



INSPIRE
Infrastructure for Spatial Information in Europe

Recommendations for INSPIRE Spatial Data Services

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Foreword

The INSPIRE directive aims to create a European Union (EU) spatial data infrastructure. The goal of the infrastructure is to enable the sharing of environmental spatial information among public sector organisations and better facilitate public access to spatial information across Europe.

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

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

The Implementing Rules are adopted as Commission Decisions or Regulations, and are binding in their entirety.

The Commission proposed the development of the spatial data services Implementing Rules to be performed in 2 phases.

An exploratory phase where in close cooperation with the INSPIRE stakeholders the overall framework for the development of the spatial data services implementing rules is defined and discussed, with the development of the implementing rules as the next phase.

This document represents the core result of this exploratory phase.

The recommendations chapter is the core of the document and as such represents the chapter the working group, associated with the drafting team, is seeking feedback on. The introduction is for informative purpose only; it aims at providing some contextual information for the readers not fully familiar with the subject.

<p>This document will be 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.</p>
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Introduction

Using the analogy of real-world entities, an infrastructure can be composed of two different types of elements: (1) the basic building blocks that form the infrastructure and (2) the resources that are facilitated by the infrastructure to achieve a certain goal¹, which is motivated by the goal of the infrastructure. These elements are very closely interlinked: e.g. the basic building blocks of an infrastructure that support the drinking water supply are a system of pipes, storage reservoirs, pumps, valves, filtration and treatment equipment and meters, including buildings and structures to house the equipment, used for the collection, treatment and distribution of drinking water. All these elements are obsolete if the main resource, drinking water, is not available.

If we map the infrastructure analogy onto INSPIRE, we can identify the same distinction of elements: building blocks and resources with related goals. Both basic building blocks and resources are of importance for the functioning of INSPIRE, and they are addressed in various Implementing Rules and Guidelines. In a nutshell, the activities of the Network Services Drafting Team covered the infrastructure's basic building blocks, while the resources are addressed through the activities on spatial data specifications and spatial data services specifications.

The resource type that we focus on in this document is spatial data services. So far this resource has not been in the focus of attention, but it remained backstage during the development of metadata regulation, discovery services, download services and the data specifications. However, interoperability arrangements and where practicable harmonization are foreseen in the INSPIRE Directive.

The context: INSPIRE and the Spatial Data Services

The problems regarding the availability, quality, organisation, accessibility and sharing of spatial information are common to a large number of policy and information themes and are experienced across the various levels of public authority. Solving these problems requires measures that address exchange, sharing, access and use of interoperable spatial data and spatial data services across the various levels of public authority and across different sectors. An infrastructure for spatial information in the Community, INSPIRE, is therefore being established providing the legal framework for the measures.

The INSPIRE Directive applies to the resources spatial data sets and spatial data services held by or on behalf of public authorities and to the use of spatial data by public authorities in the performance of their public tasks. However, certain spatial data sets and services relevant to Community policies that directly or indirectly affect the environment are held and operated by third parties. Member States therefore offer third parties the possibility of contributing to the national infrastructures.

¹ NOTE As a rule of thumb, information about resources answers questions starting with a 'what', while information about goals relate to the 'why', and information about basic building blocks answer the 'how'.

In the following section we describe the elements of INSPIRE in a nutshell. This is followed by a more detailed look into the resource Spatial Data Services, the role it plays in the INSPIRE infrastructure, and how this resource is meant to be supported by the corresponding basic building block – the service of type invoke.

The INSPIRE infrastructure elements in a nutshell

There are two resource types that make the INSPIRE infrastructure: spatial data sets/series and spatial data services. In order to support the goals linked to the resources, i.e. their exchange, sharing, access and use, there are the five Network Services that act as the basic building blocks of the infrastructure. In the following we look into each of these in a little more detail.

The resources

Spatial data sets and spatial data services are the main resources for which the named goals apply. The INSPIRE directive takes into account the wide diversity of formats and structures in which spatial data are organised and accessed, and the wide diversity of interfaces and protocols in which spatial data services are implemented and operated in the Community. This requires implementing measures for the resources to be provided for in order to facilitate the use of spatial data sets and services from different sources across the Member States. Those measures are designed to make the spatial data sets and the spatial data services interoperable [3]. They are the Member States assets and resources the infrastructure provides access to.

The loss of time, efforts and money in searching for existing resources (i.e. spatial data sets and services) or establishing whether they may be used for a particular purpose is a key obstacle to the full exploitation of the resources available. Member States therefore provide descriptions of available spatial data sets and services in the form of metadata [2]. These resources are the primary source of information for the interested stakeholders to discover, evaluate and use the spatial data sets and spatial data services.

The basic building blocks

The basic building blocks are the network services that are necessary for sharing spatial data sets and spatial data services between the various levels of public authority in the Community in a uniform way. Those network services will make it possible to discover, transform, view and download spatial data and to invoke spatial data services [4]. They represent the current core part of the service layer of the Infrastructure (see figure 1) where each type of network service has a well-defined role, linked to the goal of the resource that it supports.

- **Discovery:** this service makes it possible, based on the resource metadata, to search for the resources spatial data sets and spatial data services in order to discover the ones of potential interest based on user-defined criteria. It could be considered the first step in approaching the infrastructure and its content.

- **View:** this service makes it possible to display the resource spatial data sets. It provides an additional step towards the assessment of fitness for purpose of a spatial data set based on the visualization of its content.
- **Download:** this service makes it possible to get copies of spatial data sets or to access their content directly. It could be considered the final step in getting access to harmonized spatial data sets.
- **Transformation:** taking into account the wide diversity of formats and structures of the resource spatial data sets, it makes it possible to transform them with a view of achieving interoperability (i.e. be compliant with the *data and services Regulation*). The decision to make transformation services available as Network Services is left to each Member State to decide. Alternatively a Member State could provide access to harmonized spatial data sets directly through the network service of type download, while the transformation into the required format and structure is being done behind the scenes (see for example *draft implementing rules* from the NS DT for different scenarios)
- **“Invoke”:** taking into account the potentially wide diversity of interfaces and protocols, invoke services are services that allow the invocable spatial data services to be invoked in a uniform manner. It thus enables the activation or execution of the spatial data service.

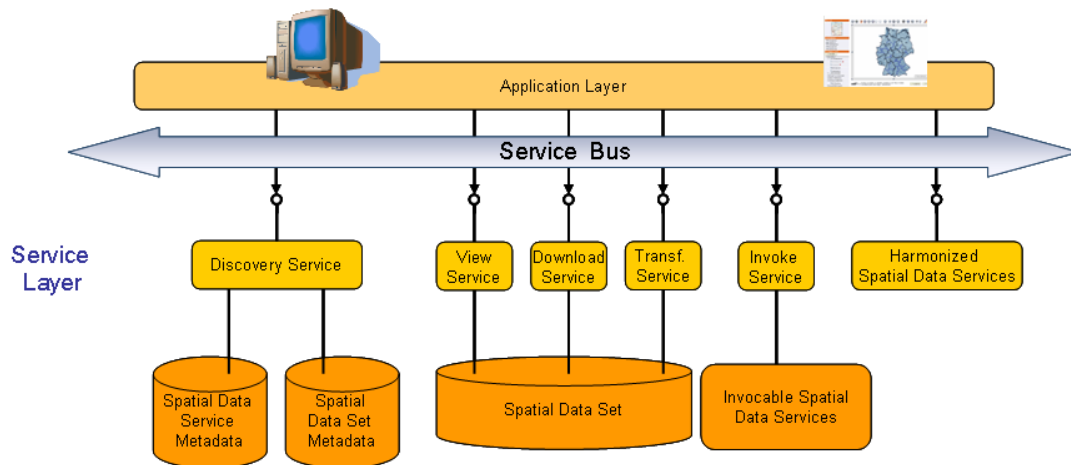


Figure 1: updated INSPIRE Architecture

In addition, and where practicable, some spatial data services would be harmonized to allow their direct invocation.

The role of Spatial Data Services in the infrastructure

The need and benefits of sharing and accessing spatial data sets in the infrastructure of INSPIRE is apparent, as it largely reflects the way how spatial data infrastructures have been implemented in the last years. However, Spatial Data Services play a role in the infrastructure, that, though less well-known, is equally important.

The first four Network Services (discovery, view, download and transformation) already provide the basic functionality through the abstract specification of their application programming interfaces (API) in the implementing rules and associated technical guidelines. However, applications, if based exclusively on the Network services, would still concentrate on the sharing and exchange of the spatial data sets. With the direct addition of harmonized spatial data services to the infrastructure or their invocation through the dedicated invoke network service (e.g. the interoperability facilitator) the infrastructure will enable the development of significantly richer applications potentially closer for example to the decision making process.

The following list contains examples for what could be considered Spatial Data Services in the Member States.

- The Slovak OGC Web Coverage Service (WCS), hosted by the Slovak Analytical server of SEA 2, is available from the service endpoint <http://geo.sazp.sk/cgi-bin/sazp>. It provides, amongst others, download access to coverage data on hill shade. It is linked to a spatial data set related to the INSPIRE Directive Annex II "Elevation" spatial data theme.
- The gazetteer of Scotland³ allows for finding place names in Scotland. It is linked to the INSPIRE Directive Annex I "Geographical names" spatial data theme.
- The postcode service of the royal mail in UK⁴, allows finding postcodes based on addresses and vice versa. It is linked to a spatial data set related to the INSPIRE Directive Annex I "Addresses" spatial data theme.
- The Slovak OGC Web Processing Service, hosted by the Slovak Analytical server of SEA 5⁶, provides GRASS visibility (Lines of Sight) analysis, based on elevation information. It is thus linked to the INSPIRE Directive Annex II "Elevation" spatial data theme.

The INSPIRE Implementing Rules

To allow the exchange and access of interoperable spatial data and spatial data services, the INSPIRE directive requires Implementing Rules (IR) to be produced for the following infrastructure elements (see figure 2):

- Metadata
 - Metadata for spatial data sets and services

² <http://geo.sazp.sk/#>

³ available at <http://www.gazetteerofscotland.org.uk>

⁴ available at <http://postcode.royalmail.com>

⁵ see <http://geo.sazp.sk/#>

⁶ available from the service endpoint <http://geo.sazp.sk/cgi-bin/sazp>

- Resources
 - Spatial data sets
 - Spatial data services
- Basic building blocks
 - Network Services

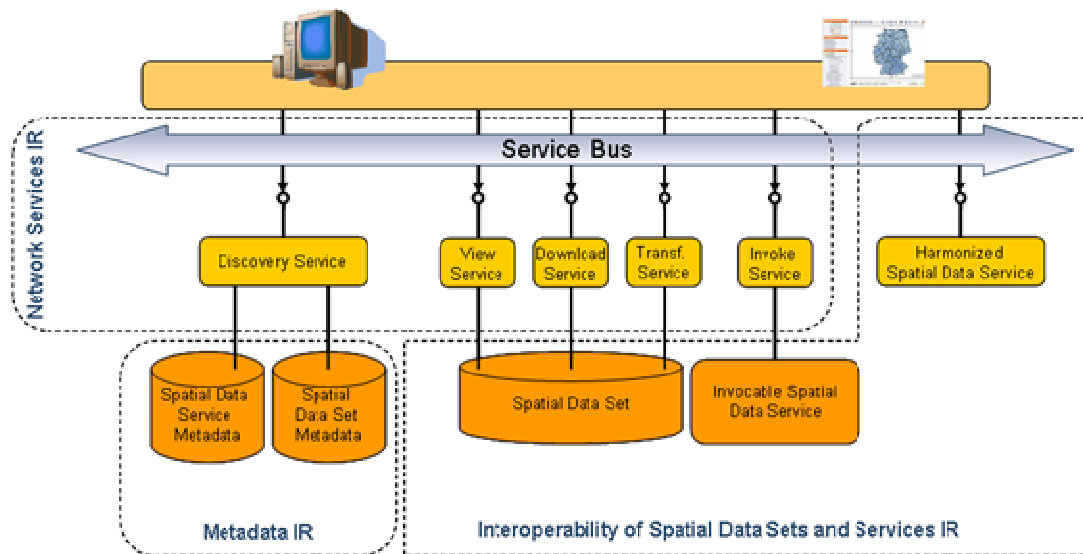


Figure 2: Updated Infrastructure components and associated Implementing Rules

Each set of implementing rules has a given purpose. Below we give a brief overview on content of each regulation containing the Implementing Rules (IR).

Interoperability of Spatial data sets

The INSPIRE Directive 2007/2/EC states in its Article 7(1):

Relevant user requirements, existing initiatives and international standards for the harmonisation of spatial data sets, as well as feasibility and cost-benefit considerations shall be taken into account in the development of the implementing rules. Where organisations established under international law have adopted relevant standards to ensure interoperability or harmonisation of spatial data sets and services, these standards shall be integrated, and the existing technical means shall be referred to, if appropriate, in the implementing rules mentioned in this paragraph.

Article 1(2) of the Directive states that INSPIRE shall build upon the infrastructures for spatial information established and operated by the Member States. Furthermore paragraph 11 of the preamble makes explicit that experience stemming from initiatives at regional, national and Community level should be considered rather than duplicate the work already done.

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

By listing a number of requirements and making the necessary recommendations, the data specifications enable full interoperability across the Member States, within the scope of the application areas targeted by the Directive. They are published as Technical

Guidelines and provide the basis for the content of the Implementing Rule on Interoperability of Spatial Data Sets and Services for data themes included in Annex I of the Directive, taking into consideration the links with the Themes of Annex II and III. The Implementing Rule is derived from the data specifications, keeping in mind the technical feasibility as well as cost-benefit considerations.

Metadata

The key characteristics of these Implementing Rules are:

- It separates clearly: (a) the text that is the base for the Implementing Rules on Metadata (i.e. legally binding), from (b) the text included in guidance document.
- It acknowledges that the documentation of quality and validity (key issue 2) which is required by the Directive in Article 5-2(c) is complex and is dependent also on the more detailed data specifications. With this in mind, the Regulation expresses Quality and Validity as the combination of two metadata elements: Lineage and Spatial Resolution, with additional information coming for the metadata elements expressing the temporal dimension of the dataset..
- Similarly, it acknowledges that the conformity of spatial data sets and services which is required by the Directive in Articles 5-2(a) and 11-2 (d) can only be fully specified once the relevant Implementing Rules on the interoperability and where practicable harmonisation of spatial datasets and services required in Article 7 of the Directive are adopted. Consequently this Regulation expresses Conformity as the combination of two metadata elements: the citation of the specification (Implementing Rules) to which conformity refers to, and the metadata element degree of conformity expressing whether the dataset or service to which the metadata refers is conformant, not-conformant, or not-tested. In this way flexibility is retained for future Implementing Rules on interoperability to define both specifications and the testing requirements.
- It clearly identifies two separate elements expressing the Conditions for Access and Use (Article 5-2(b)), which may also include information of corresponding fees where applicable, and Limitations on Public Access (Article 5-2(e)) which refers to the grounds for limitations referred to in Art. 13 of the Directive.

- It states explicitly that the Implementing Rules for metadata apply to spatial dataset series, spatial datasets, and spatial data services i.e. they do not require the documentation of individual spatial objects or attributes.
- It acknowledges that different thematic communities have different ways to express the temporal dimension of their datasets.
- It maintains the focus on metadata elements defined at an abstract level in order to make the Implementing Rules independent of specific encoding or possible future changes in standards. The Commission established, in collaboration with stakeholders and relevant standardization organisations, detailed guidelines and instructions for implementation and interoperability of metadata. These include instructions on how the European standards EN ISO 19115 and EN ISO 19119 shall be used to disseminate INSPIRE metadata, should one chose to use these standards.
- It introduces a number of value domains to facilitate the consistent implementation of the INSPIRE metadata elements in the European multilingual environment.

Network Services

The amended regulation has the following key characteristics:

- It details the Discovery, View, Download and Transformation Implementing Rules and provides the framework for future amendments to detail the Implementing Rule for the invoke service.
- In concentrating on the functionality of the services, it provides the necessary independence from the very fast pace of technology changes in the ICT domain.
- It ensures the optimal use and full consistency with the INSPIRE metadata.
- It has been complemented by a set of non-binding guidance documents revised or planned to be revised by the Initial Operating Capability Task Force. :

Developing Implementing Rules for the Spatial Data Services?

The rationale

The availability of implementing rules providing arrangements or where practicable allowing the harmonisation towards the interoperability of the spatial data services will most certainly increase the use of the services themselves as they would become easier to invoke but would also increase the use of the related spatial data sets by offering the possibility to the user to generate more easily derived spatial data sets or derived information.

The Implementing rules are not to be developed in isolation as there is the INSPIRE directive giving the general framework for their development and already adopted regulations and decisions that are related and influence and/or constraint the development of implementing rules for the spatial data services.

Also the Implementing rules development have to take into account what are the existing reference materials but has also to take into account what are the trends for this rapidly evolving field.

Legal Context

The INSPIRE Directive sets the general scene for the development of the implementing rules laying down technical arrangements for the interoperability and harmonization of spatial data services. It provides a generic definition of spatial data services, their relationship with the other elements and lists the fundamental operational requirements on the Member States apart from the compliance with the future spatial data services implementing rules:

- metadata for all existing spatial data services must be created with the attributes and constraints listed in [2]
- spatial data services must be monitored and reported [5]
- spatial data services must be accessible by the Member States to the Community institutions and bodies under harmonized conditions [6]
- spatial data services will be potentially invoked with the network service of type invoke [4]

In addition each relevant regulation or decision provides additional elements or information such as:

- a classification of spatial services given in [2]
- the provision of a list of available spatial data services by the Member States [5]
- the provision by the Member States of additional information on the spatial data service when a Community Institution and Body requests access to a spatial data service [6]

This legal background provides important elements for scoping spatial data services and the corresponding implementing rules.

A more detailed analysis of the relevant legal acts is provided in the Annex II of this document.

Technical Context

The survey of existing interoperability arrangement [7] demonstrates the existence and the pertinence of the standards and technical specifications adopted by standards development organisations, also web services directories, like seekda (<http://webservices.seekda.com/>), indicate clearly the potential in providing additional metadata and of defining a framework/protocol for their activation.

The development of implementing rules for the spatial data services is also to be seen from the wider perspective of the future internet and the Web of Services advocated for example by the EC funded research project “Service Web 3.0” (project site at <http://www.serviceweb30.eu/cms/index.php/home> , see also the video at

<http://www.youtube.com/watch?v=off08As3siM>) where it is envisioned that the emphasis on the Internet may move from a web of data to a web of services where spatial data services should be a part of.

The process

Rationale for forming the Spatial Data Services Working Group

Before starting the implementing rules drafting process and taking due consideration of the complexity of the matter, the European Commission consulted the National Contact Points on the scope of the spatial data services, of the corresponding implementing rules and the associated development process during a workshop in March 2010 and during the 2010 INSPIRE conference. Subsequently the Commission proposed the creation of a dedicated Working Group and requested the National Contact Points to nominate experts for the provision of recommendations to guide the implementing rules drafting.

Spatial Data Services Working Group Terms of Reference

The Spatial Data Services Working was given draft terms of reference detailing:

- The mission
- The objectives
- The approach
- The Deliverables

During the Kick Off meeting at the end of October 2010, the working group amended their terms of reference and the final version is detailed below.

Mission

The spatial data services working group supports the European Commission for the definition and refinement of the technical and organizational elements required for the development of the draft Implementing Rules for the spatial data services through the provision of recommendations.

Objectives

- To Detail the definition and the scope of the Spatial Data Services
- To Refine the scope and the priorities of the Spatial Data Services Implementing Rules
- To Refine the Spatial Data Services' Implementing Rules development process

Approach

- Decisions are taken through a consensus building process

- The Working Group appoints a chair/Substitute to coordinate the consensus building process
- The Working Group defines its decision and document editing process
- All decisions and choices will be documented in appropriate documents for ultimately public availability
- The Working Group defines the consultation process for the relevant documentation taking into account the current INSPIRE review process.

Deliverables

Documented decisions and recommendations

Time line

Originally From October 2010 to March 2011 extended to end of June 2011 to accommodate a wider than originally planned Consultation and review process.

The consultation process

In line with the INSPIRE implementing rules development process, feedback on the recommendations from the widest range of INSPIRE stakeholders are sought. More precisely:

- INSPIRE Drafting Teams, Task forces and Thematic Working Groups
- Spatial Data Interest Communities and Legally Mandated Organizations
- Member States' representatives

Recommendations

The Spatial Data Services Working group met several times and numerous teleconferences were held leading to the provision of recommendations for:

- The Scope of the spatial data services
- The Scope of the Implementing Rules
- The development of spatial data services implementing rules

In addition considerations on the cost benefit process, relationship with the network services drafting team and the scheduling are provided.

It is also important to stress that taking due consideration of the strong relationship between the spatial data services implementing rules and the invoke spatial data services service implementing rules, the Network Services Drafting Team was invited to participate to the meetings and teleconferences from November 2010 onwards. These recommendations are therefore to be considered as the result of the collaboration between the spatial data services working group and the Network Services Drafting Team.

Recommendations for the Scope of Spatial Data Services

Context Recommendations

Recommendation 1

There could be no other requirements than this recommendation applicable to ALL Spatial Data Services. Following ISO 19119, the following definitions should be applied:

Service

Distinct part of the functionality that is provided by an entity through **interfaces** [ISO/IEC TR 14252]

Interface

Named set of **operations** that characterize the behaviour of an entity

Operation

Specification of a transformation or query that an object may be called to execute

Recommendation 2

From an INSPIRE Implementing Rules applicability point of view, a Spatial Data Service Should be Discoverable (Metadata Regulation). In addition and based on its characteristics it could be:

- Invocable (Invoke Implementing Rules to be developed)
- Or invocable and Compliant with Interoperability Arrangements (Spatial Data Services Implementing Rules to be developed)
- Or where practicable, invocable, compliant with Interoperability Arrangements and harmonized (Spatial Data Services Implementing Rules to be developed)

As represented in figure 3

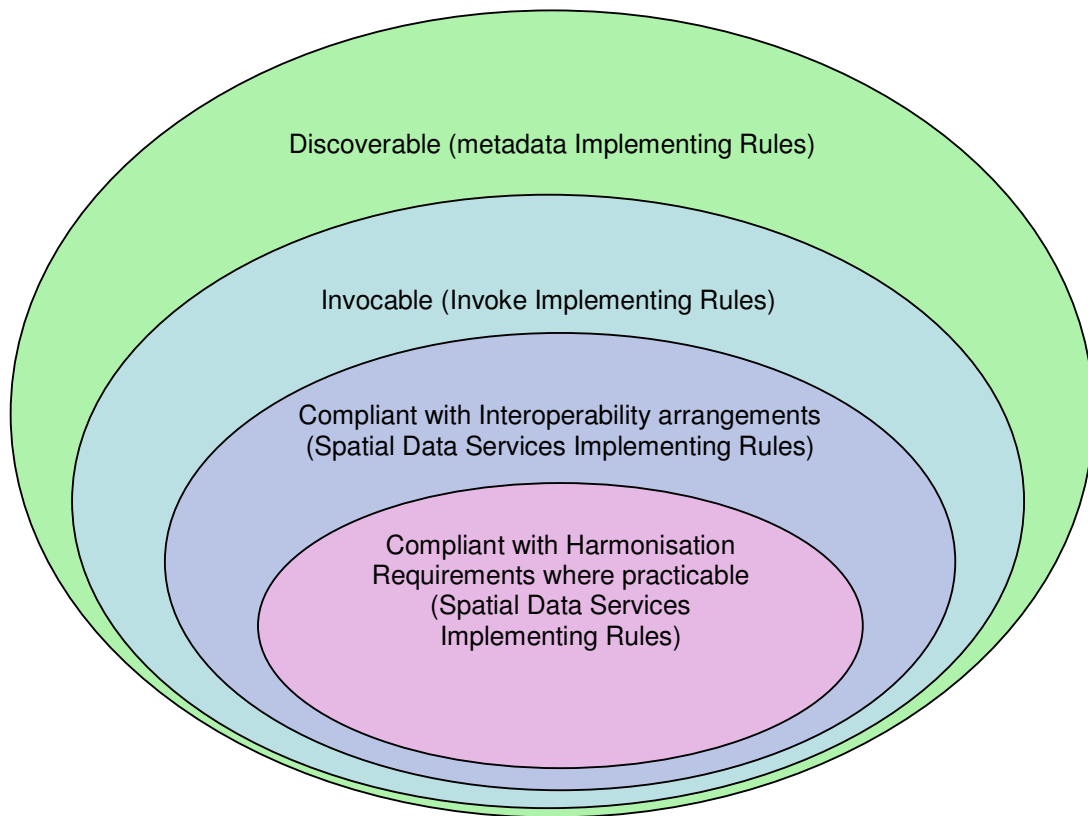


Figure 3: Applicable Implementing Rules

Recommendation 3

The Spatial data services should be considered as resources in the INSPIRE Infrastructure as with the spatial data sets and spatial data sets series.

Recommendation 4

The infrastructure should support the existing and **future** wide variety of Spatial Data Services in terms of functionality, scope, protocols, interfaces etc

Metadata Recommendations

Recommendation 5

All Spatial Data Services, related to the spatial data themes listed in the Annex I, II, III of the INSPIRE Directive, should be described by INSPIRE Metadata and made discoverable through the Network Service of type Discovery.

Recommendation 6

The category of Spatial Data Services in the metadata regulation is considered an adequate starting point, but revision will be recommended following emergence of

new standards or/and spatial data services that will then have to be maintained through the appropriate mechanisms.

Recommendation 7

The spatial data services implementing rules could request additional metadata elements (e.g. quality, SLA) complementary to the ones in the metadata regulation to cover evaluation and use of the Spatial Data Services. This recommendation should apply to the subset of the spatial data services that would be required to provide more than discovery metadata (i.e. INSPIRE metadata)

Recommendation 8

It is assumed that invocable Spatial Data Service have a resource locator as defined in the metadata regulation, a step towards allowing the request for execution of the Spatial Data Services.

Services Recommendations

Recommendation 9

An invocable spatial data service should have documented and well defined interfaces

The relationship between Spatial Data Services and the Network Services

Recommendation 10

Spatial data services are a subset of the universe of web services. In general Spatial Data Services cannot be expected to fulfil all the Implementing Rules defined for the Network Services rather Network Services can be seen as a specialization of Spatial Data Services (see figure 2 in the NS DT Position Paper v1)

Recommendation 11

The implementing rules for Spatial Data Services should not require changes to the implementing rules for network services

Recommendation 12

The minimum performance criteria of the invoke service required by the INSPIRE directive should be defined independently of the performance of the invoked spatial data service.

The relationship between Spatial Data Services and Spatial Data Sets

Recommendation 13

Once a spatial data set, or a spatial data set series, is put in conformity with the relevant regulation, the related spatial data services should, where practicable, be harmonized accordingly.

Recommendation 14

An existing spatial data service that processes non-compliant spatial data sets in the scope of INSPIRE should still be considered as a resource in the INSPIRE Infrastructure.

Recommendation 15

Note: Given the differences across non-compliant datasets in Member States it is very unlikely that any Spatial Data Service could be universally applied to a number of spatial datasets and a satisfactory result obtained. The lack of interoperability in non-compliant datasets prevents this – perhaps some customized functions could be applied but these are unlikely to be cost effective or offer significant improvements over the core Network Services.

The Spatial Data Services potential for adding value is significantly more appropriate when they are applied to datasets compliant with the ISDSS regulation and the harmonisation requirements in recommendation 31 should be applicable to the spatial data services related to harmonised (Compliant with ISDSS regulation) spatial data sets

Recommendations for the Scope of IR

Recommendation 16

The Spatial Data Services Implementing Rules should focus on re-usable services related to the spatial data sets shared under the INSPIRE legal framework so that value can be derived from it and the investments in INSPIRE can be recovered.

Note: “re-usable” is to be understood as “that could be used by other applications or/and with spatial data sets other than the ones it was created for”

Recommendation 17

The availability of Spatial Data Services from 3rd parties following the SDS implementing rules should be encouraged.

Recommendation 18

A Geographic Information System or other systems, understood as a set of tools for collecting, processing and storing spatial data should not be considered an invocable spatial data service from the perspective of the relevant Implementing Rules. But any specific functionality included in it and with a well-defined and exposed interface could be an invocable spatial data service.

Recommendation 19

Objective criteria for deciding the applicability of the spatial data service implementing rules should be available in the implementing rules or technical.

Recommendation 20

The goal of the implementing rules and their costs and benefits should be clarified.

Recommendation 21

The Quality of Service of the spatial data service should be documented.

Recommendation 22

At least the implementing rules for the invocable spatial data should require the documentation of non-functional properties (see figure 4 in the NS DT position paper v1.0).

Recommendation 23

A Spatial Data Service may be invoked as part of a sequence of events in the chain of presenting spatial data to a client from an organisational source (i.e. a data publisher), taking into account that chaining is recommended to be beyond the scope of the invoke service implementing rules.

Recommendation 24

The spatial data services implementing rules should not require the harmonization of spatial data services related to non-harmonised spatial data sets.

Recommendation 25

Spatial data services implementing rules should be inspired by the structure of the regulation regarding interoperability of spatial data sets and services. Namely it could:

- Mandate interoperability arrangements, reusing and extending what is already available for the spatial data sets, e.g. naming convention, additional metadata, coordinates and temporal reference systems or encoding rules
- Mandate harmonization, where practicable, in analogy to the mandated harmonized content for spatial data sets for some spatial data services (e.g. harmonized gazetteer service) and similar to the harmonized

Network Services. For Spatial Data Services harmonization could also be harmonized operations.

Recommendation 26

Even if the discovery should be ensured, not all spatial data services related with spatial data sets should be in the scope of the implementing rules for spatial data services

Recommendation 27

The spatial data services Implementing Rules should refine the scope of the Spatial Data Services by specifying additional conditions (similar to what the INSPIRE Directive contains for the spatial data sets in article 4 (1)), as long as it is justified with considerations on issues such as 'feasibility' or assessment of impact to produce.

Recommendation 28

The Implementing Rules could be organized as follows:

1. Requirements for all Spatial Data Services
 - Be discoverable
2. Requirements for interoperability arrangements
 - Invocable (e.g. resource locator shall be given in the INSPIRE discovery metadata, well defined interfaces available on the Internet)
 - URL or/and URI
 - Unique identifier
 - Additional metadata
 - Naming convention (e.g. operation name)
 - Support CRS mandated by INSPIRE
3. Harmonization Requirements could be twofold:
 - Generic Requirements such as:
 - (a) a mandatory “Get Service Metadata”
 - Detailed technical specifications for a limited set of services such as:
 - (a) Gazetteer service
 - (b) Registry service
 - (c) Portrayal service

Note: the lists provided above are to be considered examples and cannot in anyway be taken as constraining the future content of the Implementing Rules

Recommendation 29

Rights management and e-commerce are important issues to be considered and discussed/defined in wider domains such as e-government and therefore should not be explicitly included in the Spatial Data Services Implementing Rules.

Recommendation 30

The spatial data services implementing rules should not restrict future development of the existing spatial data services nor impede the addition of new spatial data services.

Recommendation 31

The Technical Guidance should take into account existing initiatives (e.g. such as linked data in the United Kingdom or Services Technical Specifications developed by the Open Geospatial Consortium)

Recommendation 32

The spatial data services implementing rules should not require the implementation of new Spatial Data Services. This only applies to existing spatial data services and does not require the creation of spatial data services (i.e. similar to the “collection of new spatial data” indicated in article 4 (4) of the INSPIRE directive)

Recommendation 33

The spatial data services implementing rules will foster the enrichment of the spatial data infrastructure encouraging the addition of new interoperable and where practicable harmonized spatial data services.

Recommendations for the Development of Spatial Data Services Implementing Rules

Recommendation 34

The Spatial Data Services Implementing Rules should be included in the Commission regulation IMPLEMENTING Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services.

Recommendation 35

Relevant stakeholders should be involved at the appropriate phases e.g.:

- Member States representatives prior to the development of the spatial data services Implementing Rules.
- Initial Operating Capability Task Force for implementation issue while remaining in the formal scope of the task force that includes architectural aspects and implementation of Network Services to ensure interoperability with the INSPIRE geo-portal and among Member States
- Network Services Drafting Team at every stage of the development of the implementing rules.
- Spatial data drafting team and other relevant drafting teams at the appropriate stage.

Recommendation 36

During the Spatial Data Services Implementing Rules development process, input should be invited from all thematic working groups (e.g. asking TWG to identify Spatial Data Services in the proposed use cases).

Recommendation 37

Compliant spatial data services from 3rd parties are seen as an important asset; the early feedback from these stakeholders should be explicitly requested and could be organized through consultation of the SDICs and LMOs.

Cost Benefit Consideration process

Recommendation 38

The analyses to ensure that the implementing rules are feasible and proportionate in terms of their likely costs and benefits should consider:

- The potential for re-use,
- A stepwise implementation process and its consequences,
- the benefits of consistency,
- compare independent development,
- The contribution to the development of standards,
- address the international dimension
- prioritization criteria

The relationship with the NS DT

Recommendation 39

The collaboration with the Network Services Drafting Team is very fruitful and fosters consistency. Consequently, and taking due account of the expertise readily available, the schedule constraints and the need to ensure consistency between the 2 sets of Implementing Rules, it is recommended to extend the scope of the Network Services Drafting Team.

The scope of the Network Services Drafting Team will include the development of the spatial data services implementing rules while extending its composition to the spatial data services working group interested members and other experts if necessary.

Scheduling

Recommendation 40

Based on, for example, a prior analysis of the complexity and readiness of spatial data services, a schedule that could require a stepwise entry into force of the spatial data services implementing rules should be considered (e.g. 1st interoperability arrangements then harmonization or/and date for existing ones and earlier date for

new or heavily updated SDS), while being compatible with article 7 (3) of the INSPIRE Directive.

Recommendation 41

A spatial data service compliant with the implementing rules should only relate to the reference version of the spatial data sets or series

Annex I References

- [1] Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE), OJ L 108, 24.4.2007, p. 1
- [2] Commission Regulation (EC) No 1205/2008 of 3 December 2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata (Text with EEA relevance) OJ L 326, 4.12.2008, p. 12
- [3] Commission Regulation (EU) No 1089/2010 of 23 November 2010 Implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services
- [4] Commission Regulation (EU) No 976/2009 of 19 October 2009 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards the Network Services. OJ L 274, 20.10.2009, p. 9
- [5] Commission Decision 2009/442/EC of 5 June 2009 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards monitoring and reporting, OJ L 148, 11.6.2009, p. 18
- [6] Commission Regulation (EC) No 268/2010 of 29 March 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards the access to spatial data sets and services by the Member States to the Community institutions and bodies under harmonised conditions
- [7] G. Di Matteo, M. Villa “status of Interoperability Arrangements and harmonisation for INSPIRE Spatial Data Services”, TXT e-Solutions S.p.A, 10.05.2010
(http://inspire.jrc.ec.europa.eu/documents/Network_Services/STATUS_OF_INTEROPERABILITY_ARRANGEMENTS.pdf)
- [8] Open Geospatial Consortium “OGC Web Services Common Standard” OGC Implementation Standard, Date 2010-0-07, version 2.0.0, Reference Number OGC 06-121r9.
- [9] Open Geospatial Consortium “OGC Best Practices Document: Gazetteer Service – Application Profile of the Web Feature Service Implementation Specification” OGC Candidate Implementation Specification, Date 2006-06-05, version 0.9.3, Reference Number OGC 05-035r2.
- [10] International Organization for Standardization (ISO) “Geographic information – Location-based services – Multimodal routing and navigation” ISO 19134:2007
- [11] M. Villa et al. “INSPIRE Network Services SOAP Framework” EUR 23635-2008
(http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/network/INSPIRE_NETWORK_SERVICES_SOAP_Framework.pdf)
- [12] INSPIRE Network Services performance Guidelines
(http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/network/Network_Services_Performance_Guidelines_%20v1.0.pdf)

ANNEX II the legal background

This section provides the reader with the legal background for the spatial data services. For each legal act it highlights the most relevant items in the legal acts,

INSPIRE DIRECTIVE

Recital (3)

[...] Solving these problems requires measures that address exchange, sharing, access and use of interoperable spatial data and spatial data services [...].

Recital (22)

Public authorities need to have smooth access to relevant spatial data sets and services during the execution of their public tasks.

Article 3 (1)

Infrastructure for spatial information' means metadata, spatial data sets and spatial data services; network services and technologies; [...].

Article 3 (4)

'spatial data services' means the operations which may be performed, by invoking a computer application, on the spatial data contained in spatial data sets or on the related metadata;

Article 3 (7)

'interoperability' means the possibility for spatial data sets to be combined, and for services to interact, without repetitive manual intervention, in such a way that the result is coherent and the added value of the data sets and services is enhanced;

Article 4 (3)

This Directive shall also cover the spatial data services relating to the data contained in the spatial data sets referred to in paragraph 1.

Article 5 (1)

Member States shall ensure that metadata are created for the spatial data sets and services corresponding to the themes listed in Annexes I, II and III, and that those metadata are kept up to date.

Article 6

Member States shall create the metadata referred to in Article 5 in accordance with the following timetable:

not later than two years after the date of adoption of implementing rules in accordance with Article 5(4) in the case of the spatial data sets corresponding to the themes listed in Annexes I and II;

not later than five years after the date of adoption of implementing rules in accordance with Article 5(4) in the case of the spatial data sets corresponding to the themes listed in Annex III.

Article 7 (1)

Implementing rules laying down technical arrangements for the interoperability and, where practicable, harmonisation of spatial data sets and services, designed to amend non-essential elements of this Directive by supplementing it, shall be adopted [...].

Article 7 (2)

2. As a basis for developing the implementing rules provided for in paragraph 1, the Commission shall undertake analyses to ensure that the rules are feasible and proportionate in terms of their likely costs and benefits and shall share the results of such analyses with the committee referred to in Article 22(1). Member States shall, on request, provide the Commission with the information necessary to enable it to undertake such analyses.

Article 7 (3)

Member States shall ensure that all newly collected and extensively restructured spatial data sets and the corresponding spatial data services are available in conformity with the implementing rules referred to in paragraph 1 within two years of their adoption, and that other spatial data sets and services still in use are available in conformity with the implementing rules within seven years of their adoption.

Article 7 (5)

Representatives of Member States at national, regional and local level as well as other natural or legal persons with an interest in the spatial data concerned by virtue of their role in the infrastructure for spatial information, including users, producers, added value service providers or any coordinating body shall be given the opportunity to participate in preparatory discussions on the content of the implementing rules referred to in paragraph 1, prior to consideration by the Committee referred to in Article 22(1).

Article 11 (1)

Member States shall establish and operate a network of the following services for the spatial data sets and services for which metadata have been created in accordance with this Directive:

(...)

(e) services allowing spatial data services to be invoked.

Article 12

Member States shall ensure that public authorities are given the technical possibility to link their spatial data sets and services to the network referred to in Article 11(1). This service shall also be made available upon request to third parties whose spatial

data sets and services comply with implementing rules laying down obligations with regard, in particular, to metadata, network services and interoperability.

Article 13 (1)

By way of derogation from Article 11(1), Member States may limit public access to spatial data sets and services

Article 17 (1)

Each Member State shall adopt measures for the sharing of spatial data sets and services between its public authorities referred to in point (9)(a) and (b) of Article 3. Those measures shall enable those public authorities to gain access to spatial data sets and services, and to exchange and use those sets and services, for the purposes of public tasks that may have an impact on the environment.

Article 18 (4)

The arrangements for the sharing of spatial data sets and services provided for in paragraphs 1, 2 and 3 shall be open to public authorities referred to in point (9)(a) and (b) of Article 3 of other Member States and to the institutions and bodies of the Community, for the purposes of public tasks that may have an impact on the environment

Article 18 (8)

Member States shall provide the institutions and bodies of the Community with access to spatial data sets and services in accordance with harmonised conditions.

Article 21 (2)

No later than 15 May 2010 Member States shall send to the Commission a report including summary descriptions of:

- (a) how public sector providers and users of spatial data sets and services and intermediary bodies are coordinated, and of the relationship with the third parties and of the organisation of quality assurance;
- (...)

METADATA REGULATION

Article 1

Subject matter

This Regulation sets out the requirements for the creation and maintenance of metadata for spatial data sets, spatial data set series and spatial data services corresponding to the themes listed in Annexes I, II and III to Directive 2007/2/EC.

Article 3

Creation and maintenance of metadata

The metadata describing a spatial data set, a spatial data set series or a spatial data service shall comprise the metadata elements or groups of metadata elements set out in Part B of the Annex and shall be created and maintained in accordance with the rules set out in Parts C and D thereof.

Annex part B 1.6. Coupled resource

If the resource is a spatial data service, this metadata element identifies, where relevant, the target spatial data set(s) of the service through their unique resource identifiers (URI).

Annex part B 2.2. Spatial data service type

This is a classification to assist in the search of available spatial data services. A specific service shall be categorised in only one category. The value domain of this metadata element is defined in Part D.3.

Annex part B 3. KEYWORD

If the resource is a spatial data service, at least one keyword from Part D.4 shall be provided

Annex part B 8.1. Conditions applying to access and use

This metadata element defines the conditions for access and use of spatial data sets and services, and where applicable, corresponding fees as required by Article 5(2)(b) and Article 11(2)(f) of Directive 2007/2/EC.

Annex Part C Table 2 Metadata for spatial data services

Reference	Metadata element	Multiplicity	Condition
1.1	Resource title	1	
1.2	Resource abstract	1	
1.3	Resource type	1	
1.4	Resource locator	0..*	Mandatory if linkage to the service is available.
1.6	Coupled resource	0..*	Mandatory if linkage to data sets on which the service operates are available.
2.2	Spatial data service type	1	
3	Keyword	1..*	
4.1	Geographic bounding box	0...*	Mandatory for services with an explicit geographic extent.
5	Temporal reference	1..*	

Reference	Metadata element	Multiplicity	Condition
6.2	Spatial resolution	0..*	Mandatory when there is a restriction on the spatial resolution for this service.
7	Conformity	1..*	
8.1	Conditions for access and use	1..*	
8.2	Limitations on public access	1..*	
9	Responsible organization	1..*	
10.1	Metadata point of contact	1..*	
10.2	Metadata date	1	
10.3	Metadata language	1	

NETWORK SERVICES REGULATION

No additional elements compared to the INSPIRE Directive

MONITORING AND REPORTING DECISION

Article 2

Common provisions for monitoring and reporting

1. Member States shall establish a list of the spatial data sets and spatial data services corresponding to the themes listed in Annexes I, II and III to Directive 2007/2/EC, grouped by theme and Annex, and of the network services referred to in Article 11(1) of that Directive, grouped by service type.

Article 3

Monitoring of the existence of metadata

1. The following indicators shall be used to measure the existence of metadata for the spatial data sets and services corresponding to the themes listed in Annexes I, II and III to Directive 2007/2/EC:

Article 4

Monitoring of the conformity of metadata

1. The following indicators shall be used to measure the conformity of metadata for spatial data sets and services corresponding to the themes listed in Annexes I, II and III to Directive 2007/2/EC with the implementing rules referred to in Article 5(4) of that Directive [...]

2. Member States shall determine, for each spatial data set and service mentioned on the list referred to in Article 2(1) of this Decision, whether the corresponding metadata are in conformity with the implementing rules referred to in Article 5(4) of Directive 2007/2/EC and shall attribute to the data set or service the following values [...]

Article 13

Contribution to the functioning and coordination of the infrastructure

The summary description referred to in Article 21(2)(b) of Directive 2007/2/EC shall contain the following:

- (b) A description of the role of the various stakeholders in the development and maintenance of the infrastructure for spatial information, including their role in the coordination of tasks, in the provision of data and metadata, and in the management, development and hosting of services;
- (c) a general description of the main measures taken to facilitate the sharing of spatial data sets and services between public authorities and a description of how sharing has improved as a result;

Article 14

Use of the infrastructure for spatial information

The information on the use of the infrastructure for spatial information referred to in Article 21(2)(c) of Directive 2007/2/EC shall cover the following:

The use of the spatial data services of the infrastructure for spatial information, taking into account the general and specific indicators;

Article 15

Data sharing arrangements

The summary description referred to in Article 21(2)(d) of Directive 2007/2/EC shall contain the following:

- (c) a list of barriers to the sharing of spatial data sets and services between public authorities and between public authorities and the Community institutions and bodies, as well as a description of the actions which are taken to overcome those barriers.

DATA SHARING REGULATION

Article 1

Subject matter

This Regulation establishes harmonised conditions of access to spatial data sets and services in accordance with Article 17 of Directive 2007/2/EC.

Article 3

Arrangements

Any arrangements concerning access to spatial data sets and services shall be fully compatible with the requirements of this Regulation.

Article 4

Use of spatial data sets and services

Institutions or bodies of the Community may make spatial data sets or services available to contractors acting on their behalf.

Where spatial data sets and services are made available in accordance with paragraph 1, Community institutions and bodies shall make every possible effort to avoid unauthorised use of spatial data sets and services.

Article 6

Transparency

Where an institution or body of the Community requests the provision of access to a spatial data set or service, the Member States shall also make available, upon request, information for evaluation and use, on the mechanisms for collecting, processing, producing, quality control and obtaining access to the spatial data sets and services, where that additional information is available and it is reasonable to extract and deliver it.

Where requested, offers for the provision of access to spatial data sets and services to the Community institutions and bodies made by Member States shall include the basis for charges and the factors taken into account.

Article 7

Response Times

Member States shall provide access to spatial data sets and services without delay and at the latest within 20 days after receipt of a written request, unless otherwise agreed by mutual agreement between the Member State and the institution or body of the Community.

Interoperability of Spatial Data Sets and Services Regulation

Recital (1):

Directive 2007/2/EC lays down general rules for the establishment of the Infrastructure for Spatial Information in the European Community. Within this infrastructure, Member States are required to make available data sets related to one or several of the Annexes in Directive 2007/2/EC and the corresponding spatial data services in conformity with the technical arrangements for the interoperability and, where practicable, harmonisation of spatial data sets and services.

Article 1

This Regulation sets out the requirements for technical arrangements for the interoperability and, where practicable, harmonisation of spatial data sets and spatial data services corresponding to the themes listed in Annexes I, II and III to Directive 2007/2/EC.