property. 46. dateTime NOTE This should be data or range of dates on which the data quality measure was applied. 63. DQ_QuantitativeResult / 64. value NOTE The DQ_Result type should be DQ_QuantitativeResult and the value(s) represent(s) the application of the data quality measure (39.) using the specified evaluation method (42-43.)
Example	See Table E.12 — Reporting commission as metadata (ISO/DIS 19157)
Example XML encoding	

8.3.2.2. Guidelines for reporting descriptive results of the Data Quality evaluation

Metadata element name	**See chapter 7**
Definition	See chapter 7
ISO/DIS 19157 number and name	3. report
ISO/TS 19139 path	dataQualityInfo/*/report
INSPIRE obligation / condition	optional
INSPIRE multiplicity	0..*
Data type (and ISO/DIS 19157 no.)	Corresponding DQ_xxx subelement from ISO/DIS 19157, e.g. 12. DQ_CompletenessCommission
Domain	Line 9 from ISO/DIS 19157 9. DQ_Result (C2.1.5.)
Implementing instructions	67. DQ_DescripitveResult / 68. statement NOTE The DQ_Result type should be DQ_DescriptiveResult and in the statement (68.) the evaluation of the selected DQ sub-element should be expressed in a narrative way.
Example	See Table E.15 — Reporting descriptive result as metadata (ISO/DIS 19157)
Example XML encoding	

Specify instructions for implementing the theme-specific metadata elements (other than those for reporting data quality) listed in 8.3.2 using the table template below. Include one section for each element.

If no additional metadata elements are defined, remove this section.

8.3.3 <Name of Metadata Element>

Metadata element name	**<Name of the metadata element>**
Definition	<definition> | See section <reference to DQ subsection>*(delete as appropriate)* *Provide a definition or – if the metadata element describes a data quality measure – include a reference to the corresponding subsection of section 7 Data Quality.*
ISO 19115 number and name	<number in ISO 19115>. <name in ISO 19115>
ISO/TS 19139 path	<XPath to the element in ISO 19139> *The schemas available at http://schemas.opengis.net/iso/19139/20060504/gmd/gmd.xsd shall be used.*
INSPIRE obligation / condition	mandatory | conitional | optional *(delete as appropriate.*
INSPIRE multiplicity	<multiplicity of the element> *(e.g. 0..1 | 1 | 0..* | 1..*)*
Data type (and ISO 19115 no.)	<number in ISO 19115>. <data type of the element> | See section <reference to DQ subsection> *(delete as appropriate)* *Provide the data type or – if the metadata element describes a data quality measure – include a reference to the corresponding subsection of section 7 Data Quality.*
Domain	<domain> | See section <reference to DQ subsection> *(delete as appropriate)* *Specify the values allowed or the use of free text. 'Free text' indicates hat no restrictions are placed on the content of the field. Integer-based codes shall be used to represent values for domains containing codelists.* *If the metadata element describes a data quality measure, include a reference to the corresponding subsection of section 7 Data Quality.*
Implementing instructions *(optional)*	<instructions on how the metadata can be obtained>
Example *(optional)*	<example> | See section <reference to DQ subsection> *(delete as appropriate)* *Provide one or several examples or – if the metadata element describes a data quality measure – include a reference to the corresponding subsection of section 7 Data Quality.*
Example XML encoding *(optional)*	<example XML snippet>
Comments *(optional)*	<comments>

Include mandatory and/or conditional elements here.

9 Delivery

9.1 Updates

Include this default requirement based on Art. 8(2) of the ISDSS Regulation or specify an alternative theme-specific requirement for when updates shall be made available (theme-specific requirements should be formatted with a white background).

IR Requirement
Article 8
Updates

1. Member States shall make available updates of data on a regular basis.
2. All updates shall be made available at the latest 6 months after the change was applied in the source data set, unless a different period is specified for a specific spatial data theme in Annex II.

Include the following note if no exception is defined. Otherwise delete the note and include the IR requirement specifying the exception.

NOTE In this data specification, no exception is specified, so all updates shall be made available at the latest 6 months after the change was applied in the source data set.

9.2 Delivery medium

According to Article 11(1) of the INSPIRE Directive, Member States shall establish and operate a network of services for INSPIRE spatial data sets and services. The relevant network service types for making spatial data available are:

- *view services* making it possible, as a minimum, to display, navigate, zoom in/out, pan, or overlay viewable spatial data sets and to display legend information and any relevant content of metadata;
- *download services*, enabling copies of spatial data sets, or parts of such sets, to be downloaded and, where practicable, accessed directly;
- *transformation services*, enabling spatial data sets to be transformed with a view to achieving interoperability.

NOTE For the relevant requirements and recommendations for network services, see the relevant Implementing Rules and Technical Guidelines[17].

EXAMPLE 1 Through the Get Spatial Objects function, a download service can either download a pre-defined data set or pre-defined part of a data set (non-direct access download service), or give direct access to the spatial objects contained in the data set, and download selections of spatial objects based upon a query (direct access download service). To execute such a request, some of the following information might be required:

- the list of spatial object types and/or predefined data sets that are offered by the download service (to be provided through the Get Download Service Metadata operation),
- and the query capabilities section advertising the types of predicates that may be used to form a query expression (to be provided through the Get Download Service Metadata operation, where applicable),
- a description of spatial object types offered by a download service instance (to be provided through the Describe Spatial Object Types operation).

EXAMPLE 2 Through the Transform function, a transformation service carries out data content transformations from native data forms to the INSPIRE-compliant form and vice versa. If this operation is directly called by an application to transform source data (e.g. obtained through a download service) that is not yet conformant with this data specification, the following parameters are required:
Input data (mandatory). The data set to be transformed.

[17] The Implementing Rules and Technical Guidelines on INSPIRE Network Services are available at http://inspire.jrc.ec.europa.eu/index.cfm/pageid/5

- Source model (mandatory, if cannot be determined from the input data). The model in which the input data is provided.
- Target model (mandatory). The model in which the results are expected.
- Model mapping (mandatory, unless a default exists). Detailed description of how the transformation is to be carried out.

9.3 Encodings

The IRs contain the following two requirements for the encoding to be used to make data available.

IR Requirement
Article 7
Encoding

1. Every encoding rule used to encode spatial data shall conform to EN ISO 19118. In particular, it shall specify schema conversion rules for all spatial object types and all attributes and association roles and the output data structure used.
2. Every encoding rule used to encode spatial data shall be made available.

NOTE ISO 19118:2011 specifies the requirements for defining encoding rules used for interchange of geographic data within the set of International Standards known as the “ISO 19100 series”. An encoding rule allows geographic information defined by application schemas and standardized schemas to be coded into a system-independent data structure suitable for transport and storage. The encoding rule specifies the types of data being coded and the syntax, structure and coding schemes used in the resulting data structure. Specifically, ISO 19118:2011 includes
- requirements for creating encoding rules based on UML schemas,
- requirements for creating encoding services, and
- requirements for XML-based encoding rules for neutral interchange of data.

While the IRs do not oblige the usage of a specific encoding, these Technical Guidelines propose to make data related to the spatial data theme <Theme Name> available at least in the default encoding(s) specified in section 0. In this section, a number of TG requirements are listed that need to be met in order to be conformant with the default encoding(s).

The proposed default encoding(s) meet the requirements in Article 7 of the IRs, i.e. they are conformant with ISO 19118 and (since they are included in this specification) publicly available.

9.3.1 Default Encoding(s)

If the default encoding is GML, include the section below. Else delete it.

Note that if the default encoding is not GML, specific TG requirements should be included that need to be met in order to be conformant with the relevant encoding.

9.3.1.1. Specific requirements for GML encoding

This data specification proposes the use of GML as the default encoding, as recommended in sections 7.2 and 7.3 of [DS-D2.7]. GML is an XML encoding in compliance with ISO 19118, as required in Article 7(1). For details, see [ISO 19136], and in particular Annex E (UML-to-GML application schema encoding rules).

The following TG requirements need to be met in order to be conformant with GML encodings.

TG Requirement 6	Data instance (XML) documents shall validate without error against the provided XML schema.

NOTE 1 Not all constraints defined in the application schemas can be mapped to XML. Therefore, the following requirement is necessary.

NOTE 2 The obligation to use only the allowed code list values specified for attributes and most of the constraints defined in the application schemas cannot be mapped to the XML sch. They can therefore not be enforced through schema validation. It may be possible to express some of these constraints using other schema or rule languages (e.g. Schematron), in order to enable automatic validation.

Include one section for each application schema defined in section 5.

Specify the default encoding according to one of the proposed templates and boilerplate text (for GML application schemas, (referenceable) grid coverages or other encodings). Delete the templates that are not used.

9.3.1.2. Default encoding(s) for application schema <application schema name>

Template and boilerplate text for GML application schemas

Name: <name of the application schema> GML Application Schema
Version: version <version of the GML Application Schema>
Specification: D2.8.II/III.x Data Specification on <Theme Name> – Technical Guidelines
Character set: UTF-8

Specify the location of the schema, e.g.:
http://inspire.ec.europa.eu/draft-schemas/am/2.0/AreaManagementRestrictionRegulationZone.xsd or http://inspire.ec.europa.eu/schemas/hy-n/3.0/HydroNetwork.xsd
The xml schema document is available from http://inspire.ec.europa.eu/<draft-schemas or schemas>/<XML schema namespace prefix>/<version>/<xsd filename>.

Template and boilerplate text for (Referenceable) grid coverages (range encoded as binary files)

Name: <name of the application schema> GML Application Schema (for the coverage domain)
Version: version <version of the GML Application Schema>
Specification: D2.8.II/III.x Data Specification on <Theme Name> – Technical Guidelines
Character set: UTF-8

Specify the location of the schema, e.g.:
http://inspire.ec.europa.eu/draft-schemas/am/2.0/AreaManagementRestrictionRegulationZone.xsd or http://inspire.ec.europa.eu/schemas/hy-n/3.0/HydroNetwork.xsd
The xml schema document is available from http://inspire.ec.europa.eu/<draft-schemas or schemas>/<XML schema namespace prefix>/<version>/<xsd filename>.

Name: <format used for encoding the range, e.g. TIFF or jpeg2000> (for the coverage range)
Version: <version of format>
Specification: <specification reference>
Character set: <character set>

For TIFF/GeoTIFF you may include the following note.
NOTE The Geographic Tagged Image File Format (GeoTiff), associates geo-referencing information with TIFF imagery and gridded data by supplying metadata as TIFF tags. Since it fully complies with the TIFF 6.0 specifications, it may be implemented in place of TIFF format to meet this requirement.

For all formats that also include domain information, include the following requirement. Else delete it.

TG Requirement 7	If the format used for encoding the coverage range also includes information about the coverage domain, this information shall be consistent with the information encoded using the GML Application Schema for Coverages.

Template and boilerplate text for (Referenceable) grid coverages (range encoded inline)
Name: <name of the application schema> GML Application Schema (for the coverage domain and range)
Version: version <version of the GML Application Schema>
Specification: D2.8.II/III.x Data Specification on <Theme Name> – Technical Guidelines
Character set: UTF-8

Specify the location of the schema, e.g.:
http://inspire.ec.europa.eu/draft-schemas/am/2.0/AreaManagementRestrictionRegulationZone.xsd or http://inspire.ec.europa.eu/schemas/hy-n/3.0/HydroNetwork.xsd
The xml schema document is available from http://inspire.ec.europa.eu/<draft-schemas or schemas>/<XML schema namespace prefix>/<version>/<xsd filename>.

NOTE The GML Application Schema is to be used to encode both the domain and the range of the coverage.

EXAMPLE The following is a complete RectifiedGridCoverage instance (taken from [OGC 09-146r2]), using the base type RectifiedGridCoverage defined in the OGC GML Application Schema – Coverages available from *http://schemas.opengis.net/gmlcov/1.0/*.

```
<?xml version="1.0" encoding="UTF-8" ?>
<gmlcov:RectifiedGridCoverage
   xmlns="http://www.w3.org/2001/XMLSchema"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xmlns:xlink="http://www.w3.org/1999/xlink"
   xmlns:gmlcov="http://www.opengis.net/gmlcov/1.0"
   xmlns:gml="http://www.opengis.net/gml/3.2"
   xsi:schemaLocation=
      "http://www.opengis.net/gmlcov/1.0 http://schemas.opengis.net/gmlcov/1.0/gmlcovAll.xsd"
   gml:id="C001">
   <gml:boundedBy>
      <gml:Envelope srsName="http://www.opengis.net/def/crs/EPSG/0/4326" axisLabels="Lat Long"
         uomLabels="deg deg" srsDimension="2">
         <gml:lowerCorner>1 1</gml:lowerCorner>
         <gml:upperCorner>3 3</gml:upperCorner>
      </gml:Envelope>
   </gml:boundedBy>
   <gml:domainSet>
      <gml:RectifiedGrid gml:id="RG001_C001"
         srsName="http://www.opengis.net/def/crs/EPSG/0/4326" axisLabels="Lat Long"
        uomLabels="deg deg" dimension="2">
         <gml:limits>
            <gml:GridEnvelope>
               <gml:low>0 0</gml:low>
               <gml:high>9999 9999</gml:high>
            </gml:GridEnvelope>
         </gml:limits>
         <gml:axisLabels>Lat Long</gml:axisLabels>
         <gml:origin>
            <gml:Point gml:id="P001_C001" srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
               <gml:pos>99. 99.9</gml:pos>
            </gml:Point>
         </gml:origin>
         <gml:offsetVector>1 0</gml:offsetVector>
```

```
        <gml:offsetVector>0 1</gml:offsetVector>
      </gml:RectifiedGrid>
    </gml:domainSet>
    <rangeType>
      <swe:DataRecord>
        <swe:field name="white">
          <swe:Quantity definition="http://opengis.net/def/property/OGC/0/Radiance">
            <gml:description>Panchromatic</gml:description>
            <gml:name>White</gml:name>
            <swe:nilValues>
              <swe:nilValue reason="http://www.opengis.net/def/nil/OGC/0/BelowDetectionRange">
                0
              </swe:nilValue>
              <swe:nilValue reason="http://www.opengis.net/def/nil/OGC/0/AboveDetectionRange">
                255
              </swe:nilValue>
            </swe:nilValues>
            <swe:uom code="W/cm2"/>
            <swe:constraint>
              <swe:AllowedValues>
                <swe:interval>0 255</swe:interval>
                <swe:significantFigures>3</swe:significantFigures>
              </swe:AllowedValues>
            </swe:constraint>
          </swe:Quantity>
        </swe:field>
      </swe:DataRecord>
    </rangeType>
    <gml:coverageFunction>
      <gml:GridFunction>
        <gml:sequenceRule axisOrder="+1 +2">Linear</gml:sequenceRule>
        <gml:startPoint>0 0</gml:startPoint>
      </gml:GridFunction>
    </gml:coverageFunction>
    <gml:rangeSet>
      <DataBlock>
        <rangeParameters/>
        <tupleList>
          1  2  3  4  5
          6  7  8  9  10
          11 12 13 14 15
        </tupleList>
      </DataBlock>
    </gml:rangeSet>
</gmlcov:RectifiedGridCoverage>
```

Template for other encodings
Name: <name of the format>
Version: <version of format>
Specification: <specification reference>
Character set: <character set>

D2.7 requires every encoding rule in INSPIRE to conform to ISO 19118. In particular, it shall specify schema conversion rules for all elements of the application schemas to which the rule is applied.

D2.7 recommends that encoding rules should be based on open standards and that additional encoding rules should only be added, if the new encoding rule has unique characteristics required by the encoded data that are not fulfilled by an encoding rule that has already been endorsed.

If the default encoding is not a GML application schema, include a description of or reference to the used encoding rule in the following section.

9.3.1.2.1. Encoding rules used

If the default encoding is GML, include the following sentence.
The encoding rule used for this encoding is specified in Annex B of [DS-D2.7].

NOTE Annex B of [DS-D2.7], version 3.3rc2, requires that the "encoding rule specified in ISO 19136 Annex E with the extensions in GML 3.3 shall be applied with the additional rules stated in this Annex. For types within the scope of the ISO/TS 19139 encoding rule, the encoding rule of ISO/TS 19139 shall be applied."

For coverages, include the following boilerplate text below. The detailed encoding rules should then be specified in an Annex or separate document (e.g. D2.7 in the future).
Introducing encoding formats other than GML for representing coverage elements requires the definition of encoding rules to map the <*Theme Name*> application schema to the resulting specific data structure unambiguously.

The encoding of coverage components in the file formats specified above is specified in <reference to Annex or (later) D2.7>.

For TIFF/GeoTIFF you may include the following note.
NOTE The GeoTiff format, as a specific extension of the Baseline TIFF Format, is also covered by these encoding rules.

If the GML application schema was derived using mappings from UML types to GML object element, XML Schema type and GML property types other than those specified in Table D.2 in Annex D of ISO 19136 (GML), include the mappings in the section below. Otherwise delete the section.

9.3.1.2.2. Specific mappings from UML classes to GML/XML Schema types and elements

In addition to the mappings between conceptual UML classes and the associated GML object element, XML Schema type and GML property type provided in Table D.2 of ISO 19136 (GML), the mappings included in have been used to generate the GML application schema.

Table 8 – Mappings between conceptual UML classes and the associated GML object elements, XML Schema types and GML property types

UML class *(e.g. GM_Object)*	**GML object element** *(e.g. gml:AbstractGeometry)*	**GML type** *(e.g. gml:AbstractGeometryType)*	**GML property type** *(e.g. gml:GeometryPropertyType)*

If the application schemas in section 5 are based on the RectifiedGridCoverage or ReferenceableGridCoverage types, include the relevant rows as specified below.

RectifiedGridCoverage	gmlcov:RectifiedGridCoverage	gmlcov:AbstractDiscreteCoverageType	n/a
ReferenceableGridCoverage	gmlcov:ReferenceableGridCoverage	gmlcov:AbstractDiscreteCoverageType	n/a

If the GML application schema was derived from an implementation UML model, include a description of the model and how it was derived in the following section. Otherwise delete the section.

9.3.1.2.3. Implementation UML model used for generating the GML application schema

The GML application schema was not derived directly from the conceptual model described in section 5, but from an implementation model (for a schematic illustration of this process, see Figure 5).

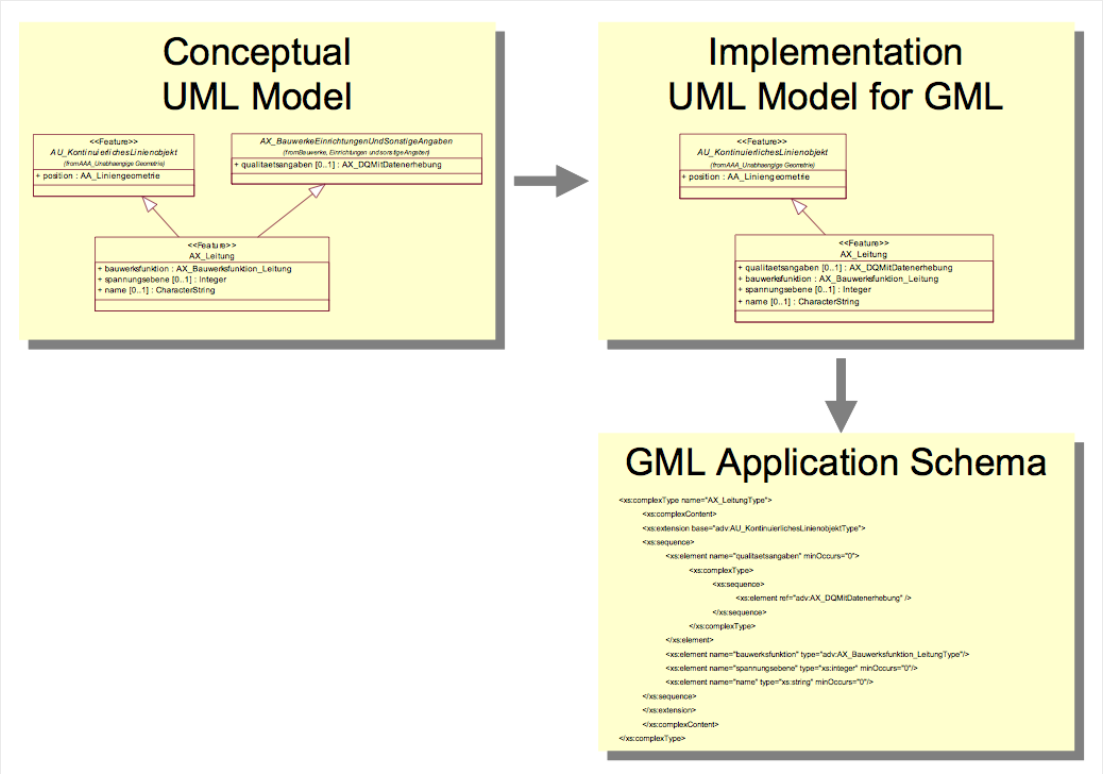


Figure 5 – Process of creating the GML application schema (from [DS-D2.7])

Replace figure with UML class diagram(s) of the implementation model. If the text becomes too small (as in the example below), use a page with landscape orientation for the diagram).

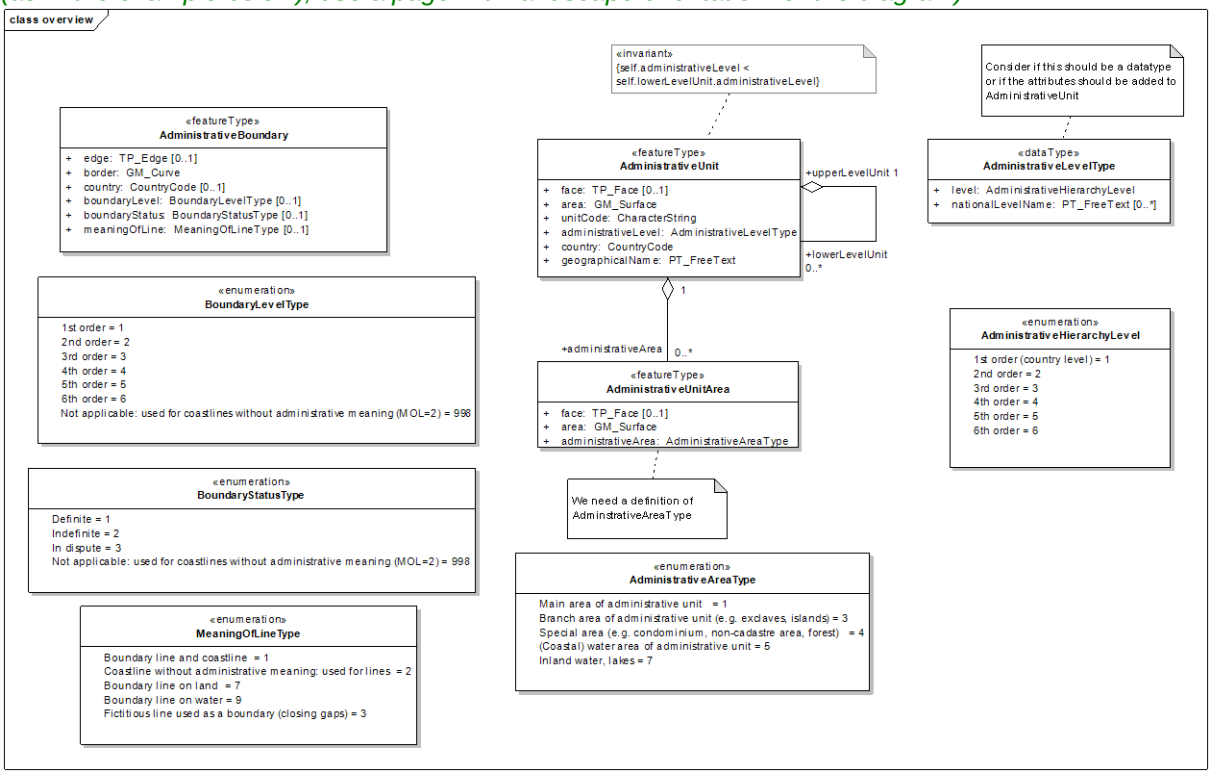


Figure 6 – UML class diagram: Overview of the implementation model for the <Theme Name> application schema

Describe the content of the diagram(s) and the mapping rules that were used to generate the implementation model from the application schema in Section 5.

While a default encoding rule is provided, the diversity of themes and practice in the communities is recognised by allowing the use additional or alternative encoding rules. Examples are:
- *a specific encoding for certain data has to be used to meet performance requirements*
- *existing file-based data (binary or text) has to be integrated as-is*

If other formats/encodings are to be used as a default format/encoding for this theme, this should be specified here, together with the encoding rules used.

9.3.2 Recommended Encoding(s)

Recommendation 42 It is recommended that also the encodings specified in this section be provided for the relevant application schemas.

Include one section for each alternative/additional encoding.

If the default encoding is not a GML Application schema, a GML application schema should be specified as the first alternative encoding.

9.3.2.1. Alternative encoding for application schema <application schema name>

Use the same structure (sub-sections), templates and boilerplate text as used for the default encodings.

If any of the application schemas in this data specification includes coverages, include the following subsection. Else delete it.

9.4 Options for delivering coverage data

For coverages, different encodings may be used for the domain and the range of the coverage. There are several options for packaging the domain and range encoding when delivering coverage data through a download service, as discussed below[18].

Multipart representation

For performance reasons, binary file formats are usually preferred to text-based formats such as XML for storing large amounts of coverage data. However, they cannot directly constitute an alternative to pure GML, since their own data structure might often not support all the ISO 19123 elements used to describe coverages in the conceptual model.

The OGC standard GML Application Schema for coverages [OGC 09-146r2] offers a format encoding which combines these two approaches. The first part consists of a GML document representing all coverage components except the range set, which is contained in the second part in some other encoding format such as 'well known' binary formats'. Some information in the second part may be

[18] Further details and examples will be included in a future version of the Guidelines for the encoding of spatial data [DS-D2.7].

redundant with the GML content of the first part. In this case, consistency must be necessarily ensured, for example by defining a GML mapping of the additional encoding format.

The advantage of this multipart representation is that coverage constituents are not handled individually but as a whole. This is not really the case with GML which also allows the encoding of the value side of the coverage in external binary files, but via references to remote locations.

TG Requirement 8	Coverage data encoded as multipart messages shall comply with the multipart representation conformance class defined in GML Application Schema for Coverages [OGC 09-146r2].

NOTE The GML Application Schema for Coverages establishes a one-to-one relationship between coverages and multipart document instances.

Reference to an external file

The range set can be encoded within the XML structure as an external binary file using the gml:File element. This has the benefit of efficiently storing the range set data within an external file that is of a well-known format type, for example TIFF or GeoTIFF. This method of encoding is of most use for the storage of large files.

Encoding the range inline

This option encodes the range set data within the XML inline. This is encoded as a DataBlock element. This encoding provides much greater visibility for the range set values, however, this comes at the cost of reduced efficiency. This method of encoding would therefore only be suitable for small datasets.

Encoding the domain inside a JPEG 2000 file

This option consists in packaging all the components of one or several coverages, including the domain expressed in GML, in a single JPEG 2000 file. It is based on the OGC standard GML in JPEG 2000 for Geographic Imagery [OGC 05-047r2], also known as GMLJP2, which specifies how to use GML within the XML boxes of JPEG 2000 files.

TG Requirement 9	Coverage data encoded in standalone JPEG 2000 files shall comply with the OGC standard GML in JPEG 2000 for Geographic Imagery [OGC 05-047r2].

TG Requirement 9 implies that all the encoding rules presented in GMLJP2 shall be strictly followed for including GML within JPEG 2000 data files correctly. For the sake of harmonization, the encoding rules adopted for the multipart message encoding should also apply to the GMLJP2 encoding.

The encoding of coverage components in GMLJP2 within a JPEG 2000 file should conform to the rules specified in the Guidelines for the encoding of spatial data [DS-D2.7].

10 Data Capture

For every spatial object type: Capturing rules describing the criteria which spatial objects are part of spatial data sets ("selection criteria") as free text. Typical selection criteria are minimum area or length or functional characteristics like the class of a road.

Data capturing rules are the main element to define the targeted level of detail. For instance, there may be a need for transport networks on two levels of detail (at the European level, scale about 1:1000000 and at the local level, scale about 1:10000) with very similar feature catalogues. However, the data will be very different. This difference is a result of different capturing rules / selection criteria for both levels of detail.

The data capturing processes used by a data provider, i.e. the "how", are not relevant for this component.

If there is no specific guidance with respect to data capture, include the following sentence.

There is no specific guidance required with respect to data capture.

Portrayal

The view service (D3.7_Draft_IR_Discovery_and_View_Services_v2.0) provides mechanisms and structures to manage layers but the content, the organization and the graphic presentation are strongly related to each INSPIRE theme: which are the layers required to represent a theme, how are they organised (groups of layers, hierarchy …), which spatial object types are portrayed in which layer?

There is no requirement in the Directive about portrayal, but to guarantee that spatial data is portrayed consistently from the different MS some rules are necessary.

NOTECartography is a complex topic. At this stage, portrayal should be addressed from the perspective of a single theme only. This means that generally it is not expected that cross-theme issues be addressed in the data specifications that are currently being developed. The view service according to the Directive is not understood as a capability to create high-quality maps, but a capability to view the data. The styles and layers should allow that, but it is not a priority at this time that combinations of cross-theme layers achieve cartographically good results.

This template specifies three simple styles (for points, curves and surfaces, respectively), which use the defaults specified in the respective symbolisers of the Symbology Encoding standard:
- *Point: Grey square, 6 pixels*
- *Curve: Black solid line, 1 pixel*
- *Surface: Black solid line, 1 pixel, grey fill*

If in a community, no agreed/standardised style exists for the symbolygy of the spatial object types of the INSPIRE theme, these simple styles should be specified as the default styles to be used for portrayal.

NOTE: How to create default style for gridded data (e.g. othophotos) is still unclear.

If an agreed/standardised style does exist for the symbolygy of the spatial object types of the INSPIRE theme, this style should be specified here as the default styles to be used for portrayal.

In addition, a data specification may specify additional well-defined styles as required. However, the default style will be shown by a view service, if no specific style is requested.

Note that of course, both defaults or other symbologies specified in INSPIRE data specifications can always be overridden by a user-defined symbology, e.g. in order to use a use an existing national or thematic style or to avoid conflicts when visualising several themes together.

11 Portrayal

This clause defines the rules for layers and styles to be used for portrayal of the spatial object types defined for this theme. Portrayal is regulated in Article 14 of the IRs.

IR Requirement
Article 14
Portrayal

1. For the portrayal of spatial data sets using a view network service as specified in Commission Regulation No 976/2009 ([19]), the following shall be available:
   (a) the layers specified in Annex II for the theme or themes the data set is related to;
   (b) for each layer at least a default portrayal style, with as a minimum an associated title and a unique identifier.

2. For each layer, Annex II defines the following:
   (a) a human readable title of the layer to be used for display in user interface;
   (b) the spatial object type(s), or sub-set thereof, that constitute(s) the content of the layer.

In section 11.1, the *types* of layers are defined that are to be used for the portrayal of the spatial object types defined in this specification. A view service may offer several layers of the same type, one for each dataset that it offers data on a specific topic.

NOTE The layer specification in the IRs only contains the name, a human readable title and the (subset(s) of) spatial object type(s), that constitute(s) the content of the layer. In addition, this TG documents suggests keywords for describing the layer.

Recommendation 43 It is recommended to use the keywords specified in section 11.1 in the *Layers Metadata parameters* of the INSPIRE View service (see Annex III, Part A, section 2.2.4 in Commission Regulation (EC) No 976/2009).

Section 11.2 specifies one style for each of these layers. It is proposed that INSPIRE view services support this style as the default style required by Article 14(1b).

TG Requirement 10 For each layer specified in this section, the styles defined in section 11.2 shall be available.

NOTE The default style should be used for portrayal by the view network service if no user-defined style is specified in a portrayal request for a specific layer.

In section 11.3, further styles can be specified that represent examples of styles typically used in a thematic domain. It is recommended that also these styles should be supported by INSPIRE view services, where applicable.

Recommendation 44 In addition, it is recommended that, where applicable, INSPIRE view services also support the styles defined in section 11.3.

Where XML fragments are used in the following sections, the following namespace prefixes apply:
- sld="http://www.opengis.net/sld" (WMS/SLD 1.1)
- se="http://www.opengis.net/se" (SE 1.1)
- ogc="http://www.opengis.net/ogc" (FE 1.1)

11.1 Layers to be provided by INSPIRE view services

A layer is the structure used by a view service to display geographic information according to styles that define the way this information is symbolized on the map. To define a layer, the view service

[19] OJ L 274, 20.10.2009, p. 9.

provider has to define what information to include, exclude or aggregate in each layer and describe the portrayal rules for each category of information.

As a layer is a structure existing only in the view service, we use the elements defined in the WMS Standard ISO19128:2005, the reference specification for view service implementing rules and guidance documents. These elements are part of the WMS capabilities.

Every non-abstract spatial object type with a spatial property, i.e., a property whose value type is GM_Object or TP_Object (or any subtype of these types), shall be covered by at least one layer. By default, one layer is defined per spatial object type defined in each theme.

Layer Name *This name is for internal use but a harmonized name for each layer across Europe will improve interoperability. If the layer refers to one spatial object type or coverage (the default, see above), the layer name should be the concatenation of the two-letter acronym of the INSPIRE theme, a dot, and the spatial object type name in UpperCamelCase, e.g., 'AD.Address'.*	**Layer Title** *This title will appear in the user interface (portals, applications). By default, this should be the spatial object type readable name as specified in the INSPIRE Feature Concept Dictionary.*	**Spatial object type(s)** *By default, there is one layer per spatial object type.*	**Keywords** *Comma-separated list of keywords. These can be used to help search engines. The default is no keyword.*
<Name used by an application to access the layer>	<Human readable title>	<spatial object type(s) or other description of the layer content>	<Keywords>

If the table specifies sets of layers for a spatial object type, include the following note (specifying the relevant spatial object type(s)) and the IR Requirement below.

NOTE The table above contains several layers for the spatial object type(s) <spatial object type names>, which can be further classified using a code list-valued attribute. Such sets of layers are specified as described in Article 14(3) of the IRs.

IR Requirement
Article 14
Portrayal

(…)

3. For spatial object types whose objects can be further classified using a code list-valued attribute, several layers may be defined. Each of these layers shall include the spatial objects corresponding to one specific code list value. In the definition of such sets of layers in Annexes II-IV,
   (a) the placeholder <CodeListValue> shall represent the values of the relevant code list, with the first letter in upper case,
   (b) the placeholder <human-readable name> shall represent the human-readable name of the code list values;
   (c) the spatial object type shall include the relevant attribute and code list, in parentheses;
   (d) one example of a layer shall be given.

11.1.1 Layers organisation

The WMS ISO19128:2005 allows the service provider to organize layers in groups, in a hierarchy. Such an organization of the layers within the theme should be specified in this subclause. For example, the layer 'Transport Network' could be comprised of three layers: 'Roads', 'Waterways' and 'Railways'.

If layers are not organised in groups, include the following sentence:

None.

11.2 Styles required to be supported by INSPIRE view services

Include one subsection for each layer defined in section 11.1.

11.2.1 Styles for the layer <layer name>

Include one table for each style to be supported for this layer by INSPIRE view services.

NOTE For each layer, there can only be one default style. This style should be the first one to be included below.

Style Name	**<Name of the style>** *The name should be composed as follows:* *<layer name>.Default (e.g. CP.CadastralParcel.Default) for default styles.* *<layer name>.<description> (e.g. CP.CadastralParcel.LabelOnReferencePoint) for other styles.*
Default Style	yes | no *Specify whether this is the default style or not. For each layer, there can only be one default style. This style should be the first one to be included below.*
Style Title	<Title of the style> *The title should be '<layer title> Default Style' (e.g. 'Cadastral Parcel Default Style') for default styles and include the layer title (e.g. 'Cadastral Parcel – with label on reference point') for other styles.* *The title is referred to in the description templates below as $TITLE. If an external SLD file is provided, the title should be the same as specified here.*
Style Abstract	<Abstract describing of the style in natural language> *If an external SLD file is provided, the abstract should be the same as specified here.*
Symbology	*Theme-specific symbology may be specified in two ways:* *1. The preferred representation is to specify the symbology using the OpenGIS Symbology Encoding Implementation Specification, version 1.1.0 (http://portal.opengeospatial.org/files/?artifact_id=16700), which is a language used for styling spatial data, and independent of any service interface specification. For defining the link between the styling defined by the Symbology Encoding and WMS layers, clause 11 (SLD Encoding) of the OpenGIS Styled Layer Descriptor (SLD) Profile of the Web Map Service Implementation Specification, version 1.1.0 (http://portal.opengeospatial.org/files/?artifact_id=22364) shall be used.* *If an agreed/standardised style exists for this spatial object type, this style should be specified here.* *In this case, add the following sentence:*

The SLD specifying the symbology is distributed in a file separately from the data specification document.

If no such style exists, one of the XML fragments below can be used as a default layer description. The layer description templates use the following parameters:

- *$NAME=Name of the layer*
- *$TITLE=Title of the style*
- *$SPATIALOBJECTTYPE=Qualified name of the spatial object type in the GML application schema*
- *$SPATIALPROPERTY=Qualified name of the spatial property of the spatial object type to be used in the default display*

*The following XML fragment can be used as default layer description for a spatial object type with a **point** geometry:*

```
  <sld:NamedLayer>
    <se:Name>$NAME</se:Name>
    <sld:UserStyle>
      <se:Name>INSPIRE_Default</se:Name>
      <sld:IsDefault>1</sld:IsDefault>
      <se:FeatureTypeStyle version="1.1.0">
        <se:Description>
          <se:Title>$TITLE</se:Title>
          <se:Abstract>The geometry is rendered as a square with a size of 6
pixels, with a 50% grey (#808080) fill and a black outline.</se:Abstract>
        </se:Description>
        <se:FeatureTypeName>$SPATIALOBJECTTYPE</se:FeatureTypeName>
        <se:Rule>
          <se:PointSymbolizer>
            <se:Geometry>
              <ogc:PropertyName>$SPATIALPROPERTY</ogc:PropertyName>
            </se:Geometry>
            <se:Graphic/>
          </se:PointSymbolizer>
        </se:Rule>
      </se:FeatureTypeStyle>
    </sld:UserStyle>
  </sld:NamedLayer>
```

*The following XML fragment can be used as default layer description for a spatial object type with a **curve** geometry.*

```
  <sld:NamedLayer>
    <se:Name>$NAME</se:Name>
    <sld:UserStyle>
      <se:Name>INSPIRE_Default</se:Name>
      <sld:IsDefault>1</sld:IsDefault>
      <se:FeatureTypeStyle version="1.1.0">
        <se:Description>
          <se:Title>$TITLE</se:Title>
          <se:Abstract>The geometry is rendered as a solid black line with a
stroke width of 1 pixel.</se:Abstract>
        </se:Description>
        <se:FeatureTypeName>$SPATIALOBJECTTYPE</se:FeatureTypeName>
        <se:Rule>
          <se:LineSymbolizer>
            <se:Geometry>
              <ogc:PropertyName>$SPATIALPROPERTY</ogc:PropertyName>
            </se:Geometry>
            <se:Stroke/>
          </se:LineSymbolizer>
        </se:Rule>
      </se:FeatureTypeStyle>
    </sld:UserStyle>
  </sld:NamedLayer>
```

*The following XML fragment can be used as default layer description for a spatial object type with a **surface** geometry:*

```
  <sld:NamedLayer>
    <se:Name>$NAME</se:Name>
    <sld:UserStyle>
      <se:Name>INSPIRE_Default</se:Name>
      <sld:IsDefault>1</sld:IsDefault>
      <se:FeatureTypeStyle version="1.1.0">
        <se:Description>
          <se:Title>$TITLE</se:Title>
          <se:Abstract>The geometry is rendered using a 50% grey (#808080)
fill and a solid black outline with a stroke width of 1 pixel.</se:Abstract>
        </se:Description>
        <se:FeatureTypeName>$SPATIALOBJECTTYPE</se:FeatureTypeName>
        <se:Rule>
          <se:PolygonSymbolizer>
            <se:Geometry>
              <ogc:PropertyName>$SPATIALPROPERTY</ogc:PropertyName>
            </se:Geometry>
            <se:Fill/>
            <se:Stroke/>
          </se:PolygonSymbolizer>
        </se:Rule>
      </se:FeatureTypeStyle>
    </sld:UserStyle>
  </sld:NamedLayer>
```

Example:

```
  <sld:NamedLayer>
    <se:Name>Buildings.Building</se:Name>
    <sld:UserStyle>
      <se:Name>INSPIRE_Default</se:Name>
      <sld:IsDefault>1</sld:IsDefault>
      <se:FeatureTypeStyle version='1.1.0' xmlns:BU='urn:x-
inspire:specification:Buildings:0.1'>
        <se:Description>
          <se:Title>Buidling Default Style</se:Title>
          <se:Abstract>The geometry is rendered using a 50% grey (#808080)
fill and a solid black outline with a stroke width of 1 pixel.</se:Abstract>
        </se:Description>
        <se:FeatureTypeName>BU:Building</se:FeatureTypeName>
        <se:Rule>
          <se:PolygonSymbolizer>
            <se:Geometry>
              <ogc:PropertyName>BU:location</ogc:PropertyName>
            </se:Geometry>
          </se:PolygonSymbolizer>
        </se:Rule>
      </se:FeatureTypeStyle>
    </sld:UserStyle>
  </sld:NamedLayer>
```

An example including labels is given in the example data specification in Appendix I.

2. Alternatively, an existing portrayal specification used for the theme is referenced. This option is only feasible, if the parts of the source application schema that are referred to by the portrayal rules are also part of the INSPIRE application schema.

In this case, add the following sentence:.
The symbology is specified in <reference>.

Minimum & maximum scales

<min scale> - <max scale>

The range of scales for which it is appropriate to use this style. The default is no scale limits.

Several default styles can be specified for one layer type – one for each scale

	range.

11.3 Styles recommended to be supported by INSPIRE view services

Include one subsection for each layer, for which other styles are proposed.

11.3.1 Styles for the layer <layer name>

Include one table for each additional style that is proposed.

Style Name	**<Name of the style>** *The name should be composed as follows: <layer name>.<description> (e.g. CP.CadastralParcel.LabelOnReferencePoint) for other styles.*
Style Title	<Title of the style> *The title should include the layer title (e.g. 'Cadastral Parcel – with label on reference point').* *The title is referred to in the description templates below as $TITLE. If an external SLD file is provided, the title should be the same as specified here.*
Style Abstract	<Abstract describing of the style in natural language> *If an external SLD file is provided, the abstract should be the same as specified here.*
Symbology	*See instructions in section 11.2.*
Minimum & maximum scales	<min scale> - <max scale> *The range of scales for which it is appropriate to use this style. The default is no scale limits.* *Several default styles can be specified for one layer type – one for each scale range.*

Bibliography

[DS-D2.3] INSPIRE DS-D2.3, Definition of Annex Themes and Scope, v3.0, http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/DataSpecifications/D2.3_Definition_of_Annex_Themes_and_scope_v3.0.pdf

[DS-D2.5] INSPIRE DS-D2.5, Generic Conceptual Model, v3.4rc2, *http://inspire.jrc.ec.europa.eu/documents/Data_Specifications/D2.5_v3.4rc2.pdf*

[DS-D2.6] INSPIRE DS-D2.6, Methodology for the development of data specifications, v3.0, http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/DataSpecifications/D2.6_v3.0.pdf

[DS-D2.7] INSPIRE DS-D2.7, Guidelines for the encoding of spatial data, v3.3rc2, *http://inspire.jrc.ec.europa.eu/documents/Data_Specifications/D2.7_v3.3rc2.pdf*

[ISO 19101] EN ISO 19101:2005 Geographic information – Reference model (ISO 19101:2002)

[ISO 19103] ISO/TS 19103:2005, Geographic information – Conceptual schema language

[ISO 19107] EN ISO 19107:2005, Geographic information – Spatial schema (ISO 19107:2003)

[ISO 19108] EN ISO 19108:2005 Geographic information - Temporal schema (ISO 19108:2002)

[ISO 19111] EN ISO 19111:2007 Geographic information - Spatial referencing by coordinates (ISO 19111:2007)

[ISO 19115] EN ISO 19115:2005, Geographic information – Metadata (ISO 19115:2003)

[ISO 19118] EN ISO 19118:2006, Geographic information – Encoding (ISO 19118:2005)

[ISO 19135] EN ISO 19135:2007 Geographic information – Procedures for item registration (ISO 19135:2005)

[ISO 19139] ISO/TS 19139:2007, Geographic information – Metadata – XML schema implementation

[ISO 19157] ISO/DIS 19157, Geographic information – Data quality

[OGC 06-103r3] Implementation Specification for Geographic Information - Simple feature access – Part 1: Common Architecture v1.2.0

Delete any of these references or add further references as applicable.

Annex A
(normative)

Abstract Test Suite

To create a theme-specific ATS, the following basic rules should be followed:

- *The ATS should include tests for all IR and TG requirements included in the data specification. Tests for Recommendations should not be included.*
- *The ATS template already contains tests with 'boilerplate text' for all IR and TG requirements included in the data specification templates.*
- *If an IR or TG requirement is not included in the data specification (because it is not relevant/applicable to the specific theme), the corresponding test should be removed.*
- *If a default IR or TG requirement (grey text) needs to be slightly modified (e.g. delete one/more of the standard CRSs) in a data specification, the corresponding test should be adapted accordingly. In such cases, you may need to copy the boilerplate text, remove the grey background (to indicate that the text is not the same as in all the other specifications) and adapt the text as required.*
- *Additional tests should be added for all theme-specific IR and TG requirement (i.e. those that are not included in this ATS template). These additional tests should be included in the relevant conformance class.*
- *In some cases, it may be necessary to create an additional conformance class. This should only be done, if there are one or several requirements that cannot be logically assigned to one of the conformance classes already included in the ATS template. Additional conformance classes should follow the same structure as used for the other conformance classes in the ATS.*
- *A test cannot limit or broaden the scope of the corresponding requirement. Please use the exact wording from the requirement as much as possible.*
- *Please add notes with further explanations for the specific data theme for all issues that may not be clear or where additional information would be useful.*
- *Do not forget to update the list of the tests. Please use the same headings for the titles of the tests. In this case you only need to refresh the table.*

Disclaimer
While this Annex refers to the Commission Regulation (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services, it does not replace the legal act or any part of it.

The objective of the Abstract Test Suite (ATS) included in this Annex is to help the conformance testing process. It includes a set of tests to be applied on a data set to evaluate whether it fulfils the requirements included in this data specification and the corresponding parts of Commission Regulation No 1089/2010 (implementing rule as regards interoperability of spatial datasets and services, further referred to as ISDSS Regulation). This is to help data providers in declaring the conformity of a data set to the “degree of conformity, with implementing rules adopted under Article 7(1) of Directive 2007/2/EC”, which is required to be provided in the data set metadata according to Commission Regulation (EC) No 2008/1205 (the Metadata Regulation).

Part 1 of this ATS includes tests that provide **input for assessing conformity with the ISDSS regulation.** In order to make visible which requirements are addressed by a specific test, references to the corresponding articles of the legal act are given. The way how the cited requirements apply to xx specification is described under the testing method.

In addition to the requirements included in ISDSS Regulation this Technical guideline contains TG requirements too. TG requirements are technical provisions that need to be fulfilled in order to be conformant with the corresponding IR requirement when the specific technical implementation proposed in this document is used. Such requirements relate for example to the default encoding described in section 9. **Part 2** of the ATS presents tests necessary for assessing the **conformity with TG requirements**.

NOTE Conformance of a data set with the TG requirement(s) included in this ATS implies conformance with the corresponding IR requirement(s).

The **ATS is applicable to the data sets that have been transformed** to be made available through INSPIRE download services (i.e. the data returned as a response to the mandatory "Get Spatial Dataset" operation) rather than the original "source" data sets.

The requirements to be tested are grouped in several *conformance classes*. Each of these classes covers a specific aspect: one conformance class contains tests reflecting the requirements on the application schema, another on the reference systems, etc. **Each conformance class is identified by a URI** (uniform resource identifier) according to the following pattern:

http://inspire.ec.europa.eu/conformance-class/ir/xx/<conformance class identifier>

EXAMPLE 1 The URI *http://inspire.ec.europa.eu/conformance-class/ir/ef/rs* identifies the Reference Systems ISDSS conformance class of the Environmental Monitoring Facilities (EF) data theme.

The results of the tests should be published referring to the relevant conformance class (using its URI).

When an INSPIRE data specification contains **more than one application schema,** the requirements tested in a conformance class may differ depending on the application schema used as a target for the transformation of the data set. This will always be the case for the application schema conformance class. However, also other conformance classes could have different requirements for different application schemas. In such cases, a separate conformance class is defined for each application schema, and they are distinguished by specific URIs according to the following pattern:

http://inspire.ec.europa.eu/conformance-class/ir/xx/<conformance class identifier>/ <application schema namespace prefix>

EXAMPLE 2 The URI *http://inspire.ec.europa.eu/conformance-class/ir/el/as/el-vec* identifies the conformity with the application schema (*as*) conformance class for the Elevation Vector Elements (*el-vec*) application schema.

An overview of the conformance classes and the associated tests is given in the table below.

Table 9. Overview of the tests within this Abstract Test Suite.

Annex A (normative) Abstract Test Suite 68

A.1 Application Schema Conformance Class 72
A.1.1 Schema element denomination test 72
A.1.2 Value type test 72
A.1.3 Value test 72
A.1.4 Attributes/associations completeness test 73
A.1.5 Abstract spatial object test 73
A.1.6 Constraints test 73

A.1.7 Geometry representation test 74
A.2 Reference Systems Conformance Class 74
A.2.1 Datum test 74
A.2.2 Coordinate reference system test 74
A.2.3 Grid test 75
A.2.4 View service coordinate reference system test 75
A.2.5 Temporal reference system test 76
A.2.6 Units of measurements test 76
A.3 Data Consistency Conformance Class 76
A.3.1 Unique identifier persistency test 76
A.3.2 Version consistency test 77
A.3.3 Life cycle time sequence test 77
A.3.4 Validity time sequence test 77
A.3.5 Update frequency test 77
A.4 Data Quality Conformance Class 78
A.4.1 Data quality target results test 78
A.5 Metadata IR Conformance Class 78
A.5.1 Metadata for interoperability test 78
A.6 Information Accessibility Conformance Class 79
A.6.1 Code list publication test 79
A.6.2 CRS publication test 79
A.6.3 CRS identification test 79
A.6.4 Grid identification test 79
A.7 Data Delivery Conformance Class 80
A.7.1 Encoding compliance test 80
A.8 Portrayal Conformance Class 80
A.8.1 Layer designation test 80
A.9 Technical Guideline Conformance Class 81
A.9.1 Multiplicity test 81
A.9.1 CRS http URI test 81
A.9.2 Metadata encoding schema validation test 81
A.9.3 Metadata occurrence test 81
A.9.4 Metadata consistency test 82
A.9.5 Encoding schema validation test 82
A.9.6 Coverage multipart representation test 82
A.9.7 Coverage domain consistency test 82
A.9.8 Style test 83

In order to be conformant to a conformance class, a data set has to pass **all** tests defined for that conformance class.

In order to be conformant with the ISDSS regulation the inspected data set needs to be conformant to **all** conformance classes in Part 1. The conformance class for overall conformity with the ISDSS regulation is identified by the URI *http://inspire.ec.europa.eu/conformance-class/ir/xx/.*

In order to be conformant with the Technical Guidelines, the dataset under inspection needs to be conformant to all conformance classes included both in Part 1 and 2. Chapter 8 describes in detail how to publish the result of testing regarding overall conformity and conformity with the conformance classes as metadata. The conformance class for overall conformity with the Technical Guidelines is identified by the URI *http://inspire.ec.europa.eu/conformance-class/tg/xx/x.y(.z).*

It should be noted that data providers are not obliged to integrate / decompose the original structure of the source data sets when they deliver them for INSPIRE. It means that a conformant dataset can contain less or more spatial object / data types than specified in the ISDSS Regulation.

A dataset that contains less spatial object and/or data types can be regarded conformant when the corresponding types of the source datasets after the necessary transformations fulfil the requirements set out in the ISDSS Regulation.

A **dataset that contain more spatial object and/or data types** may be regarded as conformant when

- all the spatial object / data types that have corresponding types in the source dataset after the necessary transformations fulfil the requirements set out in the ISDSS Regulation and
- all additional elements of the source model (spatial object types, data types, attributes, constraints, code lists and enumerations together with their values) do not conflict with any rule defined in the interoperability target specifications defined for any theme within INSPIRE.

Open issue 1: Even though the last condition can be derived from Art. 8(4) of the Directive, the ISDSS Regulation does not contain requirements concerning the above issue. Therefore, no specific tests have been included in this abstract suit for testing conformity of extended application schemas. Annex F of the Generic Conceptual Model (D2.5) provides an example how to extend INSPIRE application schemas in a compliant way.

The ATS contains a detailed list of abstract tests. It should be noted that some tests in the Application schema conformance class can be automated by utilising xml **schema validation tools.** It should be noted that failing such validation test does not necessary reflect non-compliance to the application schema; it may be the results of erroneous encoding.

Each test in this suit follows the same structure:

- Requirement: citation from the legal texts (ISDSS requirements) or the Technical Guidelines (TG requirements);
- Purpose: definition of the scope of the test;
- Reference: link to any material that may be useful during the test;
- Test method: description of the testing procedure.

According to ISO 19105:2000 all tests in this ATS are basic tests. Therefore, this statement is not repeated each time.

Part 1
(normative)

Conformity with Commission Regulation No 1089/2010

A.1 Application Schema Conformance Class

Conformance class:
http://inspire.ec.europa.eu/conformance-class/ir/xx/as/<application schema namespace prefix>

A.1.1 Schema element denomination test

a) Purpose: Verification whether each element of the dataset under inspection carries a name specified in the target application schema(s).

b) Reference: Art. 3 and Art.4 of Commission Regulation No 1089/2010

c) Test Method: Examine whether the corresponding elements of the source schema (spatial object types, data types, attributes, association roles, code lists, and enumerations) are mapped to the target schema with the correct designation of mnemonic names.

NOTE Further technical information is in the Feature catalogue and UML diagram of the application schema(s) in section 5.2.

A.1.2 Value type test

a) Purpose: Verification whether all attributes or association roles use the corresponding value types specified in the application schema(s).

b) Reference: Art. 3, Art.4, Art.6(1), Art.6(4), Art.6(5) and Art.9(1)of Commission Regulation No 1089/2010.

c) Test Method: Examine whether the value type of each provided attribute or association role adheres to the corresponding value type specified in the target specification.

NOTE 1 This test comprises testing the value types of INSPIRE identifiers, the value types of attributes and association roles that should be taken from enumeration and code lists, and the coverage domains.

NOTE 2 Further technical information is in the Feature catalogue and UML diagram of the application schema(s) in section 5.2.

A.1.3 Value test

a) Purpose: Verify whether all attributes or association roles whose value type is a code list or enumeration take the values set out therein.

b) Reference: Art.4 (3) of Commission Regulation No 1089/2010.

c) Test Method: When an attribute / association role has an enumeration or code list as its type, compare the values of each instance with those provided in the application schema. To pass this tests any instance of an attribute / association role

- shall not take any other value than defined in the enumeration table when its type is an enumeration.
- shall take only values explicitly specified in the code list when the code list's extensibility is "none".
- shall take only a value explicitly specified in the code list or shall take a value that is narrower (i.e. more specific) than those explicitly specified in the application schema when the code list's extensibility is "narrower".

Delete the bullet point(s) from the above list that are not relevant to your theme!

NOTE 1 This test is not applicable to code lists with extensibility "open" or "any".

NOTE 2 When a data provider only uses code lists with narrower (more specific values) this test can be fully performed based on internal information.

A.1.4 Attributes/associations completeness test

a) Purpose: Verification whether each instance of spatial object type and data types include all attributes and association roles as defined in the target application schema.

b) Reference: Art. 3, Art.4(1), Art.4(2), and Art.5(2) of Commission Regulation No 1089/2010.

c) Test Method: Examine whether all attributes and association roles defined for a spatial object type or data type are present for each instance in the dataset.

NOTE 1 Further technical information is in the Feature catalogue and UML diagram of the application schema(s) in section 5.2.

NOTE 2 For all properties defined for a spatial object, a value has to be provided if it exists in or applies to the real world entity – either the corresponding value (if available in the data set maintained by the data provider) or the value of *void.* If the characteristic described by the attribute or association role does not exist in or apply to the real world entity, the attribute or association role does not need to be present in the data set.

A.1.5 Abstract spatial object test

a) Purpose: Verification whether the dataset does NOT contain abstract spatial object / data types defined in the target application schema(s).

b) Reference: Art.5(3) of Commission Regulation No 1089/2010

c) Test Method: Examine that there are NO instances of abstract spatial object / data types in the dataset provided.

NOTE Further technical information is in the Feature catalogue and UML diagram of the application schema(s) in section 5.2.

A.1.6 Constraints test

a) Purpose: Verification whether the instances of spatial object and/or data types provided in the dataset adhere to the constraints specified in the target application schema(s).

b) Reference: Art. 3, Art.4(1), and Art.4(2) of Commission Regulation No 1089/2010.

c) Test Method: Examine all instances of data for the constraints specified for the corresponding spatial object / data type. Each instance shall adhere to all constraints specified in the target application schema(s).

NOTE Further technical information is in the Feature catalogue and UML diagram of the application schema(s) in section 5.2.

A.1.7 Geometry representation test

a) Purpose: Verification whether the value domain of spatial properties is restricted as specified in the Commission Regulation No 1089/2010.

b) Reference: Art.12(1), Annex III Section XX of Commission Regulation No 1089/2010

c) Test Method: Check whether all spatial properties only use 0, 1 and 2-dimensional geometric objects that exist in the right 2-, 3- or 4-dimensional coordinate space, and where all curve interpolations respect the rules specified in the reference documents.

NOTE Further technical information is in OGC Simple Feature spatial schema v1.2.1 [06-103r4].

Replace OGC 06-103r4 with ISO 19125-1:2004 when the geometry representation is restricted to the latter! In this case add in the reference the article from the 1089/2010 Regulation that eventually restricts the geometry.

A.2 Reference Systems Conformance Class

Conformance class:
http://inspire.ec.europa.eu/conformance-class/ir/xx/rs

A.2.1 Datum test

a) Purpose: Verify whether each instance of a spatial object type is given with reference to one of the (geodetic) datums specified in the target specification.

c) Reference: Annex II Section 1.2 of Commission Regulation No 1089/2010

b) Test Method: Check whether each instance of a spatial object type specified in the application schema(s) in section 5 has been expressed using:

- the European Terrestrial Reference System 1989 (ETRS89) within its geographical scope; or
- the International Terrestrial Reference System (ITRS) for areas beyond the ETRS89 geographical scope; or
- other geodetic coordinate reference systems compliant with the ITRS. Compliant with the ITRS means that the system definition is based on the definition of ITRS and there is a well-established and described relationship between both systems, according to the EN ISO 19111.

NOTE Further technical information is given in Section 6 of this document.

A.2.2 Coordinate reference system test

a) Purpose: Verify whether the two- and three-dimensional coordinate reference systems are used as defined in section 6.

b) Reference: Section 6 of Commission Regulation 1089/2010.

c) Test Method: Inspect whether the horizontal and vertical components of coordinates one of the corresponding coordinate reference system has been:

- Three-dimensional Cartesian coordinates based on a datum specified in 1.2 and using the parameters of the Geodetic Reference System 1980 (GRS80) ellipsoid.
- Three-dimensional geodetic coordinates (latitude, longitude and ellipsoidal height) based on a datum specified in 1.2 and using the parameters of the GRS80 ellipsoid.
- Two-dimensional geodetic coordinates (latitude and longitude) based on a datum specified in 1.2 and using the parameters of the GRS80 ellipsoid.
- Plane coordinates using the ETRS89 Lambert Azimuthal Equal Area coordinate reference system.
- Plane coordinates using the ETRS89 Lambert Conformal Conic coordinate reference system.
- Plane coordinates using the ETRS89 Transverse Mercator coordinate reference system.
- For the vertical component on land, the European Vertical Reference System (EVRS) shall be used to express gravity-related heights within its geographical scope. Other vertical reference systems related to the Earth gravity field shall be used to express gravity-related heights in areas that are outside the geographical scope of EVRS.
- For the vertical component in marine areas where there is an appreciable tidal range (tidal waters), the Lowest Astronomical Tide (LAT) shall be used as the reference surface.
- For the vertical component in marine areas without an appreciable tidal range, in open oceans and effectively in waters that are deeper than 200 meters, the Mean Sea Level (MSL) or a well-defined reference level close to the MSL shall be used as the reference surface.“
- For the vertical component in the free atmosphere, barometric pressure, converted to height using ISO 2533:1975 International Standard Atmosphere, or other linear or parametric reference systems shall be used. Where other parametric reference systems are used, these shall be described in an accessible reference using EN ISO 19111-2:2012.

NOTE Further technical information is given in Section 6 of this document.

Delete those CRS from the above list that are not applicable to your data theme and add eventual theme specific CRS!

A.2.3 Grid test

a) Purpose: Verify that gridded data related are available using the grid compatible with one of the coordinate reference systems defined in Commission Regulation No 1089/2010

b) Reference: Annex II Section 2.1 and 2.2 of Commission Regulation 1089/2010.

c) Test Method: Check whether the dataset defined as a grid is compatible with one of the coordinate reference.

- Grid_ETRS89_GRS80 based on two-dimensional geodetic coordinates using the parameters of the GRS80 ellipsoid
- Grid_ETRS89_GRS80zn based on two-dimensional geodetic coordinates with zoning,
- Plane coordinates using the Lambert Azimuthal Equal Area projection and the parameters of the GRS80 ellipsoid (ETRS89-LAEA)
- Plane coordinates using the Lambert Conformal Conic projection and the parameters of the GRS80 ellipsoid (ETRS89-LCC)
- Plane coordinates using the Transverse Mercator projection and the parameters of the GRS80 ellipsoid (ETRS89-TMzn)

NOTE Further technical information is given in Section 6 of this document.

Delete those grids from the above list that are not applicable to your data theme and add eventual theme specific grids!

A.2.4 View service coordinate reference system test

a) Purpose: Verify whether the spatial data set is available in the two dimensional geodetic coordinate system for their display with the INSPIRE View Service.

b) Reference: Annex II Section 1.4 of Commission Regulation 1089/2010

c) Test Method: Check that each instance of a spatial object types specified in the application schema(s) in section 5 is available in the two-dimensional geodetic coordinate system

NOTE Further technical information is given in Section 6 of this document.

A.2.5 Temporal reference system test

a) Purpose: Verify whether date and time values are given as specified in Commission Regulation No 1089/2010.

b) Reference: Art.11(1) of Commission Regulation 1089/2010

c) Test Method: Check whether:

- the Gregorian calendar is used as a reference system for date values;
- the Universal Time Coordinated (UTC) or the local time including the time zone as an offset from UTC are used as a reference system for time values.

NOTE Further technical information is given in Section 6 of this document.

A.2.6 Units of measurements test

a) Purpose: Verify whether all measurements are expressed as specified in Commission Regulation No 1089/2010.

b) Reference: Art.12(2) of Commission Regulation 1089/2010

c) Test Method: Check whether all measurements are expressed in SI units or non-SI units accepted for use with the International System of Units.

NOTE 1 Further technical information is given in ISO 80000-1:2009.

NOTE 2 Degrees, minutes and seconds are non-SI units accepted for use with the International System of Units for expressing measurements of angles.

A.3 Data Consistency Conformance Class

Conformance class:
http://inspire.ec.europa.eu/conformance-class/ir/xx/dc

or *(delete as appropriate)*

http://inspire.ec.europa.eu/conformance-class/ir/xx/dc/<application schema namespace prefix>

A.3.1 Unique identifier persistency test

a) Purpose: Verify whether the namespace and localId attributes of the external object identifier remain the same for different versions of a spatial object.

b) Reference: Art. 9 of Commission Regulation 1089/2010.

c) Test Method: Compare the namespace and localId attributes of the external object identifiers in the previous version(s) of the dataset with the namespace and localId attributes of the external object identifiers of current version for the same instances of spatial object / data types; To pass the test, neither the namespace, nor the localId shall be changed during the life-cycle of a spatial object.

NOTE 1 This test can be performed exclusively on the basis of the information available in the database of the data providers.

NOTE 2 When using URI this test includes the verification whether no part of the construct has been changed during the life cycle of the instances of spatial object / data types.

NOTE 3 Further technical information is given in section 14.2 of the INSPIRE Generic Conceptual Model.

If INSPIRE identifier is not applicable to the theme this test should be deleted.

A.3.2 Version consistency test

a) Purpose: Verify whether different versions of the same spatial object / data type instance belong to the same type.

b) Reference: Art. 9 of Commission Regulation 1089/2010.

c) Test Method: Compare the types of different versions for each instance of spatial object / data type

NOTE 1 This test can be performed exclusively on the basis of the information available in the database of the data providers.

A.3.3 Life cycle time sequence test

a) Purpose: Verification whether the value of the attribute beginLifespanVersion refers to an earlier moment of time than the value of the attribute endLifespanVersion for every spatial object / object type where this property is specified.

b) Reference: Art.10(3) of Commission Regulation 1089/2010.

c) Test Method: Compare the value of the attribute beginLifespanVersion with attribute endLifespanVersion. The test is passed when the beginLifespanVersion value is before endLifespanVersion value for each instance of all spatial object/data types for which this attribute has been defined.

NOTE 1 This test can be performed exclusively on the basis of the information available in the database of the data providers.

A.3.4 Validity time sequence test

a) Purpose: Verification whether the value of the attribute validFrom refers to an earlier moment of time than the value of the attribute validTo for every spatial object / object type where this property is specified.

b) Reference: Art.12(3) of Commission Regulation 1089/2010.

c) Test Method: Compare the value of the attribute validFrom with attribute validTo. The test is passed when the validFrom value is before validTo value for each instance of all spatial object/data types for which this attribute has been defined.

NOTE 1 This test can be performed exclusively on the basis of the information available in the database of the data providers.

A.3.5 Update frequency test

a) Purpose: Verify whether all the updates in the source dataset(s) have been transmitted to the dataset(s) which can be retrieved for the XX data theme using INSPIRE download services.

b) Reference: Art.8 (2) of Commission Regulation 1089/2010.

c) Test Method: Compare the values of beginning of life cycle information in the source and the target datasets for each instance of corresponding spatial object / object types. The test is passed when the difference between the corresponding values is less than 6 months.

NOTE 1 This test can be performed exclusively on the basis of the information available in the database of the data providers.

A.4 Data Quality Conformance Class

Conformance class:
http://inspire.ec.europa.eu/conformance-class/ir/xx/dq

A.4.1 Data quality target results test

a) Purpose: Verify whether all data quality elements meet the specified target result(s).

b) Reference: *Add reference from the legal text here*

c) Test Method: Compare the result(s) of each data quality measure for your data with the target result(s) specified in Commission Regulation 1089/2010.

NOTE Further technical information is given in section 7 of this document.

This conformance class is applicable when there are mandatory DQ results set in the IDSS regulation. Each DQ requirement should be reflected in a dedicated test. If no mandatory DQ results have been defined, the conformance class has to be deleted.

A.5 Metadata IR Conformance Class

Conformance class:
http://inspire.ec.europa.eu/conformance-class/ir/xx/md

A.5.1 Metadata for interoperability test

a) Purpose: Verify whether the metadata for interoperability of spatial data sets and services described in 1089/2010 Commission Regulation have been created and published for each dataset related to the XX data theme.

b) Reference: Art.13 of Commission Regulation 1089/2010

c) Test Method: Inspect whether metadata describing the coordinate reference systems, encoding, topological consistency and spatial representation type have been created and published. If the spatial data set contains temporal information that does not refer to the default temporal reference system, inspect whether metadata describing the temporal reference system have been created and published. If an encoding is used that is not based on UTF-8, inspect whether metadata describing the character encoding have been created.

NOTE Further technical information is given in section 8 of this document.

If topological consistency does not apply to your theme, delete it. If other mandatory metadata elements apply, please add.

A.6 Information Accessibility Conformance Class

Conformance class:
http://inspire.ec.europa.eu/conformance-class/ir/xx/ia

A.6.1 Code list publication test

a) Purpose: Verify whether all additional values used in the data sets for attributes, for which narrower values or any other value than specified in Commission Regulation 1089/2010 are allowed, are published in a register.

b) Reference: Art.6(3) and Annex III Section XXX

c) Test method: For each additional value used in the data sets for code list-valued attributes, check whether it is published in a register.

NOTE Further technical information is given in section 5 of this document.

Please add the reference to the appropriate articles of the Regulation where your eventual code lists are defined.

A.6.2 CRS publication test

a) Purpose: Verify whether the identifiers and the parameters of coordinate reference system are published in common registers.

b) Reference: Annex II Section 1.5

c) Test method: Check whether the identifier and the parameter of the CRS used for the dataset are included in a register. .

NOTE Further technical information is given in section 6 of this document.

A.6.3 CRS identification test

a) Purpose: Verify whether identifiers for other coordinate reference systems than specified in Commission Regulation 1089/2010 have been created and their parameters have been described according to EN ISO 19111 and ISO 19127.

b) Reference: Annex II Section 1.3.4

c) Test method: Check whether the register with the identifiers of the coordinate reference systems is accessible.

NOTE Further technical information is given in section 6 of this document.

A.6.4 Grid identification test

a) Purpose: Verify whether identifiers for other geographic grid systems than specified in Commission Regulation 1089/2010 have been created and their definitions have been either described with the data or referenced.

b) Reference: Annex II Section 2.1 and 2.2

c) Test Method: Check whether the identifiers for grids have been created. Inspect the dataset and/or the metadata for inclusion of grid definition.

NOTE Further technical information is given in section 6 of this document.

A.7 Data Delivery Conformance Class

Conformance class:
http://inspire.ec.europa.eu/conformance-class/ir/xx/de

A.7.1 Encoding compliance test

a) Purpose: Verify whether the encoding used to deliver the dataset comply with EN ISO 19118.

b) Reference: Art.7 (1) of Commission Regulation 1089/2010.

c) Test Method: Follow the steps of the Abstract Test Suit provided in EN ISO 19118.

NOTE 1 Datasets using the default encoding specified in Section 9 fulfil this requirement.

NOTE 2 Further technical information is given in Section 9 of this document.

A.8 Portrayal Conformance Class

Conformance class:
http://inspire.ec.europa.eu/conformance-class/ir/xx/po

A.8.1 Layer designation test

a) Purpose: verify whether each spatial object type has been assigned to the layer designated according to Commission Regulation 1089/2010.

b) Reference: Art. 14(1), Art14(2) and Annex II Section XX .
Please insert the section number from the ISDSS Regulation that is related to your theme!

c) Test Method: Check whether data is made available for the view network service using the specified layers respectively:
Copy layer names from the regulation!

NOTE Further technical information is given in section 11 of this document.

Part 2
(informative)

Conformity with the technical guideline (TG) Requirements

A.9 Technical Guideline Conformance Class

Conformance class:
http://inspire.ec.europa.eu/conformance-class/tg/xx/x.y(.z)

A.9.1 Multiplicity test

a) Purpose: Verify whether each instance of an attribute or association role specified in the application schema(s) does not include fewer or more occurrences than specified in section 5.

c) Reference: Feature catalogue and UML diagram of the application schema(s) in section 5 of this guideline.

b) Test Method: Examine that the number of occurrences of each attribute and/or association role for each instance of a spatial object type or data type provided in the dataset corresponds to the number of occurrences of the attribute / association role that is specified in the application schema(s) in section 5.

A.9.1 CRS http URI test

a) Purpose: Verify whether the coordinate reference system used to deliver data for INSPIRE network services has been identified by URIs according to the EPSG register.

c) Reference: Table 2 in Section 6 of this technical guideline

b) Test Method: Compare the URI of the dataset with the URIs in the table.

NOTE 1 Passing this test implies the fulfilment of test A6.2

NOTE 2 Further reference please see *http://www.epsg.org/geodetic.html*

A.9.2 Metadata encoding schema validation test

a) Purpose: Verify whether the metadata follows an XML schema specified in ISO/TS 19139.

c) Reference: Section 8 of this technical guideline, ISO/TS 19139

b) Test Method: Inspect whether provided XML schema is conformant to the encoding specified in ISO 19139 for each metadata instance.

NOTE 1 Section 2.1.2 of the Metadata Technical Guidelines discusses the different ISO 19139 XML schemas that are currently available.

A.9.3 Metadata occurrence test

a) Purpose: Verify whether the occurrence of each metadata element corresponds to those specified in section 8.

c) Reference: Section 8 of this technical guideline

b) Test Method: Examine the number of occurrences for each metadata element. The number of occurrences shall be compared with its occurrence specified in Section 8:

NOTE 1 Section 2.1.2 of the Metadata Technical Guidelines discusses the different ISO 19139 XML schema

A.9.4 Metadata consistency test

a) Purpose: Verify whether the metadata elements follow the path specified in ISO/TS 19139.

c) Reference: Section 8 of this technical guideline, ISO/TS 19139

b) Test Method: Compare the XML schema of each metadata element with the path provide in ISO/TS 19137.

NOTE 1 This test does not apply to the metadata elements that are not included in ISO/TS 19139.

A.9.5 Encoding schema validation test

a) Purpose: Verify whether the provided dataset follows the rules of default encoding specified in section 9 of this document

c) Reference: section 9 of this technical guideline

b) Test Method: Inspect whether provided encoding(s) is conformant to the encoding(s) for the relevant application schema(s) as defined in section 9:

NOTE 1 Applying this test to the default encoding schema described in section 9 facilitates testing conformity with the application schema specified in section 5. In such cases running this test with positive result may replace tests from A1.1 to A1.4 provided in this abstract test suite.

NOTE 2 Using Schematron or other schema validation tool may significantly improve the validation process, because some some complex constraints of the schema cannot be validated using the simple XSD validation process. On the contrary to XSDs Schematron rules are not delivered together with the INSPIRE data specifications. Automating the process of validation (e.g. creation of Schematron rules) is therefore a task and an opportunity for data providers.

A.9.6 Coverage multipart representation test

a) Purpose: Verify whether coverage data encoded as multipart messages comply with the multipart representation conformance class defined in GML Application Schema for Coverages [OGC 09-146r2].

b) Reference: OGC standard GML Application Schema for Coverages [OGC 09-146r2].

c) Test Method: Inspect whether coverage data encoded as multipart messages comply with the multipart representation conformance class defined in GML Application Schema for Coverages [OGC 09-146r2].

NOTE further information is provided in section 9.4 of this technical guideline.

A.9.7 Coverage domain consistency test

a) Purpose: Verify whether the encoded coverage domain is consistent with the information provided in the GML application schema.

b) Reference: Section 9.4.1.2 of this technical guideline.

c) Test Method: For multipart coverage messages compare the encoded coverage domain with the description of the coverage component in the GML application schema

NOTE 1 This test applies only to those multipart messages, where the coverage range is encoded together with the coverage domain (some binary formats).

NOTE 2 .This test does not apply to multipart messages where the coverage range is embedded without describing the data structure (e.g. text based formats).

For coverages include here specific tests related to encoding the range part (TIFF, JPEG2000). For examples please see Elevation or Orthoimagery ATS!

A.9.8 Style test

a) Purpose: Verify whether the styles defined in section 11.2 have been made available for each specified layer.

b) Reference: section 11.2.

c) Test Method: Check whether the styles defined in section 11.2 have been made available for each specified layer.

Annex B
(informative)
Use cases

Include a description of the use cases on which the data secification is based in this annex. The template provided is an adapted version of that proposed in RISE (2006) Methodology and Guidelines on Use Case and Schema Development, version 1.1, deliverable number 15.

A use case is initiated by an actor with a particular goal in mind, and completes successfully when that goal is satisfied. It describes the sequence of interactions between actor and the system necessary to deliver the service that satisfies the goal. Actors are parties that interact with the system under consideration. An actor may be a class of users (e.g. an analyst or a system administrator), a role a user can play (a data provider), or other systems (e.g. a flood early warning system).

Generally, use case steps are written in an easy-to-understand structured narrative using the vocabulary of the domain. This is engaging for users who can easily follow and validate the use cases, and the accessibility encourages users to be actively involved in defining the requirements.

If you have difficulties with the use case description, start by thinking about the final product (the data set created by executing the use case) and then go backwards step-by-step. through the process of producing it.

The use cases should be described using the structured template included in this section. See below for a fictional example for filling the template.

Use Case Description	
Name	*Calculate flood impact*
Primary actor	*Analyst*
Goal	*To assess the presumed impact of a flood with a particular extent.*
System under consideration	*Flood Information System *)*
Importance	*High*
Description	*The analyst calculates for a given flood extent a set of maps that shows the affected area, number of people, and types of land use that are affected by administrative unit (NUTS3).*
Pre-condition	*Flood extent has been calculated (if the analysis shall be based on a simulated flood extent)*
Post-condition	*Flood impact data set*
Flow of Events – Basic Path	
Step 1	*The analyst imports the flood extent*
Step 2	*The analyst identifies the administrative units (NUTS3) affected by the flood*
Step 3	*For each administrative unit the analyst calculates the area that the flood covers (in ha)*

Use Case Description	
Step 4	*For each administrative unit the analyst calculates the number of people living in the flooded area, based on a population density map.*
Step 5	*For each administrative unit the analyst calculates the affected land cover type (in ha) based on land cover information.*
Step 6	*The analyst combines all three thematic layers in a single flood impact dataset*
Flow of Events – Alternative Paths	
	NONE
Data set: Flood extent	
Description	*Flood extent showing the total extent of the flood*
Type	*input*
Data provider	*Flood monitoring centre*
Geographic scope	*Country XYZ*
Thematic scope	*Flood extent. Either based on historic observation or on flood simulation (see use case 'calculate flood extent').*
Scale, resolution	*1:25 000*
Delivery	*Online*
Documentation	*http://floods.country.xyz*
Data set: NUTS 3	
Description	*Administrative boundaries*
Type	*input*
Data provider	*EUROSTAT*
Geographic scope	*European*
Thematic scope	*Administrative boundaries*
Scale, resolution	*1:250.000*
Delivery	*Online*
Documentation	
Data set: Population density map	
Description	*Population density map*
Type	*input*
Data provider	*Country's statistical office*
Geographic scope	*Country XYZ*
Thematic scope	*Population density per grid cell for a 250 x 250 m grid*

Use Case Description	
Scale, resolution	*250m*
Delivery	*DVD*
Documentation	*http://statistics.country.xyz/populationDensity*
Data set: CORINE Land Cover	
Description	*Corine Land Cover 2006 raster data - version 13 (02/2010)*
Data provider	*EEA*
Type	*input*
Geographic scope	*Country XYZ*
Thematic scope	*Raster data on land cover for the CLC2006 inventory*
Scale, resolution	*250m*
Delivery	*online*
Documentation	*http://www.eea.europa.eu/data-and-maps/data/corine-land-cover-2006-raster*
Data set: Flood impact	
Description	*The output of the flood impact analysis*
Data provider	*The analyst's organisation*
Type	*output*
Geographic scope	*CountryXYZ*
Thematic scope	*Flood impact indicator (scale 1-5) by NUTS 3 administrative unit*
Scale, resolution	*1:250.000*
Delivery	*online*
Documentation	*http://www.flooding.xyz/flood-impact.html*

**) The use case, system and data sources are fictive*

*Where several use cases are described belonging to the same system, a UML use case diagram may be included for illustration. This diagram should include the primary actor(s) (note that every use case should only have **one** primary actor), the boundary of the system under consideration and the use cases.*

In the example diagram below, two use cases (calculate flood extent, calculate flood impact) are shown that are both executed using the flood information system. Note that the 'calculate flood extent' use case should only be modelled as a separate use case if the generated information is valuable in its own right. If it only used in the 'calculate flood impact' use case, the task of creating the flood extent should be modelled as part of that use case.

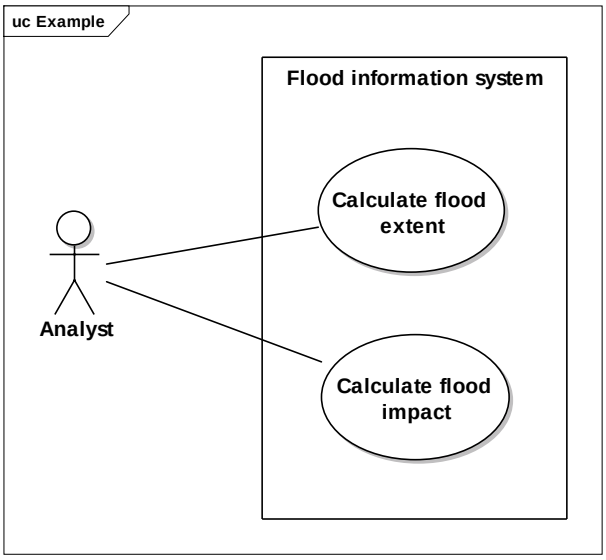


Figure 7 – Example UML use case diagram

This annex describes the use cases that were used as a basis for the development of this data specification.

B.1 <Use case name>

Use Case Description	
Name	*A short name for the use case, usually describing an activity, e.g. predict flood extent, estimate impact of pollutant on human health* <name>
Primary actor	*The main person or system interested in the outcomes of the task* <primary actor>
Goal	*The goal of the primary actor, i.e. the state or product that shall be produced by successfully executing the task, e.g. a flood extent map; an understanding of the effects of the pollutant on health* <goal>
System under consideration	*The (computer) system that the actor interacts with for executing the use case, e.g. a flood simulation model; a GIS* <system under consideration>
Importance	<high/medium/low>
Description	*Give a short narrative description of the task.* <description>
Pre-condition	*What are the pre-requisites? What input is required?* <pre-condition>
Post-condition	*What is the output from the use case? What are the anticipated next steps?* <post-condition>
Flow of Events – Basic Path *Describe the basic steps needed for executing the use case from the perspective of the primary actor. Concentrate on those steps that require or produce data sets.*	
Step 1.	
…	
Step m.	
…	
Step n.	
Flow of Events – Alternative Paths *Only describe alternative paths if these require or produce other data sets than the basic path.*	
Step m.	

Use Case Description	
Step m+1.	
…	
Data set: <Name> *Describe the data sets required or produced when executing the use case. Repeat section for each input or output.*	
Description	*Short description of the data set* <description>
Type	*Is the data set required as an input or produced as the output or intermediate result of the data set?* input|output|intermediate
Data provider	*The organisation providing the data set. If the data set is provided as an output, this is the organisation executing the use case.* <data provider>
Geographic scope	*Describe the geographic extent of the data set* <geographic extent>
Thematic scope	*Describe the content of the data set, e.g. spatial object types, properties, parameters.* <thematic scope>
Scale, resolution	*Describe the resolution or scale of the data set* <scale/resolution>
Delivery	*Describe the delivery medium or access type, e.g. FTP download, WFS, WCS* <delivery>
Documentation	*Include pointers to any additional documentation of the data set* <documentation>

Annex C
(normative)
Code list values

Include the HTML document with the code list values here.

Annex D
(informative)
<Annex Heading>

Include additional information (e.g. use cases, examples) that helps the reader understand the data specification here.

Add/delete further annexes as required.

D.1 <Annex Subsection>

D.1.1 <Annex Subsubsection>