



# INSPIRE

Infrastructure for Spatial Information in Europe

## Technical Guidance for INSPIRE Spatial Data Services and services allowing spatial data services to be invoked

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## Foreword

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

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

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

- Metadata;
- The interoperability and harmonisation 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.

In particular with respect the Network Services, Implementing Rules are required for the following services (Article 11(1) of the Directive):

- a) *discovery services search for spatial datasets and spatial data services on the basis of the content of corresponding metadata, and display the metadata content;*
- b) *view services as a minimum, display, navigate, zoom in/out, pan, or overlay spatial datasets and display legend information and any relevant content of metadata;*
- c) *download services enabling copies of complete spatial datasets, or of parts of such sets, to be downloaded;*
- d) *transformation services enabling spatial datasets to be transformed with a view to achieving interoperability;*
- e) *invoke spatial data services "enabling data services to be invoked."*

The Implementing Rules are adopted as Commission Decisions or Regulations, and are legally binding.

In addition to the Implementing Rules, non-binding Technical Guidance documents describe detailed implementation aspects and relations with existing standards, technologies and practices in order to support the technical implementation process. They may need to be revised during the course of implementing the infrastructure to take into account the evolution of technology, new requirements, and cost benefit considerations. In other words, these Technical Guidance documents are supporting material to assist in the technical implementation of the INSPIRE Directive but no additional obligations can be derived from these documents over and above the obligations set out in the Directive and the Implementing Rules. The Technical Guidance documents are also not intended to interpret legal obligations. Figure 1 illustrates the relationship between the INSPIRE Regulations containing Implementing Rules and their corresponding Technical Guidance documents.

This Technical Guidance relates to the INSPIRE Spatial Data Services and services allowing spatial data services to be invoked.

Implementing this Technical Guidance are designed to maximise the interoperability of INSPIRE services. Technical Guidance documents describe how Member States might implement the

Implementing Rules described in a Commission Regulation. The technical provisions and the underlying concepts are often illustrated by use case diagrams and accompanied by examples. Technical Guidance documents may also include non-binding technical recommendations that should be satisfied if a Member State chooses to conform to the Technical Guidance. However, these recommendations have no legally binding effect.

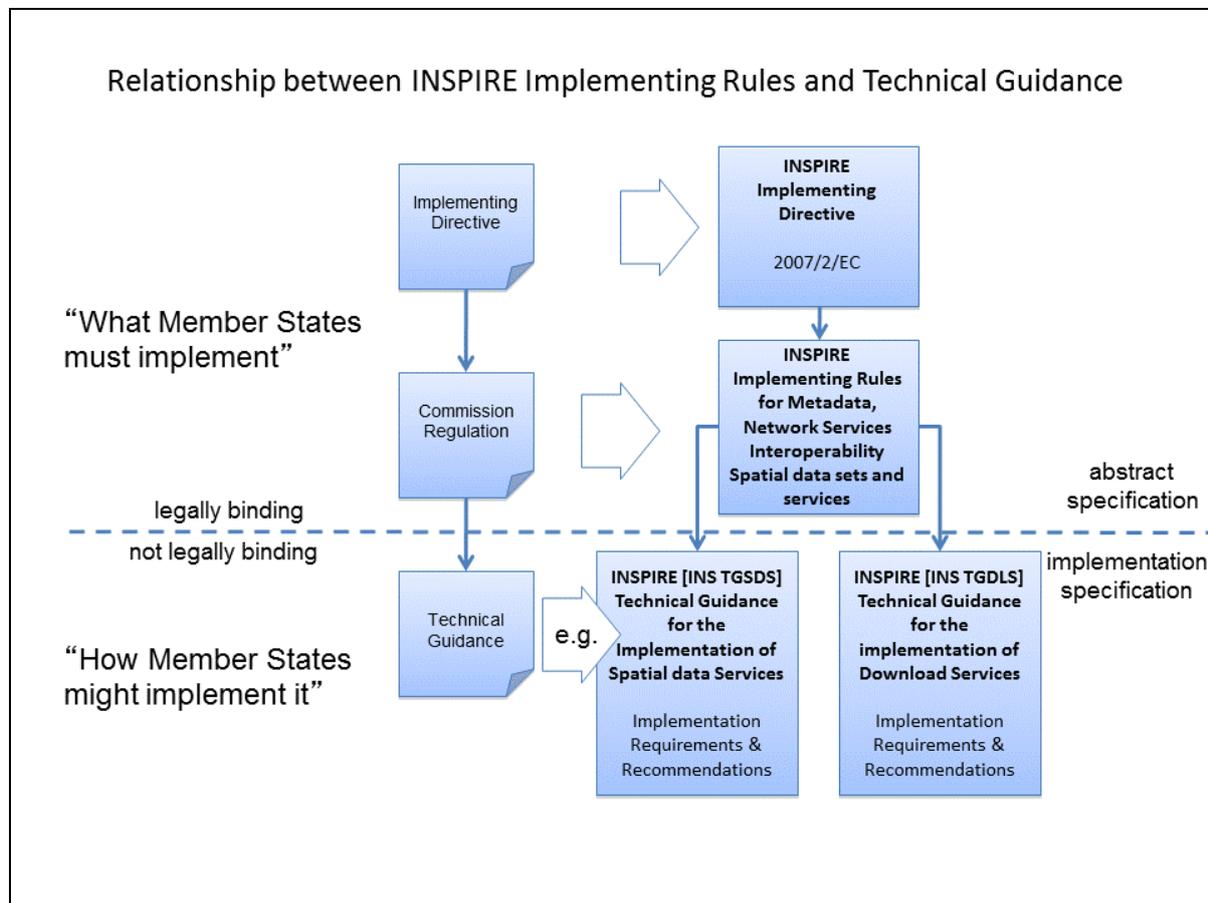


Figure 1 - relationship between the INSPIRE Implementing Rules and the associated Technical Guidance.

### Disclaimer

This document has been developed collaboratively through the INSPIRE maintenance and implementation framework, involving experts of the European Commission services, the European Environment Agency, EU Member States, the Accession and EFTA Countries. The document should be regarded as presenting an informal consensus position on best practice agreed by all partners. However, the document does not necessarily represent the official, formal position of any of the partners. To the extent that the European Commission's services provided input to this technical document, such input does not necessarily reflect the views of the European Commission and its services. This document does not bind the Commission and its services, nor can the Commission and its services be held responsible for any use which may be made of the information contained herein.

The technical document is intended to facilitate the implementation of Directive 2007/2/EC and is not legally binding. Any authoritative reading of the law should only be derived from Directive 2007/2/EC itself and other applicable legal texts or principles such as the related Implementing Rules. Only the Court of Justice of the European Union is competent to authoritatively interpret Union legislation.

# 1 Introduction

## 1.1 *The INSPIRE Directive and Implementing Rules*

Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) was published in the official Journal on the 25<sup>th</sup> April 2007. The INSPIRE Directive entered into force on the 15<sup>th</sup> May 2007.

The purpose of the infrastructure is to enable the formulation, implementation, monitoring activities and evaluation of Community environmental policies at all levels – European, national and local – and to provide public information.

INSPIRE builds on the infrastructures for spatial information that have already been created by the Member States. The components of those infrastructures include: metadata, spatial data themes (as described in Annexes I, II, III of the Directive), network services and technologies; agreements on data sharing, access and use; coordination and monitoring mechanisms, processes and procedures.

The guiding principles of INSPIRE are:

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

The text of the INSPIRE Directive is available from the European Union Law website (EU-LEX) <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32007L0002:EN:NOT>. The Directive identifies what needs to be achieved, and Member States have two years from the date of adoption to bring into force national legislation, regulations, and administrative procedures that define how the agreed objectives will be met taking into account the specific situation of each Member State. 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 a number of specific areas. Implementing Rules are adopted as Commission Decisions, and are binding in their entirety.

According to Article 5(4) of the Directive, the INSPIRE Implementing Rules shall take account of relevant, existing international standards and user requirements.

## 1.2 *Technical Guidance for INSPIRE Spatial Data Services and services allowing spatial data services to be invoked*

The scope of this document is to detail the INSPIRE technical requirements for **Spatial Data Services and services allowing spatial data services to be invoked** from the Implementing Rules, such that these services can be described and implemented consistently across Europe.

These Implementing Rules are, as much as possible, in conformance with European and international standards, current practices in stakeholder communities and relevant European initiatives such as e-Government, and the EU interoperability framework.

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The document has been developed on the discussion paper "Scope and definition of Spatial Data Services" created by MIG-T – Spatial data services group. The discussion paper has been integrated in the final version of this document.

For details on how to provide metadata elements, including a specific encoding example, please refer to INSPIRE Metadata Technical Guidelines.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- INS DIR** 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
- INS MD** 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
- INS ISDSS** 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 as amended by Commission Regulation (EU) No 1312/2014 of 10 December 2014, OJ L 354, 11.12.2014, p. 8–16
- INS NS** 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 as amended by Commission Regulation (EU) No 1311/2014 of 10 December 2014, OJ L 354, 11.12.2014, p. 6–7
- INS NS TG** Technical Guidance for the implementation of INSPIRE Download Services, v3.1 ([http://inspire.jrc.ec.europa.eu/documents/Network\\_Services/Technical\\_Guidance\\_Download\\_Services\\_v3.1.pdf](http://inspire.jrc.ec.europa.eu/documents/Network_Services/Technical_Guidance_Download_Services_v3.1.pdf))
- INS MD TG** Technical Guidelines for the implementation of INSPIRE dataset and service metadata based on ISO/TS 19139:2007, v2.0  
<http://inspire.ec.europa.eu/id/document/tg/metadata-iso19139/2.0>
- DC DS** Common document collection provided for all INSPIRE Data Specifications  
<http://inspire.jrc.ec.europa.eu/index.cfm/pageid/2>
- OGC WS** OGC Web Services Common Standard  
[http://portal.opengeospatial.org/files/?artifact\\_id=38867](http://portal.opengeospatial.org/files/?artifact_id=38867)
- ISO 19115** ISO 19115:2003/Cor 1:2006, Geographic information – Metadata  
[http://www.iso.org/iso/catalogue\\_detail.htm?csnumber=26020](http://www.iso.org/iso/catalogue_detail.htm?csnumber=26020)
- ISO 19119** ISO 19119:2005/Amd 1:2008, Geographic information – Services  
[http://www.iso.org/iso/home/store/catalogue\\_tc/catalogue\\_detail.htm?csnumber=44268](http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=44268)
- ISO 19139** ISO/TS 19139:2007, Geographic information – Metadata – XML schema implementation  
[http://www.iso.org/iso/catalogue\\_detail.htm?csnumber=32557](http://www.iso.org/iso/catalogue_detail.htm?csnumber=32557)
- ISO 19108** ISO 19108:2002/Cor 1:2006, Geographic information - Temporal schema  
[http://www.iso.org/iso/home/store/catalogue\\_tc/catalogue\\_detail.htm?csnumber=44883](http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=44883)
- ISO 19111** ISO 19111:2007, Geographic information - Spatial referencing by coordinates  
[http://www.iso.org/iso/home/store/catalogue\\_tc/catalogue\\_detail.htm?csnumber=41126](http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=41126)
- ISO 19118** ISO 19118:2011 Geographic information – Encoding

[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=44212](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=44212)

**ISO 19127** ISO/TS 19127:2005, Geographic information - Geodetic codes and parameters  
[http://www.iso.org/iso/home/store/catalogue\\_tc/catalogue\\_detail.htm?csnumber=41784](http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=41784)

## 3 Terms and abbreviations

### 3.1 Terms

- (1) **Access point:** an internet address containing a detailed description of a spatial data service, including a list of endpoints to allow its execution.
- (2) **End point:** the Internet address used to directly call an operation provided by a spatial data service.
- (3) **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 [INS DIR, Art. 3].
- (4) **Network services** are services provided for in Article 11(1) of [INS DIR] for the discovery, viewing, download and transformation of spatial data sets and services. The services shall be conformant regarding the specific requirements in Commission Regulation (EC) 976/2009.

NOTE In [INS DIR, Art. 11] also a 5<sup>th</sup> type of network service is defined: “services allowing spatial data services to be invoked”. Since all services can be invoked when metadata is published and accessed through a discovery service, there is no need to have a special service to invoke other services. Instead, in practice, the discovery service will take the role as making it possible to invoke a service. (see also section 4.2.2).

- (5) **Discovery service** is a service that makes it possible to search for spatial data sets and services on the basis of the content of the corresponding metadata and to display the content of the metadata [INS DIR, Art. 11].
- (6) **View service** is a service making it possible, as a minimum, to display, navigate, zoom in/out, pan, or overlay viewable spatial data sets and to display legend information and any relevant content of metadata [INS DIR, Art. 11].
- (7) **Download service** is a service enabling copies of spatial data sets, or parts of such sets, to be downloaded and, where practicable, accessed directly [INS DIR, Art. 11].
- (8) **Transformation service** is a service enabling spatial data sets to be transformed with a view to achieving interoperability [INS DIR, Art. 11].
- (9) **Invocable spatial data service** is a spatial data service that fulfils all of the following: (a) has metadata which fulfils the requirements of Commission Regulation (EC) 1205/2008, (b) has at least one resource locator that is an access point, (c) is conformant with a documented and publicly available set of technical specifications providing the information necessary for its execution. [INS ISDSS, Art. 2.33]

NOTE The technical specifications could e.g. be a web site documentation explaining how to use the service, or they could be more formal, e.g. a WSDL document or a description of a RESTful interface.

- (10) **Interoperable spatial data service** means an invocable spatial data service which fulfils the requirements of Annex VI of [INS ISDSS]. [INS ISDSS, Art. 2.34]
- (11) **Harmonised spatial data service** means an interoperable spatial data service which fulfils the requirements of Annex VII of [INS ISDSS]. [INS ISDSS, Art. 2.35]
- (12) **Conformant spatial data set** means a spatial data set in conformity with Commission Regulation (EU) No 1089/2010. [INS ISDSS, Art. 2.36]

- (13) **Interface:** named set of operations that characterise the behaviour of an entity as defined by ISO 19119:2005. [INS ISDSS, Art. 2.38]
- (14) **Operation:** means an action supported by a spatial data service. [INS ISDSS, Art. 2.37]
- (15) **Resource locator:** The resource locator defines the link(s) to the resource and/or the link to additional information about the resource. The value domain of this metadata element is a character string, commonly expressed as uniform resource locator (URL). [INS MD, Annex, Part B 1.4].

### 3.2 Symbols and abbreviations

DT	Drafting Team
ISDSS	Interoperability of spatial data sets and services
ISO	International Organization for Standardization <sup>1</sup>
MD	Metadata
MS	Member state
NS	Network Services
OGC	Open Geospatial Consortium <sup>2</sup>
QoS	Quality of Service
SDS	Spatial Data Services
SOAP	Simple Object Access Protocol <sup>3</sup>
URL	Uniform Resource Locator
WSDL	Web Services Description Language <sup>4</sup>
XSD	XML Schema Definition

### 3.3 Verbal forms for the expression of provisions

In accordance with the ISO rules for drafting, the following verbal forms shall be interpreted in the given way:

- “shall” / “shall not” : a requirement, mandatory to comply with the technical guidance
- “should” / “should not” : a recommendation, but an alternative approach may be chosen for a specific case if there are reasons to do so

<sup>1</sup> <http://www.iso.org/iso/home.htm>

<sup>2</sup> <http://www.opengeospatial.org/ogc>

<sup>3</sup> <http://www.w3.org/TR/soap12>

<sup>4</sup> <http://www.w3.org/TR/wsdl>

- “may” / “need not” : a permission

### Technical Guidance Conformance Classes notation

The Technical Guidance in this document is divided into Conformance Classes, so that it is possible to declare conformance to specific parts of the Technical Guidance. *To conform to a Conformance Class it is necessary to meet all of the Requirements (see next section) in that Conformance Class.*

Conformance Classes are identified in the document as follows:

**TG Conformance Class #:** [TITLE] conformance classes are shown using this style

### Technical Guidance Requirements and Recommendations notation

Requirements and the recommendations for INSPIRE Spatial Data Services and services allowing spatial data services to be invoked within this technical guidance are highlighted and numbered as shown below:

**TG Requirement #** requirements are shown using this style

**TG Recommendation #** recommendations are shown using this style.

Requirements and recommendations belong to the conformance class in which they are found in this document.

**Note:** It is worth noting that requirements as specified in the INSPIRE Regulations and Implementing Rules are legally binding, and that requirements and recommendations as specified in INSPIRE Technical Guidance are **not** legally binding. Therefore, within this technical guidance we have used the terms ‘TG requirement’ and ‘TG recommendation’ to indicate what is technically required or recommended to conform to the Technical Guidance.

### XML Example notation

XML Examples are shown using Courier New on a grey background with yellow for emphasis as below:

```
<inspire:example>
  <inspire:highlight>
    Highlighted Text for emphasis
  </inspire:highlight>
</inspire:example>
```

**Note:** XML Examples are informative and are provided for information only and are expressly not normative.

## 3.4 References

References within this document are denoted using “Section” or “Annex”. For example, Section 5.3.1 or Annex A.

References to other documents refer to the list of normative references in Section 1.1 and use the abbreviated title as indicated in **Bold** text. For example, [**INS NS**] uses the abbreviated title for the document as shown below:

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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

References within other documents are shown as above using the reference code, together with the appropriate section within the document. For example, [**INS NS**, Section 2.2.3], refers to Section 2.2.3 within the document as listed above.

## 4 Technical Guidance

This section includes guidance related to categories of SDS (section 4.1), requirements from the different INSPIRE Implementing Rules and the Directive (section 4.2) and instructions on meeting the requirements for SDS included in [INS ISDSS] (sections 4.3 to 4.5) and for services allowing SDS to be invoked (section 4.6).

The technical guidance for the requirements included in [INS ISDSS] are structured according to conformance classes. The conformance classes for invocable SDS (section 4.3) and interoperable SDS (section 4.4) include only requirements on the creation of additional metadata. The conformance class for harmonised SDS includes requirements related to metadata, quality of service, output encoding and the Get Harmonised Spatial Data Service Metadata Operation.

### 4.1 Categories of INSPIRE Spatial Data Services

The spatial data services covered by the INSPIRE Directive are defined in Art. 4(3) as follows:

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

This means, the Directive covers all SDS that relate to INSPIRE-relevant data as defined in Art. 4(1) of [INS DIR]. In addition, an SDS could also include other data.

According to Art. 5(1) of [INS DIR], all SDSs within INSPIRE shall be described with metadata in conformity with [INS MD]. Furthermore, all SDS shall meet the requirements for data and service sharing laid down in Art. 17 of [INS DIR].

The SDSs that Member States establish and operate according to Art. 11 of [INS DIR] are called *network services*. All network services shall meet the requirements specified in [INS NS].

Those SDS that are not network services, but fulfil the requirements of Commission Regulation (EC) 1205/2008, have at least one resource locator and follow a publicly available technical specification are called *invocable spatial data services*. All invocable SDS shall meet the requirements specified in [INS ISDSS]. All other SDS are referred to in this document as *other SDS*.

The flowchart in Figure 2 provides guidance for distinguishing services that are not within the scope of INSPIRE, network services, invocable SDS and other SDS.

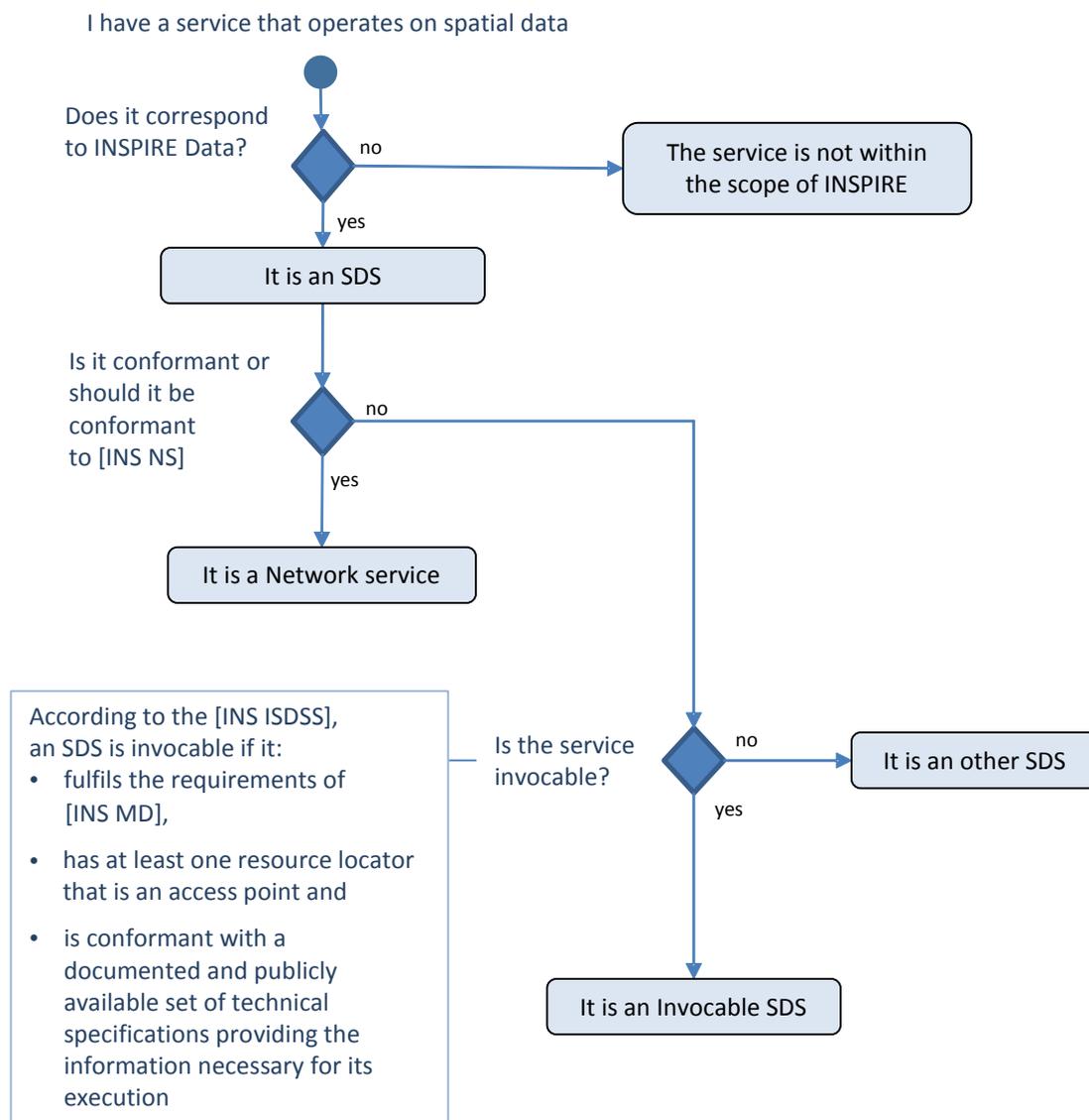


Figure 2: Guidance to understand if a spatial data services is in or out of scope of INSPIRE<sup>5</sup>

SDS regulated by [INS ISDSS] are further divided into three different categories depending on level of interoperability: Invocable SDS, Interoperable SDS and Harmonised SDS. SDS regulated by [INS NS] consist of four different types of services: discovery services, view services, download services and transformation services.

Figure 3 gives an overview of the different types of spatial data services.

<sup>5</sup> See discussion paper: Scope and definition of Spatial Data Services. MIG-T Spatial data services group, 2015.

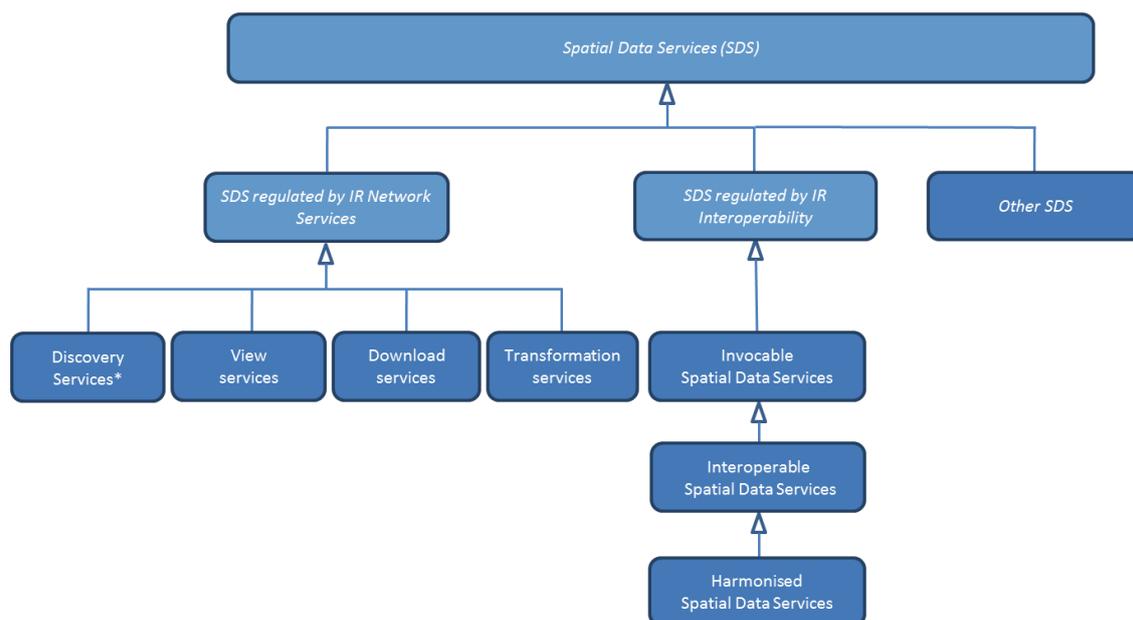


Figure 3 - Spatial data services in the context of INSPIRE and their relationships to different types and categories of services. \* Discovery Services also take the role as making it possible to invoke a service.

## 4.2 Requirements according to INSPIRE regulations

### 4.2.1 Requirements for Spatial Data Services

For the spatial data sets and services for which metadata have been created, member states shall establish and operate at least one (but may decide to establish and operate more than one) of each type of network service defined in [INS DIR, Art. 11] for discovery, view, download and, if necessary, transformation.

Transformation services are not mandatory to implement as long as “spatial data sets are made available in conformity with the implementing rules [for data interoperability] through the adaptation of existing spatial data sets” [INS DIR, Art. 7(3)], i.e. if they are transformed into the INSPIRE data models through some other means (e.g. offline transformation or on-the-fly transformation in the download service).

These services shall follow the requirements of [INS NS].

All spatial data services, including network services, shall have metadata according to [INS MD]. Furthermore, Member States need to adopt measures for data sharing for all spatial data services according to [INS DIR, Art. 17].

Invocable spatial data services, which have a technical specification providing information necessary for its execution (e.g. an API description), shall also have additional metadata as described in Annex V and VI and, where practicable, meet the requirements related to metadata, quality of service, output encoding and the Get Harmonised Spatial Data Service Metadata Operation that are described in Annex VII of [INS ISDSS].

NOTE 1 These additional requirements do not have to be met by, and are not relevant to, network services, as clarified by [INS ISDSS] (“This Regulation does not apply to the network services falling within the scope of Commission Regulation (EC) 976/2009”).

The requirements related to metadata are illustrated in Figure 4.

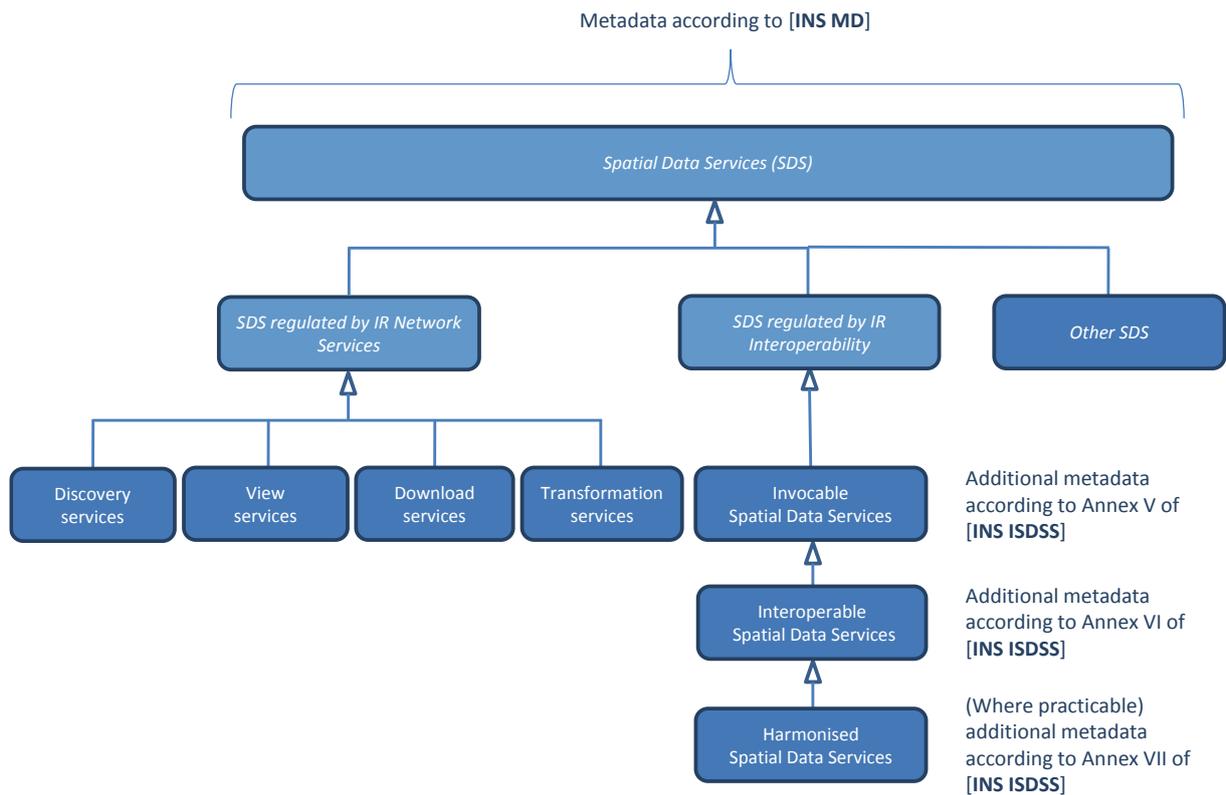


Figure 4 - Metadata required for SDS

## 4.2.2 Requirements for services allowing spatial data services to be invoked

No specific Implementing Rules exist in INSPIRE that specify requirements for “services allowing spatial data services to be invoked” as defined in [INS DIR, Art. 11(1.e)].

However, in the latest amendment of [INS NS] (Commission Regulation (EU) No 1311/2014 of 10 December 2014), the definition of “INSPIRE metadata element” is extended beyond the metadata elements defined in [INS MD] to include also the metadata elements defined in Annexes V-VII of [INS ISDSS].

This means that discovery network services need to provide access also to the additional SDS metadata elements, which contain, among other things, information necessary for the invocation of SDS. Through the provision of these metadata additional elements, the obligation to provide (network) “services allowing spatial data services to be invoked” is being fulfilled.

## 4.2.3 Guiding flow chart

In the INSPIRE scope it is required to set up Network services to be able to discover, view, download and, if necessary, transform data that is described in [INS DIR, Annexes I-III]. Specific regulations are published for setting up these services. But since other spatial data services can be of broad variation there is no detailed description. To support the understanding of SDS and its requirements the flow chart in Figure 5 can be used.

At the starting point there is an already existing service. It could be a service that was not initially intended as an INSPIRE service when it was set up.

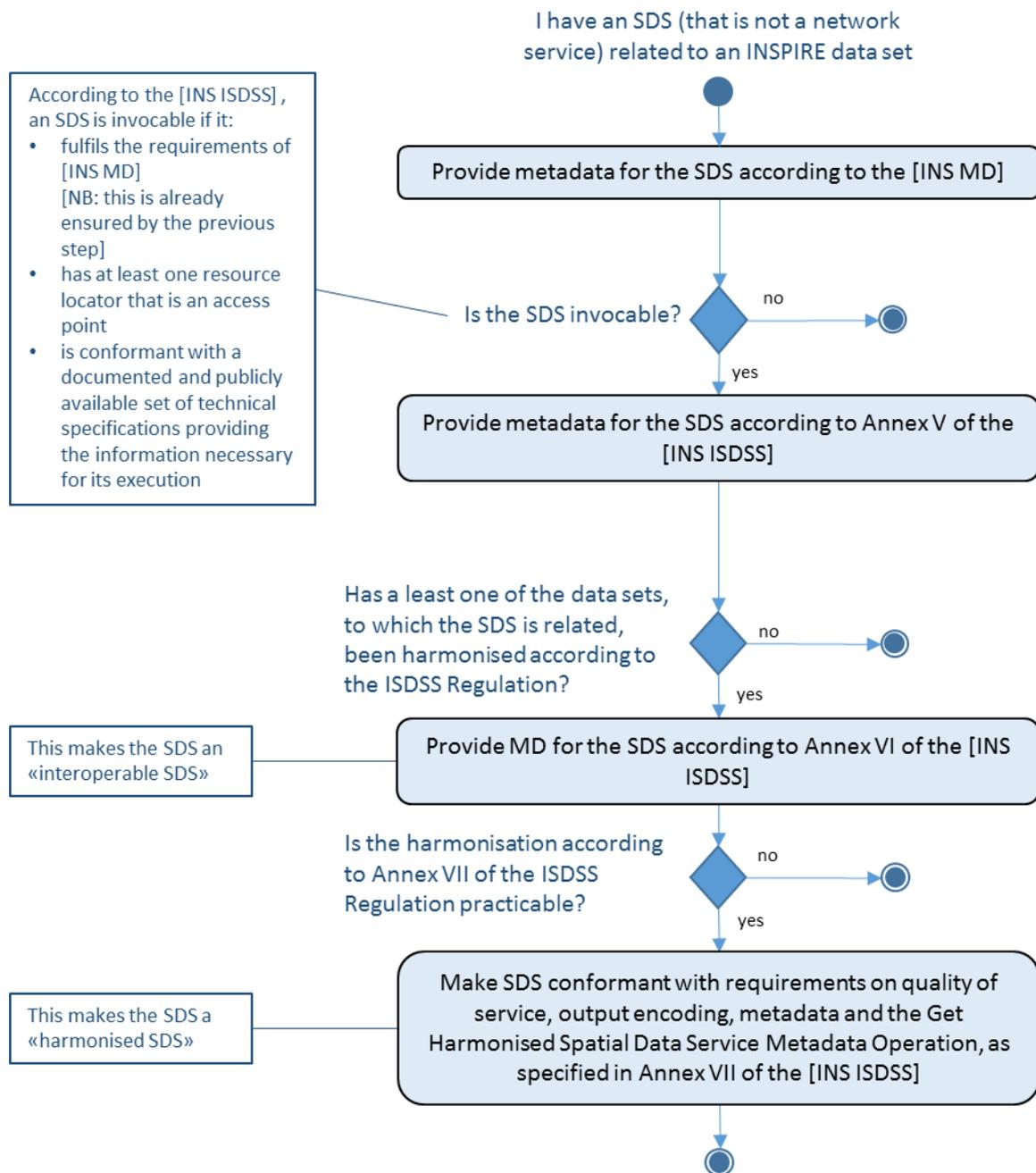


Figure 5 - Flow chart illustrating the obligations for spatial data services

All SDS shall have metadata which fulfils the requirements of [INS MD TG]. The availability of such [INS MD TG]-compliant metadata is assumed, but since the corresponding requirements, mapping rules and metadata elements are already detailed in [INS MD TG], they are not repeated in this TG. For details please refer to [INS MD TG].

#### 4.2.4 Deadlines

As for harmonisation of data sets, the fulfilments of the requirements for invocable spatial data services are done step-wise.

##### **15-May-2009**

Member States shall adopt measures for the sharing of spatial data sets and service, in accordance with [INS DIR, Art. 17].

##### **03-Dec-2010**

Metadata according to [INS MD] shall be available for spatial data services corresponding to Annex I and II themes

##### **09-Nov-2011**

Metadata for SDS shall be provided through INSPIRE discovery services, in accordance with [INS NS]

##### **03-Dec-2013**

Metadata according to [INS MD] shall be available for spatial data services corresponding to Annex III themes

##### **10-Dec-2015**

All invocable spatial data services shall be conformant to Annex V of [INS ISDSS]

##### **10-Dec-2016**

Invocable spatial data services related to newly collected and extensively restructured spatial data sets shall be conformant with Annex VI and, where practicable, Annex VII of [INS ISDSS]

##### **10-Dec-2021**

All invocable spatial data services shall be conformant with Annexes VI and (where practicable) VII of [INS ISDSS]

NOTE Also the additional metadata that has to be provided for SDS under [INS ISDSS] shall be provided through INSPIRE discovery services, in accordance with [INS NS]

### 4.3 Invocable Spatial Data Services

Guidelines for implementing the requirements for invocable SDS are provided in [INS MD TG].

### 4.4 Interoperable Spatial Data Services

Guidelines for implementing the requirements for interoperable SDS are provided in [INS MD TG].

### 4.5 Harmonised spatial data services

**TG Conformance Class:** Implementation of Harmonised Spatial Data Services

*This conformance class is inclusive of:*

*TG Requirement 2 to TG Requirement 6*

*TG Recommendation 1 to TG Recommendation 2*

#### **TG Requirement 1**

If at least one of the data sets, to which a spatial data service is related, has been harmonised according to [INS ISDSS], following aspects shall be considered, where practicable.

- the metadata document for the spatial data service shall include all metadata elements and meet the additional requirements for metadata elements
- meet the requirements on quality of service
- output encoding
- Get Harmonised Spatial Data Service Metadata Operation.

Guidelines for implementing the requirements on metadata for harmonised SDS are provided in [INS MD TG]. This document only provides implementation guidance for the requirements on quality of service, output encoding and the Get Harmonised Spatial Data Service Metadata Operation.

#### 4.5.1 Quality of the Harmonised Spatial Data Service

[INS ISDSS] requires that the probability of a harmonised spatial data service to be available shall be 98 % of the time.

##### 4.5.1.1 Normalized testing procedure

The following procedure has been copied from [INS NS TG].

#### **TG Requirement 2**

Availability shall be measured consistently based on sample reference requests to a given service. Minimum 10 reference requests per hour shall be issued to the service continuously during its lifetime.

To respect long running operations, the number of requests may be reduced. In such cases, a new request can be issued maximum 6 minutes after the previous request has finished.

**EXAMPLE** If a previous request for a 1 GB data set was issued at 8:00 and lasts until 8:30, the next reference request shall be issued at the latest at 8:36.

**TG Recommendation 1** The sample request issued to the service to measure performance can be used to measure availability as well, thus also fulfilling the same evaluation and assessment criteria.

**TG Requirement 3** The availability shall be based on a time frame of one year meaning a maximum unplanned downtime of 3.63 days per year. Periods of planned downtime e.g. because of system maintenance, shall not be included in the measure. Downtime is considered planned when notified to the community well in advance (minimum 1 week), e.g. via notifications to registered users or on portals.

**NOTE** It is assumed that the availability is calculated in the following way:

100% ↔  $365 \times 24 - (\text{planned downtime})$

99% ↔  $[365 \times 24 - (\text{planned downtime})] \times 0.99$

etc.

Unplanned downtime of 3.63 days per year corresponds if the service failure occurs at the beginning of a long weekend (a weekend with an observed holiday immediately preceding or following), e.g. service went down at 6 PM on Friday evening, it might not be restored until 9 AM on Tuesday morning for a downtime of  $6+24+24+24+9 = 87$  hours = 3.63 days

**TG Recommendation 2** Planned downtime is recommended to be less than 10 hours per month (i.e., less than 120 hours per year).

#### 4.5.2 Encoding of the spatial objects in the Spatial Data Service

[INS ISDSS] requires a harmonised spatial data service returning spatial objects in the scope of the [INS DIR] to encode those spatial objects according to [INS ISDSS].

**TG Requirement 4** If a request to the spatial data service returns spatial objects in the scope of the [INS DIR], the returned data shall meet the requirements for encoding specified for these spatial objects in Art. 7 and the relevant annexes of [INS ISDSS].

Article 7 of [INS ISDSS] on Encoding requires the following:

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

The INSPIRE data specifications Technical Guidelines contain default encoding rules for all spatial data themes that meet the requirements of [INS ISDSS].

#### 4.5.3 Operations for Harmonised Spatial Data Services

[INS ISDSS] requires a harmonised spatial data service to include a Get Harmonised Spatial Data Service Metadata operation, as specified in the following sections.

**NOTE** This operation is similar to the Get Discovery/View/Download/Transformation Service Metadata Operations described in [INS NS].

#### 4.5.3.1 Get Harmonised Spatial Data Service Metadata Description

<b>Get Harmonised Spatial Data Service Metadata</b>	
<p>It provides the mandatory information about the service and describes the service capabilities. It is inspired by the generic elements of the similar operations as included in [INS NS] for the network services.</p> <ul style="list-style-type: none"> <li>• <b>Request parameters</b> <ul style="list-style-type: none"> <li>○ Natural language to be used for the content of the response</li> </ul> </li> <li>• <b>Response parameters</b> <ul style="list-style-type: none"> <li>○ Spatial Data Service Metadata</li> <li>○ Operations Metadata</li> <li>○ Language</li> </ul> </li> </ul>	
<b>Recommended implementation</b>	
<b>Get Harmonised Spatial Data Service Metadata Request</b>	<p>Metadata records for Spatial Data Service shall be available in a Discovery Service.</p> <p><i>Note: The Resource locator metadata element for the Spatial Data Service shall contain a link to the Get Harmonised Spatial Data Service Metadata operation and it shall be unambiguously identified</i></p>
<b>Get Harmonised Spatial Data Service Metadata Response</b>	<p>The Get Harmonised Spatial Data Service Metadata response will be a custom capabilities document. There are two possibilities to implement this response:</p> <ul style="list-style-type: none"> <li>• Scenario 1: Repeat all metadata and operations</li> <li>• Scenario 2: Provide a link to ISO metadata and to a document describing the operations provided by the service (e.g. WSDL)</li> </ul>

<b>TG Requirement 5</b>	The Resource locator metadata element for the Spatial Data Service shall contain a link to the Get Harmonised Spatial Data Service Metadata operation, and it shall be unambiguously identified using the function described at paragraph 4.3. The response shall be provided using one of the two options described in sections 4.5.3.2 and 4.5.3.3.
-------------------------	---

NOTE The mapping of the Get Harmonised Spatial Data Service Metadata response to an extended capabilities document works well for OGC web services, which already offer a GetCapabilities operation. However, it may be less suitable for other types of SDS (e.g. RESTful services, custom APIs, ...). An alternative way to provide the required information would be to use a simple XML type GetSDSMetadataResponse consisting of two elements:

- gmd:metadata : MD\_Metadata (to be provided inline (scenario 1) or through an xlink:href reference to the metadata record (scenario 2))
- ins\_com:SupportedLanguages : supportedLanguagesType (to provide the supported languages)

Note that the required operations metadata is already included as “invocation metadata” (see [INS MD TG]).

#### 4.5.3.2 Scenario 1 – Get Capabilities response – Metadata URL

In this scenario, in order to avoid duplication of metadata already provided in the ISO metadata, the capabilities document returned by the Get Harmonised Spatial Data Service Metadata operation has only to provide the reference to the ISO metadata and to a document that describes all the operation provided by the service itself. This scenario follows more the atom implementation of the download service (use of describedby for each “block”) while still providing explicitly a get service metadata operation.

The reference to the spatial data service metadata is provided through the “MetadataUrl” element in the INSPIRE Extended Capabilities.

The operation section contains the GetCapabilities operation itself and an operation called “DescribeServiceOperations”. This operation is a link to a document (for example a WSDL) that provides all the information needed to invoke the service.

An encoding example of this scenario is provided in Annex A.

#### 4.5.3.3 Scenario 2 – Get Capabilities response – Metadata replication

In this scenario, all the metadata provided in the ISO metadata shall be repeated in the capabilities document (including INSPIRE Extended Capabilities metadata elements). This scenario is based on the experience of the discovery, view and downloads (WFS option) technical guidance.

NOTE In order to provide all the new metadata needed by the INSPIRE Spatial Data Service, the current XSD describing the INSPIRE Extended Capabilities would need to be extended. An example for the XSD’s extension is provided in Annex A.

In addition to the service information metadata, an operation for each service’s operation has to be provided in the operation metadata section of the Get Capabilities response.

An encoding example of this scenario is provided in Annex A.

## 4.6 Services allowing spatial data services to be invoked

**TG Conformance Class:** Implementation of services allowing spatial data services to be invoked

*This conformance class is inclusive of:*

*TG Requirement 6*

### **TG Requirement 6**

When requesting metadata on a spatial data service through the Discover Metadata operation of an INSPIRE Discovery Service, the response shall contain all the elements required to be available for that spatial data service.

## Annex A – Get Harmonized Spatial Data Service Metadata

This is an example of the Get Harmonized Spatial Data Service Metadata operation as described at chapter 4.5.3.

### A.1 Get Harmonized Spatial Data Service Metadata Request

This section contains a description about the GetCapabilities Request, including a table specifying the parameters needed by the request.

In this request there is no need to provide the “service” information (this is a deviation from the standard OWS capabilities).

Table 1 - Get Harmonized Spatial Data Service Metadata request

Request Parameter	Mandatory / optional	Description
Request=GetCapabilities	M	Operation name (text). Fixed value: GetCapabilities
AcceptVersions=version	O	Request version: 2.0.2

[INS NS] requires that multilingual aspects for network services are supported. As there is no standard way to deal with multilingualism within the [OGC WS] specifications, the HTTP/GET binding of the GetCapabilities-Operation is extended by an additional parameter that indicates the client’s preferred language.

Request Parameter	Parameter value	Description														
LANGUAGE	<p>Codelist (See ISO/TS 19139) based on alpha-3 codes of ISO 639-2.</p> <p>Use only three-letter codes from in ISO 639-2/B (bibliographic codes),</p> <p>The list of codes for the 23 official EU languages and EFTA Countries is:</p> <table border="0"> <tr> <td>Bulgarian – <b>bul</b></td> <td>Italian – <b>ita</b></td> </tr> <tr> <td>Czech – <b>cze</b></td> <td>Latvian – <b>lav</b></td> </tr> <tr> <td>Danish – <b>dan</b></td> <td>Liechtenstein – <b>ger</b></td> </tr> <tr> <td>Dutch – <b>dut</b></td> <td>Lithuanian – <b>lit</b></td> </tr> <tr> <td>English – <b>eng</b></td> <td>Maltese – <b>mlt</b></td> </tr> <tr> <td>Polish – <b>pol</b></td> <td>Norwegian – <b>nor</b></td> </tr> <tr> <td>Estonian – <b>est</b></td> <td>Portuguese – <b>por</b></td> </tr> </table>	Bulgarian – <b>bul</b>	Italian – <b>ita</b>	Czech – <b>cze</b>	Latvian – <b>lav</b>	Danish – <b>dan</b>	Liechtenstein – <b>ger</b>	Dutch – <b>dut</b>	Lithuanian – <b>lit</b>	English – <b>eng</b>	Maltese – <b>mlt</b>	Polish – <b>pol</b>	Norwegian – <b>nor</b>	Estonian – <b>est</b>	Portuguese – <b>por</b>	<p>It is optional for a Client Request.</p> <p>It is mandatory to be supported for the service and shall be processed if the parameter is present in a client’s request with a supported language code. If the parameter is absent in a client’s request or it requested an unsupported language the service shall response in the service default language.</p>
Bulgarian – <b>bul</b>	Italian – <b>ita</b>															
Czech – <b>cze</b>	Latvian – <b>lav</b>															
Danish – <b>dan</b>	Liechtenstein – <b>ger</b>															
Dutch – <b>dut</b>	Lithuanian – <b>lit</b>															
English – <b>eng</b>	Maltese – <b>mlt</b>															
Polish – <b>pol</b>	Norwegian – <b>nor</b>															
Estonian – <b>est</b>	Portuguese – <b>por</b>															

<p>Finnish – <b>fin</b>                      Romanian – <b>rum</b>  French – <b>fre</b>                              Romansh - <b>roh</b>  German – <b>ger</b>                            Slovak – <b>slo</b>  Greek – <b>gre</b>                               Slovenian – <b>slv</b>  Hungarian – <b>hun</b>                        Spanish – <b>spa</b>  Irish – <b>gle</b>                                 Swedish – <b>swe</b>  Icelandic – <b>ice</b></p> <p>The list of all the codes is defined at <a href="http://www.loc.gov/standards/iso639-2/">http://www.loc.gov/standards/iso639-2/</a></p> <p>Regional languages also are included in this list.</p>
--

EXAMPLE      GetCapabilities Request KPV Encoding:

<http://www.example.com/srv?REQUEST=GetCapabilities&LANGUAGE=eng>

## A.2 Scenario 1 – Get Harmonized Spatial Data Service Metadata Response

```
<?xml version="1.0" encoding="UTF-8"?>
<Capabilities xmlns="http://www.opengis.net/ows/1.1"
xmlns:ows="http://www.opengis.net/ows/1.1"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:ins_com="http://inspire.ec.europa.eu/schemas/common/1.0"
xmlns:ins_vs="http://inspire.ec.europa.eu/schemas/inspire_vs_ows11/1.0"
version="1.0.0" xsi:schemaLocation="http://www.opengis.net/ows/1.1
http://schemas.opengis.net/ows/1.1.0/Examples/exampleCapabilities.xsd
http://inspire.ec.europa.eu/schemas/inspire_vs_ows11/1.0
http://inspire.ec.europa.eu/schemas/inspire_vs_ows11/1.0/inspire_vs_ows_11.
xsd">
  <ows:OperationsMetadata>
    <ows:Operation name="GetCapabilities">
      <ows:DCP>
        <ows:HTTP>
          <ows:Get xlink:href="http://www.example.com/service.cgi?">
            <ows:Constraint name="GetEncoding">
              <ows:AllowedValues>
                <ows:Value>KVP</ows:Value>
              </ows:AllowedValues>
            </ows:Constraint>
          </ows:Get>
          <ows:Post xlink:href="http://www.example.com/service.cgi?">
            <ows:Constraint name="PostEncoding">
              <ows:AllowedValues>
                <ows:Value>SOAP</ows:Value>
              </ows:AllowedValues>
            </ows:Constraint>
          </ows:Post>
        </ows:HTTP>
      </ows:DCP>
    </ows:Operation>
  </ows:OperationsMetadata>
</Capabilities>
```

```

    </ows:HTTP>
  </ows:DCP>
</ows:Operation>
<ows:Operation name="DescribeServiceOperation">
  <ows:DCP>
    <ows:HTTP>
      <ows:Get
xlink:href="http://www.dinoservices.nl/geo3dmodelwebservices-
1/Geo3DModelService?wsdl">
        <ows:Constraint name="PostEncoding">
          <ows:AllowedValues>
            <ows:Value>SOAP</ows:Value>
          </ows:AllowedValues>
        </ows:Constraint>
      </ows:Get>
    </ows:HTTP>
  </ows:DCP>
</ows:Operation>
<!-- =====>
<!-- == The INSPIRE Extended Capabilities. ==-->
<!-- =====>
<ins_vs:ExtendedCapabilities>
  <ins_com:MetadataUrl>
    <ins_com:URL>http://link-to/discovery-metadata</ins_com:URL>
  </ins_com:MetadataUrl>
  <ins_com:SupportedLanguages>
    <ins_com:DefaultLanguage>
      <ins_com:Language>dan</ins_com:Language>
    </ins_com:DefaultLanguage>
    <ins_com:SupportedLanguage>
      <ins_com:Language>eng</ins_com:Language>
    </ins_com:SupportedLanguage>
  </ins_com:SupportedLanguages>
  <ins_com:ResponseLanguage>
    <ins_com:Language>eng</ins_com:Language>
  </ins_com:ResponseLanguage>
</ins_vs:ExtendedCapabilities>
</ows:OperationsMetadata>
</Capabilities>

```

### A.3 Scenario 2 – Get Harmonized Spatial Data Service Metadata Response

```

<?xml version="1.0" encoding="UTF-8"?>
<Capabilities xmlns="http://www.opengis.net/ows/1.1"
xmlns:ows="http://www.opengis.net/ows/1.1"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:ins_com="http://inspire.ec.europa.eu/schemas/common/1.0"
xmlns:ins_sds="http://inspire.ec.europa.eu/schemas/inspire_sds_ows11/1.0"
xmlns:ins_qos="http://to-be-provided/schemas/qos/1.0"
xmlns:ins_sdsc="http://to-be-provided/schemas/sdsc/1.0" version="1.0.0"
xsi:schemaLocation="http://www.opengis.net/ows/1.1
http://example/exampleCapabilities.xsd
http://inspire.ec.europa.eu/schemas/inspire_vs_ows11/1.0
http://example/inspire_sds_ows_11.xsd">
  <ows:ServiceIdentification>

```

```

<ows:Title>Geo 3D Model service</ows:Title>
<ows:Abstract>This Spatial Data Service supports various operations on
the Digital Subsurface Models (Regis, DGM and GeoTop) provided by the
Geological Survey of the Netherlands. There is for example an operation to
create a "virtual borehole" through one of the subsurface models for any
given location in the Netherlands. The result can either be returned as Xml
data or as a graphical representation. There is also supported for creating
a VerticalSection a depthSection and many others. All operations and
returned values are in the EPSG:28992 (RDNew) coordinate reference
system.</ows:Abstract>
  <ows:Keywords>
    <ows:Keyword>infoCoverageAccessService</ows:Keyword>
    <ows:Keyword>subsurface</ows:Keyword>
    <ows:Keyword>geology</ows:Keyword>
    <ows:Keyword>Netherlands</ows:Keyword>
    <ows:Keyword>3D model</ows:Keyword>
  </ows:Keywords>
  <ows:ServiceType>other</ows:ServiceType>
  <ows:ServiceTypeVersion>1.0.0</ows:ServiceTypeVersion>
  <ows:Fees>none</ows:Fees>
  <ows:AccessConstraints>TNO terms and conditions
apply</ows:AccessConstraints>
</ows:ServiceIdentification>
  <ows:ServiceProvider>
    <ows:ProviderName>Geological Survey of the
Netherlands</ows:ProviderName>
    <ows:ServiceContact>
      <ows:IndividualName>Servicedesk Geological Survey of the
Netherlands</ows:IndividualName>
      <ows:ContactInfo>
        <ows:Address>
          <ows:ElectronicMailAddress>info@dinoloket.nl</ows:ElectronicMailAddress>
        </ows:Address>
      </ows:ContactInfo>
    </ows:ServiceContact>
  </ows:ServiceProvider>
  <ows:OperationsMetadata>
    <ows:Operation name="GetCapabilities">
      <ows:DCP>
        <ows:HTTP>
          <ows:Get xlink:href="http://www.example.com/service.cgi?">
            <ows:Constraint name="GetEncoding">
              <ows:AllowedValues>
                <ows:Value>KVP</ows:Value>
              </ows:AllowedValues>
            </ows:Constraint>
          </ows:Get>
          <ows:Post xlink:href="http://www.example.com/service.cgi?">
            <ows:Constraint name="PostEncoding">
              <ows:AllowedValues>
                <ows:Value>SOAP</ows:Value>
              </ows:AllowedValues>
            </ows:Constraint>
          </ows:Post>
        </ows:HTTP>
      </ows:DCP>
    </ows:Operation>
    <ows:Operation name="sampleColumn">
      <ows:DCP>
        <ows:HTTP>

```

```

    <ows:Post
xlink:href="http://www.dinoservices.nl/geo3dmodelwebservices-
1/Geo3DModelService?wsdl">
        <ows:Constraint name="GetEncoding">
            <ows:AllowedValues>
                <ows:Value>SOAP</ows:Value>
            </ows:AllowedValues>
        </ows:Constraint>
    </ows:Post>
</ows:HTTP>
</ows:DCP>
</ows:Operation>
<ows:Operation name="drawColumn">
    <ows:DCP>
        <ows:HTTP>
            <ows:Post
xlink:href="http://www.dinoservices.nl/geo3dmodelwebservices-
1/Geo3DModelService?wsdl">
                <ows:Constraint name="GetEncoding">
                    <ows:AllowedValues>
                        <ows:Value>SOAP</ows:Value>
                    </ows:AllowedValues>
                </ows:Constraint>
            </ows:Post>
        </ows:HTTP>
    </ows:DCP>
</ows:Operation>
...

<!-- =====>
<!-- == The INSPIRE Extended Capabilities.      ==-->
<!-- =====>
<ins_sds:ExtendedCapabilities>
    <ins_com:ResourceLocator>
        <ins_com:URL/>
    </ins_com:ResourceLocator>
    <ins_com:ResourceType>service</ins_com:ResourceType>
    <ins_com:TemporalReference/>
    <ins_com:Conformity>
        <ins_com:Specification>
            <ins com:Title>Webservice for making virtual boreholes in the
Digital Subsurface Models of the Netherlands</ins_com:Title>
            <ins_com:DateOfPublication>2011-11-
03</ins_com:DateOfPublication>
        </ins_com:Specification>
        <ins_com:Degree>notEvaluated</ins_com:Degree>
    </ins_com:Conformity>
    <ins_com:MetadataPointOfContact>
        <ins_com:OrganisationName/>
        <ins_com:EmailAddress>info@dinoloket.nl</ins_com:EmailAddress>
    </ins_com:MetadataPointOfContact>
    <ins_com:MetadataDate>2010-12-08</ins_com:MetadataDate>
    <ins_com:SpatialDataServiceType>other</ins_com:SpatialDataServiceType>
    <ins_com:MandatoryKeyword>
<ins_com:KeywordValue>infoCoverageAccessService</ins_com:KeywordValue>
        <!--Arbitrary value to make file valid-->
    </ins_com:MandatoryKeyword>
    <ins_com:SupportedLanguages>
        <ins_com:DefaultLanguage>
            <ins_com:Language>dan</ins_com:Language>

```

```

    </ins_com:DefaultLanguage>
    <ins_com:SupportedLanguage>
      <ins_com:Language>eng</ins_com:Language>
    </ins_com:SupportedLanguage>
  </ins_com:SupportedLanguages>
  <ins_com:ResponseLanguage>
    <ins_com:Language>eng</ins_com:Language>
  </ins_com:ResponseLanguage>
  <!-- An extension to the INSPIRE ExtendedCapabilities schma is
needed in order to support the following Quality of Service elements -->
  <ins_qos:QualityOfService>
    <ins_qos:criteria>availability</ins_qos:criteria>
    <ins_qos:unit>percentage of time</ins_qos:unit>
    <ins_qos:value>99.0</ins_qos:value>
    <ins_qos:measurementDescription> Availability on yearly basis,
expressed as percentage of time</ins_qos:measurementDescription>
  </ins_qos:QualityOfService>
  <ins_qos:QualityOfService>
    <ins_qos:criteria>performance</ins_qos:criteria>
    <ins_qos:unit>seconds</ins_qos:unit>
    <ins_qos:value>1.457</ins_qos:value>
    <ins_qos:measurementDescription>Average response time in
seconds</ins_qos:measurementDescription>
  </ins_qos:QualityOfService>
  <ins_qos:QualityOfService>
    <ins_qos:criteria>capacity</ins_qos:criteria>
    <ins_qos:unit>number of requests per second</ins_qos:unit>
    <ins_qos:value>20</ins_qos:value>
    <ins_qos:measurementDescription> Maximum number of simultaneous
requests per second meeting the performance
criteria</ins_qos:measurementDescription>
  </ins_qos:QualityOfService>
  <!-- An extension to the INSPIRE ExtendedCapabilities schema is
needed in order to support the following SDS Class elements -->
  <ins_sdsc:Category>invocable</ins_sdsc:Category>
</ins_vs:ExtendedCapabilities>
</ows:OperationsMetadata>
</Capabilities>

```

## Annex B – WSDL Example

The following code shows a WSDL example that can be provided in order to fulfil requirements for invocation metadata.

Original URL: <http://www.dinoservices.nl/geo3dmodelwebservices-1/Geo3DModelService?wsdl>

The code highlighted in yellow is an addition to the original example in order to include an example of a possible way of adding the getCapabilities operation in the WSDL document.

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- Published by JAX-WS RI at http://jax-ws.dev.java.net. RI's version is
JAX-WS RI 2.1.3-b02-. -->
<ws:definitions xmlns:ws="http://schemas.xmlsoap.org/wsdl/"
xmlns:types="http://ws.geo3dmodel.dino.nitg.tno.nl/types"
xmlns:http="http://schemas.xmlsoap.org/wsdl/http/"
xmlns:gml="http://www.opengis.net/gml"
xmlns:tns="http://ws.geo3dmodel.dino.nitg.tno.nl/"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:xmime="http://www.w3.org/2005/05/xmlmime"
xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
xmlns:wsaw="http://www.w3.org/2006/05/addressing/wsdl"
xmlns:mime="http://schemas.xmlsoap.org/wsdl/mime/"
targetNamespace="http://ws.geo3dmodel.dino.nitg.tno.nl/"
name="Geo3DModelService">
  <ws:documentation>
    This WSDL describes a webservice for making "virtual" boreholes in the
    Digital Subsurface Models of DINO.
    The following operations are provided:
    1. sampleColumn creates a synthetic borehole for the specified
    location using the specified model.
    See the documentation in the schema for the types (available at the
    schemaLocation below) for additional details.
    2. listModels lists all models available for sampling.
  </ws:documentation>
  <ws:types>
    <xs:schema
      <xs:import namespace="http://ws.geo3dmodel.dino.nitg.tno.nl/types"
        schemaLocation="http://www.dinoservices.nl:80/geo3dmodelwebservices-
        1/Geo3DModelService?xsd=1"/>
    </xs:schema>
  </ws:types>
  <ws:message name="sampleColumn">
    <ws:part name="parameters" element="types:sampleColumn"/>
  </ws:message>
  <ws:message name="sampleColumnResponse">
    <ws:part name="parameters" element="types:sampleColumnResponse"/>
  </ws:message>
  <ws:message name="drawColumn">
    <ws:part name="parameters" element="types:drawColumn"/>
  </ws:message>
  <ws:message name="drawColumnResponse">
    <ws:part name="parameters" element="types:drawColumnResponse"/>
  </ws:message>
  <ws:message name="listModels">
    <ws:part name="parameters" element="types:listModels"/>
  </ws:message>
  <ws:message name="listDocuments">
    <ws:part name="parameters" element="types:listDocuments"/>
  </ws:message>
</ws:definitions>
```

```

</ws:message>
<ws:message name="listRasters">
  <ws:part name="parameters" element="types:listRasters"/>
</ws:message>
<ws:message name="listModelsResponse">
  <ws:part name="parameters" element="types:listModelsResponse"/>
</ws:message>
<ws:message name="listDocumentsResponse">
  <ws:part name="parameters" element="types:listDocumentsResponse"/>
</ws:message>
<ws:message name="listRastersResponse">
  <ws:part name="parameters" element="types:listRastersResponse"/>
</ws:message>
<ws:message name="describeModel">
  <ws:part name="parameters" element="types:describeModel"/>
</ws:message>
<ws:message name="describeModelResponse">
  <ws:part name="parameters" element="types:describeModelResponse"/>
</ws:message>
<ws:message name="sampleDepth">
  <ws:part name="parameters" element="types:sampleDepth"/>
</ws:message>
<ws:message name="sampleDepthResponse">
  <ws:part name="parameters" element="types:sampleDepthResponse"/>
</ws:message>
<ws:message name="drawDepthSection">
  <ws:part name="parameters" element="types:drawDepthSection"/>
</ws:message>
<ws:message name="drawDepthSectionResponse">
  <ws:part name="parameters" element="types:drawDepthSectionResponse"/>
</ws:message>
<ws:message name="drawVerticalSection">
  <ws:part name="parameters" element="types:drawVerticalSection"/>
</ws:message>
<ws:message name="drawVerticalSectionResponse">
  <ws:part name="parameters"
element="types:drawVerticalSectionResponse"/>
</ws:message>
<ws:message name="userInputErrorResponse">
  <ws:part name="parameters" element="types:userInputErrorResponse"/>
</ws:message>
<ws:portType name="Geo3DModelPortType">
  <ws:operation name="sampleColumn">
    <ws:input message="tns:sampleColumn"
wsaw:Action="http://ws.geo3dmodel.dino.nitg.tno.nl/sampleColumnRequest"/>
    <ws:output message="tns:sampleColumnResponse"
wsaw:Action="http://ws.geo3dmodel.dino.nitg.tno.nl/sampleColumnResponse"/>
    <ws:fault name="fault" message="tns:userInputErrorResponse"/>
  </ws:operation>
  <ws:operation name="drawColumn">
    <ws:input message="tns:drawColumn"
wsaw:Action="http://ws.geo3dmodel.dino.nitg.tno.nl/drawColumnRequest"/>
    <ws:output message="tns:drawColumnResponse"
wsaw:Action="http://ws.geo3dmodel.dino.nitg.tno.nl/drawColumnResponse"/>
    <ws:fault name="fault" message="tns:userInputErrorResponse"/>
  </ws:operation>
  <ws:operation name="listModels">
    <ws:input message="tns:listModels"
wsaw:Action="http://ws.geo3dmodel.dino.nitg.tno.nl/listModelsRequest"/>

```

```

    <ws:output message="tns:listModelsResponse"
wsaw:Action="http://ws.geo3dmodel.dino.nitg.tno.nl/listModelsResponse"/>
    <ws:fault name="fault" message="tns:userInputErrorResponse"/>
  </ws:operation>
  <ws:operation name="listDocuments">
    <ws:input message="tns:listDocuments"
wsaw:Action="http://ws.geo3dmodel.dino.nitg.tno.nl/listDocumentsRequest"/>
    <ws:output message="tns:listDocumentsResponse"
wsaw:Action="http://ws.geo3dmodel.dino.nitg.tno.nl/listDocumentsResponse"/>
    <ws:fault name="fault" message="tns:userInputErrorResponse"/>
  </ws:operation>
  <ws:operation name="listRasters">
    <ws:input message="tns:listRasters"
wsaw:Action="http://ws.geo3dmodel.dino.nitg.tno.nl/listRastersRequest"/>
    <ws:output message="tns:listRastersResponse"
wsaw:Action="http://ws.geo3dmodel.dino.nitg.tno.nl/listRastersResponse"/>
    <ws:fault name="fault" message="tns:userInputErrorResponse"/>
  </ws:operation>
  <ws:operation name="describeModel">
    <ws:input message="tns:describeModel"
wsaw:Action="http://ws.geo3dmodel.dino.nitg.tno.nl/describeModelRequest"/>
    <ws:output message="tns:describeModelResponse"
wsaw:Action="http://ws.geo3dmodel.dino.nitg.tno.nl/describeModelResponse"/>
    <ws:fault name="fault" message="tns:userInputErrorResponse"/>
  </ws:operation>
  <ws:operation name="sampleDepth">
    <ws:input message="tns:sampleDepth"
wsaw:Action="http://ws.geo3dmodel.dino.nitg.tno.nl/sampleDepthRequest"/>
    <ws:output message="tns:sampleDepthResponse"
wsaw:Action="http://ws.geo3dmodel.dino.nitg.tno.nl/sampleDepthResponse"/>
    <ws:fault name="fault" message="tns:userInputErrorResponse"/>
  </ws:operation>
  <ws:operation name="drawDepthSection">
    <ws:input message="tns:drawDepthSection"
wsaw:Action="http://ws.geo3dmodel.dino.nitg.tno.nl/drawDepthSectionRequest"
/>
    <ws:output message="tns:drawDepthSectionResponse"
wsaw:Action="http://ws.geo3dmodel.dino.nitg.tno.nl/drawDepthSectionResponse"
"/>
    <ws:fault name="fault" message="tns:userInputErrorResponse"/>
  </ws:operation>
  <ws:operation name="drawVerticalSection">
    <ws:input message="tns:drawVerticalSection"
wsaw:Action="http://ws.geo3dmodel.dino.nitg.tno.nl/drawVerticalSectionReque
st"/>
    <ws:output message="tns:drawVerticalSectionResponse"
wsaw:Action="http://ws.geo3dmodel.dino.nitg.tno.nl/drawVerticalSectionRespo
nse"/>
    <ws:fault name="fault" message="tns:userInputErrorResponse"/>
  </ws:operation>
</ws:portType>
<ws:binding name="Geo3DModelServicePortBinding"
type="tns:Geo3DModelPortType">
  <soap:binding transport="http://schemas.xmlsoap.org/soap/http"
style="document"/>
  <ws:operation name="sampleColumn">
    <soap:operation soapAction="sampleColumn"/>
    <ws:input>
      <soap:body use="literal"/>
    </ws:input>
  </ws:operation>

```

```
<ws:output>
  <soap:body use="literal"/>
</ws:output>
<ws:fault name="fault">
  <soap:fault name="fault"/>
</ws:fault>
</ws:operation>
<ws:operation name="drawColumn">
  <soap:operation soapAction="drawColumn"/>
  <ws:input>
    <soap:body use="literal"/>
  </ws:input>
  <ws:output>
    <soap:body use="literal"/>
  </ws:output>
  <ws:fault name="fault">
    <soap:fault name="fault"/>
  </ws:fault>
</ws:operation>
<ws:operation name="listModels">
  <soap:operation soapAction="listModels"/>
  <ws:input>
    <soap:body use="literal"/>
  </ws:input>
  <ws:output>
    <soap:body use="literal"/>
  </ws:output>
  <ws:fault name="fault">
    <soap:fault name="fault"/>
  </ws:fault>
</ws:operation>
<ws:operation name="listDocuments">
  <soap:operation soapAction="listDocuments"/>
  <ws:input>
    <soap:body use="literal"/>
  </ws:input>
  <ws:output>
    <soap:body use="literal"/>
  </ws:output>
  <ws:fault name="fault">
    <soap:fault name="fault"/>
  </ws:fault>
</ws:operation>
<ws:operation name="listRasters">
  <soap:operation soapAction="listRasters"/>
  <ws:input>
    <soap:body use="literal"/>
  </ws:input>
  <ws:output>
    <soap:body use="literal"/>
  </ws:output>
  <ws:fault name="fault">
    <soap:fault name="fault"/>
  </ws:fault>
</ws:operation>
<ws:operation name="describeModel">
  <soap:operation soapAction="describeModel"/>
  <ws:input>
    <soap:body use="literal"/>
  </ws:input>
```

```

<ws:output>
  <soap:body use="literal"/>
</ws:output>
<ws:fault name="fault">
  <soap:fault name="fault"/>
</ws:fault>
</ws:operation>
<ws:operation name="sampleDepth">
  <soap:operation soapAction="sampleDepth"/>
  <ws:input>
    <soap:body use="literal"/>
  </ws:input>
  <ws:output>
    <soap:body use="literal"/>
  </ws:output>
  <ws:fault name="fault">
    <soap:fault name="fault"/>
  </ws:fault>
</ws:operation>
<ws:operation name="drawDepthSection">
  <soap:operation soapAction="drawDepthSection"/>
  <ws:input>
    <soap:body use="literal"/>
  </ws:input>
  <ws:output>
    <soap:body use="literal"/>
  </ws:output>
  <ws:fault name="fault">
    <soap:fault name="fault"/>
  </ws:fault>
</ws:operation>
<ws:operation name="drawVerticalSection">
  <soap:operation soapAction="drawVerticalSection"/>
  <ws:input>
    <soap:body use="literal"/>
  </ws:input>
  <ws:output>
    <soap:body use="literal"/>
  </ws:output>
  <ws:fault name="fault">
    <soap:fault name="fault"/>
  </ws:fault>
</ws:operation>
</ws:binding>
<ws:service name="Geo3DModelService">
  <ws:port name="Geo3DModelServicePort"
binding="tns:Geo3DModelServicePortBinding">
    <soap:address
location="http://www.dinoservices.nl:80/geo3dmodelwebservice-
1/Geo3DModelService"/>
  </ws:port>
</ws:service>
<!-- Example of a possible getCapabilities operation in WSDL - The
following lines has been added to the original WSDL -->
<ws:message name="GetCapabilitiesRequest">
  <ws:part name="Body" element="csw:GetCapabilities"/>
</ws:message>
<ws:message name="DescribeRecordRequest">
  <ws:part name="Body" element="csw:DescribeRecord"/>
</ws:message>

```

```

<ws:message name="GetRecordsRequest">
  <ws:part name="Body" element="csw:GetRecords"/>
</ws:message>
<ws:message name="GetRecordByIdRequest">
  <ws:part name="Body" element="csw:GetRecordById"/>
</ws:message>
<ws:message name="GetDomainRequest">
  <ws:part name="Body" element="csw:GetDomain"/>
</ws:message>
<ws:message name="HarvestRequest">
  <ws:part name="Body" element="csw:Harvest"/>
</ws:message>
<ws:message name="TransactionRequest">
  <ws:part name="Body" element="csw:Transaction"/>
</ws:message>
<ws:portType name="csw">
  <ws:operation name="csw.getCapabilities">
    <ws:input message="csw-req:GetCapabilitiesRequest"/>
    <ws:output message="csw-resp:GetCapabilitiesResponse"/>
    <ws:fault name="ServiceExceptionReport" message="csw-
resp:ServiceExceptionReport"/>
  </ws:operation>
  <ws:operation name="csw.describeRecord">
    <ws:input message="csw-req:DescribeRecordRequest"/>
    <ws:output message="csw-resp:DescribeRecordResponse"/>
    <ws:fault name="ServiceExceptionReport" message="csw-
resp:ServiceExceptionReport"/>
  </ws:operation>
  <ws:operation name="csw.getRecords">
    <ws:input message="csw-req:GetRecordsRequest"/>
    <ws:output message="csw-resp:GetRecordsResponse"/>
    <ws:fault name="ServiceExceptionReport" message="csw-
resp:ServiceExceptionReport"/>
  </ws:operation>
  <ws:operation name="csw.getRecordById">
    <ws:input message="csw-req:GetRecordByIdRequest"/>
    <ws:output message="csw-resp:GetRecordByIdResponse"/>
    <ws:fault name="ServiceExceptionReport" message="csw-
resp:ServiceExceptionReport"/>
  </ws:operation>
  <ws:operation name="csw.getDomain">
    <ws:input message="csw-req:GetDomainRequest"/>
    <ws:output message="csw-resp:GetDomainResponse"/>
    <ws:fault name="ServiceExceptionReport" message="csw-
resp:ServiceExceptionReport"/>
  </ws:operation>
</ws:portType>
<ws:binding name="csw-GET" type="csw-req:csw">
  <ws:documentation>CSW interface bound to the HTTP/1.1 GET
method.</ws:documentation>
  <http:binding verb="GET"/>
  <ws:operation name="csw.getCapabilities">
    <http:operation location="GetCapabilities"/>
    <ws:input>
      <http:urlEncoded/>
    </ws:input>
    <ws:output>
      <mime:mimeXml/>
    </ws:output>
    <ws:fault name="ServiceExceptionReport">

```

```
        <soap:fault use="literal" name="ServiceExceptionReport"/>
    </ws:fault>
</ws:operation>
<ws:operation name="csw.getRecordById">
    <http:operation location="GetRecordById"/>
    <ws:input>
        <http:urlEncoded/>
    </ws:input>
    <ws:output>
        <mime:mimeXml/>
    </ws:output>
    <ws:fault name="ServiceExceptionReport">
        <soap:fault use="literal" name="ServiceExceptionReport"/>
    </ws:fault>
</ws:operation>
</ws:binding>
<ws:service name="CSW">
    <ws:documentation>
        This is an example
    </ws:documentation>
    <ws:port binding="csw-http-kvp:csw-GET" name="csw-GET-Port">
        <http:address
location="http://someurl.com/example/services/CSWDiscovery"/>
        </ws:port>
    </ws:service>
</ws:definitions>
```

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## **Annex C – SDS examples**

A web site with examples of SDS included in the yearly Member States' monitoring of INSPIRE data and services is available at <http://inspire.ec.europa.eu/id/document/tg/sds/4.0/examples>.