EUFODOS

D320.3 Service Network Inspire Implementation TN

EUFODOS – Improved Information of Forest Structure and Damages

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EUFODOS

EXECUTIVE SUMMARY

The report contains the Technical Note on Service Network INSPIRE Implementation for the EUFODOS Project prepared under the Seventh Framework Programme (Cooperation FP7-SPACE-2010-1) no: 262786.

Based on a two-phase approach (Phase 1: OGC compliant, Phase 2 extension to INSPIRE compliancy), the Technical Note provides the background and technical recommendations how to implement INSPIRE standards and requirements in the Forest Downstream Services. It summarizes the INSPIRE history (back to the year 2001) and describes the background of INSPIRE Implementing Rules (IR) as well as the Documentation Framework and envisaged INSPIRE schedule (until 2012). Key INSPIRE Requirements on Metadata, Data Specifications and Network Services are explained in detail and the possible approach how to technically include these relevant Implementing Rules in EUFODOS and the respective Forest Downstream Services is described. The report concludes with the presentation of different software options (free and proprietary), which are recommended to provide INSPIRE compliant web services for EUFODOS.

EUFODOS

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1. Introduction

A key requirement and crucial to the success of the GMES service component as well as GMES Downstream Services is the compliance with requirements and guidelines included in the INSPIRE Directive [European Parliament, INSPIRE Directive 2007/2/EC]. This requires defining the frame conditions in EUFODOS to ensure that Forest DS are compliant with INSPRE standards. Therefore the main objectives of the report are to

- clarify relevance of INSPIRE for EUFODOS and related Downstream Services
- lay out key INSPIRE requirements for EUFODOS
- propose an approach, how to incorporate INSPIRE standards in EUFODOS

This involves the description of INSPIRE objectives and history, the different working groups involved in drafting, commenting INSPIRE regulations and the whole document framework. Chapter 2 also summarizes the standards (e.g. ISO and OGC), which build the basis for INSPIRE to achieve interoperability of data and services. The Chapter 3 reviews the key INSPIRE requirements for EUFODOS in respect to the most relevant Implementing Rules (IR) Metadata, Data Specifications as well as report in detail on the requirements for Network Services

- Discovery
- View
- Download.

Chapter 4 further elaborates on the two-phase approach, how INSPIRE will be implemented in EUFODOS, using OGC compliant server software in Phase 1 (first 18 months) and INSPIRE compliant software (if available) in phase 2.

2. Relevance of INSPIRE to EUFODOS

Several problems concerning the missing interoperability of Geo-information-systems (discoverability, accessibility of spatial information) constrain the environmental policy-making in the European Union, notably the Sixth Environment Action Programme (Decision No 1600/2002/EC of the European Parliament and of the Council of 22 July 2002). The environmental policy-making should be assisted by the Infrastructure for Spatial Information in the European Community for access to interoperable spatial data and services (*European Parliament 2007, p.1*).

A benefit of the INSPIRE Services is their interoperability by using common standards for network services and especially created data specifications. GMES Services could also achieve this level of interoperability by regarding the INSPIRE Implementing Rules. That is the reason why INSPIRE is important for EUFODOS and all GMES projects.

The INSPIRE Directive references directly to GMES. INSPIRE *"will represent significant added value for — and will also benefit from — other Community initiatives such as […] Global Monitoring for Environment and Security (GMES) […]"* (European Parliament 2007, p.2). GMES data and services should be used by the Member States as they become available (European Parliament 2007, p.2).

The Regulation (EU) No 911/2010 on GMES corresponds also to INSPIRE. This regulation instructs, that *"GMES data should maintain coherence with Member States' spatial reference data and support the development of the infrastructure for spatial information in the Union […] (INSPIRE)"* (*European Commission 2010c, p.4*).

2.1 History of INSPIRE

The first meeting of an E-ESDI (Environmental European Spatial Data Infrastructure) group took place in September 2001. In March 2003 an open consultation with many organisations from the EU Member States was arranged by the European Commission to develop a proposal for a Framework Directive on INSPIRE. The proposal was adopted in July 2004. In April 2005 the Work Programme for the preparation of the Implementing Rules was published. At this time an open call was launched for the registration of interest by Spatial Data Interest Communities (SDIC) and Legally Mandated Organizations (LMO). The conciliation process between the Commission, the European Parliament and the Council of Europe started at the end of the year 2006. On the 15th May 2007 the Directive of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) entered into force (*European Commission 2011a*).

2.2 Objectives of INSPIRE

The objective of INSPIRE is to establish a European Spatial Data Infrastructure for the environmental policy-making, because with the diversity of formats and structures of spatial data it is difficult to implement, monitor and evaluate the European legislation. Therefore the Member States should provide their spatial data considering the INSPIRE implementing rules. These rules (based on international standards) should make the spatial data sets interoperable so that the use of spatial data from different sources in Europe becomes possible (*European Parliament 2007, p.2 et seq.*).

2.3 INSPIRE Participants

Different Working Groups are involved in the drafting process of the INSPIRE Implementing Rules. Four groups will be introduced in this chapter.

Spatial Data Interest Communities (SDICs) consists of users and producers of spatial information. Legally Mandated Organisations (LMOs) are institutions and public authorities with a legal mandate to set up a component of INSPIRE. The role of these stakeholder groups is to propose experts, review deliverables and test the draft specifications.

The Drafting Teams (DTs) are composed of experts proposed by the SDICs and LMOs. These experts are selected by the European Commission INSPIRE Team (with staff from the Directorate-General Environment, Eurostat and JRC). Their role is to analyse and review the reference material and to draft the INSPIRE Implementing Rules.

The Thematic Working Groups (TWGs) develop the technical specifications. They consist of experts of the different spatial data themes (*European Commission 2011c*).

2.4 INSPIRE Documents

INSPIRE consists of documents with different types. It is important to distinguish legally binding and not binding documents.

Figure 1 shows the structure of the INSPIRE document types. The INSPIRE Directive and all Commission Regulations (the figure shows only the Regulation No 976/2009 for Network Services) are legally binding and contain the implementing rules for all binding aspects of INSPIRE. They deliver an abstract specification of all required INSPIRE elements.
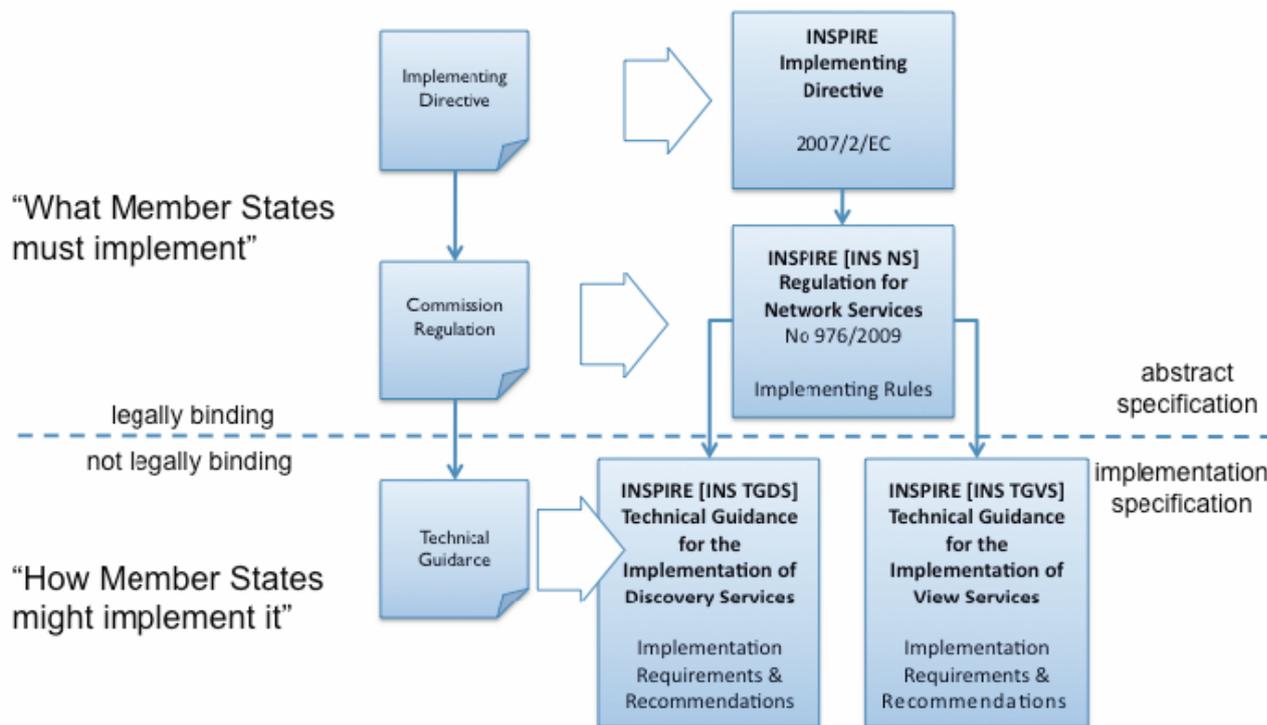
Figure 1: Relationship between the INSPIRE Implementing Rules and the Technical Guidance (Source: *Initial Operating Capability Task Force Network Services 2011, p.7*)

These binding documents are supplemented by the non-binding Technical Guidance documents (the figure shows the two Technical Guidance documents for the Example-Regulation No 976/2009). These documents contain recommendations how the Member States can implement the INSPIRE Services. They are describing, which specific standards can be used for the implementation. In contrast to the Commission Regulations, the guidance documents can be updated regularly.

2.5 INSPIRE Standards

INSPIRE uses several standards to achieve interoperability of data and services. The procedure of drafting standards for the future data specifications of Annex II and III runs in multiple phases until October 2012. Three versions of the data specifications will be created before the final draft is ready. Version 2 of the data specifications should be published for consultation and testing until October 2011. Two comment resolution phases will lead to Version 3 of the data specifications. Version 1 of the Implementing Rules should be reviewed by the Member States in June 2012 followed by Version 2 in July 2012. The final draft should be available in September 2012 (*European Commission 2011d*).

The standards of the Open Geospatial Consortium and the International Organization for Standardization are widely used. Figure 2 is showing how ISO and OGC standards will be extended to achieve INSPIRE compliance. INSPIRE Services are based on OGC standards. INSPIRE defines additional functions by using the OGC extension mechanism. These additional INSPIRE functions have to be implemented in an INSPIRE compliant service and can be requested by INSPIRE enabled clients.
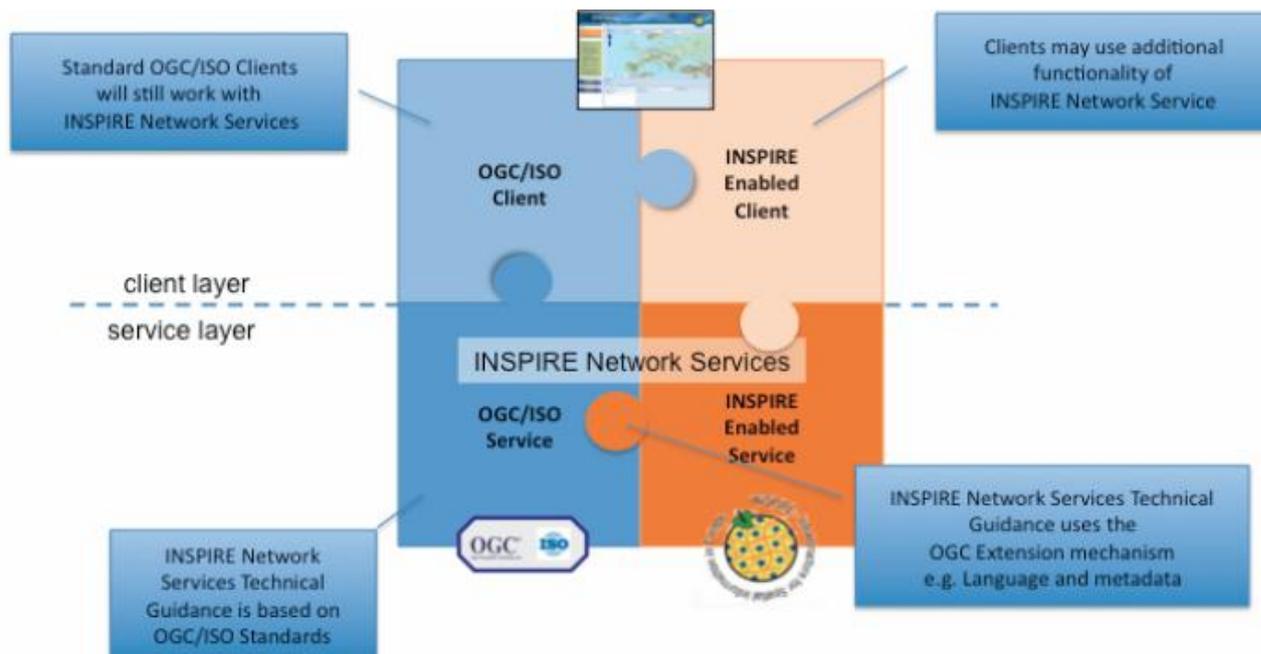
Figure 2: Extending ISO and OGC standards for INSPIRE requirements (Source: *Initial Operating Capability Task Force Network Services 2011, p.9*)

2.6 INSPIRE Schedule

The entire INSPIRE project runs from 2007 to 2019. Major INSPIRE milestones with relevance to EUFODOS have been summarized in **Fehler! Verweisquelle konnte nicht gefunden werden.**.

Table 1: INSPIRE milestones relevant for EUFODOS (Source: *European Commission 2011b*)

15-May-2007	Entry into force of INSPIRE Directive
03-Dec-2008	Adoption of INSPIRE Metadata Regulation
19-Oct-2009	Adoption of INSPIRE Regulation on Network Services (Discovery and View)
23-Nov-2010	Adoption of amendment of Regulation (EC) No 976/2009 as regards download services and transformation services
23-Nov-2010	Adoption INSPIRE regulation for the interoperability of spatial data sets and services for Annex I spatial data themes
03-Dec-2010	Metadata available for spatial data sets and services corresponding to Annex I and II
30-Jun-2011	The European Commission establishes and runs a geo-portal at Community level
09-Nov-2011	Discovery and view services operational
October 2012	Submission for opinion of the INSPIRE committee of Implementing Rules for the interoperability of spatial data sets and services for Annex II and III spatial data themes (Date proposed by the commission)
December 2012	Download services operational (Date proposed by the commission)

The regulations on Metadata, the Network Services and the data specifications of the Annex I data themes have been adopted. The data specifications of the Annex II and III data themes are still under development. The data themes Land Cover (Annex II) and Land Use (Annex III) are related to EUFODOS. That means the data specifications of both themes will not be available at the beginning of the EUFODOS project.

3. Key INSPIRE Requirements for EUFODOS

The INSPIRE Directive defines several requirements. Relevant requirements for EUFODOS are summarized in this chapter. Its structure follows the common INSPIRE model.

Implementing rules for the following themes have been created or are planned:

- Metadata
- Data Specifications (data themes of INSPIRE Annex I ready, II and III are expected for 2012)
- Network Services (Discovery, View, Download, Transformation)
- Data and Service Sharing (defines harmonised conditions of access to spatial data sets and services)
- Monitoring and Reporting (regarding the implementation of INSPIRE)
- Spatial Data Services (in early drafting phase)

The last three Implementing Rules are not relevant for EUFODOS at this time. The Regulation on Data and Service Sharing defines harmonised conditions of access to INSPIRE services and data sets. EUFODOS will define own conditions access to the services. The Implementing Rule on Monitoring and Reporting should ensure the reporting regarding the implementation of INSPIRE. These Implementing Rules are legally binding for public authorities. The Implementing Rules on Spatial Data Services is in an early drafting phase.

The following chapters describe the requirements of INSPIRE which are relevant for EUFODOS data sets and services.

3.1 Metadata

The INSPIRE Metadata Regulation defines a common metadata set for all INSPIRE data sets and services: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:326:0012:0030:EN:PDF.

The Technical Guidelines document describes how the general metadata elements for INSPIRE data sets and services can be implemented based on ISO 19115 and 19119:

http://inspire.jrc.ec.europa.eu/documents/Metadata/INSPIRE_MD_IR_and_ISO_v1_2_20100616.pdf.

Additional metadata elements are defined in the Technical Guidance document of a data theme.

3.2 Data Specifications

The INSPIRE Drafting Teams are creating data specifications for every data theme of the three INSPIRE Annexes. The Data Specifications of the Annex I data themes are finished. Relevant for EUFODOS are the data themes Land Cover and Land Use. They belong both not to Annex I and are not specified finally yet.

3.2.1 *Coordinate Reference Systems*

The INSPIRE-compliant Coordinate Reference Systems are described in the Implementing Rule on data specifications with all themes of Annex I.

(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: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:323:0011:0102:EN:PDF)

More information can be found in the Technical Guidance document:

http://inspire.jrc.ec.europa.eu/documents/Data_Specifications/INSPIRE_Specification_CRS_v3.1.pdf

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3.2.2 *Land Cover*

The data theme Land Cover is listed in Annex II of the INSPIRE Directive. The specification is under development and only available as draft for SDICs and LMOs. The draft Technical Guidance includes the data models and additional metadata elements.

3.2.3 *Land Use*

The data theme Land Use belongs to Annex III. It is also in the development phase an available as draft for SDICs and LMOs.

3.3 Network Services

The INSPIRE Network Services are described in two different Regulations. The Discovery and View Services are defined in Regulation No 976/2009 (Commission Regulation (EC) 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). The Regulation is accessible online:

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:274:0009:0018:EN:PDF

The Regulation No 1088/2010 contains the Download and Transformation Services (Commission Regulation (EU) No 1088/2010 of 23 November 2010 amending Regulation (EC) No 976/2009 as regards download services and transformation services). The Download of this Regulation is possible under:

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:323:0001:0010:EN:PDF

3.3.1 *Discovery Service*

INSPIRE forces "discovery services making 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" (*European Parliament 2007, p.7*).

The Technical Guidance recommends the usage of the Open GIS Catalogue Service Version 2.0.2 and is available online:

http://inspire.jrc.ec.europa.eu/documents/Network_Services/TechnicalGuidance_DiscoveryServices_v3.0.pdf

This Service expects requests as XML-documents or as URL-request and delivers answers with the metadata records in the XML-format. Search requests can contain many filter options, so that only relevant metadata records are delivered. A list of operations for Discovery Services is presented in Table 2 below.

Table 2: List of Operations for Discovery Services (Source: *Regulation No 976/2009*

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:274:0009:0018:EN:PDF)

Operation	Role
Get Discovery Service Metadata	Provides all necessary information about the service and describes service capabilities
Discover Metadata	The Discover Metadata operation allows requesting INSPIRE metadata elements of resources based on a query statement to be retrieved from the target Discovery Service
Publish Metadata	The Publish Metadata operation allows editing INSPIRE metadata elements of resources in the Discovery Service (push or pull metadata mechanisms). Editing meaning insert, update and delete
Link Discovery Service	The Link Discovery Service function allows the declaration of the availability of a Discovery Service for the discovery of resources through the Member State Discovery Service while maintaining the resource metadata at the owner location

3.3.2 *View Service*

The INSPIRE View Service should "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" (*European Parliament 2007, p.7*).

It is recommended to use ISO 19128 (Web Map Service 1.3.0) for the implementation of an INSPIRE View Service. The OGC Styled Layer Descriptor Profile and the OGC Symbology Encoding Implementation Specification are also used in the INSPIRE Profile for ISO 19128 (*Initial Operating Capability Task Force Network Services 2011, p.9*).

This Profile is documented in the Technical Guidance for View Services:

http://inspire.jrc.ec.europa.eu/documents/Network_Services/TechnicalGuidance_ViewServices_v3.0.pdf

A Web Map Service delivers pre-rendered images of maps in ordinary web-formats (PNG, GIF). This is very useful for web-clients. The service can be integrated in a geoinfomation system for viewing data sets as background-layer, but this kind of data can not be used for GIS-calculations. A list of operations for View Services is presented in Table 2 below.

Table 3: List of Operations for View Services (Source: *Regulation No 976/2009*

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:274:0009:0018:EN:PDF)

Operation	Role
Get View Service Metadata	Provides all necessary information about the service and describes service capabilities
Get Map	Returns a map containing the geographic and thematic information coming from the available spatial datasets. This map is an image spatially referenced
Link View Service	Allows a Public Authority or a Third Party to declare a view Service for the viewing of its resources through the Member State View Service while maintaining the viewing capability at the Public Authority or the Third party location

3.3.3 *Download Service*

An INSPIRE download service permits downloads of spatial data sets. There are two main types of download services: a download service for pre-defined data sets or pre-defined parts and a direct access download service with a query capability. The first type of download service is conceptually a download of a file stored in a data set repository. This file can be downloaded completely. Changes of the content are not possible (*Network Services Drafting Team 2009, p.8*)

Stored data sets should be encoded in GML (Geography Markup Language). GML 3.2.1 is an OGC and ISO Standard (ISO 19136).

The second type is the direct access download service. In this case, a middleware data management system is required for access to the data set stored in a repository. This type is called direct access download service, because the client interacts directly with the repository. This Download Service delivers specific features of the repository based upon a query (*Network Services Drafting Team 2009, p.11*).

This service offers additional query functionalities. The repository could contain huge data sets covering whole Europe, but the user can select the area and features of interest. He does not receive more data than he needs.

The Web Feature Service is recommended for the implementation of the direct access service. The OGC and ISO/TC 211 developed ISO 19142 (Web Feature Service) and ISO 19143 (Filter Encoding) together (*Network Services Drafting Team 2009, p.12*).

The Technical Guidance document contains more information:

http://inspire.jrc.ec.europa.eu/documents/Network_Services/INSPIRE%20Draft%20Technical%20Guidance%20Download%20(Version%202.0).pdf.

The last update of this document was in 2009. The next version should be more detailed. All Technical Guidances for Network Services are published on the INSPIRE Website:

http://inspire.jrc.ec.europa.eu/index.cfm/pageid/5.

A Web Feature Service (WFS) can be used for the download of vector data. All requests and answers are encoded in XML just like the other OGC Services CSW and WMS. The requests can contain complex filter options. The usual data format for the transmission of vector data is GML. GML data sets are encoded in a special type of XML.

The Web Coverage Service (WCS) can handle raster data sets. The communication with the service runs also with specified XML-requests and answers. The data format GeoTIFF is usual for the service.

The Technical Guidance document for Download Services of 2009 only mentions regarding the WCS, that if the data specifications of the Annex II and III theme require additional functionality (like WCS), the Technical Guidance will be extended (*Network Services Drafting Team 2009, p.13*). Table 4 and Table 5 provide a list of operations for Download Services and Direct Access Download Services:

Table 4: List of Operations for Download Services (Source: *Regulation No 1088/2010*

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:323:0001:0010:EN:PDF)

Operation	Role
Get Download Service Metadata	Provides all necessary information about the service, the available Spatial Data Sets, and describes the service capabilities.
Get Spatial Data Set	The Get Spatial Data Set operation allows the retrieval of a Spatial Data Set.
Describe Spatial Data Set	This operation returns the description of all the types of Spatial Objects contained in the Spatial Data Set.
Link Download Service	Allows the declaration, by a Public Authority or a Third Party, of the availability of a Download Service for downloading Spatial Data Sets or, where practicable, Spatial Objects, through the Member State's Download Service while maintaining the downloading capability at the Public Authority or the Third Party location.

Table 5: Additional Operations for the Direct Access Download Service

Operation	Role
Get Spatial Object	This operation allows the retrieval of Spatial Objects based upon a query.
Describe Spatial Object Type	This operation returns the description of the specified Spatial Objects types.

4. Approach for Inclusion of INSPIRE in EUFODOS

This chapter introduces the approach of the INSPIRE-Inclusion in EUFODOS. The structure of the chapter follows the structure of chapter 3. It describes, how the INSPIRE requirements can be implemented in the EUFODOS services. The implementation of INSPIRE Services in EUFODOS will be separated in two phases, because of the ongoing development of INSPIRE and the lack of INSPIRE compliant software.

In Phase 1 the usage of OGC compliant Server Software (Open Source Software preferred) is planned. If INSPIRE compliant Open Source Software is available in Phase 2, all Service Providers should upgrade their server software to these INSPIRE compliant versions.
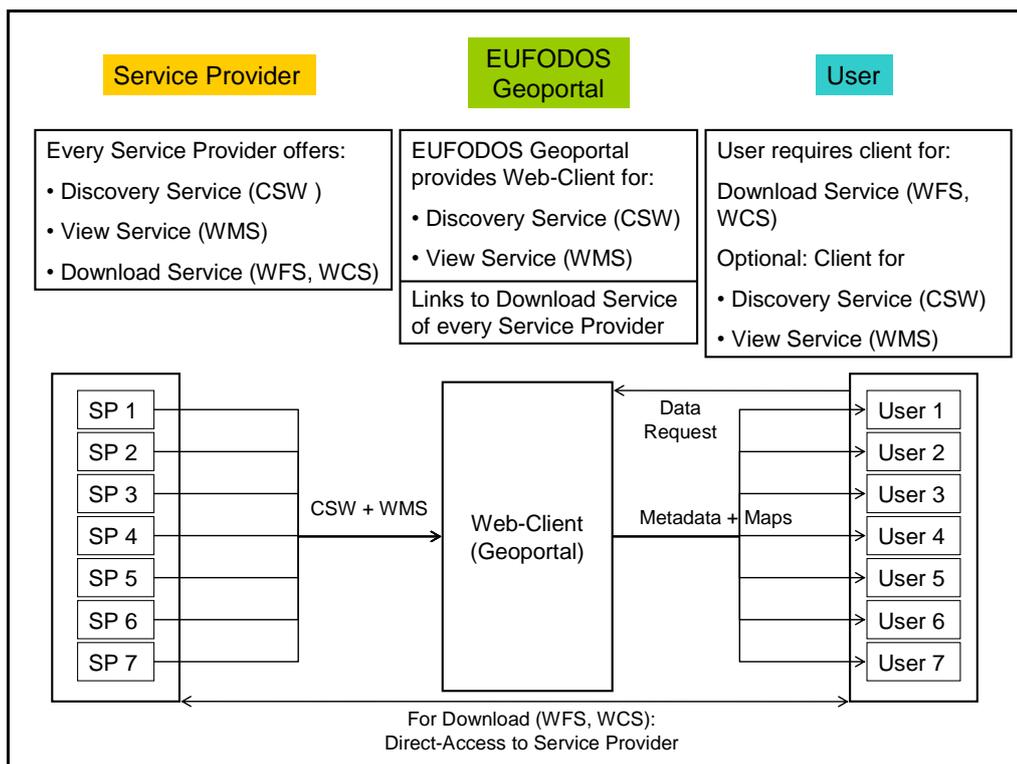
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Figure 3: Architecture of EUFODOS Network Services

Figure 3 is showing the architecture of the EUFODOS Network Services. It is the task of every Service Provider to set up several Web-Services. These are the Discovery Service (Catalogue Service), the View Service (Web Map Service) and the Download Services (Web Feature Service and/or Web Coverage Service). The EUFODOS Geoportal will access the services of every Service Provider (over CSW and WMS) and offers a Web-Client of the Discovery and View Service for every user. That means the user does not need necessarily a client for these two services. The user can request Metadata and Maps over a Webbrowser. The metadata sets will contain a Link to the Download Services of every Service Provider. For access to a Download Service the user needs the appropriate rights (access data) and a WFS and/or WCS Client. This client will set up a direct connection to the Service Provider and download the required parts or features of the dataset. Table 6 provides the overview about the two implementation phases of the Network Services for EUFODOS.

Table 6: Two implementing phases of INSPIRE Network Services for EUFODOS

Service	Phase 1 (OGC)	Phase 2 (INSPIRE)
Discovery Service	CSW 2.0.2	INSPIRE Discovery Service (based on CSW 2.0.2)
View Service	WMS 1.1.1	INSPIRE View Service (based on WMS 1.3.0)
Download Service (Raster data)	WCS 1.0.0	INSPIRE Download Service (no guidance for raster data until now) Potential: WCS 1.1.2 / WCS 2.0
Download Service (Vector data)	WFS 1.1.0 GML 3.1.1	INSPIRE Download Service (based on WFS 2.0, GML 3.2.1)

Phase 1 will be the "OGC-Phase", because all services should be compliant to OGC-Standards. For these standards are free software implementations immediately available. INSPIRE Services are based on OGC-Standards, but require some additional functions. The details are defined in the Technical Guidance documents. These are complete for the Discovery and the View Service at this time, but not yet implemented in Free Software. The last Technical Guidance document for the Download Service is a draft of 2009. A new version should be published in the near future. For EUFODOS it is planned, to upgrade the Web-Services to INSPIRE-compliant versions for Phase 2, if INSPIRE-compliant software solutions are available.

4.1 Metadata

In Chapter 3.1 the two important INSPIRE documents for metadata have been introduced. For the EUFODOS Implementation Phase 1 it is planned to create general metadata sets regarding the INSPIRE implementing rules for metadata and to set up a Catalogue Service (CSW 2.0.2). For GeoNetwork (Open-Source implementation of CSW 2.0.2) a free template for INSPIRE compliant metadata is not yet available. The INSPIRE Metadata Web-Editor should be used to create the INSPIRE compliant metadata sets instead: http://www.inspire-geoportal.eu/index.cfm/pageid/342.

These metadata sets can be exported (XML) and imported in a GeoNetwork installation. Afterwards GeoNetwork can be used to provide the Catalogue Service with the CSW 2.0.2 Standard.

For Phase 2 it is planned to upgrade the services to an INSPIRE compliant Discovery Service. The additional thematic metadata elements of the data themes Land Cover or Land Use should be added to the standard INSPIRE metadata set of phase 1. The final specification of the additional thematic metadata elements is expected in 2012.

Annex I: Metadata Profile of this document shows in detail all for EUFODOS required metadata elements.

4.2 Data Specifications

EUFODOS will use one specific INSPIRE coordinate reference system and the two data specifications Land Cover and Land Use.

4.2.1 Coordinate Reference System

The coordinate reference system for EUFODOS is a two-dimensional INSPIRE Coordinate Reference System with plane coordinates using the ETRS89 Lambert Azimuthal Equal Area coordinate reference system, **EPSG: 3035** (*European Commission 2010a, p.22*). This coordinate reference system is also intensely used by the European Environment Agency.

It should be set as the default coordinate reference system on the server of each Service Provider (in this case, the request of the user has not to contain a specific parameter of the requested coordinate reference system. If the server supports a live reprojection of spatial datasets, a reprojection of the original dataset is not mandatory. Nevertheless it is recommended to reproject all datasets to the ETRS89 Lambert Azimuthal Equal Area coordinate reference system before publishing them on the server.

4.2.2 Land Cover and Land Use

The final data specifications of the data themes Land Cover and Land Use are expected in 2012. They can not be used for phase 1 of EUFODOS. It is planned to provide the EUFODOS datasets in the INSPIRE compliant data models in phase 2. A transformation to the INSPIRE data model would be required. The internal processes of every provider could run on the original data models. The transformation is only necessary for providing INSPIRE compliant data sets for the INSPIRE Network Services.

4.3 Network Services

4.3.1 *Discovery Service*

Every Service Provider should set up an OGC compliant Catalogue Service following the OpenGIS Catalogue Service Implementation Specification 2.0.2 (OGC document 07-006r1). The Open Source GeoNetwork Catalogue Service can be recommended for the implementation. For Phase 2 it is planned to upgrade the Catalogue Service to an INSPIRE compliant Discovery Service. The INSPIRE Discovery Service is also based on the CSW 2.0.2 standard.

4.3.2 *View Service*

In phase 1 a Web Map Service regarding the Web Map Service Implementation Specification 1.1.1 should be implemented (OGC document 01-068r3). Recommended for implementation is the Open Source GeoServer.

This service should be upgraded to an INSPIRE compliant View Service for Phase 2. The INSPIRE Service is based on ISO 19128: 2005 (Geographic information — Web map server interface). It is also an OGC Standard: OpenGIS Web Map Service (WMS) Implementation Specification 1.3.0 (OGC document 06-042).

4.3.3 *Download Service*

4.3.3.1 Raster Data

Phase 1 of EUFODOS requires the OpenGIS Web Coverage Service (WCS) Implementation Specification 1.0.0 (OGC document 03-065r6) for raster data.

For phase 2, there is no detailed INSPIRE Technical Guidance for the WCS until now (last Version of the Technical Guidance Download Services is from 2009). This Technical Guidance document references to the OpenGIS Web Coverage Service (WCS) Implementation Standard 1.1.2 (OGC document 07-067r5). The WCS 2.0 Standard is available since 2010 and could be recommended by INSPIRE for the Annex II and III data themes in the next years. Both standards are potential requirements for phase 2 of EUFODOS.

4.3.3.2 Vector Data

Phase 1 requires the OpenGIS Web Feature Service (WFS) Implementation Specification 1.1.0 (OGC document 04-094) using the OpenGIS Geography Markup Language (GML) Encoding Specification 3.1.1 (OGC document 03-105r1) as data format for vector data.

For phase 2 every service provider should upgrade to an INSPIRE compliant Download Service. INSPIRE requires ISO 19142 (Web feature service) and ISO 19136:2007 Geographic information - Geography Markup Language (GML) as data format for vector data. These are also OGC Standards: The OpenGIS Web Feature Service 2.0 Interface Standard (OGC document 09-025r1) and the OpenGIS Geography Markup Language (GML) Encoding Standard (OGC document 07-036).

4.4 Software recommendations

The listed free and proprietary software in Table 7 can be recommended to provide Web-Services for EUFODOS. GeoNetwork will be used for the implementation of the EUFODOS Geoportal.

Table 7: Software recommendations for the implementation of the EUFODOS services

Service	Free Software	Proprietary Software
Discovery Service	GeoNetwork	terraCatalog

	ESRI Geoportal Server	
View Service Download Service	GeoServer deegree MapServer	ESRI ArcGIS for INSPIRE (Extension for ArcGIS Server 10)
Geoportal	GeoNetwork ESRI Geoportal Server Mapbender	

A list of Client Software, which supports WFS 1.1.0 and WCS 1.0.0 can be found on:

http://www.opengeospatial.org/resource/products/byspec.

4.5 Access Rights

The access to some EUFODOS services will be limited. The Discovery and View Service will be accessible for everyone. The user may view all datasets, but for access to the EUFODOS Download Service a registration and login at the geoportal is required. It is also required to sign a use agreement document before the access to a Download Service is granted.

5. Conclusions and Recommendations

Whilst the INSPIRE process is still evolving with full implementation in 2019 and not all INSPIRE Implementing Rules have been finalized so far, it is recommended in EUFODOS to use a two-phase approach, where the usage of OGC compliant Server Software is planned in phase 1. In case that INSPIRE compliant Software is available in phase 2, it is recommended that service providers upgrade their server software to these INSPIRE compliant versions. With respect to metadata it is recommended to use the INSPIRE Metadata Web-Editor in phase 1 and to upgrade the services to an INSPIRE compliant Discovery Service in phase 2, including additional thematic metadata elements of the data themes "Land Cover" and "Land Use" (final specifications expected by end of 2012).

Annex I: Metadata Profile in EUFODOS – Phase 1

General INSPIRE Metadata Elements – for data sets (Source: *Regulation No 1205/2008:*
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:326:0012:0030:EN:PDF)

Element Name	Definition
Resource title	This a characteristic, and often unique, name by which the resource is known.
Resource abstract	This is a brief narrative summary of the content of the resource.
Resource type	This is the type of resource being described by the metadata.
Resource locator	The resource locator defines the link(s) to the resource and/or the link to additional information about the resource.
Unique resource identifier	Unique resource identifier
Resource language	The language(s) used within the resource.
Topic category	The topic category is a high-level classification scheme to assist in the grouping and topic-based search of available spatial data resources.
Keyword value	The keyword value is a commonly used word, formalised word or phrase used to describe the subject. While the topic category is too coarse for detailed queries, keywords help narrowing a full text search and they allow for structured keyword search.
Originating controlled vocabulary	If the keyword value originates from a controlled vocabulary (thesaurus, ontology), for example GEMET, the citation of the originating controlled vocabulary shall be provided.
Geographic bounding box	This is the extent of the resource in the geographic space, given as a bounding box.
Temporal extent	The temporal extent defines the time period covered by the content of the resource. This time period may be expressed as any of the following: — an individual date, — an interval of dates expressed through the starting date and end date of the interval, — a mix of individual dates and intervals of dates.
Date of publication	This is the date of publication of the resource when available, or the date of entry into force. There may be more than one date of publication.
Date of last revision	This is the date of last revision of the resource, if the resource has been revised. There shall not be more than one date of last revision.
Date of creation	This is the date of creation of the resource. There shall not be more than one date of creation.
Lineage	This is a statement on process history and/or overall quality of the spatial data set. Where appropriate it may include a statement whether the data set has been validated or quality assured, whether it is the official version (if multiple versions exist), and whether it has legal validity.
Spatial resolution	Spatial resolution refers to the level of detail of the data set. It shall be expressed as a set of zero to many resolution distances (typically for gridded data and imagery-derived products) or equivalent scales (typically for maps or map-derived products).
Specification	This citation shall include at least the title and a reference date (date of publication, date of last revision or of creation) of the implementing rules

	adopted under Article 7(1) of Directive 2007/2/EC or of the specification.
Degree	This is the degree of conformity of the resource to the implementing rules adopted under Article 7(1) of Directive 2007/2/EC or other specification.
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. The element must have values. If no conditions apply to the access and use of the resource, 'no conditions apply' shall be used. If conditions are unknown, 'conditions unknown' shall be used. This element shall also provide information on any fees necessary to access and use the resource, if applicable, or refer to a uniform resource locator (URL) where information on fees is available.
Limitations on public access	When Member States limit public access to spatial data sets and spatial data services under Article 13 of Directive 2007/2/EC, this metadata element shall provide information on the limitations and the reasons for them. If there are no limitations on public access, this metadata element shall indicate that fact.
Responsible party	This is the description of the organisation responsible for the establishment, management, maintenance and distribution of the resource. This description shall include: — the name of the organisation as free text, — a contact e-mail address as a character string.
Responsible party role	This is the role of the responsible organisation.
Metadata point of contact	This is the description of the organisation responsible for the creation and maintenance of the metadata. This description shall include: — the name of the organisation as free text, — a contact e-mail address as a character string.
Metadata date	The date which specifies when the metadata record was created or updated.
Metadata language	This is the language in which the metadata elements are expressed.

Phase 1 – Additional metadata elements for services (Source: *Regulation No 1205/2008:*

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:326:0012:0030:EN:PDF):

Element Name	Definition
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).
Spatial data service type	This is a classification to assist in the search of available spatial data services. A specific service shall be categorized in only one category.

Abbreviations & Acronyms

CO	Confidential, only for members of the consortium (including the Commission Services)
CSW	Catalogue Service for the Web
DS	Downstream Service
DT	Drafting Team
EC	European Commission
E-ESDI	Environmental European Spatial Data Infrastructure
ESRI	Environmental Systems Research Institute
ETRS	European Terrestrial Reference System
EU	European Union
EUFODOS	European Forest Downstream Service
FP7	Framework Programme 7
GIF	Graphics Interchange Format
GIS	Geographic Information System
GMES	Global Monitoring for Environment and Security
GML	Geography Markup Language
INSPIRE	Infrastructure for Spatial Information in Europe
IR	Implementing Rules
ISO	International Organization for Standardization
ISO/TC	International Organization for Standardization/Technical Committee
JRC	Joint Research Centre
LMO	Legally Mandated Organisation
OGC	Open Geospatial Consortium
PNG	Portable Network Graphic
PP	Restricted to other programme participants (including the Commission Services)
PU	Public
RE	Restricted to a group specified by the consortium (including the Commission Services)
SDIC	Spatial Data Interest Community
TWG	Thematic Working Group
URI	Unique Resource Identifier
URL	Uniform Resource Locator
WCS	Web Coverage Service
WFS	Web Feature Service
WMS	Web Map Service
XML	Extensible Markup Language

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