INSPIRE

Infrastructure for Spatial Information in Europe

INSPIRE Annex I Themes Testing Summary

Title	INSPIRE Annex I Themes Testing Summary
Creator	JRC INSPIRE Data Specifications Team
Date	2011-06-22
Subject	Spatial data specifications development and implementation.
Status	Draft
Publisher	JRC INSPIRE Data Specifications Team
Type	Text
Description	The summary of the process of INSPIRE Annex I themes spatial data specifications testing.
Contributor	JRC Data Specifications Team, Annex I TWGs, SDICs & LMOs testing participants
Format	Portable Document Format (pdf)
Source	
Rights	Public
Identifier	inspire_annex_i_testing_summary.pdf
Language	En
Relation	INSPIRE Roadmap for data specifications http://inspire.jrc.ec.europa.eu/index.cfm/pageid/2/list/5
Coverage	Annex I data specification development process (2008-2009)

These are Dublin Core metadata elements. See for more details and examples http://www.dublincore.org/.

Acronyms / Glossary

Used Term	Definition
ATKIS	Authoritative Topographic-Cartographic Information System
BIOR	Biospheric Reservation
CP	Cadaster Parcel
CRS	Coordinate Reference System
CSV	Comma Separated Values
CT	Consolidation Team
CVO	Cadastral Virtual Office
DBF	Data Base Format
DG JRC	Directorate General Joint Research Centre
DM	Data Model
DS	Data Specification
DXF	Drawing Exchange Format
EDINA	National Datacentre, University of Edinburgh
ETRS-LAEA	European Terrestrial Reference System - Lambert Azimuthal Equal Area
EU	European Union
FGI	Finnish Geodetic Institute
FME	Spatial Data Transformation Platform
GCM	Generic Conceptual Model
GDF	Geographic Data Files
GEMET	GEneral Multilingual Environmental Thesaurus
GIS	Geographic Information System
GML	Geography Markup Language
HTML	HyperText Markup Language
HELCOM	Baltic Marine Environment Protection Commission
IDEE	Working Group of the Commission on Geomatics (National Geographic High Council), Spain
IFCD	Inspire Feature Concept Dictionary
INSPIRE	Infrastructure for Spatial Information in the European Community
ISO	International Organization for Standardization
IT	Information Technology
LMO	Legally Mandated Organisation
LRS	Linear Reference System
MIF	MapInfo Interchange Format
N2000	Natura 2000
NLS	Ministry of Environment, Finland
NSG	National Street Gazeteer
NVR	Naturvårdsregistret
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PT	Protected Trees
SDE	ESRI ArcSDE (Spatial Database Engine)
SDIC	Spatial Data Interest Community
SHP	ESRI Shapefile
Strandja NPD	Strandja Nature Park Directorate
TWG	Thematic Working Group
TN	Transport Network
TXT	Text File
UML	Unified Modeling Language
UNESCO	United Nations Educational, Scientific and Cultural Organization

XLS	Microsoft Excel Format
XML	Extensible Markup Language
WFD	Water Framework Directive
WFS	Web Feature Service

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Executive summary

Establishment of spatial data infrastructures as frameworks offering effective evolvement of the spatial information usage to support the large number of the policies and activities on across the various levels of public authority in Europe, requires measures coordinating the involved stakeholders. The Directive 2007/2/EC[1] 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.

As a building block of the infrastructure, provisions on the interoperability of spatial data sets and services are foreseen. Interoperability of spatial data sets (for themes described in Annexes I, II, III of the INSPIRE) is one of the INSPIRE components aiming to support the establishment of a European infrastructure, which will be based on the infrastructures for spatial information that are created and maintained by the Member States.

The development framework elaborated by the INSPIRE Data Specification Drafting Team[2] aims at keeping the data specifications of the different themes coherent. It summarizes the methodology to be used for the data specifications and provides a coherent set of requirements and recommendations to achieve interoperability.

One of the key steps defined in the Methodology for the development of data specifications (D 2.6) is the "STEP CT-6: Implementation, Test and Validation". In the test, a representative part of the relevant use cases should be implemented in conformance with the INSPIRE data specification. The use cases shall then be executed with real world data.

The first version of the data specifications was open for consultation of the other INSPIRE Drafting Teams (metadata and network services) and the Commission in autumn 2008. Based on the comments received on that preliminary version, version 2 was produced by the INSPIRE Thematic Working Groups[3] (TWGs) and submitted to the consultation of the INSPIRE stakeholders from December 2008 to March 2009. At the same time the data specifications v2.0 were made available for testing.

The phase of testing by stakeholders was organized by the Commission with appropriate instructions and facilities to support registration, teaming-up for testing, the sharing of experiences, tools, data and results among the participants. Eighty two SDIC and LMO registered for testing, some of the registrations representing European projects with the participation of several Member States and ad-hoc consortium organized for testing the INSPIRE data specifications for Annex I. All the testing exercise was done in-kind by the stakeholders.

Most of the test was focused on transformation from local to INSPIRE data model, in a modality of online or offline transformation. Only a few applications test were carried out. There was a good interaction between the testers and the Thematic Working Groups. The findings from the testing were submitted in 90 standardized reports. The results from those reports were taken into consideration by the TWGs to prepare version 3 of the data specifications. Moreover, useful lessons were learned from the process that will be applied to Annex II and III themes.

[1] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32007L0002:EN:NOT
[2] http://inspire.jrc.ec.europa.eu/index.cfm/pageid/2/list/3
[3]

Purpose of this document

The main purpose of this document is to summarize the results from the testing process of the INSPIRE Annex I themes data specifications. The testing process was aimed to review the draft INSPIRE Annex I themes data specifications (Version 2.0) under the real world conditions, to verify its feasibility and to provide a first attempt information and cost and benefits considerations. This testing process also provided the first test bed for interaction with and between the representatives of the stakeholders and allowed them to team up together to exchange the available contribution as well as experiences.

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

1 Introduction

The Directive 2007/2/EC of the European Parliament and the Council establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) foresees Implementing Rules laying down technical arrangement for interoperability, and where practicable, harmonization of spatial datasets and services as part of the infrastructure.

This testing reports summary concerns the testing phase of the draft INSPIRE Data Specifications for the Annex I spatial data themes, which took place from 14.10.2008 to the 06.03.2009. This testing phase represented one of the steps defined in the Methodology for the development of data specifications[4] and was 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 I data specifications[5].

1.1 INSPIRE Directive: recitals and articles related to testing

The following recitals and articles of the Directive refer to the testing of the data specifications:

Art. 7 of the Directive foresees Implementing Rules laying down technical arrangement for interoperability, and where practicable, harmonization of spatial datasets and services.

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 I of the Directive.
Art. 7 further specify 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.

[4] http://inspire.jrc.ec.europa.eu/index.cfm/pageid/2/list/1
[5] http://www.ec-gis.org/inspire/reports/ImplementingRules/DataSpecifications/Roadmap_annexI.pdf

2 Testing Essentials

2.1 Purpose of the testing

The main purpose of the testing was to test and review the draft INSPIRE Annex I themes data specifications (Version 2.0) under the real world conditions.
In practice the testing had consequences on the following: (defined in chapter 2.5):

- The TWGs used the results of the testing to adapt and/or refine the data specifications for their respective themes (see chapter 4.2).
- The INSPIRE CT used the results of testing and the general feedback received during the testing phase in the elaboration of the draft Implementing Rules for the "Interoperability of Spatial Data Sets and Services" for the Annex I themes. In particular, the feedback helped in some cases to decide which content of the data specifications will be used in the Implementing Rules, and which will stay in guidance documents (see chapter 4.1). The cost and benefit considerations, when available, help on that decision.
- Registered SDICs and LMOs used testing results to assess how the proposed INSPIRE Annex I themes data specifications can be used under their own conditions (see chapter 4.3).

2.2 Scope of testing

The scope of testing was limited to:

- The INSPIRE Data Specifications (Version 2.0);
- The INSPIRE Annex I themes:
  - Coordinate reference systems;
  - Geographical grid systems;
  - Geographical names;
  - Administrative units;
  - Addresses;
  - Cadastral parcels;
  - Transport networks;
  - Hydrography;
  - Protected sites.
- The technical feasibility of transformation and application of existing data to INSPIRE data specification and data model in particular
- Cost-benefits considerations of harmonizing data.

2.3 Types of testing

The testing process can be of two main types:

- Transformation testing;
- Application testing.

Transformation testing was focused on the transformation of local data (e.g., from Member States' organizations) into the draft INSPIRE application schemas. The encoding of these schemas, was specified in the INSPIRE data specifications. The testing could use transformation services, but they were not necessarily part of the testing. Although the focus of the testing was on the transformation of the data structure encodings, other aspects of the data specifications could also be taken into account (such as metadata, quality, and portrayal).
Application testing was based on real world use cases in order to test the INSPIRE harmonized data specifications, possibly involving cross-theme, cross-border and cross-language elements.

It was up to the testers to consider the time available and resources, whether they will execute both tests, as application testing was strongly depending on the results from the transformation testing.

Most of the test was focused on transformation from local to INSPIRE data model, in a modality of online or offline transformation. Only a few applications test were carried out. An important reason for that was the short period available in the roadmap for testing. More detailed results from the testing are described in chapter 3.

2.4 Testing timing

Although core time for the testing took place at the turn of 2008/2009, the process of testing was initiated earlier as it was important to establish the testing environment. The whole process could be divided to the main tree parts according the following schema:

The first part of the process was focused on the establishment of the testing environment. Main testing activity took place within almost 3 months. This phase was closed by the deadline to be able to collect and evaluate the testing results, in line with the narrow INSPIRE roadmap. Nevertheless, to allow the testing participant to continue their testing when relevant and to deliver the results later on, considering the interest to keep the mutual access to the other testing participants and their testing results, the INSPIRE Wiki testing platform remained open and updated reports could be delivered later.

Summary of the main milestones with the activities setting the scene:

Milestone	**Activity**
23.07.2008	INSPIRE Annex I data specifications testing - Call for Participation launched.
06.10.2008	INSPIRE Annex I Data Specification (version 1) released to testers.
10.10.2008	List of testing participants released to testers.
13.10.2008	Const Benefit Consideration and Testing Report Template documents released to testers.
14.10.2008	Launching of INSPIRE Annex I Data Specification testing.(Kick Off Web Meeting).
14.10.2008	Setting up the INSPIRE Testing Wiki collaboration platform.
05.11.2008	Interim Web Meeting presentation.
19.12.2008	INSPIRE Annex I Data Specification (version 2) released to testers.
06.03.2009	INSPIRE Annex I Testing Deadline for testers to deliver the Testing Reports.

2.4.1 Call for participation

The European commission via DG JRC launched the Call for Participation for the involvement of SDICs and LMOs in the testing of the INSPIRE Annex I data specifications (draft versions) [6]. This call has provided the opportunity to express the interest of the stakeholders to participate in-kind on the testing with their contribution through the webform registration. The call was open to 15.09.2009 and there were 82 registrations from the registered SDICs and LMOs[7].

2.4.2 Registration of the testing participants

The main purpose of the registration was to identify the dedicated group of the stakeholders willing to execute the testing within their own infrastructures. Creating this kind of focused group helped to make the communication between the testing participants straighter and more effective. Registered testing participants (Annex 1) expressed their willingness to join the testing process replying to the Call for Participation and indicate their foreseen contribution in one or more areas specified as:

- Data provider;
- Software provider;
- Transformation testers;
- Application testers.

Together with the information about the estimation of required effort (in average 43 person days), testing participants indicated, whether they agree to share the results of the testing within the other testing participants and if they are planning to cooperate with other SDICs and LMOs.

2.5 Roles in testing

To ensure the INSPIRE Annex I testing process will fulfill expectations defined in the Methodology for the development of data specifications (D 2.6, Version 3.0)[8] the organizational framework with the participants had to be established. To proceed the testing the two main roles were identified:

- **Testing facilitators** represented by European Commission (INSPIRE CT) and TWGs;
- **Testing participants** registered as SDICs and LMOs.

2.5.1 Testing facilitators

Executing the testing process requires facilitating all related activities including creation of the testing environment which was established by the INSPIRE CT assisted by the TWGs. Besides the general organization of the process, the need for collaborative environment ensuring the connection with the testing participants has been identified.

2.5.2 Testing participants

Testing participants were the representatives of the stakeholders willing to test the proposed INSPIRE Annex I data specifications under the real world conditions. They have been represented as registered INSPIRE SDICs and LMOs. Projects, organizations, companies, consortia, or other parties that were interested, but not yet registered as a SDIC or LMO, were invited to register as such through the INSPIRE website in order to take part in the testing.
Important is to highlight the participation was based on in-kind contribution.

[6] http://inspire.jrc.ec.europa.eu/index.cfm/pageid/241/documentid/690
[7] http://inspire.jrc.ec.europa.eu/index.cfm/pageid/2/list/9
[8] http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/DataSpecifications/D2.6_v3.0.pdf

In replay to the Call for participation, 82 stakeholders expressed registered to join the process. Some European projects with the participation of several Member States registered for testing, as well as ad-hoc consortium organized for testing the INSPIRE data specifications for Annex I.

Participants expressed the area of their main interest in the testing process, specifying the scope of their involvement as data, hardware, software, human resources, and knowledge provider / user, or as the opportunity to better study/understanding the proposed INSPIRE data specifications.

Very important aspect was the opportunity to team up within the registered testing participants, to share the resources and knowledge when execute the testing.

2.6 Tools and material supporting the testing

2.6.1 INSPIRE Testing WikiWebSite

To support the testing process, the collaborative networking platform have been established with the INSPIRE Testing WikiWebSite. The main purpose of the WikiWebSite is to provide the source of relevant information, communication platform for the all testing participants during the testing process, supporting the exchange of the information, experience and knowledge. This space also provides the possibility to team up for the testing participants to the groups/consortiums according their expectations and capacities. All testers had the possibility to provide the current status of their progress during the testing process. Finally the results of the testing summarized in the testing were published here. The WikiWebSite has showed the importance of this kind of communication tool for the support of the interaction within the involved communities.
The WikiWebSite provided the shared webspace, where the testing participants could:

- Find the latest news related to the testing;
- Find the related information:
  - Documentation;
  - Meetings;
  - Participants;
  - Testing Road Map.
- Discuss open issues via categorized Forums;
- Publish the information related their status of the testing;
- Create the testing groups/consortiums;
- Find the final testing reports of all the testing participants.

Some basic statistics summarize the usage of the WikiWebSite:

- 324 registered Wiki Accounts;
- 26 Wiki Forum Threads;
- 46 Wiki Forum Replies;
- 82 registered SDICs/LMOs;
  - 49 Data providers;
  - 11 Software providers;
  - 60 Transformation testers;
  - 34 Application testers;
- 90 final testing reports;
  - From 46 SDICs/LMOs.

2.6.2 WebMeetings with testing participants

To support the testing process, two web-meetings were organized with the testing participants. The main aim of those events was to provide the guidance with testing related information and

answer the questions raised by the meetings participants. Both meetings were recorded and voice recordings together with the presentations were provided via WikiWebSite.

The first web-meeting was the Kick off meeting for testing and took place on 14th October 2008 with the attendance of 80 participants. This meeting was split into two main parts, where the first part was focused on the introduction to the testing process, explanation of the organization, supporting tools and expectations from the testing reports. The second part of the meeting was devoted to the answers of the questions, the meeting participants rise during the first part of the meeting via webconferencing tool. This event provided the first opportunity for the direct interaction with the stakeholders.

The second webmeeting was held on 05th November 2008, with the attendance of about 40 participants. The meeting was focused on updating the testing participants with the current status of the Data Specification development, further information about the usage of WikiWebSite for the teaming up as well as for the discussions in the Wiki Forum. The meeting also provided the opportunity to raise the questions.

The experience with these web-meetings showed the importance of to support the community of testers. This interaction can significantly contribute to the awareness rising as well as the higher quality of the testing deliverables, encouraging the discussions and potential cooperation across the community and making INSPIRE process more transparent.

2.6.3 Supporting material

To ensure the testing participants were provided with the relevant and accurate information, the process had to be accompanied with the relevant support material.

The list of the material supporting the testing process:

- INSPIRE Annex I data specifications testing Call for Participation;
- INSPIRE Annex I data specifications (Version 1.0);
- INSPIRE Annex I data specifications (Version 2.0):
  - Html export for UML model view;
  - GML application schemas;
  - UML model.
- The “INSPIRE Data Specifications Cost-benefit considerations” document (as a guideline for the cost-benefit considerations that are part of the test report template);
- Testing report template.

2.6.4 Testing reports

Testing report webform has provided the structured space where the testing participants could summarize the experience they collected during the testing process. The webform was based on the testing report template, where testing participants were asked to provide the answers for questions. There were only 2 mandatory and 53 optional questions. Testing participants were also invited to use the upload facility to attach any related material to the testing reports.

3 Testing results

The testing process was summarized in 90 testing reports provided by the 36 testing participants (Annex 2), distributed by the Member States as shown in Table 1. The complete geographic coverage may be even wider, as some projects and testbeds were established across the various partners from various countries. The participation of the LMOs was slightly higher (20 LMOs) than in case of SDICs (16 SDICs). More than 47 testing reports delivered additional material related to the testing as mapping tables, samples of transformed metadata and data, comments delivered via SDIC/LMO consultation, etc.

No	Country	Testing reports	%
1	AUSTRIA	1	1.1%
2	BELGIUM	2	2.2%
3	CANADA	1	1.1%
4	CZECH REPUBLIC	7	7.8%
5	DENMARK	3	3.3%
6	FINLAND	2	2.2%
7	FRANCE	5	5.6%
8	GERMANY	7	7.8%
9	ITALY	7	7.8%
10	NETHERLANDS	6	6.7%
11	NORWAY	4	4.4%
12	POLAND	8	8.9%
13	SLOVAKIA	3	3.3%
14	SPAIN	10	11.1%
15	SWEDEN	10	11.1%
16	SWITZERLAND	2	2.2%
17	UNITED KINGDOM	12	13.3%
	Sum	**90**	100.0%

Table 1. Overview of testing reports by country.

Most of the testing reports were focused on schema transformation testing (83 reports). Only a few testing participants carried both transformation and application testing (6 reports) and one testing participant has focused only on application testing.

3.1 Transformation testing

This testing provided the opportunity to see, whether the existing available spatial data can be transformed from their current structure to the structure defined by the INSPIRE data specification. Majority of the responses has indicated the feasibility of this transformation, taking into consideration some requirements and recommendations. Transformation testing has provided unique opportunity to identify the distance between the current state of available spatial data and the status, when the harmonized interoperable data sets and their services will have to be in place. Together with this distance evaluation, the testing process provides the estimation of need and effort required to eliminate these gaps and ensure the INSPIRE principles will be meet across the community of EU member states.

All INSPIRE Annex I themes have been tested. Amongst the most „favorite“ themes were identified Addresses (with 25 reports), followed by the Hydrography (16 reports), Cadastral Parcels (14 reports) and Geographical Names (13 reports). Complete themes overview is shown in Table 2. It is important to mention that in some cases, testing participants described more than one theme in a single testing report.

Theme	Number of reports	%
Coordinate reference systems	3	2.9%
Geographical grids	1	1.0%
Geographical names	13	12.6%
Administrative units	9	8.7%
Addresses	25	24.3%
Cadastral parcels	14	13.6%
Transport networks	13	12.6%
Hydrography	16	15.5%
Protected sites	9	8.7%
Total	**103**	**100.0%**

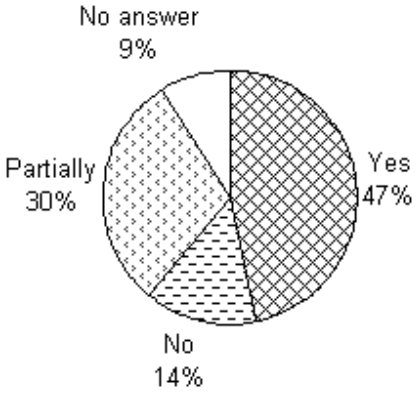
Table 2. Number reports per theme (Transformation testing).

The results of the transformation testing is divided in the groups of the questions, following the structure of the draft INSPIRE Annex I themes data specifications (Version 2.0) and summarized in the following subchapters.

3.1.1 Data sources

Initial set of questions from the INSPIRE Annex I testing report template were focused on the data sources used as an input for the transformation. Testing participants used the data with the structure as currently available within their databases and information systems.

To get an overview about the input data, the testing participants have been asked to indicate whether it was possible to perform the transformation using a single source of data (one dataset). Almost half of the testing reports indicated the direct transformation from a single data set and more than a quarter of reports pointed to the partial feasibility of straight transformation from single data set (Graph 1). These results indicate that the proposed data specifications took into consideration the current state the existing data sets.



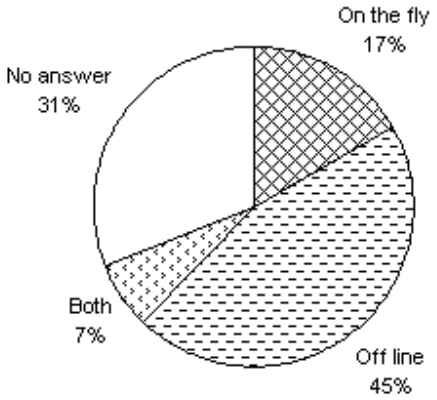
Graph 1. Feasibility of transformation from single data (set).

The reports referring the input data sources showed the significant heterogeneity in various formats and data repositories (csv, dbf, dxf, gml, mif, oracle db, postgis, shp, sde, txt, xml xls), level of detail (from sub-meter accuracy, 1:1 000, 1:1 250, 1:2 880, 1:2 500, 1:5 000, 1:10 000, 1:25 000, 1:50 000, 1:100 000, 1:250 000,), size (from less than 1 MB to 55 GB), % if the subset of the more complex data source (from 0,001% to 100%) has been used, as well as the quite rare indication about the access to that information, reporting mainly the limitations of access.

The datasets used for the testing were described in various level of detail by 76 testing reports. This variety of the datasets and their structure may indicate the complexity of the mapping the testing participants had to do, to pass the transformation testing.

3.1.2 Testing architecture

Testing participants described also the hardware and software components used for the testing. This architecture allowed to testers execute various methods of transformation, from the source data structures to the structure defined by the draft INSPIRE Annex I themes data specifications (Version 2.0) (Graph 2). Majority of the transformations were done “offline” (41 reports), 15 reports the transformation executed “on the fly” and some cases of testing did both methods of transformation (6 reports).



Graph 2. Transformation method.

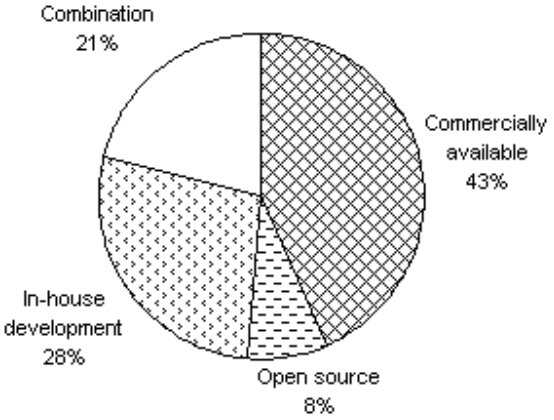
The transformation methodology depended on various factors like:

- Need to consider internal processes and procedures;
- Estimation of time needed for transformation;
- Capacity and performance of transformation;
- Evaluation of software tool compliance;
- Time accuracy of the transformed data;
- Cascading/transforming WFS support;
- Incremental updates of the data;
- Scalability and robustness;
- Complexity of the dataset;
- Need for multiply output;
- Flexibility for mapping;
- Available architecture;
- Size of the dataset;
- Data maintenance;
- Update frequency;
- Lineage aspects.

To summarize, the offline transformation was used mainly in case of large and relatively static datasets, where as the on the fly method was deployed within the smaller and frequently updated datasets.

3.1.3 Data schema transformation process

This section of questions was focused on additional aspects of the transformation process as identification of the mapping used by the testing participants. The feedback received showed various approaches of the mapping and matching from the source data structures, to the structure defined by the draft INSPIRE Annex I themes data specifications (Version 2.0). Some of the methods were based on simple mapping, whereas other used complex mapping computing, using calculating indexes allowing to achieving the desired output. There were also various techniques used to execute the mapping from simple "paper solution" and tables, through available proprietary as well as open source software to the specific in-house developed applications. This was reflected in the software used for the transformation (Graph 3). The most frequent were commercially available software solutions (33 reports), followed by in-house developed solutions (21 reports). Open source tools utilization took place in case of 6 testing reports.



Graph 3. Software used for transformation.

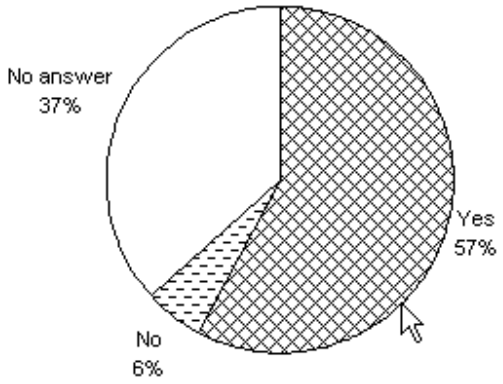
Various issues and topics for the discussions were identified. To give an overview, here it is the extract of those most frequently mentioned:

- In cases, where a spatial object type has a large number of voidable attributes, which are not present in the source data set, a lot of mappings need to be defined stating that these attributes should have the value "missing" with the void value reason "unknown/unpopulated";
- Clarify the difference between cardinality, the voidable condition and the concept mandatory;
- Handling of multiple geometries, enumerated types, measures, network links, x-links, and temporal ranges;
- Query mapping is very rudimentary; it just supports the most basic queries;
- Semantic differences between the source and target schemas;
- Balance between complexity and comprehensiveness of data specifications;
- Need for more in-depth understanding and possibility of training;
- Implementation of associations via xlinks in GML;
- Need for significant manual interference;
- Language translation issues;
- Thematic mapping issues;
- Financial constrains;
- Time constrains, too short period available for testing.

To summarize the INSPIRE compliance regarding the content, almost half of the testing reports (44) indicated that the local data were sufficient to cover all the mandatory content required in the INSPIRE data specification.

3.1.4 Reference Systems

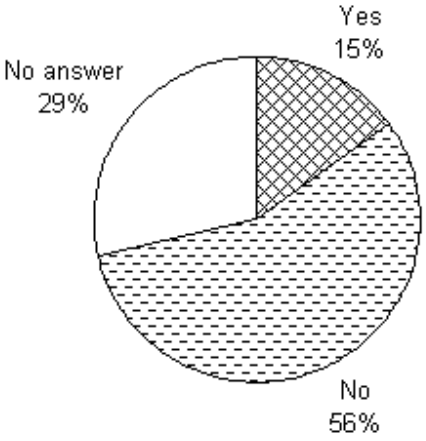
Evaluation of the feasibility of the transformation of the source data from their local coordinate reference system (CRS) to the target CRS defined in draft INSPIRE Annex I themes data specifications (Version 2.0) was one of the aims of the testing. The results showed quite positive results (Graph 3). More than half of the testing was able to execute CRS transformation.



Graph 4. Feasibility of CRS transformation.

3.1.5 Data quality

Lower feedback was received regarding the results from the data quality point of view, where only a small group of testing reports was testing the specified minimum data quality requirements. (Graph 5).



Graph 5. Minimum data quality requirements tested.

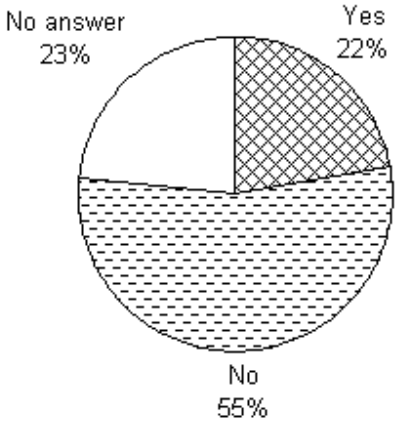
Only few reports described the methods used for testing the data quality and consistency requirements. These descriptions show the variety in the approaches from the specific in house developed procedures, to the utilization of the functionality available in the ready to use software solutions. Some examples of the data quality and consistency tests:

- Overlap between parcels;
- Gaps between parcels;

- Missing vertex;
- Logical consistency.

3.1.6 Metadata

Similar results as in case of data quality were collected in the metadata aspects testing, although there was slightly higher amount of testing participants, who positively indicated that their local metadata could be transformed to conform to the draft INSPIRE Annex I themes data specifications (Version 2.0) requirements (Graph 6).



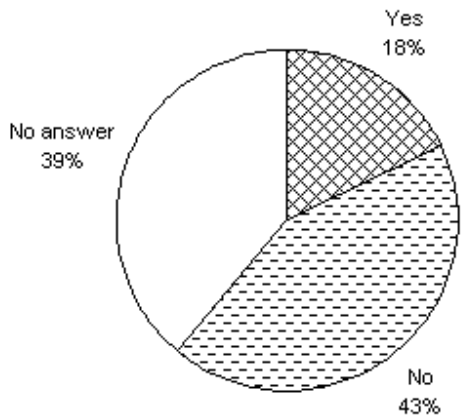
Graph 6. Metadata requirements.

In general, there was quite significant lack of the metadata. Going from the dataset to the feature level, the availability of the metadata is getting even lower. The majority of metadata available is collected on the dataset level and only some of the reports indicated the collection of metadata on feature level. Amongst the main problems occurred with metadata, there are:

- Absence of metadata encoding definition;
- Lack of source data metadata;
- Lack of available time.

3.1.7 Portrayal

To be able to visualize the results of the transformation in harmonized way, the rules for layers and styles to be used for portrayal of the spatial object types were tested. In this case the testing participants were asked whether it was feasible to fulfill the requirements of the INSPIRE data specification. The results (Graph 7) have shown that in 16 testing reports those requirements were indicated as feasible.



Graph 7. Testing the portrayal requirements.

3.1.8 Cost benefit considerations for transformation testing

Costs

To evaluate the potential impact of the proposed INSPIRE data specifications on the transformation testing participants, there were questions dedicated to the encountered costs as well as identified or foreseen benefits. The costs related with transformation were monitored by the frequency of occurrence of:

- Costs recognized regarding the modeling of the data to be transformed (identified by the 41 testing reports);
- Costs related with the personnel involvement need for specific training (identified by the 39 testing reports);
- Costs coming from allocating the necessary hardware before starting the INSPIRE testing (identified by the 37 testing reports);
- Overall costs recognized regarding the transformation process (identified by the 37 testing reports);
- Any additional costs not already listed (identified by the 37 testing reports);
- Costs for resources required for the testing (identified by the 33 testing reports);
- Costs regarding the architecture maintenance (identified by the 25 testing reports).

From the comments received regarding the cost related questions, the most frequent observations were:

- Setting up the transformation is laborious and (at least the first time) requires a significant level of IT competence and time;
- Requires for detailed knowledge about UML, the ISO 19100 Series and (most probably) about XML Schema;
- Educational costs, infrastructure investments, supporting organization costs and hosting organization costs. Technical and management coordination costs;
- For certain attributes which cannot be immediately mapped, some additional resources can be expected;
- Costs related to the transformation infrastructure, ensuring the performance issues will be solved;
- Costs to analyze of the transformation rules between internal structure and INSPIRE one;
- Costs for development of transformation routines, portrayal and on-line services;
- Third party consultations and assistance in understanding INSPIRE data specification;
- Costs related to consultations regarding the conformity of the source data;
- Implementation of transformations, industrialization of the process;

- Costs regarding the development of source schemas;
- Costs related with obtaining the standards;
- Data licensing cost;
- Maintenance costs.

There were only a few testing reports estimating the costs in quantitative way (monetary, time consuming) and the majority of the reports remain on the qualitative level. Among the most required cost related comments is the need for more time available for the testing as well as the need for improved knowledge and experience exchange within this area. It is important to mention that there were also comments saying those costs should not be significant, especially, when the implementation will move to the operational phase.
To summarize, in the overall evaluation of the costs, in average around one third of the testing participants (36% of the testing reports) identified some costs which have to be considered on the EC level during the fine tuning of the data specifications as well as on the level of Member States during the implementation phase.

Benefits

On the side of the benefits the testing participants were asked to indicate the benefits they encountered, or foresee, when the INSPIRE compliant data and services will be available using the transformation techniques they tested. To help the testing participants to evaluate or estimate the benefits five sets of the questions were prepared focusing on the potential benefits.

The first group of the questions was focused on „**Direct user value and benefits**“, where the testing participants could express which of the proposed indicators best fits their benefit expectations. From the set of 14 indicators the most frequently mentioned were:

- Improved data compatibility (33 testing reports);
- Availability of data models (29 testing reports);
- Better data sharing ability (29 testing reports).

The second area of potential benefits was covering the aspects of „**Social value**“, where from the five available indicators the most favorite was found the „Reduction the barriers between the organizations“(29 testing reports). „**Institutions operational benefits**“ collection provided the six indicators focused on the institutional aspects from which the „Support of inter-institutional collaboration“ (37 testing reports) was found as a most important. From the „**Institutional financial value**“ evaluation, both offered indicators were equally (14 testing reports) selected as considerable benefits. Last but not least set of 4 indicators was proposed within the area of „**Strategic and political Value**“ oriented questions, where the support for „eGoverment“ as well as „Improved decision making“ benefits have got the same attention (23 testing reports) from the testing respondents. Testing participants were also asked, to highlight any other benefits they have encountered from which the following were most frequently mentioned:

- General agreement about proposed benefits from transformation and they hope in such a way to simplify and speed up their work;
- As far as social value is concerned, the INSPIRE data specifications (the results from transformation) should improve better decision making (e.g. trans-boundary issues) and public participation;
- Institutional operational benefits have been envisaged especially at EU level, by promoting intra/inter institutional collaboration and re-use of data. Costs for IT/information management should decrease;
- As strategic and political value of the INSPIRE data specifications, it should mainly support an improved decision making and eGovernment;
- Increased participation of public, because better transparency of existing information;
- In general it provide guidance for implementing further Address Data Infrastructures;
- For organizations with uncompleted Data Model provides the necessary elements;
- For organizations without Data model, provides the basis to implement it in an harmonized way in Europe;
- Fosters international collaboration and project management;
- Adding new knowledge to the organization;
- Individual challenges to increase the knowledge on data model and spatial data infrastructure;
- Learning by doing;
- Technical innovation;
- Logical data structure.

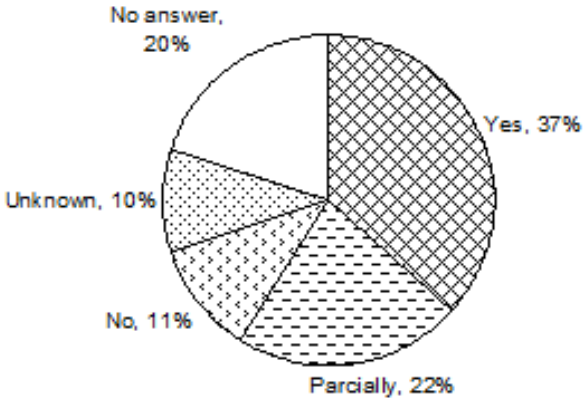
The list of the collected comments is available in Annex 3. This list provides the overview about the direct and undirected benefits with their possibilities and limitations as identified by the stakeholders.

It was expecting that the evaluation the benefits is more time demanding activity. Therefore **the feedback from the testing participants was very positive on identifying the benefits of the**

INSPIRE data specifications. Based on the summary of the above indicators, almost a quarter of the responses (24% of the testing reports) identified the various types of benefits coming out of this transformation effort.

3.1.9 Transformation testing results

To conclude the overall evaluation of the transformation testing, the testing participants were asked to describe whether it was feasible to fulfill the requirements of the INSPIRE data specifications. From the summarized responses (Graph 8), the transformation was fully or partially feasible in more than half of the delivered testing reports. This message gave very important signal to the EC INSPIRE team, as well as TWGs about the direction their work is facing to. Meanwhile this information also gives good base for the discussions about the possible ways for the implementation.



Graph 8. Feasibility to fulfill the requirements of the INSPIRE data specification

Testing participants could also summarize the problems they encountered during the test and the ways those problems were solved or why they could not be solved.

The experience of the transformation testing made available very important evidences about the feasibility of the approach taken by the INSPIRE spatial data sets and services interoperability and harmonization, providing also relevant comments and recommendations identified by the testing participant and used by the data specifications team to develop the data specification v3.0 and to draft the regulation on interoperability of spatial data sets and services.

This means also that those who participated on the testing can have the first estimations about what kind of impact they can expect during the implementation phase.

3.2 Application testing

Main expectation from the application testing was to use the results from the transformation testing under the real word conditions. These conditions could be simulated with use cases (use cases describe a specific task or process from the point of view of a user). Those use cases could be based on the high-level use cases developed by the TWGs or other use cases defined by the tester. Ideally, the use cases should require the combination of different INSPIRE data themes in order to show cross-thematic, cross-border and cross-language benefits.

The INSPIRE scenario assumed data to be available in the schema and encoding defined in the relevant INSPIRE data specification. Thus, application testing could clearly benefit from having access to the harmonized data, which were the result of transformation testing. The INSPIRE scenario could be used to show that chosen use cases can be implemented using INSPIRE-compliant data and (optionally) to illustrate the benefits of harmonized INSPIRE data.

The application testing was therefore significantly depending on the results from the transformation testing, and together with the time limitation has been found as the main reason for relatively lower feedback from the testing participants. Nevertheless, result from the contributions were analyzed and considered for the further Annex I data specification themes development.

The goal of the application testing was twofold:

- To show whether the chosen use case can be implemented, using data that is harmonized according to an INSPIRE data specification;
- To illustrate benefits of a scenario that uses harmonized INSPIRE data (called INSPIRE scenario) by comparing the required efforts to a baseline scenario that does not use INSPIRE-compliant data.

Regarding the INSPIRE Annex I themes, it is also possible to conclude that in case of application testing all themes has been taken into consideration by the reports delivered. Except the Coordinate reference systems, Geographical Names and Hydrography (which were referred by the two testing reports), all the other themes were mentioned in one testing report. Complete themes overview is shown in Table 3. In some cases, testing participants described more than one theme in a single testing report.

Theme	Number of reports	%
Coordinate reference systems	2	16.7%
Geographical grids	1	8.3%
Geographical names	2	16.7%
Administrative units	1	8.3%
Addresses	1	8.3%
Cadastral parcels	1	8.3%
Transport networks	1	8.3%
Hydrography	2	16.7%
Protected sites	1	8.3%
Total	**12**	**100.0%**

Table 3. Number reports per theme (Application testing).

3.2.1 Use cases

Testing participants have been asked to describe the use cases underlying the application test. In total, there were proposed four use cases, from which one was based on the use cases defined

by the TWGs and the other three were described by the testing participants. The description of the use cases varied from very brief to comprehensive.

3.2.2 Data sources

To execute the application testing, the input data sources had to be identified. The testing participants were allowed to describe INSPIRE-compliant source data used in the testing. This was done in case of four testing reports. Non INSPIRE-compliant source data used in the testing were described by another two testing reports.

3.2.3 Software applications used in testing

To execute the application testing, the implementing software applications and proper processes can play very important role. Therefore, the testing report provided appropriate space for their description, including the possibility to describe the functionality, data requirements (schema, quality etc.), data sources and providers (which data are used in the system? who provides them?), reprocessing requirements (what preprocessing has to be done in order to 'get the data into the system') and development aspects (required changes, creation from scratch etc.).

The feedback from the testing participants was limited, but provided important indications of the aspects which require attention and further analysis. Delivered testing reports described applications with functionalities for transformations, publishing, simple querying, viewing and gazetteer. Within the applications were used INSPIRE compliant as well as non-compliant data sources.

Testing participants could also identify the potential problems encountered using described applications:

- Limitation that we modified its name spaces to point to a GML 3.1.1 version of the Inspire schema (hydrology and geographic names);
- Speed of network connection and amount of data to transfer during displaying all data from dataset;
- Properties that we currently have trouble resolving are xlinks, though in theory we will be able to resolve these more easily than embedded objects, which are a less desirable alternative;
- Linking the changes in the structure of source databases used to derive INSPIRE compliant data;
- Controlling or changing the name of the geometry column(s);
- Extracting data from nested property structures.

3.2.4 Cost benefit considerations for application testing

Costs

To identify the potential impact of the proposed INSPIRE data specifications on the application testing participants, the questions dedicated to the related costs as well as identified or foreseen benefits were available. The costs related with application testing were monitored by the occurrence of:

- Costs recognized regarding the resources for transformation (identified by the 2 testing reports);
- Costs regarding the modeling of the data to be transformed (identified by the 2 testing reports);
- Missing costs regarding the application testing cost categories in previous questions (no feedback).

From the comments received the following observations were encountered:

- Additional costs (and time) have been identified for training, for collecting new data and/or change data structure, for Software and their maintenance;
- The whole process lasted two month at participation of 1 analyst, 2 transformer-modelers All cost related to salaries is approximately 3200 Euro;
- The main advantage was that source data were provided free because they were properties of State institutions;
- Potential costs for modifying the database to be compliant with INSPIRE address data specification;
- Primarily testing time and time to review and understand the associated INSPIRE schemas and specifications.

Despite the marginal feedback on the application testing, it is important to consider that the INSPIRE spatial data specifications can generate differences in the costs, depending on level of infrastructure development as well as INSPIRE "readiness". The better knowledge about INSPIRE spatial data specification will help the stakeholders with more proper planning and higher benefits achievements.

Benefits

From the point of view of the benefits the testing participants could indicate the benefits they encountered, or foresee, when the implemented applications based on the use cases will be operating with the INSPIRE compliant data and services. To help the testing participants to evaluate or estimate the benefits, they identified from the availability of the INSPIRE compliant data and services for the use cases application there were as well as in case of transformation testing prepared 5 sets of the questions focusing on specific areas of the potential benefits.

The first group of the questions was focused on „**Direct user value and benefits**", where the testing participants could express which of the proposed indicators best fits their benefit expectations. From the set of 14 indicators the most frequently mentioned were:

- Improved data identification (3 testing reports);
- Improved data compatibility (3 testing reports).

The second area of potential benefits was covering the aspects of „**Social value**", where from the five available indicators amongst which the following encountered highest indication:

- Reduces barriers between organizations (2 testing reports);
- Promotes more efficient use of (taxpayer) funds (2 testing reports).

„**Institutions operational benefits**" collection provided the 6 indicators focused on the institutional aspects where the response were almost equally balanced across all the indicators, which were chosen mostly in case of 2 testing reports.

From the „**Institutional financial value**" evaluation, both offered indicators were equally (2 testing reports) selected as considerable benefits.

The last set of four indicators was proposed within the area of „**Strategic and political Value**" oriented questions, where again all indicators has received equal ranking by the one testing report.

Each of the available indicators were identified at least in one testing reports, what can give the justification for their relevance.

Testing participants were also asked, where possible to comment the benefits they considered relevant to comment. The list summarizing this contribution is available in Annex 4.

Certainly there were objective circumstances, why this part of the testing could not be done in fully satisfactory way, but it is important to consider the real benefits will became clear, when the basic reference set of data specifications represented by the Annex I themes will be implemented. These will provide the base for Annex II+III themes development and following implementation. In that phase the direct and undirected benefits will became more visible.

The amount of the results collected in this section certainly is not representing the complete picture, but in this phase the identification of any benefits is not a trivial task. The feedback already collected shows the benefits that the stakeholders foresee as a relevant to the application level of harmonized INSPIRE data specifications implementation.

3.2.5 Application testing results

To summarize the application testing, the participants were asked to provide the feedback on the results they observed. The limited responses brought the answers to the following questions:

Can application use the INSPIRE compliant data without repetitive manual intervention?
The answers collected for this questions confirmed, the usability of described applications with the INSPIRE compliant data without the repetitive manual intervention and satisfaction with the results of portrayal and query requests. At the same time, problems were identified related with the transformation, like:

- Currently the lack of ability to specify the geometry column name or the ability to store multiple geometries per feature;
- Limitations to support for nested properties such as enumerated types, lifespan.start life-span.end etc.;
- Current lack of GML 3.2.1 support.

Can application perform all necessary actions to execute the use case?
In general, responses confirmed the possibility of applications to perform the crucial actions to execute the use cases. Some of those actions were mentioned and the results were considered as INSPIRE like, but not precisely INSPIRE compliant.
There were also mentioned limitations preventing the full compliance.

What are the bottlenecks and potential problems encountered in using the harmonized data within the application?
Amongst the issues identified by the testing participants, there are the following:

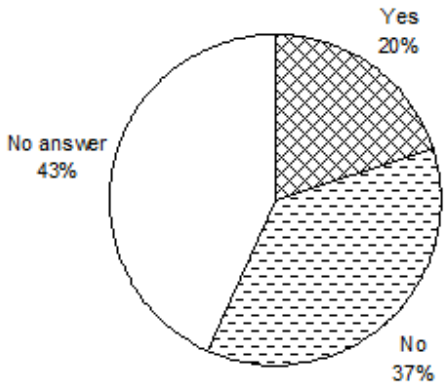
- Extracting data from nested property structures. These currently had to be modified manually, although we should be able to modify this in the future;
- Controlling or changing the name of the geometry column(s);
- Xlinks. In theory we will be able to resolve these more easily than embedded objects, which are a less desirable alternative;
- Speed of network connection and amount of data to transfer during displaying all data from dataset.

If applicable, describe the effort required to use non-INSPIRE compliant data in the application.
Here the responses referred mainly to the need of mapping various different sources. As the most of tested non-INSPIRE complaint datasets were available in relatively flat structure there were not encountered significant difficulties in their usage for the testing purposes.

3.3 Frequency of data requests

Linkage between the tested data and users was another important aspect which testing report summary was trying to focus on. To collect some basic information about the data related requests, the following questions were asked:

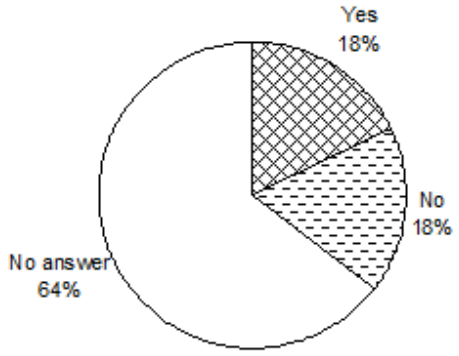
Can your organization provide statistics / estimations how frequently the data tested is requested by users?
The results (Graph 9) showed relatively quite high number of responses saying that the testing participants are not collecting such a statistics/estimations (33 testing report) or did not answer at all (39) on this question. The rest 20% (18 testing reports) of responses indicated they can provide this kind of statistics/estimations. As the majority of the answers remained in the “grey area”, it is difficult to estimate, whether such a relatively low attention to the utilization and reuse of the tested data is close to the current state of play, or just the consequence of the lack of time of testers to investigate this aspect. Nevertheless, it is possible to expect that at least the minority group of positive responses on this question was base for the answers on further questions about the utilization of tested data.



Graph 9. Testing data user requests statistics availability.

Please indicate the number of request by users for the data. What is the average volume of data requested?
With this questions the testing participants were asked to provide some more concrete information about the number of request per year and if possible also with the indication of the size of provided data (in MB per request). The responses varied in level of detail as some responses mentioned downloads, some requests, some hints as access. Statistics were quite generic and on the other hand some quite detailed. Users' requests also vary from the specific objects to the whole databases. This diversity and relatively low amount of responses allow only making some very general estimation, where users' requests vary from 1 GB to 22 000 GB, what in average comes to about 7000 GB per year.

Do you need to transform your data in order to satisfy the requirements of the users?
This kind of requirements from the users has been indicated by the 16 testing reports. The same amount of answers mentioned they don't need to transform their data in order to satisfy the users (Graph 9). In this question the uncertainty of the user driven requests for the transformation is higher than in case of user requests/statistics as the amount of "No answer" responses reached 58 testing reports.



Graph 10. Need to transform the data driven by the user requirements.

What are the most frequently asked transformations?
From the available responses the most frequently asked transformations seems to be CRS transformations, together with **extraction of specific objects from more complex databases**. Amongst the other types of requests, there is the need for reclassification of values listed in some enumeration/code list, format (encoding) transformation, requests for statistics, reports, coordinate transformations and analyses.

3.4 Possible strategic decisions based on the results of testing

This section of the testing report was dedicated to the evaluation of the testing process and utilization of this experience in the upcoming decisions which are or can be foreseen by the testing participants in the near future.

Based on the results of transformation testing is your organization going to fully keep the existing specifications and produce INSPIRE conform data on the request?
This question was focused on the collection of the information, how the testing participants plans to provide the INSPIRE compliant data to the users and how INSPIRE can influence their existing data structures. The feedback collected confirmed that various scenarios are foreseen for the INSPIRE implementation. Almost third of the reports (26 testing reports) provided positive answers, what confirms they will keep their data structures and are planning to prepare INSPIRE conform data on request; 20 testing reports they will follow this approach partially and 12 testing reports will use different model. There is also the largest group of "No answer" responses, which can be divided to any of above-mentioned groups.

Based on the results of the testing, will your organization provide services to:
The one from or both offered options of on-line/off-line transformation services which testing participants were asked to select. Although the majority of responses remained in the group of "No answer" (52 testing reports), 18 testing reports showed the support for on-line transformations, followed by the combination with the off-line services in choice "Both" (13 testing reports) and closing with pure off-line transformation provision of services reported in 7 testing reports.

Based on the results of the testing will your organization modify the existing specifications in order to accommodate specific INSPIRE requirements?
In this question testing participants were asked to report, whether they foresee the modification their existing models and specifications according the INSPIRE requirements. Considering the relativity of the responses with "No answer" the results indicates quite strong influence of INSPIRE data specifications on existing models "Yes" and "Partially" options with the same amount of 19 testing reports; 15 testing reports answered their models will not be influenced by the need of their modification.

Based on the results of the testing will your organization modify the existing specifications in order to accommodate specific INSPIRE requirements? If yes, what modifications are necessary?
This question is extending the previous one and was focused in detail on the way how the testing participants plans to implement the INSPIRE aspect to their existing models. Amongst the most frequent modifications foreseen by the testing participants belongs:

- Support for the data structure types particular to INSPIRE such as enumerated types, code lists, network links, xlinks, time spans, metadata and geometry types;
- Dividing existing attributes to the several partial to be able to derive desired INSPIRE attributes;
- Geometry column name control for writing and detection for reading;
- Enforced regulations on the spatial attributes;
- Adding some non mandatory attributes;
- Modifications of reference geometry;
- Introducing some new feature types;
- Writer side schema validation;
- Including rural data address;
- Change of coordinates;
- Creation of metadata;
- GML 3.2.1 support.

Do the modifications add value for the national/local users? If yes, which ones?
Similarly like in previous questions from indicated answers, the stronger group of responses sees the added value of the modifications (13 testing reports). Partial added value was encountered and five testing reports were negative in this perception. The rest of the responses did not react on this question.

If your organization is going to collect new data or extensively restructure/update the existing ones do you expect that INSPIRE specifications can be used?
The last question in this section was trying to monitor the usability of the INSPIRE data specification in relation to the nearest time target (2 years after implementing rules adoption) set in Article 7 (point 3).
More than one third (28 testing reports) of responses expect the data specifications can be used in case they will set up collection of new data or significantly rebuild existing ones. Five testing reports came with opposite expectations, whilst the rest of the responses did not provide the answer.

3.5 Testing summary

To get the overall summary of the testing process, the last set of questions were focused on the conclusion of the testing process, highlighting the recommendations they consider as relevant to the data specification fine-tuning, formulating the unanswered questions, as well as the possibility for description and evaluation of the teaming up experience.

Describe the main outcomes of the testing.
The complete list of the outcomes gained with the testing process is too long to be included here, therefore we summarized in following list:

Positives:

- From a technical point of view, the testing was a way to study all the possibilities to do the mapping and provide services and to set up one of them. From a database point of view, it gave us a first idea of the extent of the work that will have to be done. Moreover, we are now more used to read such specifications;
- The result of the data mapping indicates that a multitude of different data sources and additional capture and recording to meet the requirements of the transport Data Specification would be required;
- Testing has provided the possibility to acquire new skills regarding Data Models, GML schemas. It gives a first idea of the extent of the work that will have to be done;
- The INSPIRE Address data specification will provide a simplified and nationally/internationally recognized standard for addressing;
- We have been able to transform our internal data base structure into the structure defined in the INSPIRE specification without significant problems;
- Data quality and consistency requirements have been in most cases tested. The accuracy (scale) often meets the INSPIRE specifications;
- We tried to create specification compatible output from our data and we are confident its possible, without extensive cost;
- The documentation appears well structured and highlighting of requirements and recommendations is well chosen;
- Better understanding of the overall procedure, but also exposure to potential implementation problems;
- We have seen that a transformation is feasible. Some attributes are missing, but mapping is possible;
- Gained confidence the tested datasets can reach compliance without extensive rebuilding;
- Documenting the mapping of data from local schema to the INSPIRE specification schema;

- It is feasible to do on-the-fly transformation and put up WFS using current open source software.
- The testing showed that the local data could be used to generate INSPIRE Cadastral parcels;
- Technically, i.e. UML and xsd, well thought through and nice piece of engineering work.
- In most cases the transformation from local CRS to target CRS is possible
- Ability to create output of our dataset in INSPIRE data specification;
- Documentation, which testing data fulfill requirements;
- Successful transformation.

Things to improve

- The INSPIRE schema for Protected sites does not support point objects, which means that point objects in the NVR dataset have to be converted into small polygons in order to make them compliant with the specification;
- Knowledge of what features and attributes that are missing in the Swedish water standard, and what we think is missing in the INSPIRE data specification from our point of view;
- Definitions are the central aim and need to be as clear as possible. Allowing for too diverse interpretation eases translation, but results in non-harmonic data sets;
- With the current definitions translations were possible, but with unclear results. Quality in translation is a central aspect, which requires more consideration;
- Portrayal rules don't seem to be a problem. Partners interviewed are ready in most cases to apply the INSPIRE rules in this field;
- Some translation, for example to FormOfWay will involve geo-processing, here a best practice should be developed;
- Also, we know, our data do not cover whole thematic range, which has to be dealt with on national level;
- Minority languages are to be considered during delivery to INSPIRE geo-portal.
- More time will be necessary to test further INSPIRE-conform data sets;
- Most of Metadata elements are not presented in the source dataset;
- Identification which requirements could not be fulfilled.

Things to consider

- "The testing of the INSPIRE data specification for Protected sites shows that it is quite complex to adapt national datasets to the requirements and recommendations in the specification. In order to be successful in implementing the directive it will be important to start the preparations of the implementation of the INSPIRE directive as soon as the final version of the data specifications are released. It is also important to be aware of the costs and need of resources, both manpower and hardware/software that will be a consequence of the implementation;"
- Most of the partners interviewed are not convinced to produce as soon as possible data INSPIRE conform. A part of them is going to implement services for transformation (on-fly, off-line) and in general the majority of them intend to modify existing specifications to match INSPIRE requirements (mainly revision of attributes and metadata);
- "The only possible problem is the definition of the feature class Cadastral parcel as single area, because 1% of our cadastral parcels are multisurfaces;"
- "Transformation testing was successful. However, it has to be considered that due to the limit time only a relatively simple dataset was used;"
- "Some of the INSPIRE feature must be created composing several of our features".

Describe the main recommendations to the changes in the tested INSPIRE data specifications.

This space allowed the testing participants to express their recommendations for improving the tested INSPIRES data specification. These recommendations were considered in the

development of version 3.0 of the INSPIRE data specifications. The following list provides their summary, as captured from the reports and categorized according the areas they belong:

Generic conceptual model

- The approach of introducing MinMaxLaneValues for the Road Transport Network very well accounts for the specific role of the INSPIRE data models. They are intended to be targets of translation and may therefore include elements for clarifying the semantics of translation results. MinMax (and maybe Average) values could be used for much more attributes, for example, for road width. If we translate from BRF to road width, we get a value for the intended width, if we translate from BRV, we get an upper bound. This could be captured using the MinMax construct;
- One unclear issue is how the extent of objects should be defined. E.g. in the schema, there is an attribute defined for related spatial object in another INSPIRE theme. This multiplicity is 0..1, which means that one named place object can only refer to (at most) one object in another theme. In the transport network objects extent of objects are defined differently or at least one named place object may refer to many road objects. Should named place objects be split up based on the smallest possible extent? We suggest 0 to more references to objects in other themes;
- It is a good approach to re-use definitions from other data models, ambiguous definitions or contradicting one should not be kept. Semantics should be clarified from version 3.0 on. This implies more data acquisition for individual member states, because specific information won't be available, but without clear target semantics, integration would be illusive;
- Our first interpretation of the criterion geometry was a requirement for x & y coordinates. Communication on the wiki told us that this was not so, that geometry referred to the implicit geometry of the dataset. To make this clearer we suggest having 2 criteria, geometry (implicit) and geometry (explicit);
- Make data elements optional / voidable, if you want general topographic datasets such as ATKIS being published according to the INSPIRE Protected Sites schema. Otherwise, the INSPIRE-compliant resources will be limited to the detailed theme-specific datasets on Protected Sites.

Definitions

- One of the desirable goals of the harmonization process is to maximize the match of data provider datasets' features, attributes and coded values with the corresponding ones in the INSPIRE data model. In order to achieve this goal and at the same time obtain a high level of thematic accuracy in the matching process (being the exact matching the highest level desired for this quality element), there is a major need for clear and concrete definitions, detailed and accurate semantic descriptions of features, attributes and coded values in both models matched (INSPIRE and dataset ones), in such a way that no misunderstanding might be possible;
- EuroRoadS partially considers the difference between information objects and the Universe of Discourse. For example in the definition of Road Feature as "part of the road network model that represents an abstraction of real world phenomena that are uniquely identifiable, has a set of characteristics, an independent lifetime and belongs to or is related to a road network" (Svard 2006). This distinction could be applied to the INSPIRE definitions, too;
- The road width definition is said being from EuroRoads, where they use the one from GDF, where they in turn already defined units of measure. As I understand the use of the Measure data type, this restriction should not hold for the INSPIRE data specification. If so, this has to be stated! A general statement of units of measure and their use would be good. This may include a pointer to a mandatory INSPIRE unit dictionary (or re-using an existing one);

- The principle of separation between land and water area must be more precise. Indeed this is not something natural in our country and we don't know from which size of water area we should separate it from the land area;
- If re-using definitions anyway (which is basically a good approach), why are not other sources (like GEMET thesaurus or Wordnet) conducted?
- Use a more open definition of the schema to allow export of attributes from national data bases;
- Need for clear semantics of data models to improve the harmonization process.

Data quality

- Cadaster parcels: It would be very helpful to have precision for each point instead of define precision for boundary that is made from points. Of course precision has sense only for points that are parts of boundaries, because there is no need for precision of reference points. Cadaster has special needs for precision: It is possible to say that it is not so important if a line that defines central line of river has 0.1m or 1m precision, but to know exact precision of parcels is very important.

Geometry

- INSPIRE schema has problems to handle the Multi-Geometry. The mapping performed are connecting the MultiGeometry (source schema) to CompositeGeometry (INSPIRE schema). After translation the Multi-Geometry turns to several geometries, however with the same attribute records;
  An exception is the Multi-Geometry which has the pure exterior/interior relationship. It maintains after the translation, It happens during the translation of "watercourse.geometry";
- Support for Circles and Arc‘s in geometry, because today only linear interpolation can be used. Or define common exact way how to code source parameters of Circle/Arc (for example as a XML comment) in output XML to make lossless export/import possible if it is needed;
- It is a requirement that data is in a polygon form. In order to ascertain how many datasets are non-compliant points and lines we have put into the Reference system section criteria for points and lines;
- Data for dataset Protected trees are not included in INSPIRE specification for Protected areas, we suggest to introduce possibility of presence of space representation – point;
- The INSPIRE data specification should support all geometry types (point, line, polygon).

Understandability

- Having the final users in mind, the specification as such is not self-contained. The separation between Generic Conceptual Model and Thematic Data Models is mandatory, but finally users require being familiar with a large branch of ISO standards and many technologies. A condensed user guide containing all required background material would be highly desirable considering operational implementations. Best practices and overviews of recent schema matching and translation tools are suggested for further improvement’;
- However, in general terms we recognized that the specification document on its own, even supported by the generic data specification, is not always easy to interpret. For end users who must implement this as part of their obligations, this may prove a barrier unless the underlying relevant ISO specifications can be pulled together into a generic data specification to underpin and support the specific data themes.
- As far as it is concerned, a detailed Feature Concept Dictionary and Feature Catalogue is needed for the INSPIRE Model. On the other hand, a sort of semantic glossary of terms used within the context of INSPIRE Data Specification process could help to improve its understanding by the final data providers.

Complexity

- Why referring sometimes to ”GDF”, other times to ”GDF and EuroRoads” or ”TWG TN based on EuroRoadS” or ”adopted from EuroRoadS”? Such definitions become complex and it remains unclear what ”based on” or ”adopted from” means. Such occurrences should simply be deleted;
- "Keep the model as simple as possible.

Identifiers

- "We haven't got a natural unique key to use as an inspireId for CadastralParcel and CadastralBoundary. We have got a natural unique key to use as an inspireId for basic property unit. Basic property unit may be made up of none or several parcels. We recommend that BasicPropertyUnit would be added to the INSPIRE model and the schema as a new class;
- NationalCalculatedArea for CadastralParcel should not be mandatory;
- EstimatedAccuracy for CadastralBoundary should not be mandatory;
- InspireId for CadastralParcel should not be mandatory.

Examples

- A GML example of a network dataset. It would help understanding the GCM and understand how to produce the GML output;
- Describe friendly how to implement the model, providing examples.

Feasibility

- It is already important to remark that a great number of the attributes matched show some semantic or data capture differences which must be stressed. The above mentioned lack of exact matching might be a more frequent situation than what would be desirable in the harmonization process;
- The tested data specifications are acceptable as data producer but we believe that it may be difficult to use as a user will have to take into account a lot of featureTypes (all the address components) to obtain the whole address.

Application schemas

- Inline (by value) features or by reference encoding in GML. Currently according to the schema both approaches are possible. Encoding by reference makes much smaller files size and no redundancy of data. It may however, be more difficult for applications to parse and read the file. By reference is much more ’true’ to the schema as the aggregation tells that components are shared among addresses. This holds true for thoroughfareName, AddressAreaName, PostalDescriptor, AdminUnitName. For the locator components the situation is different. As also mentioned earlier, firstly Denmark does not consider the locator as an independent shared components. If the address disappears the locator(s) does as well (at least for unit level). This is a conceptually contradiction in the model as they are not shared in the same way as the other components. We suggest removing locator as a subclass of addressComponent but rather making it as an attribute of feature Address;
- The parent - child relationship is not well-defined. Firstly, it shall only be uni-directional. Currently the association is bidirectional which is a problem as parents can have many children (whereas child usually does not have more than one, possibly two parents and at max 5 parents). We suggest to make the association uni-directional with the parent role as navigable. Secondly, we propose a name change of parent to something like: ”withinContex-tOf”;
- There are bi-directional associations from CadastralParcel to CadastralIndexSet and from CadastralBoundary to CadastralParcel. It will cause a lot of overhead to encode that every Cadas-tralIndexSet should have a reference to CadastralParcel and likewise for CadastralParcel to include a reference for each CadastralBoundary. We recommend to use uni-directional associations instead where CadastralBoundary -> CadastralParcel the role parcel should be navigable and boundary should be non-navigable. In

CadastralParcel -> CadastralIndexSet the role indexSet shall be navigable and parcel non-navigable;

- As a result of the matching process carried out in GIS4EU project between the Data providers' datasets and the INSPIRE Transport Networks data models, some features and attributes have been identified as candidates to be added to those data models;
- protectedFeatureType should be deleted. It should be replaced with new criteria in the Protected Areas section, namely categoryType and the 3 new designationTypes (geo, archaeo & cultural);
- The feature type Road is a subclass of AggregatedTransportLink. The relation-ships to RoadLink is not described. As a consequence, it seems that Road is lacking coordinate representation;
- Source of name is mentioned in the UML diagram and the data type GeographicalName. However, a specification of what is meant by this is missing in the text;
- In order to represent sub addresses e.g. 1a 1b, we propose to have a uni-directional association with a role called ownedBy, ie. 1a is owned by 1;
- reduce the number of associations in the schema, e.g. all those expressing spatial relationships that are already part of the feature geometries;
- The text says however that a Road consists of a set of RoadLinks. Does a road consist of all RoadLinks with the same name?
- Use a more open code list (HabitatClass) for N2000 with the possibility to add national codes;
- Change existing relation 1:1 between Catchment area and SurfaceWater to 1:n.;
- NamedPlace Type code list is not finalized.

Management

- Overall, we are currently happy with the INSPIRE draft data specification schemas thus far. They clearly make good use of existing standards. However, we will need more time to fully evaluate the schemas once we implement GML 3.2.1 support on both reading and writing. We also strongly recommend that JRC provide leadership on establishing a comprehensive baseline INSPIRE compliant GML dataset for the purposes of testing and validation. This greatly enhances the ability of software tools to provide a consistent level of support for the specification;
- Due to the comprehensive nature of the specifications and ISO standards involved, the level of expertise and investment required for participation is rather high at the moment. It may be helpful if recommendations are made for a phased approach for adopting these specifications, starting with key foundational components of limited complexity and building from there;
- It is also important to note that schemas can be used for both discovery and validation. It is typical for schemas to be designed top down and have a lot of placeholders, abstract types etc. These can be used for validation but not discovery. One possibility would be to maintain a master design / reference schema that have all the abstract types then generate an implementation schema that has the abstract types removed. This later schema would be easier to use for schema extraction and discovery.

Encoding

- GML 3.2 support is currently a problem with many GIS tools. In the short term, it may be desirable if JRC could generate a 3.1.1 schema based on 3.2 for use till 3.2 become more widely applicable. We will of course make development of GML 3.2.1 support a top priority, but it will likely take some time for other tools to follow suit;
- Another issue is regarding handling of multi-geometries. We have the need to represent one parcel with multiple geometries (e.g., islands). We have done this using GML:Surface type with GML:PolygonPatches. We are not completely sure whether this approach is valid according to GML. If it is valid, a recommendation should be included stating that multi-geometries should be handled like this;
- The use of GML could turn into very big files difficult to handle the information.

Level of detail

- One of the characteristics observed in the INSPIRE Transport Network Model is the possible use of different views for the same object;
- However, the INSPIRE Transport Network Model is not provided with a pragmatic mechanism to specify the level of detail of the information given by a specific data provider. Concretely there is not a quantitative or fuzzy indication of the spatial resolution or scale of acquisition of the data, while quality of the matching and harmonization process clearly depends on it. The information content of INSPIRE models should be slightly different for each level of detail, leading this to a necessary distinction between mandatory and optional features and attributes;
- The differences found during GIS4EU matching process highlight the existing heterogeneity in the use of levels of detail for the transport network elements considered within the different INSPIRE sub-models;
- Most of the missing elements identified during the analysis phase are examples of this heterogeneity, for example:
    - The feature “RoadServiceNode” is lacking in the INSPIRE Road Transport Network Data Model.
    - The properties ”ConditionOfFacility” , ”locationCategory” , ”OwningAuthority”, ”MaintenanceAuthority”, ”RestrictionForVehicles” and ”AccessRestrictions” are defined in the Transport Networks Common Application Schema but they are only used (instantiated) in some of them;
    - The attributes ”length” and ”speedLimit” are applicable to most of Transport Networks INSPIRE sub-models but they are only defined in some of them.
    - ""Feature ”Island” that appears in the IGP EuroGlobalMapPT and EuroRegionalMapPT datasets is not present in the INSPIRE data model and should be incorporated into it because this feature cannot be replaced/matched with ”Shore” or a similar feature once the definitions are not equivalent (semantic differences).
    - From the analysis of the matching between the VUGK/UNIBA SK50-Hydrography dataset and the INSPIRE data model it was found that the INSPIRE model does not contain the ground water features ”ecoregion” and ”administrative hydrological units” . Thus, we recommend to add WFD feature classes with environmental context in the INSPIRE data model ”GroundWaterBody”, ”Ecoregion”. Also, the relation between INSPIRE ID value domain of main hydrological features and WFD ID value domain is not explicit in the INSPIRE data model.
    - It was also reported that in the case of the Venice lagoon dataset (MAV GD010IDROLAGL1 dataset) the INSPIRE data model does not include the attributes ”Speed limit” and ”jurisdiction” in the hydrography theme but only for Transportation Network features and, at least in this case, these attributes are used and are needed in the hydrography theme.
- The analysis of data content has evidenced a fact that some Data Providers (ICC, VUGK, RVEN, IN-SIEL) consider as important to store information about the surface (in square meters) of an administrative units, and/or the boundary lengths. The decision is argued with a need for providing precise ”official” values established at national level, which might be different from the ones derived from geometries;
- The ICC dataset includes also information on the capitals of administrative units, thus enhancing searching and localizing of administrative unit authorities.

Others comments

- Linear Reference System does not have enough supplementary specifications. A more detailed description is needed linking LRS to the to the Network Model;
- Some attributes are not the same, and code lists does not have the same values. Is it possible to use national code lists, and provide code lists as a service?

- CRS ETRS-LAEA is not used in Norway, and no coordinate transformation exists at this point;
- Our GIS and the main GIS applications used in Europe do not have any problem to work with cadastral parcels as object types multi-surface, so we have asked to change this concept to optional;
- Some information about protected species are not allowed for publication by national legislation. Nature Protection Organization of Slovak Republic has no obligation to public such information that could result in hazard for some species;
- Two features of INSPIRE DM (Mandatory geometry as Location point and Mandatory Locator) mainly prevent to fulfill the DS concerning with the considered source;
- These specifications are acceptable and globally correspond to the data we have.

Many of the mentioned recommendations were also submitted via SDIC/LMO consultation process.

Any other comments, annexes, questions, recommendations.
To allow the testing participant to express any additional feedback on the testing process they could not expressed in previous questions.

Comments:

- 1Spatial believes it is feasible at a general scale to fulfill the requirements of the INSPIRE data specifications. The vision of the INSPIRE specification teams to base the specification on the richness of GML 3.2 may mean that some vendors will take time in gathering momentum to support it, but we have demonstrated that with the right technologies, that support object orientation, it is possible. With data transformed into the INSPIRE object model within Radius Studio, services for data integration, edge matching and geometry generalization can be readily developed and effectively deployed within the network service environment of INSPIRE. These services will underpin the pan-European applications and end user scenarios of INSPIRE;
- The INSPIRE Data Specification theme aims to serve for data harmonization for the purposes of information exchange in service-oriented environment. Current model follows rather database pattern assuming that several elements can be derived by spatial analyses and merging operations, but are not trivial outside static database or GIS system environment. Considering, that administrative unit is not obliged to include its geometric representation, the question for square area of unit in a worse case would require spatial merge of all geometries of the unit areas related to this unit. However, such calculation is impossible at the pure cascaded web service level assumed in INSPIRE;
- Testing time was too short to fully acknowledge and understand all aspects around data (model) specifications transformation. Fundamental issues which take time to get basic understanding of:
    - Characteristics of Inspire CP data specs (growing awareness)
    - Possible impact of CP data specs on local data set and vice versa
    - UML, GML, XML
    - Mapping between data models
    - Etc.
- In Finland we have very large cadastral parcels with many holes inside them (i.e lakes) and also cadastral parcels with very many nodes (i.e the lakes). There is an example in the file attached to the testing results. The xml/gml file is in finnish but Palsta=CadastralParcel (Rekisteriyksikko=basic property unit). See for example fi.nls.ktjkii-Palsta-59676441. It is much slower to extract this kind of areas than very simple ones. This should be considered when the requirements for performance are considered in download services;
- The same building number has numbers of entrance (parts of building) as entrances to individually numbered dwellings. The number is necessary for the building register with

flat, not for postal addresses. It is part of unambiguous flat identification. In the Czech Republic are three possibilities depending on the existing of the streets and / or street numbers. Therefore DM uses further locator, Designator Entrance number (Číslo vchodu), which can use street number or not;

- Some technologic advances like the useful dynamic segmentation (that could be optionally used in the TN INSPIRE model 2nd draft) is not implemented by none of the data providers participating within the GIS4EU TWG-DM TN. These shows the need to support data producers and data providers in the way towards INSPIRE transposition, having in mind the technologic developments which are currently applied;
- OSPAR, Ramsar and Helcom": The OSPAR and Ramsar datasets consist of a subset of objects from the N2000-dataset. The conclusions above are therefore valid also for these datasets. The Helcom BSPA dataset consist of objects from both the N2000-dataset and the NVR-dataset, however the test result of the Helcom dataset is conformant with the test result of the N2000-dataset;
- Finally regarding GML 3.2, since there is not much software support for this version it is very limited to assess the applicability of the data. Also the main reason that we have not tested the schema at a service level, e.g. using a WFS;
- The main problem that is encountered by CELRL today is not about the data or metadata model but on the quality of the data itself (scale of digitalization). INSPIRE is going to give this scale, but it won't improve it...;
- There would be useful to have some web-based viewer of INSPIRE-xml, that would work as an official INSPIRE validator. Because current we could only validate according to xsd-schema or to user defined validators;
- We recommend continuous cooperation with the EuroGeographics structures involved in the EuroGeoNames WFS services for purposes of the finalization of the Inspire Feature Concept Dictionary (IFCD);
- Use a more open code list (HabitatClass) for N2000 with the possibility to add national codes.

Recommendations:

- The proposed INSPIRE data specification doesn't count with the feature class „protected tree" with the point (GM_Point) geometric representation. According the specification INSPIRE requires for all objects identified within the feature class „ProtectedSites" polygon (GM_MultiSurface) geometric representation. Given that declared protected tree often represents the group of trees, we can provide the objects in (GM_MultiSurface) geometric representation. But we would like to mention, that logically correct presentation should be defined by GM_MultiPoint;
- Another issue concerns the use of script and language in the spelling. First of all there is already language in the metadata for the resource which means that, as will be the case for many member states, filling this attribute will be highly redundant. We suggest a recommendation that if the same language is used for all geographical names this should be indicated in metadata rather than on each individual spelling instance. The same holds true for the script. However, the script of the resource should then be included as a dataset metadata item. E.g., the Address specification has done so.
- The objects of small and large scale protected areas are represented also by geometry of their buffer zones. It is not clear from the specifications, whether the zonation is the part of geometric presentation required by INSPIRE;
- We propose to enlarge the enumerations for three new codes, representing the subtypes of protected areas:
    - BIOR – Biospheric reservations;
    - PT – Protected tree/s;
    - UNESCO – Natural heritage area.
- Some elements will be not possible to publish, because of valuable species and biotopes protection, which occurs on specific areas. This publication is limited by national legislation to avoid endanger of those specific species.

Describe cooperation with other SDICs and LMOs if relevant.

One of the brand new experience within the INSPIRE development process was also the pool of testing participants and to establish the teams working on the same aim. This teaming experience was confirmed by the 42 testing reports showing the importance of established cooperation, consultations and knowledge exchange.

4 How the results were taken into consideration

INSPIRE Annex I testing results were used as an important community input to the process of the data themes specification development. This contribution was transferred to the third version of data specifications which provided the base for the text of the legally binding Implementing Rules (IR) which were unanimously adopted by the INSPIRE Committee on 14th of December 2009[9]. Third version of data specifications named as a Technical Guidelines provides the supporting documentation for the implementation of IRs.

4.1 JRC INSPIRE data specification team

The JRC INSPIRE data specification team collected the feedback from the testing participants and distributed this contribution to the TWGs for updating the second version of data specifications. At the same time, it also solved the issues addressed at general level (CT level) and, later on during the process of drafting the IR legal text, taking the relevant considerations into account.

4.2 Thematic Working Groups (TWGs)

TWGs evaluated the results from the testing in the process of data specifications development for the version 3. In many cases there was an established direct contact with the testing participants or via INSPIRE Testing WikiWebSite Forum.
The TWGs summarized their perception of the testing process by answering a set of seven questions. This sub-chapter provides the summary of their observations.

1. Do you consider the testing reports being helpful for completing the version 3 of the Data Specification for your theme?

In general, the TWGs have found the testing reports helpful. In many cases, the testing reports provided the same comments as delivered via SDICs/LMOs consultation process. Still the testing phase itself was source of many helpful comments. There was no reported observation for significant negative feedback.

2. What are the main items of the Data Specifications that were influenced by the results of the testing reports?

The replies from the TWGs can be divided to the three groups of answers. The first group of replies from TWGs did not identify specific items, but the testing reports worked as a “confirmation” of the comments received in the comments resolution process. Second group of observations remained on generic level specifying the areas of items (descriptive texts, occasionally cardinality / voidability of attributes). Last group specified the main areas of the discussions which had impact on the work done on of data specifications update to the version 3 for example:

- The endless discussion about the geometry types that should be limited to polygons only or not. At the end, point and lines have been introduced in the data model;
- Some misunderstandings about level and levelName (for CadastralIndexSets): it leaded TWG CP to add an example in the clause “data capture”;
- Issue about circular arcs raised in the testing reports (and during review): it leaded TWG CP to remove constraint about linear interpolation;
- More generally, remarks from testing reports have confirmed remarks from review by SDIC/LMOs or internal discussion within TWG CP;
- Issues about associations raised in the testing reports (and during review): it leaded TWG CP to lots of discussion of this topic.

[9] http://inspire.jrc.ec.europa.eu/index.cfm/newsid/4204

3. What are the main positive aspects of the proposed data specifications identified in the testing reports?

Feasibility of the tested data specifications was identified as the main benefit arising from the testing. This feasibility offers benefits to users and data providers. Of course, this feasibility has showed the need to finish some tasks, but the main principles can be secured and the aims achieved. Interesting were observations about the well documented data specifications and their preferred usage for basic as well as advanced purposes (academic sector).

The technical schema transformation was possible by using existing technology. In some cases, one-to-one transformation was easily possible from existing data sets. Missing elements could easily be collected.

Although some TWGs did not analyze in detail the cost-benefit aspects collected by the testing reports, in some cases most benefits seem to be linked to the INSPIRE process and principles than to the proposed specifications themselves. The testing helped to achieve a better understanding of the whole INSPIRE process as a practical exercise of the data specifications.

4. What are the main negative aspects of the proposed data specifications identified in the testing reports?

Although there was no reported observation for significant negative feedback, still some issues, requiring attention were identified. Not all of them could be solved by the TWGs:

- Some of the testers have a strong focus just on the existing data and data exchange formats; people are not able to analyze the real requirements of the INSPIRE data models (it is of course not possible to derive object oriented data sets out of raster maps);
- The data model is too complex (that is a general issue, not just addressed to PS). On the other hand the data model is not specific enough to allow significant testing results;
- 14 countries didn't participate in the test and may be not aware of the transformations that will be necessary;
- Lack of time for testers to proceed to more comprehensive testing and for TWGs to analyze the report testing;
- Issues from Poland to move from a DXF structure to the INSPIRE model;
- Lack of software to support GML 3.2.1;
- Other issues were raised also during the review by SDIC/LMOs (CP as multi-surface rather than surface, accuracy on cadastral points rather than on cadastral boundaries, circular arcs and not only linear interpolation, clarifications about cadastral index sets).

5. Based on your experience, should the structure or format of the reports be modified / improved for the Annex II and III testing? If so, how?

This question was addressing the usability of the Testing report structure for the needs of TWGs and to verify if there was a need to modify it for the Annex II & III themes. The responses from TWG can be summarized in following groups:

- Usage of data specification development tables indicating attributes that could be mapped (and how) and those that cannot be (and why) etc. These could be very useful and provide a quick overview of problems encountered. In other words: it should be introduced a list with elements that can easily be mapped and some hints about the problems in cases they cannot be mapped;
- Proposals to replace the testing reports with the table used for the comment resolution process, to unify the process of evaluation comments from the consultations as well as from the testing;
- Related proposal recommended to ask the testing participants to participate in the consultation process;
- To extend current template with 4-5 questions about the general view and fitness for purpose of the data specification;
- Cost / Benefit information are always subjective using free text and therefore of little use;

- Testing reports should be delivered to TWGs together with the results of the consultation process.

6. Do you want to provide feedback to any specific reports?

There was no specific request of TWGs to use this summary for the specific report feedback, because where they needed some clarification they contacted the testing participants directly. Other testers received feedback through the comment spreadsheet submitted during the review.

7. Please add any other information regarding the usefulness of the testing reports for your work.

The TWGs could evaluate the usefulness of the testing contribution to the work they've been facing for the fine-tuning the data specifications. Following points are summarizing their observations:

- The testing reports gave TWG confidence that DS were generally feasible, even if some changes were required;
- Remarks from testing gave more weight to some issues already raised by the consultation or within the TWG;
- Cost / Benefit analyses information are always subjective as provided using free text and therefore of little use;
- If changes were proposed, almost all of these were also provided as part of SDIC / LMO consultation.

4.3 Testing participants

Testing participants provided their considerations via testing reports, but also very important, they had the opportunity to do the transformation and application aspects of data harmonization approach proposed by the INSPIRE. This gave the opportunity to see what kind of expectations as well as requirements will have to be considered in real implementation of INSPIRE.

To evaluate the fulfillment of expectations defined before the Testing, the following list provides the overview of which of the contributions proposed in the call for the testing took place in the testing and which not.

Contributions identified in the testing:

Testing infrastructure

- Providing data for testing including the technical documentation of the data set (Application schema (UML), encoding (GML/XML or other), data format specification, code lists, ...) related to INSPIRE Directive Annex I spatial data themes;
- Providing test licenses for software for the duration of the testing period;
- Providing training or guidance in the use of the testing tools;
- Providing software tool assistance (support functionality).

Transformation Testing

- Developing and documenting transformation testing methodology;
- Developing transformation rules or mappings from input data set to INSPIRE data specifications;
- Performing and documenting transformation tests;
- Coordinating transformation tests.

Application Testing

- Developing and documenting use cases for application testing.

Other

- 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).

Contributions that were not identified in the testing:
Absent elements doesn't mean they did not occur at all, but there was not identified direct relevant information in the delivered documentation.

Transformation Testing

- Demonstrating the efficiency of the chosen technical solution;
- Reporting on the need and requirements for registers, such as code list registers.

Application Testing

- Developing and documenting application testing methodology;
- Performing and reporting about application tests;
- Demonstrating the usefulness of the harmonized schemas for applications;
- Coordinating application tests.

Other

- Reviewing test results.

Contributions delivered by the testing participants showed the heterogeneity which is the stakeholders 'community facing to. The variety of this feedback from the simple testing reports to the very complex deliveries is the evidence how diverse was the approach of the testing participants regarding the time, resources and attention invested here. Each testing participant focused on the contribution they considered the most relevant for their needs, taking into consideration main expectations of the testing. Therefore, contribution did not necessarily have to cover all aspects needed for a test to be performed. From that reason in some cases specific testing participants only proposed to provide data sets for testing while other testing participants proposed software licenses for testing purposes. Finally, those partial contributions could merge together creating the teams/consortia trying to mutually benefit from their specific expertise and utilize it in the successful testing results.

5 Conclusions

INSPIRE Annex I testing process provided the first direct interaction with the stakeholders, showing the importance of this communities input and practical validation of the proposed measures. Evaluation of this kind of impact can ensure that the real implementation will be done easier, following the preoperational testing exercise.

The main outcome of the testing ensured that data specifications were feasible to implement with the consideration included in this summary. The results of the testing were used to prepare the third version of the Data specifications, which were used as a base for the drafting of the Implementing rules.

Although there were issues which require attention, in general the testing process fulfilled the expectation, at least from the transformation feasibility point of view. Applicability of the transformed spatial data to described use cases was not extensively done, requiring higher attention especially in the Annex II and III development phase.

6 INSPIRE Annex II and III themes testing recommendations

The following list contains points to consider when the Annex II and III testing process is going to be established:

- Dedicate more time and resources to testing;
- Focus more on
  - transformation feasibility of the proposed data specifications;
  - fitness for purpose of transformed spatial data for specific use cases;
- Improve the level of user requirements descriptions (providing and encourage the description of use cases):
  - Help users to state what they want;
  - Use case usage on various levels (from local to global);
  - Reaching the real users – 25% of time (Users don't track the GI developments, i.e. INSPIRE);
- Ensure higher amount of cross country and cross theme interoperability tests;
- Target wider community of the stakeholders;
- Strengthen knowledge and competences;
- Ensure the balance between the data producer and data user communities;
- Consider the testing iterations;
- Establish better testing infrastructure;
- Provide the more samples for testers.

Annex 1 List of registered testing participants

	SDIC/LMO	Name of LMO/SDIC	Data Provider	Software provider	Transformation Tester	Application Tester
1	SDIC	1Spatial		X	X	
2	SDIC	4C Technology, kZen Labs				
3	SDIC	AGI (UK)	X			
4	SDIC	AGIV	X		X	
5	LMO	Bavarian Ministry of Finance	X	X	X	
6	SDIC	BELGIUM - Walloon Region - SPW - General Directorate for Agriculture, Natural Resources and the Environment	X		X	X
7	LMO	Brussels Environment IBGE BIM	X			
8	LMO	Bundesamt fuer Kartographie und Geodaesie	X		X	
9	SDIC	CAGI	X		X	X
10	LMO	CENIA, Czech Environmental Information Agency		X		
11	LMO	CNIG & BRGM	X	X	X	X
12	LMO	CNIPA				
13	LMO	Coastal & Marine Resources Centre				X
14	LMO	Comissió de Coordinació Cartogràfica de Catalunya	X		X	
15	SDIC	Corila				
16	SDIC	CSI Piemonte	X			
17	LMO	Czech Office for Surveying, Mapping and Cadastre	X			
18	LMO	Czech Statistical Office				
19	LMO	Department of Natura 2000 Ministry of Environment				X
20	SDIC	EDINA, University of Edinburgh			X	
21	SDIC	Environment Agency for England and Wales			X	
22	LMO	Environmental Agency of the Republic of Slo	X			
23	SDIC	ESDIN consortium	X		X	
24	SDIC	ESRI Europe			X	X
25	SDIC	EuroGeographics	X		X	
26	SDIC	European Environment Agency	X			
27	LMO	Federal Institute for Geosciences and Natural Resources (BGR)				X
28	LMO	Federal Institute of Hydrology				
29	LMO	Federal Office for the Environment	X			X
30	LMO	Finnish Environment Institute (SYKE)	X		X	
31	LMO	General Administration of the Patrimonial Documentation (Belgian Administration of Land Survey, Registry, Public Property and Mortgages)	X			
32	LMO	Geodesy, Cartography and Cadastre Authority			X	
33	SDIC	Geofoto	X		X	X
34	LMO	Geonovum		X	X	X
35	LMO	GKSt. GDI-DE (SDI Office)	X	X		
36	LMO	Grupo de Trabajo IDEE (GT IDEE)	X		X	X
37	LMO	Head Office of Geodesy and Cartography				X
38	LMO	HM Land Registry - England and Wales	X			
39	SDIC	HUMBOLDT Consortium	X	X	X	X
40	LMO	ICC	X		X	
41	LMO	IDEA (UKLG)			X	X
42	SDIC	IDsW	X		X	
43	SDIC	IfGI, University of Münster, Germany			X	
44	LMO	Institute of Geodesy, Cartography and Remote Sensing	X		X	
45	SDIC	Instituto geografico agustin codazzi IGAC UIS				X
46	SDIC	interactive instruments	X	X	X	
47	SDIC	Intergovernmental Committee on Surveying and Mapping				
48	SDIC	Italian National Research Council	X			X
49	LMO	JRC-IPTS-Competitiveness and Sustainability	X		X	
50	LMO	Kadaster Netherlands	X		X	
51	SDIC	KORIS	X		X	
52	LMO	KTIMATOLOGIO S.A. (Hellenic Cadastre)			X	X
53	SDIC	LA POSTE	X			
54	LMO	Lantmäteriet, Swedish mapping and cadastral service authority	X		X	
55	SDIC	Latvian Geospatial Information Agency			X	X
56	SDIC	Marine Environmental Data and Information Network	X		X	X
57	LMO	MEEDDAT/DGITM/MTI	X		X	X
58	LMO	Metria			X	
59	LMO	National Land Survey of Finland	X		X	
60	LMO	National Water Management Authority	X		X	
61	LMO	Norwegian Mapping Authority	X	X	X	
62	SDIC	Norwegian Public Roads Administration (Norge Digitalt)	X		X	
63	LMO	Ordnance Survey	X		X	
64	LMO	Ordnance Survey Ireland			X	
65	SDIC	Polish Geological Institute	X			
66	LMO	Property Registration Authority				
67	LMO	Registers of Scotland				
68	SDIC	Safe Software		X	X	
69	LMO	SAITS	X			
70	SDIC	SDIC – PASI (Polish Association for Spatial Information)			X	
71	SDIC	SDIC Nature-GIS	X		X	X
72	SDIC	SIS	X			
73	LMO	Slovak environmental agency	X		X	
74	SDIC	Snowflake Software		X		
75	LMO	Spanish General Directorate for Cadastre	X		X	
76	LMO	Surveying and Mapping Authority of the Republic of Slovenia	X			
77	SDIC	Swedish Rescue Services agency			X	X
78	LMO	swisstopo	X		X	
79	SDIC	TIH; c/o Harrod Booth Consulting Ltd			X	
80	SDIC	TRACASA	X			
81	LMO	United Kingdom Hydrographic Office	X			
82	SDIC	VMM	X			
		Sum	**51**	**11**	**48**	**22**

Annex 2 List of testing participants delivering reports

	Name of the LMO/SDIC	Country	LMO	SDIC	Number of reports
1	1Spatial	UNITED KINGDOM		X	1
2	Bundesamt für Kartographie und Geodäsie (BKG)	GERMANY	X		2
3	Cadastre, Land Registry and Mapping Agency	NETHERLANDS	X		2
4	Comissió de Coordinació Cartogràfica de Catalunya	SPAIN	X		1
5	Czech Office for Surveying, Mapping and Cadastre	CZECH REPUBLIC	X		5
6	Czech Statistical Office	CZECH REPUBLIC	X		1
7	Digital Norway (Norw.: Norge Digitalt)	NORWAY		X	1
8	EDINA National Datacentre, University of Edinburgh	UNITED KINGDOM		X	2
9	ESRI Europe	GERMANY		X	1
10	EURopean Addresses Infrastructure	SPAIN*		X	16
11	European Spatial Data Infrastructure Network	FRANCE*		X	7
12	Federal Office of Topography (Switzerland) - swisstopo	SWITZERLAND	X		1
13	General Administration of Patrimonial Documentation	BELGIUM		X	1
14	General Directorate for Cadastre	SPAIN	X		2
15	Geodesy, Cartography and Cadastre Authority of the Slovak Republic- GCCA	SLOVAKIA	X		1
16	Geographic Information Standards Initiative in Sweden	SWEDEN		X	2
17	Geonovum	NETHERLANDS	X		3
18	GIS4EU	ITALY		X	3
19	Head Office of Geodesy and Cartography	POLAND	X		7
20	HUMBOLDT	SWITZERLAND		X	1
21	IfGI, University of Münster, Germany	GERMANY		X	1
22	INSTITUT CARTOGRAFIC DE CATALUNYA	SPAIN	X		3
23	interactive instruments	GERMANY		X	1
24	Lantmateriet, National Land Survey	SWEDEN	X		5
25	Lenkungsgremium GDI-DE (Steering Committee GDI-DE) (explanation: GDI-DE = Spatial Data Infrastructure Germany)	GERMANY	X		1
26	Local Government Information House	UNITED KINGDOM	X		2
27	National Land Survey of Finland	FINLAND	X		1
28	National Water Management Authority	POLAND	X		1
29	Nature-GIS	ITALY*		X	1
30	Norwegian Mapping and Cadastre Authority	NORWAY	X		2
31	Ordnance Survey	UNITED KINGDOM	X		5
32	Safe Software	CANADA		X	1
33	SDI GIS-Flanders	BELGIUM		X	1
34	Slovak environmental agency	SLOVAKIA	X		2
	Snowflake Software	UNITED KINGDOM		X	1
35	Swedish Environmental protection Agency	SWEDEN	X		2
	Sum		**20**	**16**	**90**
* Some LMOs/SDICs can represent more than one country.					

Annex 3 Transformation testing benefits

Benefits 1/6: Direct User Value or Benefit:

Availability of the data models

- A definitive transport model for roads including standardization of attributes and unique reference of roads for the UK would be beneficial for highway maintenance, transport analysis etc. This has partly been achieved and recognized for highway maintenance based on the NSG;
- The existence of a standardized documented model will favour the understanding and the interoperability of the GIS of the institutions that work in territorial management and will allow the companies and other stakeholders to know our cadastral system better;
- The data models can serve as a guide for new developments of spatial data and data infrastructures. The time source to develop such in each new task can be saved;
- Time saving to receive data in a well-known and documented schema. The possibilities of combining data from different sources will increase.
- INSPIRE data model is well documented and could be preferred for some basic (it doesn't cover all cadastral data) purposes;
- Can expect multiple benefits and savings from using a standardized approach rather than a variety of proprietary approaches;
- Interesting to have some example to see if relevant fields could be added to own specification;
- Data models will be built on unified framework and therefore meet the demands of availability;
- All the information will be in general geographic data model and not only in specialized datasets;
- Preview of what to come. Head start preparing routines for the INSPIRE implementation;
- In general the availability of approved data models reduces costs of it- development;
- Easily accessible administration structure is good for cross-border projects;
- Elaborated data models can be used in future by many other institutions;
- Users have to study and develop applications for just one data model.

Higher flexibility for further data requests

- Once the transformation work has begun Strandja NPD will concentrate on the development of a good data base and data infrastructure and will probably add some missing data to its data base. This will enhance the flexibility for further data requests by direct users as well as data availability because data from other institutions will be gathered as well;
- Once transformation process has been programmed and embedded in the application, data can be transformed more easily into the INSPIRE data format;
- There will be higher possibilities for further data requests with more and specific connections between datasets;
- It will be easier to download data and when the data models are known further data requests will be easier to perform;
- Especially the publication of the metadata will favor the knowledge of the characteristics of our data set;
- Higher flexibility for further data requests can repurpose the service for multiple uses;
- A model for transforming data into the INSPIRE specification will be available;
- Users have to study and develop applications for just one data model;
- Less time needed to find valuable data to answer request;
- Data requests from other countries are more flexible;
- Taxonomy and field homogeneity;
- User could use other clients.

Faster data management

- This is probably one of the greatest advantages of using common data schemes;
- With the INSPIRE principles, the Spanish Cadastral Virtual office enables establishing direct interoperability with external systems;
- Compliance with INSPIRE provisions will lead to all-over improvement in the work with spatial data;
- Faster incorporating updates better possibility of consolidation of dates, less redundancy;
- This is probably one of the greatest advantages of using common data schemes;
- Knowledge of what resources it will demand.

Increased data availability

- Yes, through the principles of INSPIRE that are followed by our Cadastral Virtual Office, we provide cost-free, easy, rapid, 24-hour, 7 days a week access to all cadastral data to citizens, private companies and other administrations that ask for our information;
- If exposed using a download service or e.g., an INSPIRE gazetteer service it will provide easier immediate access to geographical names data;
- Availability through INSPIRE services. Possible after adopting official Natura2000 data availability policy;
- Specific and wider information on protected areas in Fundamental Base of Geographic Data;
- Making INSPIRE-compliant data available, based on existing national service;
- Data are more available for international data exchange purposes;
- Availability on the bases of standardized outputs (WFS services);
- At least the is relevant when it comes to already existing data;
- Transformation will improve basic conditions for availability;
- Yes, for foreign parties and international use;
- At least the is relevant when it comes to already existing data;
- Can observe all datasets at the same time.

Improved data identification

- Road transport network data would be referenced to the same unique street reference number. At the moment this only applies to a limited set of data related to the NSG;
- Availability through INSPIRE services. Possible after adopting official Natura2000 data availability policy;
- Starting creation of metadata will improve data identification;
- Data could be easily gained and identified correctly abroad;
- A common data model will improve data identification;
- Data models considerably facilitate data identification;
- Better semantic interoperability;
- Wider metadata.

Improved data access

- Yes, not only the citizens but numerous Public Administrations with territorial functions, at the national, regional and local levels, access now much better to our alpha-numeric and graphic cadastral data to perform their work;
- The INSPIRE directive will improve the data access by the demands on the member states to provide metadata and services by which the user can search and access data;
- Access and cooperation with other countries will be easier if both can transform to/from the INSPIRE specification;
- Online discover services in defined environment should help;
- Standards-based access to INSPIRE-compliant content;
- Via international Web services;
- WFS, WMS services.

Improved data compatibility

- Evolution of the CVO has included implementation of webservices to integrate systems applications used by Collaborating Entities, permitting on-line maintenance of the database, improving the exchange of information and incorporating an external geographical system to overlay Cadastral information onto their own cartographies;
- The transport data specification for roads would improve compatibility of data reference to the road network. Currently, resources are spent within local authorities to match between different road referencing based on the NSG and the OS ITN network;
- If all institutions, which work with spatial data fulfill the INSPIRE requirements, data will become compatible which will increase the effectiveness of the work (decrease of time and costs spend on often transformations) and the quality of data analysis;
- In case the target definitions are clarified, they serve a shared vocabulary to a large user community. For example, two groups can communicate about INSPIRE roads and road width;
- The user will be able to access data from all the countries with the same specifications;
- INSPIRE compliant NLPG dataset will improve compatibility with other address datasets as the same standard is used;

- This is clearly one of the benefits of INSPIRE. Data can be shared and analyzed across nation boarders;
- Excited by prospect of harmonized data and potential of being able to aggregate across themes;
- Standards introduced by INSPIRE will live through in government and commercial institutions;
- Specific and wider information on protected areas in Fundamental Base of Geographic Data;
- This is clearly one of the benefits of INSPIRE. Data can be shared and analyzed across nation boarders;
- The user will be able to access data from all the countries with the same specifications;
- Datasets analysis will be simplified because all data is in the same projection;
- Access to data from different countries that use same specifications;
- Online discover services in defined environment should help;
- Trans-boundary spatial data are more compatible;
- With other INSPIRE Protected Sites themes;
- Data will be compatible with other EU data;
- Increased standardization of dataset;
- Over border compatibility;
- INSPIRE-compliance.

Increased ease of use

- Yes, our experience is that the CVO following the INSPIRE principles has been a social phenomena in Spain. It is widely used by public and private sectors because of its ease of use The increase of use has been spectacular since its creation In 2008, 121 million maps were served, more than 2.1 millions a week;
- There is no guarantee that there will be an increased ease of using the data for the end user. This will depend on client software etc. However it is reasonable to assume that the common data schemes will make it easier for the user;
- There is no guarantee that there will be an increased ease of using the data for the end user. This will depend on client software etc. However it is reasonable to assume that the common data schemes will make it easier for the user;
- Simplified data structure for address component only. However, data structure will not meet full requirements of NLPG and BS7666;
- Experts will get used to the data model and it will be easier to work with different data sets if the model is the same;
- Don't have to see tutorials or work with different projections;
- Through INSPIRE services;
- Smoother dataflow.

Better data sharing ability

- There is no guarantee that there will be an increased ease of using the data for the end user. This will depend on client software etc. However it is reasonable to assume that the common data schemes will make it easier to share data;
- If all institutions, which work with spatial data fulfill the INSPIRE requirements, data will get easier for sharing, which will enhance quality of activities for nature protection and for providing relevant information to the public;
- Once all data are provided in the same format, data could be more easily shared but the costs would be immense to achieve this;
- Access and cooperation with other countries will be easier if both can transform to/from the INSPIRE specification;
- Yes, as has happened with our CVO, the use of standard data and services increases the data sharing ability;
- One dataset now have a standardized format and therefore easily prepared for delivery;
- Can share easily the data, because have the same projection;
- At a European level (no improvement at UK level);
- Encourage producers and users of GIS data;
- Via international Web services;
- Yes, for foreign parties;
- Use of standards;
- Through INSPIRE services.
- Uniformity.

Reduced cost of integrating data

- At least in cases where data has to be integrated with more then one other source (else, also a single transformation would be required anyway) and if the other sources are also INSPIRE conformant;
- Excited by prospect of harmonized data and potential of being able to aggregate across themes. Should be much easier, especially once tooling is available/better.
- Knowing the INSPIRE specifications and belonging documentation will be beneficial when implementing the final and requested specifications;
- If every data is produced according to the INSPIRE recommendations, there will be almost no costs for integrating them;
- As common data format is used, data from different data sources should be more easily integrated;
- Yes, in our experience the use of standard services has significantly reduced the cost of integrating;
- A common format, higher quality and metadata will reduce costs of integrating data;
- Integration will maybe cost more in the beginning;
- As all data are provided to the same data model;
- Less labour input, more time for creative work;
- No more cost but perhaps more time?;
- Yes if process well defined.

Increased data quality

- There is no guarantee that the data quality will be improved, but it is likely that increased transparency of data and recommendations on data completeness and spatial accuracy will stimulate the data producers to improve the data quality;
- Inspire provisions are developed carefully in the work of many specialists, this ensures the increasing of data quality if the INSPIRE provisions are met by the institutions;
- There is no guarantee that the data quality will be improved, but it is likely that increased transparency of data and recommendations on data completeness and spatial accuracy will stimulate the data producers to improve the data quality.
- The widespread use of the data ensures its quality.

Increased data reliability

- The metadata regulation will make metadata available for all INSPIRE data themes and this will increase the reliability of data significant;
- Yes, the widely used and easy free access to data through standard services guarantees reliable data that everybody can consult;
- Metadata increase reliability of data, because one knows who exactly created the data, when, is it the last version etc…;
- The metadata regulation will make metadata available for all INSPIRE;
- Because inspire makes obligatory the presence of metadata.

Availability of new services

- In our case, in the last years the OVC has made a significant progress as a result of the demands of the citizens, of the public administrations and of the collaborating institutions that has made it more user-oriented, inclusive and interoperable. New utilities requested by users have been incorporated and it has been possible thanks to the use of standards data and programs that facilitate the development of this new services;
- Once the transformation work has begun, Strandja NPD will concentrate on the development of good data base and data infrastructure and will probably develop new services for end users starting with the INSPIRE services but proceeding to providing information about nature protection to the public;
- Maybe, if generic transformation services are offered, which can be used by a wider com-munity. If these services are specific, other users won't benefit;
- The new services will make it possible to gain benefits from the common data model by making data available;
- Possible incorporation of Natura2000 theme into new kinds of environmentally oriented assessments;
- A new combination of dataset will available by request. Through what services is not yet decided;
- Harmonized data opens prospect of new ser-vices based on integration of data;

- When data can be combined there are high possibility for new services;
- Via international Web services;
- WPS services.

Improved efficiency and quality of environmental assessments

- For cross-boarder scenarios the efficiency will increase. It is still unclear, which quality aspects will get better. Quality of integrated data sets can only improve if translations are tractable. This especially requires clear definitions of target data model elements, i.e. what do they represent;
- Hungary lies within the Pannonian Ecoregion, it covers about 75%. Other parts are belonging to the neighborhood countries – to perform environmental assessments of the ecoregion could be much efficient;
- From an European point of view the efficiency and the quality of environmental assessments will improve. It is harder to recognize these improvements on a national level;
- The quality of environmental assessments can firstly be improved by better quality data, but also by easy access to more data as provided by the INSPIRE recommendations;
- To maximize benefit, a considered research programs needs to be developed and en-acted by the academic sector. Education required;
- By adding up previously mentioned advantages effectivity should improve;
- Possibility of solving environmental impacts (problems);
- Data could be better available in different countries;
- More detailed base information and their validity;
- Yes, for transborder projects.

Benefits 2/6: Social Value.

Enables better decision making

- In some cases better decision making is enabled more by Toscana's address data than by INSPIRE's, e.g. since Toscana Model specifies and details relations between Entrance types this is more functional to different services such as the case of quickly reaching a site by ambulances and rescuing people in danger or needing help;
- The Cadastral system now provides all the institutions that work in the territory with all the products and services they need to support their policies and competencies;
- Easier to come to decision between different sphere of activities, and also decisions where using data from more than one country, when data cross borders;
- From European point of view the efficiency and the quality of environmental assessments will improve. It is harder to recognize these improvements on a national level;
- A good spatial data base will enhance the dialogue between different parties involved in the decision making process;
- Yes, with combined and cross-border information there will be a better basic for decision making;
- With better chance to gather relevant data, decision making should be improved;
- Due to increased knowledge and hands-on experience with the INSPIRE specifications;
- Especially for cross-border scenarios;
- More objectivity in decision making;
- Yes, for transport network analysis;
- Cross boundary issues;
- On the data providing.

Reduces barriers between organizations

- Thanks to interoperability we have passed from a corporate system, to having a platform of good, complete and updated cadastral information at the service of all the entities that collaborate in the Cadastral Management and all the others that use our information;
- Easier to work between organization when working with a common data model where all understands the model;
- INSPIRE-related developments could serve also as a basis for the improved national level interoperability;
- However, reducing barriers between organizations requires more than just implementing INSPIRE; it requires the fulfillment of for example the EIF as defined by IDABC;
- Easier to work between organization when working with a common data model where all understands the model;
- The transformation made several organizations work together on the specifications;

- Discussion and advice from other companies on difficulties by the specifications;
- All have to face INSPIRE challenges. This will naturally increase collaboration;
- A good spatial data base will enhance the dialogue between different parties;
- In theory this should reduce barriers once implemented;
- Yes, in exchanging information;
- Enforces integrated standards;
- Because have the same projection;
- Working together.

Increases institutional effectiveness

- The CVO has signified a reorganization of services and processes to make cadastral administration more efficient and effective, increase collaboration between administrations avoiding duplication of work, and reduce the administrative burden;
- If all institutions, which work with spatial data fulfill the INSPIRE requirements, data will become compatible, which will increase the effectiveness of the work (decrease of time and costs spent on often transformations);
- Easier to work between organization when working with a common data model where all understands the model;
- Yes, if the institute requires thematic data exchange and integration;
- Natura2000 available in standard INSPIRE data format, comparable with other spatial data;
- It enables for institution use new WPS services;
- Yes, in diminishing double workload.

Promotes more efficient use of (taxpayer) funds

- Maybe in the long run. Initially the adjustment to Inspire directive will cost taxpayers money;
- For some matters it might be more efficient. Initially will probably the cost increase for the society;
- Of course, avoiding duplication of work and reducing the administrative burden, INSPIRE promotes more efficient use of (taxpayer) funds;
- Availability of new data sets which are streamlined for delivery;
- Avoiding duplication of work;
- Less redundant activities.

Increases public participation (raised public sector confidentiality)

- Using FME clearly provides the potential for increased public participation because of our support for both OGC and popular proprietary formats, from SDF and KML to Shape, TAB and DWG to spatial databases such as Post-GIS and Oracle;
- Increased availability and access to metadata might result in increased involvement, commitment from the general public (media, re-searchers, etc);
- Introduction of reasonable and transparent standards can rapidly increase number of users;
- Because access to information;
- Better availability of data.

Benefits 3/6: Institutions Operational benefits.

Promotes intra-institutional collaboration

- Yes, once achieved but the organizational barriers and cultural and organizational change required to bring the different data components together may be difficult to achieve as data sources meet different statutory requirements and would therefore not be fit for the purpose of the INSPIRE transport DS. The transport DS focuses mainly on transport networks and not so much on highway maintenance. However, both reference the same road network;
- Interoperability has permitted to our system, based on confidence in our Collaborating Entities and principally in our Local Authorities, to be a clear example of efficient innovative administration which, through the optimization of existing resources, allows service reorganization and process simplification and promotes intra-institutional collaboration;
- Building the partnership, the NP Directorates in Bulgaria show their will to exchange their experience and build common data base. NP Directorates are parts of the National Forest Agency;
- Changing to another format will probably not alone promote intra-institutional collaboration, however higher quality demands will/might probably promote to this;

- Use of same address format will facilitate the intra-institutional working for example across local partnerships;
- People working all along the production process to see where the transformations will have to be done;
- Two meetings with a national group (digital Norway) discussing implementation and difficulties;
- With better chance to gather relevant data, decision making should be improved;
- Especially in training and maintenance.

Promotes inter-institutional collaboration

- The Spanish cadastre is the main data provider of the IDEE (Spanish Data Infrastructure), which has united under a single portal all the geo-referenced data distributed over different GIS, by different administrations. It is now accessible and interoperable on the Internet with the cadastral information as principal layer;
- If all institutions, which work with spatial data fulfill the INSPIRE requirements, data will become compatible, which will increase the effectiveness of work (decrease of time and costs spend on often transformations);
- Will do eventually, but first the two communities of highway maintenance and transport needs to come together. The cultural and organizational barriers will be hard to overcome;
- Yes, a common format, higher quality and metadata will promote inter-institutional collaboration;
- Should do, especially as Annex 2 and 3 IN-SPIRE compliant services become available;
- The transformation made several institutions work together on the specifications;
- One meeting with a Swedish company advising us on LRS and GML;
- Institutions used up to now their own structures of data;
- Nice collaboration between NLS Finland and FGI;
- On the data providing;
- Better interoperability;
- Working together.

Reduces data integration cost across institutions

- Unknown whether integration costs will be reduced. If there is a large imbalance between data model complexity and data complexity, then costs could be raised significantly. For example, if the source data is just a point with a name and a country and the destination has a very rich and nested structure, the costs of integrating with that structure could be significantly greater than the costs of using the original. In many cases place holder data may need to be created where detailed source data is not available. This can lead to significant increases in data volumes for data sets post conversion;
- Interoperability services have allowed the transfer of solutions to other administrations and permit that we all work together with the cadastral parcels in a common space, reducing data integration cost;
- If all institutions, which work with spatial data fulfill the INSPIRE requirements, data will become compatible, which will increase the effectiveness of work (decrease of time and costs spend on often transformations);
- This is strongly case dependent. Only if there are new integration tasks and both fit the INSPIRE themes;
- Yes, a common format will reduce data integration costs across institutions;
- Depending on intra-institutional standardization diffusion;
- Better interoperability.

Promotes re-use of existing datasets

- If (through implementation of Inspire) data sets produced from one institution are accessible to other institutions, which need this data, this will promote their re-use and will prevent costs for creating them again;
- In our experience, the open access, cost free, 24 hours a day, 7 days a week , has clearly promoted reuse of our data;
- Only in cases, where the costs of learning and using relatively complex models pay-off. This will require a survey in practice;
- Integration of specific information with general data model – need to get only one dataset;
- Dataset streamlined for delivery. Would be beneficial to use as a dataset for delivery;
- Many users will use the same data;
- Due to unified data structures;

- In the INSPIRE context.

Decreases cost of IT / information management

- Possibly if we get an automated process based on stable routines and existing applications. Demands further application development;
- As in our CVO, increase of affectivity and efficiency in the information management ensures decreasing cost of information technology;
- In short term of time the costs will increase, however in the long term of time the costs will probably decrease;
- Standardizing national Natura2000 datasets will ease production of EU-wide coverage and its regular updates;
- It will be demanding investments and can hopefully be a fact in the long run;
- It depends, the management can be more flexible and efficient;
- Very case dependent.

Increasing potential to run or join various kinds of projects commission of research tasks

- The potential will increase, it will be easier to search for data, receive data, and work with research tasks. When a common data model is used it is easier to make interpretation of data, especially between data covering different countries;
- A major factor for EDINA. This exercise is helping us understand the consequences for the academic sector. The sector we serve and for whom we provide services;
- If a testing program like this gives beneficial values to the organization continuing precipitating similar projects and research will be highly recommended;
- Yes, the availability of the data and its reliability increase potentially for research projects
- It enables better comparability of results of various projects;
- Use of shared data models obviously in-creases collaboration possibilities, because of less required integration efforts;
- There is possibility of cooperation with universities that would prefer INSPIRE data for their GIS purposes;
- Join procurement and project implementation across local area partnerships;
- Promote compatibility.

Benefits 4/6: Institutional Financial Value.

Overall cost savings for info management

- Yes, our experience is that even increasing very much our services, the interoperability principles permit budgetary stability. In other words, a freeze in public spending, requiring administrators to be more efficient and to optimize the use of the economic resources available;
- We are expecting future cooperation on united transformation between different CRS's for all data;
- In short term of time the costs of info management will increase, however in the long term of time the costs will probably decrease, especially costs of intra-institutional info management;
- Saving of in administration of large databases.

Achieves cost avoidance (as opposed to savings)

- It is possible to use other organization's data on the contrary of establishing and running own database;
- Standardized common data schemas and metadata will reduce info management cost;
- Allocates funds for testing and research rather than direct implementation funding;
- Yes, we were able to provide many new services without to raising our cost;
- Of future data conversion and matching.

Benefits 5/6: Strategic and Political Value.

Fosters closer working relationships

- Unless one person has all information needed, the process incorporates subjects for discussion and maturing. Needed for a good solution a process of cooperation is most likelynecessary;
- With the CVO and the IDEE in Spain we have established many collaboration agreements. It has been possible because of the INSPIRE philosophy;

- Sharing of data will foster closer working together because of the increased dialogue on common topics and tasks;
- Everybody will face similar challenges, closer relationships will increase exchange of experiences.
- A common data model, metadata, higher quality of data fosters closer working relationships;
- Complex information in fundamental dataset;
- International relationships are strengthened.

Support improved decision making

- To have good quality, updated, freely available and standardized cadastral information that can be easy interoperated with other data is a very powerful tool in the decision making process;
- Common data specification should improve management of cross boundary issues such as those involved with disaster management as well as environmental;
- A good spatial data base will enhance the dialogue between different parties involved in the decision making process;
- A common data model, metadata, higher quality of data improves decision making;
- Enables common knowledge to be shared across all organizations;
- Once a comprehensive transport network datasets will be available;
- Support improved basic data as a ground for decision making;
- More valid information for decision making;
- Comparable with other INSPIRE themes.

Supports other information infrastructure

- INSPIRE has understood that the cadastral parcel is part of the basic information over which the environmental information infrastructure will be generated. The current technical advances and the current legal support of INSPIRE allow us to provide adequately. This tendency can be extended to any policies needing the mesh of property distribution or other cadastral information;
- A common data model, metadata and higher quality of data make it easier to integrate data in other new and existing solutions, infrastructures;
- A common data model, metadata and higher quality of data make it easier to integrate data in other new and existing solutions, infrastructures;
- Transformation will bring basic conditions for that;
- Data will be compatible with other EU data.

eGoverment support

- Yes INSPIRE DIRECTIVE is fully aligned with E. U and Spanish Government Information Society initiatives, legal, political and strategic aspect: PSI, Spanish law electronic access of citizens to public services etc.;
- A common data model, metadata, higher quality of data makes it easier to build solutions of high quality;
- Public spatial data will improve the provision of electronic administrative services which is a part of the e-Government;
- A common data model, metadata, higher quality of data makes it easier to build solutions of high quality;
- Wide Use of Inspire services.

Annex 4 Application testing benefits

- Initially increased availability and data sharing is expected to be of minimal benefit until the INSPIRE standards become an accepted and adopted standard in which case data sharing ability should improve. Early on the high cost and level of investment required to comply with INSPIRE is likely to deter smaller authorities and agencies from pursuing INSPIRE compliance until regulatory and practical project requirements dictate that it is necessary.
- One dataset in common use will allow easier sharing of information between various levels of government as long as licensing is unified as well;
- Increased data availability limitations with current licensing restricts availability of national addresses data;
- Improved efficiency and quality of environmental assessments based on more detailed base information and their validity;
- It is possible to use other organization's data on the contrary of establishing and running own database;
- Regarding the improved data compatibility, single standard should foster better compatibility;
- Use of external addresses controlled by other bodies Inspire dataset could ensure continuity;
- Standards introduced by INSPIRE will live through in government and commercial institutions;
- Overall cost savings for info management (saving of in administration of large databases);
- More efficient use of (taxpayer) funds if reduction in costs of accessing national dataset occur;
- Introduction of reasonable and transparent standards can rapidly increase number of users;
- Inspire compliance should make it easier to set up rich OGC web services such as WFS;
- Reduced data integration cost across institutions if centrally distributed method is used;
- Increased institutional effectiveness enables for institution use new WPS services;
- Reduced barriers between organizations enforces integrated standards;
- Better data sharing ability encourage producers and users of GIS data;
- Improved data access will make it easier to access national dataset;
- Availability on the bases of standardized outputs (WMS services);
- Data can be more easily shared between different organizations;
- Common identification system will allow easier sharing of data;
- Single standard should mean reduced costs and more choice;
- More objectivity and valid information for decision making;
- Wide Use of Inspire services for eGovernment support;
- Institutions used up to now their own structures of data;
- Data models considerably facilitate data identification;
- Better comparability of results of various projects;
- Less labour input, more time for creative work;
- Many users will use the same data;
- Simplified addressing standard;
- Less redundant activities;
- Smoother dataflow.

Annex 5 INSPIRE Annex I Data Specification Testing Report Template

INSPIRE
Infrastructure for Spatial Information in Europe

INSPIRE Annex I Data Specification Testing Report Template <Theme Name>/<Use Case Name>

- *<Theme Name>/<Use Case Name> and <Testing SDIC/LMO Name> is a reference of the custom document property 'Theme Name', 'Tester Name' and 'Use Case Name'. Please change the value of this document property (Select "File → Properties → Custom") and do not directly change the text in the document. To refresh all references press ctrl+A and F9.*
- *<Theme Name>/<Use Case Name> - choose the relevant*

Title	INSPIRE Annex I Data Specification Testing Report Template <Theme Name> <Use Case Name>
Creator	<Testing SDIC/LMO Name> <Testing SDIC/LMO Name>
Date	<date>
Subject	Testing Process of the INSPIRE Annex I Data Specification
Publisher	INSPIRE Consolidation Team
Type	Text
Description	This document describes the results from the INSPIRE Testing Process for the INSPIRE Annex I <Theme Name> <Use Case Name> This template is the annex of the Guidelines for Cost-Benefit Considerations document
Contributor	<Testing SDIC/LMO Name> registered for the testing process via INSPIRE Annex I data specifications testing Call for Participation[1]
Format	MS Word (doc)
Source	
Rights	Restricted to TWG members, DT DS and CT, <Testing SDIC/LMO Name>.
Identifier	INSPIRE_Annex_I_testing_report_template_v3
Language	En
Relation	n/a
Coverage	INSPIRE Annex I testing period (15.10.2008 – 13.2.2009)

[1] http://www.ec-gis.org/inspire/reports/ImplementingRules/DataSpecifications/INSP_testing_CfP_final.pdf

Change history

Version	Date	Changed by	Changed Sections	Changes made
0.1	2008-07-07	M.Lutz	all	Created document based
0.2	2008-08-21	M.Lutz, A.Friis Christen-sen, F.Fierens, M.Tuchyňa, K.Tóth, D. Lihteneger	all	Integrated comments by AIL, AFC, FF, MT, KT, DL made template conformant (as much as possible) to INSPI_Testing_CFP; removed unnecessary sec-tions;
0.3	2008-08-21	M.Tuchyňa	all	Decomposition of former CBC chapter - dissolved in testing chapters, adding intro page with Dublin Core metadata elements, prepared for internal JRC CT comments.
0.4	2008-10-10	M.Tuchyňa	1	Revision for sending the draft to testing participants.

Version 0.x refers the internal drafts
Version 1.0 is delivered for internal consultation with selected TWGs, DTs, CT, and EIONET
Version 2.0 is delivered for consultation with SDICs/LMOs.
Version history should be removed from v1.0 and v2.0

Table of content

1 Executive Summary

The purpose of this document is to provide the testing report template for the stakeholders participating on the "Testing INSPIRE Data Specifications for Annex I data themes"[2]. Results from this testing process should be summarised by the web form based on this template, to have unified output for the testing summary document and shaping of Implementing Rules on interoperability of spatial data sets and services, as required in Art 7(1) of the Directive.
The scope of this testing report is to obtain information on theme or use case level, therefore are all the stakeholders kindly asked to multiply the testing report according the each unique theme/use case, if it will be necessary. Regarding the area of testing participants' interest and available resources some templates, can be filled only for transformation testing, some for application testing and some of course for both parts of testing.
Template contains information about two types of testing procedures. First is focused on transformation testing and second on application testing phase. Each testing phase is composed from the two interlinked parts. First part is more technical and is oriented on data content and the testing techniques used. The second part of the testing phase contains the cost-benefit considerations according the Guidelines for Cost-Benefit Considerations in INSPIRE Data Specification Development[3].
The role of the testing participants is to help to understand how existing data can be made available according to the proposed INSPIRE common data specifications, to demonstrate the usefulness of harmonised specifications, and to determine the readiness of relevant methods and software tools.

Testing report is based on set of the questions which can provide the guidance for testing stakeholders with summarizing their testing results.

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.

2 Testing Scope

2.1.1 Testing Scope

Question 1:

What kind of test would you like to report?	Tick by "X", if this one is relevant
Transformation	
Application	
Both	

Question 2:

Reference the INSPIRE data specification(s) that was/were tested?
Answer:

Reference the INSPIRE data specification(s) that was/were tested. 1st released draft of data specifications (30 September 2008) will be released mostly for the information, preparing and for testing planning purposes. This version of data specification will be released for the INSPIRE Consolidation team consultation phase. 2nd released draft of data specifications (15 November 2008) will be released for testing and also for commenting process during the SDIC and LMO consultation phase.

[2] http://www.ec-gis.org/inspire/reports/ImplementingRules/DataSpecifications/INSP_testing_CfP_final.pdf
[3] https://inspire-twg.jrc.it/inspire-model/testing/CBC guidelines.doc

3 Transformation Testing

3.1 Transformation Testing Procedure

3.1.1 Source data

Question 3:

Which INSPIRE data theme your test is related to?
Answer:

Question 4:

Was it possible to perform the transformation using a single source of data (one dataset)?
Answer:

Question 5:

If not, what datasets were used and what was the method of data integration?
Answer:

Question 6:

Describe each source data sets used in the testing, including their: • metadata (incl. data quality if applicable) • level of details (scale, resolution) • schema • format/encoding • size (in MB, and also in % of the full dataset, if a subset was tested) • area of the data set (km2, %of the whole territory) If they are freely available, please provide information on how to access the test data sets.
Answer:

3.1.2 Testing Architecture

Question 7:

Describe the testing architecture, including the used hardware and software components (commercial software products or own developments).
Answer:

Question 8:

Describe the transformation method (on-the-fly or off-line transformation). Explain why this method was chosen add information about the stability (percentage of the target data set that remains unchanged over longer periods of time) and the update frequency of the data sets used.
Answer:

Question 9:

If the transformation method chosen is off-line, describe how updates of the target dataset are handled.
Answer:

Question 10:

Describe the output data services (WFS/WCS) that were used for making input/output data avail-

able (including portrayal).
Answer:

3.1.3 Data transformation

Question 10:

Describe whether local data could be transformed to conform to the INSPIRE data specification.
Answer:

Question 11:

If the transformation is possible, describe the mapping used, how it was developed and which problems were encountered during its development. If possible, also describe how to access the mapping file.
Answer:

Question 12:

Could you use commercially or freely available transformation algorithms or did you need to develop transformation algorithms on your own?
Answer:

Question 13:

If no (complete) transformation is possible, describe the problems that prevent a (complete) transformation.
Answer:

Question 14:

Describe whether the local data are sufficient to cover all the content required in the INSPIRE data specification.
Answer:

3.1.4 Reference Systems

Question 15:

Describe whether the data could be transformed from their local CRS to the target CRS.
Answer:

Question 16:

If the transformation is possible, describe the way of transformation you used.
Answer:

Question 17:

If not, describe the problems that prevent the transformation.
Answer:

Question 18:

Describe whether there is the loss in precision.
Answer:

3.1.5 Data quality

Question 19:

Describe whether the specified minimum data quality requirements were tested.
Answer:

Question 20:

If they could be tested, describe methods that were used for this testing.
Answer:

Question 21:

If they could be tested, describe which minimum data quality requirements are (not) met.
Answer:

3.1.6 Metadata for evaluation and use

Question 22:

Describe whether local metadata could be transformed to conform to the INSPIRE data specification.
Answer:

Question 23:

If the transformation was possible, describe the mapping used, how it was developed and which problems were encountered during its development. If possible, also describe how to access the mapping file.
Answer:

Question 24:

If no (complete) transformation was possible, describe the problems that prevent a (complete) transformation (e.g. metadata might be missing that are required by the INSPIRE data specification).
Answer:

Question 25:

Describe the granularity of metadata (feature and/or dataset level).
Answer:

3.1.7 Portrayal

Question 26:

Describe whether the data could be portrayed according to the specified INSPIRE rules.
Answer:

Question 27:

Do you have portrayal rules for the source data?
Answer:

3.2 Transformation Testing Results

Question 28:

Describe whether it was feasible to fulfill the requirements of the INSPIRE data specification?
Answer:

Question 29:

Describe the problems encountered and how were they solved (or why could they not be solved)?
Answer:

3.3 Cost Benefits Considerations For Transformation Testing

3.3.1 Costs for transformation

Question 29:

Describe via following table content the costs you consider the relevant regarding the transformation.		
Type of costs	Tick by "X", if this one is relevant	Give an example/explanation of why you consider this to be relevant
Did you recognize some costs regarding the resources for transformation?		
Did you recognize some costs regarding the modeling of the data to be transformed?		
Did your organization posses the necessary hardware before starting INSPIRE testing?		
Did you recognize some costs regarding the architecture maintenance? (network maintenance, external consultations, etc.)		
Did the personnel involved in INSPIRE transformation testing need specific training?		
Did you recognize some costs regarding the transformation?		
Did you recognize some missing cost categories in previous questions?		

3.3.2 Potential benefits from the transformation

Question 30:

Describe via following table content the possible benefits you consider the relevant regarding the transformation.			
Group of the impacts	Impact	Tick by "X", if this one is relevant	Give an example/explanation of why you consider this to be relevant
a. Direct User Value/Benefit			
	Availability of the data models		
	Higher flexibility for further data requests		
	Speeded up data management		
	Increased data availability		
	Improvement of data identification		
	Improvement of data access		
	Improvement of data compatibility		
	Increased ease of use		

	Better data sharing ability		
	Reduced cost of integrating data		
	Increased data quality		
	Increased data reliability		
	The new services availability		
	Improvement the efficiency and the quality of environmental assessments		
b. Social Value			
	Enables better decision making		
	Reduces barriers between organizations		
	Increases institutional effectiveness		
	Promotes more efficient use of (taxpayer) funds		
	Increases public participation (raised public sector confidentiality)		
c. Institutions operational benefits			
	Promotes intra-institutional collaboration		
	Promotes inter-institutional collaboration		
	Reduces data integration cost across institutions		
	Promotes re-use of existing datasets		
	Decreases cost of IT / information management		
	Increasing potential to run or join various kinds of projects commission of research tasks		
d. Institutional Financial Value			
	Overall cost savings for info management		
	Achieves cost avoidance (as opposed to savings)		
e. Strategic and Political Value			
	Fosters closer working relationships		
	Support improved decision making		
	Supports other information infrastructure		
	eGoverment support		
Any other proposals?			

4 Application Testing

4.1 Application Testing Procedure

4.1.1 Use case

Question 31:

Describe the use case underlying the application test (following the method described in D2.6 or using the check list developed by the Thematic Working Groups - TWGs) or make a reference to a use case already specified by a TWG. Describe at least the following aspects: • actors • goal(s) • data requirements (INSPIRE themes) • application
Answer:

4.1.2 Source data

Question 32:

Could you specify the reference the INSPIRE data specification(s) that was/were tested?
Answer:

Question 33:

Describe the INSPIRE-compliant source data used in the testing, including their • metadata (incl. data quality if applicable) • schema • format/encoding • generation (how were INSPIRE-compliant data generated from source data?)?
Answer:

Question 34:

If applicable, describe the non INSPIRE-compliant source data used in the testing, including their • metadata (incl. data quality if applicable) • schema • format/encoding If they are freely available, please provide information on how to access the test data sets.
Answer:

4.1.3 Application

Question 35:

Describe the software application used in the testing, including its • functionalities • data requirements (schema, quality etc.) • data sources and providers (what data are used in the system? who provides them?) • preprocessing requirements (what preprocessing has to be done in order to 'get the data into the system')

• development (required changes, creation from scratch etc.)
Answer:

4.2 Application Testing Results

Question 36:

Describe whether the application can use the INSPIRE-compliant data without repetitive manual intervention. If not, describe the problems that were encountered.
Answer:

Question 37:

Describe whether the application can perform all necessary actions to execute the use case. If not, de-scribe the problems that were encountered.
Answer:

Question 38:

Describe bottlenecks and potential problems encountered in using the harmonized data within the application.
Answer:

Question 39:

If applicable, describe the effort required to use non INSPIRE-compliant data in the application.
Answer:

4.3 Cost Benefits Considerations for Application Testing

4.3.1 Costs for application

Question 40:

Describe via following table content the costs you consider the relevant regarding the use case application.		
Type of costs	Tick by "X", if this one is relevant	Give an example/explanation of why you consider this to be relevant
Did you recognize some costs regarding use case implementation via the INSPIRE compliant data? (Did you record the costs related to the development of the application (cost of the project/testing)?)		
Did you recognize some costs regarding use case implementation without the INSPIRE compliant data? (Did you record the costs related to the development of the application (cost of the project/testing)?)		
Did you recognize some missing cost regarding the application testing cost categories in previous questions?		

4.3.2 Benefits from application

Question 40:

Describe via following table content the possible benefits you consider the relevant regarding the use case application.			
Group of the impacts	Impact	Tick by "X", if this one is relevant	Give an example/explanation of why you consider this to be relevant
a. Direct User Value/Benefit			
	Use case relevance validation		
	Increased data availability		
	Improvement of data identification		
	Improvement of data access		
	Improvement of data compatibility		
	Increased ease of use		
	Better data sharing ability		
	Reduced cost of integrating data		
	Increased data quality		
	Increased data reliability		
	The new services availability		
	Ensuring of existing services continuity		
	Improvement of possible usage of spatial information (phenomena identification, visualization / presentation, simple analysis, forecasting, modelling and scenario analysis, etc.)		
	Improvement the efficiency and the quality of environmental assessments		
b. Social Value			
	Enables better decision making		
	Reduces barriers between organizations		
	Increases institutional effectiveness		
	Promotes more efficient use of (taxpayer) funds		
	Increases public participation (raised public sector confidentiality)		
c. Institutions operational benefits			
	Promotes intra-institutional collaboration		
	Promotes inter-institutional collaboration		
	Reduces data integration cost across institutions		

	Promotes re-use of existing datasets		
	Decreases cost of IT / information management		
	Increasing potential to run or join various kinds of projects commission of research tasks		
d. Institutional Financial Value			
	Overall cost savings for info management		
	Achieves cost avoidance (as opposed to savings)		
e. Strategic and Political Value			
	Fosters closer working relationships		
	Support improved decision making		
	Supports other information infrastructure		
	Decreasing of time and costs for EIA and SEA reports		
	Consistent and correct application of EIA and SEA systems		
	eGoverment support		
Any other proposals?			

5 Conclusions & recommendations

5.1 Frequency of data requests

Question 41:

Can your organization provide statistics /estimations how frequently the data tested is requested by the users?
Answer:

Question 42:

If yes, please indicate the number of requests?
Answer:

Question 43:

If yes, what is the average volume of data requested?
Answer:

Question 44:

Do you need to transform your data in order to satisfy the requirements of the users?
Answer:

Question 45:

If yes, what are the most frequently asked transformations?
Answer:

5.2 Possible Strategic Decisions Based On the Results of Testing

Question 46:

Based on the results of transformation testing is your organization going to fully keep the existing specifications and produce INSPIRE conform data on the request?
Answer:

Question 47:

If yes, will your organization provide services to request on the fly transformation or the transformation will be performed off-line?
Answer:

Question 48:

Based on the results of the testing will your organization modify the existing specifications in order to accommodate specific INSPIRE requirements?
Answer:

Question 49:

Based on the results of the testing will your organization modify the existing specifications in order to accommodate specific INSPIRE requirements? If yes, what modifications are necessary?
Answer:

Question 50:

Do the modifications add value for the national/local users? If yes, which ones?
Answer:

Question 51:

If your organization is going to collect new data or extensively restructure/update the existing ones do you expect that INSPIRE specifications can be used?
Answer:

5.3 Testing Summary

Question 52:

Describe the main outcomes of the testing.
Answer:

Question 53:

Describe the main recommendations to the changes in the tested INSPIRE data specifications.
Answer:

Question 54:

Any other comments, annexes, questions, recommendations
Answer:

Question 55:

Describe the possible cooperation with other SDICs and LMOs if relevant
Answer:

Thank you very much for your huge effort and testing participation.

Inspire Team