



INSPIRE

Infrastructure for Spatial Information in Europe

INSPIRE Annex II+III Data Specifications Testing Call for Participation

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Acronyms / Glossary

Used Term	Definition
CfP	Call for Participation
CT	INSPIRE Consolidation Team
DS DT	Data Specifications Drafting Team
HTML	HyperText Markup Language
GML	Geography Markup Language
EC	European Commission
INSPIRE	Infrastructure for Spatial Information in Europe
INSPIRE Directive	Directive of the European Parliament and of the Council establishing an infrastructure for spatial information in the Community (2007/2/EC).
IRs	Implementing Rules
JRC	Joint Research Centre
LMO	Legally Mandated Organisation
OGC	Open Geospatial Consortium
SDIC	Spatial Data Interest Community
SLD	Styled Layer Descriptor
TWG	INSPIRE Thematic working group
UML	Unified Modelling Language
WCS	Web Coverage Service
WFS	Web Feature Service
WMS	Web Map Service
XMI	XML Metadata Interchange
XML	eXtensible Markup Language

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Purpose of this document

The purpose of this document is to inform INSPIRE stakeholders about the upcoming testing activities for the development of draft INSPIRE data specifications for the spatial data themes (further **data specifications development**) defined in Annex II and III of the INSPIRE Directive (2007/2/EC). According to the provisions of Art. 7, the Annex II/III INSPIRE data specifications will constitute the foundation for an amendment of *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*.

The testing activities will take place in a period of **4 months between 20 June and 21 October 2011**.

Testing of the INSPIRE Annex II+III data specifications is one of the steps defined in the Methodology for the development of data specifications (c.f. D 2.6, section 5.1.2)¹. The main aim of the testing process is to review the draft INSPIRE Annex II+III themes data specifications (Version 2.0) under real-world conditions and report back to Thematic Working Groups and INSPIRE Consolidation Team the gained experience. This process can also provide the first test bed for interaction with and between the participating stakeholders. It is an opportunity for them to team up, to collaborate on the testing and exchange of experiences.

The cost benefit considerations obtained during the testing will also help to shape version 3 of the data specifications.

The intended readership of this document is the stakeholders of the INSPIRE Directive, and in particular Spatial Data Interest Communities (SDICs) and Legally Mandated Organisations (LMOs).

This document describes the rationale and the objectives of the testing, defines the required background material, and identifies the principal contributions sought and the timeframe of the process.

The readers are recommended to carefully read this document before responding to the Call.

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

¹ http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/inspireDdataspecD2_6v2.0.pdf

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1 Introduction

1.1 Rationale

The INSPIRE Directive 2007/2/EC was published in the Official Journal of the European Union on 25 April 2007, and entered into force on 15 May 2007. INSPIRE lays down general rules for the establishment of an infrastructure for spatial information in Europe, for the purposes of environmental policies and policies or activities which may have a direct or indirect impact on the environment.

This Call for Participation (CfP) concerns the testing phase of the draft INSPIRE data specifications for the Annex II and III spatial data themes. The testing phase is part of the roadmap defined by the Consolidation Team (CT) in order to guide the work of the Thematic Working Groups (TWGs) for the Annex II and III data specifications.

1.2 Main principles

This CfP is based on the following **main principles**, taking into consideration the feedback received from the participants at Annex I testing and INSPIRE stakeholders:

- The duration of the testing period is 4 months.
- The testing should mainly focus on transformation feasibility.
- Where possible, transformed data (compliant with the proposed data specifications) should be made available for subsequent fitness for purpose testing.
- If requested by testing participants, JRC support the testing by setting up tools and services.
- Where possible, testing participants should make concrete proposals for the improvement of the draft data specifications as part of the parallel SDIC/LMO consultation. The context for the concrete proposals will be provided through a short testing report describing the testing set-up and execution.

1.3 INSPIRE Directive: recitals and articles related to testing

The requirement to test of the data specifications is deduced from the following recitals and articles of the Directive:

The Implementing Rules laying down technical arrangements for the interoperability and, where practicable, harmonisation of spatial data sets and services, are requested by the Directive in Art. 7. The INSPIRE Directive states in Art. 7(5) that “representatives of Member States at national, regional and local level as well as other natural or legal persons with an interest in the spatial data concerned by virtue of their role in the infrastructure for spatial information, including users, producers, added value service providers or any coordinating body shall be given the opportunity to participate in preparatory discussions on the content of the implementing rules referred to in paragraph 1, prior to consideration by the Committee referred to in Article 22(1).”

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The Implementing Rules will be based on the technical provisions of the INSPIRE data specifications, currently being developed by the Thematic Working Groups for each of the data themes listed in Annex II and III of the Directive.

Art. 7(2) further specifies that the Implementing Rules shall consider, amongst others, feasibility and cost-benefit aspects.

Recital (6) is particularly relevant to the vision of INSPIRE stating that the European spatial data infrastructure should allow “to combine spatial data from different sources across the Community in a consistent way”.

Recital (13) clarifies that INSPIRE should not set requirements for the collection of new data, while (16) states that the Implementing Rules should be based, where possible, on international standards and should not result in excessive costs for the Member States.

2 Testing scope and purpose

2.1 Scope

The testing will be based on the draft INSPIRE data specifications v2.0 developed by the Thematic Working Groups (TWGs) for the INSPIRE Annex II and III themes:

Annex II

1. Elevation
2. Land cover
3. Orthoimagery
4. Geology

Annex III

1. Statistical units
2. Buildings
3. Soil
4. Land use
5. Human health and safety
6. Utility and governmental services
7. Environmental monitoring facilities
8. Production and industrial facilities
9. Agricultural and aquacultural facilities
10. Population distribution, demography
11. Area management/restriction/regulation zones and reporting units
12. Natural risk zones
13. Atmospheric conditions
14. Meteorological geographical features
15. Oceanographic geographical features
16. Sea regions
17. Bio-geographical regions
18. Habitats and biotopes

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- 19. Species distribution
- 20. Energy resources
- 21. Mineral resources

NOTE Despite of the fact Annex I themes data specifications will not be the subject of consultations testing participants are welcome to consider them where possible and needed.

2.2 Types of testing

This CfP covers two types of testing activities: “**feasibility testing**” (during Annex I testing called “transformation testing”) and “**fitness for purpose testing**” (Annex I: “application testing”), which are shortly introduced in this section.

The testing should mainly focus on transformation feasibility. However, where possible, transformed data (compliant with the proposed schemas) should be made available for subsequent fitness for purpose testing.

2.2.1 Feasibility testing

The objective of the feasibility testing is to measure the technical feasibility and the efforts related to transforming existing data (e.g., from Member States’ organisations) into data compliant with the requirements and schemas proposed in the data specification documents. The encoding of the data is specified in the INSPIRE data specifications. The data can be transformed using transformation services, but the latter is not the primary goal of the testing. Although the focus of the testing is on the transformation of the data structure, other requirements of the data specifications (for instance for reference systems) can also be considered.

Feasibility testing can include a number of tasks, namely (but not necessarily limited to) the following:

- Development of mapping tables, transformation rules or workflows.
- Implementing the mapping rules in a transformation tool or service.
- Execute the transformation.
- Validate the transformed data against the schema specified in the Encoding section of the data specification (e.g. the GML application schema).
- Provide the transformed data through an INSPIRE Network Service, or through other adequate services².

Note that these tasks do not have to be executed in sequence and, depending on the transformation approach used, some of them may not be required at all.

Feasibility testing should identify areas, where it is difficult or impossible to transform national data sets into the proposed INSPIRE schema. These problems should be

² Since the INSPIRE Annex II/III data models may include coverages and Observations & Measurements (O&M), transformed data could also be made available through OGC Web Coverage Services (WCS) and/or Sensor Observation Services (SOS). While such experiments are not the main focus of this call, they may provide valuable feedback for the maintenance and further development of the Technical Guidance documents on INSPIRE download services.

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highlighted in the comments submitted as part of the SDIC/LMO consultation (see section 2.4) and suggestions should be made for improving the data specifications.

The results of feasibility testing (i.e. data sets that are compliant with the proposed INSPIRE schemas) are recommended to be used as a starting point for fitness for purpose testing (see below). Thus, the testing participants are encouraged to make transformed (sample) data sets available for further testing.

It is highly recommended to keep records of time necessary to perform the transformations necessary to achieve the INSPIRE schema and other specification elements. This is a valuable input for cost-benefit considerations required by the Directive.

For a more in-depth discussion, of feasibility testing, see Annex A.

2.2.2 Fitness for purpose testing

The objective of fitness for purpose testing is to assess the benefits of harmonised data specifications from an end-user or application point of view.

Fitness for purpose testing aims at demonstrating the usefulness of spatial data compliant with the INSPIRE data specifications when addressing real applications – the use cases. These can be either the use cases defined in the INSPIRE data specifications (located in Annex B) or use cases defined by the testing participants, e.g. based on existing applications or tasks (for example based on their routine activities) or any of the use cases provided as exemplified in the auxiliary material for testing. Where possible, they should involve cross-theme, cross-border and cross-language elements.

Fitness for purpose can be tested in a number of ways:

1. In a paper exercise, the data requirements for a specific use case can be compared with the application schemas for a given spatial data theme.
2. Using INSPIRE-compliant data in an existing system, GIS or web client to perform a specific task, analysis or visualisation.
3. Using INSPIRE-compliant data to implement a novel specific task, analysis or visualisation.

Applications where heterogeneous data sets from several data providers (e.g. from different Member States) have to be integrated, are especially welcome to assess gain in efficiency (reduction of data harmonisation efforts).

2.2.3 Cost-benefit considerations

Based on the INSPIRE Directive requirements, cost-benefit considerations play an important role in assessing feasibility and proportionality of the proposed INSPIRE spatial data specifications. Testing data specifications against real applications and scenarios will provide an important opportunity for evaluating whether the tested data specifications are well balanced in terms of simplicity/complexity and usability.

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The cost and benefit considerations obtained during the testing will help to shape version 3 of the data specifications, as well as the amendment of the INSPIRE Implementing Rules (IRs) on interoperability of spatial data sets and services.

INSPIRE Data specifications for Annex I are already an example of how data can be made more usable through mapping to a common schema and reference system. INSPIRE Data specifications for Annex II and III themes should, likewise, help to minimise pre-processing costs (although initial investments would be needed). The testing can help to identify and quantify both these costs and benefits.

The information on the costs has to be collected in course of feasibility testing. It may include following elements:

- Time needed for transforming the original data in INSPIRE-compliant schema and specification
- Time needed for developing (reusable) algorithms, software, and tools necessary for transformation
- Notes on qualification / experience of the personnel able to perform the transformations
- Cost of eventual investments (e.g. purchasing new specialised software, training need, etc)

The benefits can be assessed in fitness for purpose testing. We recommend to collect the following information

- Time necessary for preparation of the data to be used in the selected use-case / application when data that is NOT compliant with INSPIRE
- Time necessary for preparation of the data to be used in the selected use-case / application when data that IS compliant with INSPIRE
- Notes on qualification of the personal able to implement the use-case when a) data IS compliant, b) data is NOT compliant with INSPIRE
- Notes whether INSPIRE compliant data can be used in other use-cases applications

Putting INSPIRE compliant data in existing applications are highly appreciated, which provides sound basis for comparison. Repeating the same testing exercise with compliant and non-compliant data gives extraordinary value for assessing the potential benefits. In absence of time records, relative statements and qualitative comparisons are welcome, too.

Different perception of cost-benefit considerations between data providers (who are likely to experience costs associated with INSPIRE compliance) and data users (who are likely to gain benefits from such harmonised data) is expected.

It should be emphasised that the cost-benefit aspects of testing are not less important than technical feasibility. Omitting these parts may send the message that related costs do not constitute an issue for data providers. On the other hand, users are encouraged to give feedback on the work of organisations investing considerable efforts in interoperability arrangements when data is not INSPIRE compliant.

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In order to help testing participant to collect cost-benefit related information, guidance with examples will be provided via testing report template provided by JRC CT.

2.3 Possible contributions

The following, non-exhaustive, list gives examples of possible contributions:

Testing infrastructure

- Providing licences for software / tools (e.g. for data access, viewing or transformation) for the duration of the testing period
- Providing software / tool assistance (support, training or guidance)
- Providing a server/s hosting software / tools available for testing

Feasibility testing

- Providing data for testing including the technical documentation of the data set (Metadata, application schema (UML), encoding (GML/XML or other), data format specification, code lists, portrayal (SLDs...) related to INSPIRE Directive Annex II and III spatial data themes
- Developing mappings between source and INSPIRE data models
- Implementing and performing feasibility tests

Fitness for purpose testing

- Providing INSPIRE-compliant data as a basis for fitness for purpose testing (product of feasibility testing)
- Providing existing, or developing and documenting use cases for fitness for purpose testing
- Performing and reporting about fitness for purpose tests (paper exercise, use in existing applications, implementation of new application)

Other

- Coordinating & management of the tests
- Providing contextual cost-benefit elements not directly related to the testing (e.g. number of data sets in Member state/per LMO level, Average/min/max size of data sets, Frequency and type of use, etc)

A proposal for contribution does not necessarily have to cover all aspects necessary for a test to be performed. It is for instance quite acceptable that a contributor only proposes to provide data sets for testing while another contributor proposes software licences for testing purposes. In order to match proposed contributions, the JRC INSPIRE Data Specifications Team, in collaboration with contributors, will try to match the complementary parts from all responses in order to establish test teams that cover all aspects needed for the testing.

When feasible, testing participants are encouraged to continue with the testing related activities also after the consultation phase is closed and the related report on testing delivered. This can help to transfer their testing experience directly to the process of INSPIRE data specifications implementation.

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2.4 Expected outcomes

The testing activities should result in the following outcomes:

1. Every testing activity should be described in a short (form-based) **report describing the testing set-up, execution and products**. This report will include the following information:
 - Who was participating in the testing (in case of more than one organisation cooperating in the testing activity), and in which role?
 - How the testing was organised / executed? Which data / tools / methodology were used?
 - Which products (see below) have been created during the testing?
 - May the products be used for further testing (e.g. fitness for purpose)? Under which conditions?
 - Information on cost-benefit considerations.

JRC INSPIRE team will provide the report template to help testing participants to collect testing results in comparative way.

If agreed by the testing participants, (parts of) the report will be made publicly available.

2. If the testing activities identify possible improvements of the proposed data specifications, testing participants should also make **concrete change proposals for the draft data specifications**. In order to make it easier for the Thematic Working Groups (TWGs) to consider and incorporate the comments for version 3.0 of the data specifications, **all comments shall be provided as part of the SDIC/LMO consultation**, which will be running in parallel to the testing.

The context for the concrete proposals will be provided through the testing report. Therefore, it will be required to provide a reference to the relevant report when submitting a testing-based comment during the SDIC/LMO consultation.

After the comment resolution phase by the TWGs, the comments received during the SDIC/LMO consultation and the proposed resolutions will be made publicly available.

3. Where possible, testing participants should make available **products resulting from the testing**, e.g. mapping tables, transformed data sets, transformation services, view / download services providing access to the transformed data sets, for further testing.

Both the testing report and the specific comments will help the INSPIRE Consolidation Team (CT) to elaborate the amendment to the Implementing Rules for

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the “Interoperability of Spatial Data Sets and Services” for the Annex II and III themes.

2.5 Benefits for testing participants

There are several potential benefits for SDICs and LMOs to participate in the testing, e.g.

- Get an in-depth insight into the draft data specifications at an early stage in the development process.
- Be able to discuss problems, opportunities and technical options with other testing participants. It may help during the implementation
- Test how well one’s own data sets are aligned with the INSPIRE data specifications.
- Investigate different methods and technical options for data transformation.
- Test the readiness and demonstrate the usefulness of existing transformation tools and methods. To identify the needs for further developments.
- Contribute to and influence the further development of the INSPIRE data specifications and Implementing Rules.
- Evaluate how transformed data sets fits to one’s own data needs, procedures and processes.

2.6 Testing environment

JRC will support the testing activities by providing a set of tools.

2.6.1 INSPIRE Forum testing web site

To support the testing process, the collaborative networking platform will be established via INSPIRE Forum web site³. The main purpose of the INSPIRE Forum Testing web site is to provide the source of relevant information, communication platform for the all testing participants supporting the exchange of the information, experience and knowledge. This place will be also used for uploading and sharing the deliverables of the testing.

2.6.2 Testing infrastructure

If requested by testing participants, JRC will support the setting up of an infrastructure for the testing activities.

Any requests for infrastructural support should be expressed via the registration form.

2.6.3 Web conferences

At the beginning of the testing, a **web kick-off meeting** will be organised to introduce the goals of the testing and the provided tools to support the testing.

³ <http://inspire-forum.jrc.ec.europa.eu/>

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During the testing period, further web conferences may be organised if needed, to discuss occurring issues and to answer questions raised by the participants.

2.6.4 Background related material

Input information is provided by the JRC and represent the work of the Data Specifications Drafting Team, the Annex I, II and III Thematic Working Groups, the JRC INSPIRE Data Specification Team and the INSPIRE Consolidation Team.

The following documents will be provided for the testing process:

- This CfP for testing
- The draft versions 2.0 of the data specifications for the Annex II and III themes, including:
 - GML application schemas;
 - UML model (as XMI exports, Enterprise Architect project files and as an HTML view).
- The “INSPIRE Data Specifications Cost-benefit considerations” document, as a guideline for the cost-benefit considerations that are part of the test report template.
- INSPIRE Annex I testing summary report
- Short presentations of each TWG describing the Annex II/III themes. These will be given at the INSPIRE Conference and be made available as recordings.
- Background material on transformation methodologies applied in different INSPIRE-related projects.
- Examples of use-cases where more than one theme are needed

3 Administrative issues

3.1 Who can participate?

All registered SDICs and LMOs are invited to participate in the testing.

Global Monitoring for Environment and Security (GMES) projects are being requested to contribute to the testing, by verifying if and to what extent the proposed INSPIRE data specifications cover both input information requirements, and the GMES service products.

Participants to the testing of INSPIRE Annex II and III data specifications are encouraged to use these Terms of Reference to report back on their findings, and to consider participating also to the Group on Earth Observations (GEO) Architecture and Implementation Pilot (AIP) 4 for coordination and harmonization purposes across the GEO user communities.

If your organisation, project, initiative or any related stakeholders activity is interested in participating, but it is not yet registered as an SDIC or LMO, you can do so at any time on the INSPIRE web site at

<http://inspire.ec.europa.eu/index.cfm/pageid/7>.

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3.2 How to apply?

An online registration form will be made available to registered SDICs and LMOs. Registration will only be possible through this online form, which is available to registered SDICs and LMOs at their login page on the INSPIRE website.

During the registration, the following information should be provided:

- **Contact person:** Each registering SDICs or LMOs needs to nominate a testing contact person who is ensuring the communication with the JRC INSPIRE Data Specification Team and the distribution of information within the registered SDIC or LMO. The contact person will nominate the other members of SDIC/LMO testing team, who will receive access to the communication tools used for the testing.
- The **spatial data themes** covered by the testing
- Contributions to the **testing infrastructure**
- Contributions to the **feasibility testing**
- Contributions to **fitness for purpose testing**
- Other SDICs or LMOs with whom a **cooperation** is already planned

Note that it will be possible to submit only one registration form per SDIC or LMO, although a SDIC or LMO can participate at more than one team for testing.

3.3 Deadline for registration

The registration will remain open until the start of the testing period on 20 June. However, we **encourage SDICs and LMOs to register by 15 May** to facilitate better planning and organisation of the required support.

3.4 Type of contribution

All contributions of SDICs and LMOs to the testing are in-kind contributions. This includes the use of the testing infrastructure needed to perform the tests.

3.5 Deliverables

All registered testing participants should provide a report describing the testing set-up, execution and products. In addition, testing participants are encouraged to make available products resulting from the testing activities for further testing (e.g. of fitness for purpose) and to make concrete proposals based on the results from the testing, for improving the draft data specifications through the parallel SDIC/LMO consultation.

Detailed instructions how to provide the report and submit comments will be provided to the participants at a later stage.

For further details on expected outcomes, see section 2.2.

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3.6 Time Planning

Activity	Milestone
CfP published	April 2011
Submission of application form for testing registration	15 May 2011
Start of ANNEX II+III testing 2 nd draft version of themes data specifications	20 June 2011
End of ANNEX II+III testing Delivery of comments and documentation to CT	21 October 2011

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- [2] INSPIRE Implementing Rules on interoperability of spatial data sets and services (IR-ISDSS)
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:323:0011:0102:EN:PDF>
- [3] Amendment of IR-ISDSS regarding code lists
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:031:0013:0034:EN:PDF>
- [4] INSPIRE data specifications web site:
<http://inspire.jrc.ec.europa.eu/index.cfm/pageid/2>
- [5] Guidelines for Cost-Benefit Considerations in INSPIRE Data Specification Development;
- [6] Feasibility and cost-benefit considerations for implementing rules on interoperability of spatial data sets and services:
- [7] Development of Technical Guidance for the INSPIRE Transformation Network Service - State Of The Art Analysis:
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[12] INSPIRE Forum group on “Transformation”:

<http://inspire-forum.jrc.ec.europa.eu/pg/groups/3101/transformation/>

[13] Video: Introduction to INSPIRE transformations and the Transformation Network Service:

http://inspire-forum.jrc.ec.europa.eu/pg/izap_videos/group:3101

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Annex A

Feasibility testing

The relevant sections of the INSPIRE data specifications for feasibility testing are sections 5 and 9, which constitute the application schema and its encoding, and Section 6 specifying the coordinate reference system (CRS)⁴.

The main technical challenges of feasibility testing are:

- Establish cross-walks or mappings between the local schema of a data set provided by testing participants and the (common) application schema specified in the INSPIRE data specifications. These mappings can be documented as mapping rules in some kind of formal language, or as mapping tables.

Note that, depending on the source and target data model, these mappings can be quite complex and may involve several GIS operations.

- Based on these mappings, implementing and executing a transformation from the testing data set into the encoding of the INSPIRE application schema, which is specified in the delivery section (Section 9.2) of the INSPIRE data specification. This transformation of data also covers transformation of data in one coordinate reference system into another (here according to Section 6 in the data specifications and the specification of the Annex I theme Coordinate Reference Systems).

The main issues to be addressed for data transformation include:

- Can local data be mapped to the common INSPIRE schema?
- Do existing data cover the content required?
- Do existing solutions (tools and/or services) allow the transformation of source data into INSPIRE-compliant data?
- Can local CRS be mapped to target CRS and is there loss in precision?
- What are the technical challenges for transformations?

Creating and documenting mappings

To allow transformation of source (local) datasets to the target INSPIRE compliant datasets, mapping rules from the input data schema to INSPIRE application schemas have to be specified. These schema mappings can be specified using existing model mapping languages. As identified in State Of The Art Analysis prepared for INSPIRE Transformation Network Service [6], there is no standard meta-language for model mappings. Furthermore, few standards exist for schema transformations and schema mapping encodings.

When preparing mappings, the level of schema transformation should be taken into the consideration. These levels describe different types of functionality that will be required in order to transform schemas of varying complexity. When the source

⁴ Examples of Annex I INSPIRE Data Specifications can be found at <http://inspire.jrc.ec.europa.eu/index.cfm/pageid/2>

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schema is closely aligned to the target schema, a lower level of transformation functionality will be required.

Each level incorporates all functionality from earlier levels, i.e. if a transformation service supports functionality in level n, it should also support all functionality in level n – 1.

Level	Description
Level 1	Renaming classes and attributes.
Level 2	Simple attribute derivation.
Level 3	Aggregating input records.
Level 4	Complex derivation and dynamic type selection.
Level 5	Deriving values based on multiple features.
Level 6	Conflation and model generalisation.

For more information about the transformation levels description see Appendix B – Schema Transformation Levels in the State Of The Art Analysis [6].

The methodologies for documenting the mappings also vary depending on the language, tools, type of transformation and datasets used for testing. In general basic expressions (pathnames, conditions) constructs (comparison, arithmetic, string, date/time, logical, identifier, geometric functions, miscellaneous) as well as joins for creating mappings between a source and a target dataset have to be used. Generalization rules can play also important role when mapping is taking place.

Possible methods to document mappings include mapping tables and mapping rules expressed in a formal rule language.

Examples of mapping methods:

- INSPIRE Schema TNS: Development of Technical Guidance for the INSPIRE Transformation Network Service - Prototype Report for the INSPIRE Schema Transformation Network Service. Chapter 3.1.3 Model Mapping Definitions.
- ESDIN: D10.3 version 1.1 Draft transformation specification per NMCA. Chapter 4 Mapping descriptions for transformation column
- EURADIN: Intermediate Deliverable WP 3 Address Data Model Report. Chapter 2.1.1 INSPIRE data model matching.

Implementing and executing the transformation

No particular approach is prescribed for the implementation and execution of the data transformation. Broadly, two overall approaches can be distinguished:

- On-the-fly transformations
- Off-line transformations

On-the-fly transformations are used when data stored in one schema is requested in another, and the transformation is executed synchronously. Here, request/transformation/response are considered as one action. An example is that

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national road data in a local schema is, upon requested, transformed into an INSPIRE-compliant schema. The data is not stored (persistently) in the INSPIRE-compliant schema but transformed into the INSPIRE-compliant schema when requested. In the on-the-fly transformation, query transformation needs to be taken into consideration. If the data is not stored persistently in the common schema, any query expressed using the common schema has to be transformed into the local schema.

Off-line transformations are used in two different situations:

- Ad-hoc or
- At (ir)regular intervals

Ad-hoc off-line transformation occurs when data stored in one schema is requested in another, and the transformation is executed asynchronously. Here, request/transformation/response are executed as a sequence of actions. An example is that a request for road data in the INSPIRE-compliant schema is received. Then a transformation process is initiated and, when it has completed, the requester is notified and he/she can download the data. This approach is useful, e.g., when data is stored in complex models and considerable processing time is required in order to execute the transformation.

(Ir)regular off-line transformation occurs when data stored in one schema is transformed at (ir)regular intervals into another schema independently of external requests. An example is that road data in a local schema is transformed every night into a representation in the INSPIRE-compliant schema. Such a transformation could be scoped only to data that has been updated since the last transformation. In the off-line transformation setting, attention should be given to the fact that replicas will exist of the same features, thus inconsistencies may occur.

The transformations can be done either via (network) services or using desktop software solutions/products. The data output of the transformations can be stored either in files or distributed via INSPIRE network services, any other adequate service or through OGC WFS/WMS/WCS/SOS. LMOs and SDICs are free to choose which approach to take for the testing purposes. The decision depends on skills, experience, and software available. Even a comparative test of various approaches would be useful. What is important is that the required costs (resources, investment in software/software developments, and hardware) are assessed.