PD CEN/TR 15449-2:2012

BSI Standards Publication

Geographic information — Spatial data infrastructures

Part 2: Best practices

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National foreword

This Published Document is the UK implementation of CEN/TR 15449-2:2012. Together with PD CEN/TR 15449-1:2012, PD CEN/TR 15449-3:2012 and PD CEN/TR 15449-4, it supersedes PD CEN/TR 15449:2011, which will be withdrawn upon publication of all parts of the series.

The UK participation in its preparation was entrusted to Technical Committee IST/36, Geographic information.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Foreword

This document (CEN/TR 15449-2:2012) has been prepared by Technical Committee CEN/TC 287 “Geographic information”, the secretariat of which is held by BSI.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes CEN/TR 15449:2011.

The present standard comprises the following parts:

— CEN/TR 15449-1, *Geographic information — Spatial data infrastructures — Part 1: Reference model*;

— CEN/TR 15449-2, *Geographic information — Spatial data infrastructures — Part 2: Best practices* (the present part);

— CEN/TR 15449-3, *Geographic information — Spatial data infrastructures — Part 3: Data centric view*;

— CEN/TR 15449-4, *Geographic information — Spatial Data Infrastructure (SDI) — Part 4: Service centric view*.

Introduction

Spatial data infrastructure (SDI) is a general term for the computerised environment for handling data that relates to a position on or near the surface of the earth. It may be defined in a range of ways, in different circumstances, from the local up to the global level.

This Technical Report focuses on the technical aspects of SDIs, thereby limiting the term SDI to mean an implementation neutral technological infrastructure for geospatial data and services, based upon standards and specifications. It does not consider an SDI as a carefully designed and dedicated information system; rather, it is viewed as a collaborative framework of disparate information systems that contain resources that stakeholders desire to share. The common denominator of SDI resources, which can be data or services, is their spatial nature. It is understood that the framework is in constant evolution, and that therefore the requirements for standards and specifications supporting SDI implementations evolve continuously.

SDIs are becoming more and more linked and integrated with systems developed in the context of e-Government. Important drivers for this evolution are the Digital Agenda for Europe, and related policies. This Technical Report takes these developments into account. By sharing emerging requirements at an early stage with the standardization bodies, users of SDIs can help influence the revision of existing or the conception of new standards.

The users of an SDI are considered to be those individuals or organisations that, in the context of their business processes, need to share and access geo-resources in a meaningful and sustainable way. Based on platform- and vendor-neutral standards and specifications, an SDI aims at assisting organisations and individuals in publishing, finding, delivering, and eventually, using geographic information and services over the internet across borders of information communities in a more cost-effective manner.

Considering the complexity of the subject and the need to capture and formalize different conceptual and modelling views, CEN/TR 15449 is comprised of multiple parts:

- Part 1: Reference model: this provides a general context model for the other Parts, applying general IT architecture standards;
- Part 2: Best practices: this provides best practices guidance for implementing SDI, through the evaluation of the projects in the frame of the European Union funding programmes;
- Part 3: Data centric view: this addresses concerns related to the data, which includes application schemas and metadata;
- Part 4: Service centric view (in preparation): this includes the taxonomy of services, concepts of interoperability, service architecture, service catalogue, and the underlying IT standards.

Further parts may be created in the future.

1 Scope

This part of the Technical Report provides best practices regarding Spatial Data Infrastructures (SDIs), referencing to the outcomes of the projects in the frame of the European Union funding programmes. It summarises the deliverables of projects, structured according to the reference model defined in Part 1 of this Technical Report, to be made available in an on-line repository where the relevant outcomes are collected and classified in order to provide a structured sets of recommendations for implementing SDIs at the European, national and sub-national levels.

This collection refers mainly to the projects funded by the European Union funding programmes: this choice is driven by the wide vision and analysis which such kind of projects can provide and the wide numbers of stakeholders which have been involved.

The outcomes delivered by these relevant practices are collected into a document registry available through the CEN/TC 287 web site. This part of the Technical Report defines the processes and the content of these projects and documents registries, which will help making them more accessible and re-usable. It provides the relevant project deliverables addressing the main SDI issues as described in the other parts of this Technical Report.

The intended readership of this Technical Report are those people who are responsible for creating frameworks for SDI, experts contributing to INSPIRE, experts in information and communication technologies and e-government that need to familiarize themselves with geographic information and SDI concepts, and standards developers and writers.

2 Normative references

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

EN ISO 19115, *Geographic information — Metadata (ISO 19115)*

EN ISO 19135:2007, *Geographic information — Procedures for item registration (ISO 19135:2005)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
interoperability
capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units

[SOURCE: ISO/IEC 2382-1:1993]

3.2
register
set of files containing identifiers assigned to items with descriptions of the associated items

[SOURCE: EN ISO 19135:2007]

3.3
registry
information system on which a register is maintained

[SOURCE: EN ISO 19135:2007]

3.4
spatial data infrastructure
policies, standards and procedures under which organizations and technologies interact to foster more efficient use, management and production of geo-spatial data

[SOURCE: United Nations SDI initiative (UNSDI)]

4 Abbreviated terms

CB	Control body
CB-PoC	Point of contact of the Control Body
ESDI	European Spatial Data Infrastructure
GEO	Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
GI	geographic information
GIGAS	GEOSS, INSPIRE and GMES, an Action in Support
GMES	Global Monitoring for Environment and Security
INSPIRE	Infrastructure for Spatial Information in Europe
ICT	information and communications technology
ISO	International Organization for Standardization
IT	information technology
OGC	Open Geospatial Consortium
OMG	Object Management Group
RM	Register manager
SDI	Spatial Data Infrastructure
SOA	Service Oriented Architecture
UML	Unified Modelling Language

5 Overview

5.1 Introduction

This clause describes the various roles that projects can assume in relation to the standardisation processes. It will describe the categories of contributions that projects give, directly or indirectly, to standards development, evaluation, support to the implementation, and education of standards for geographic

information. In addition there are projects that help linking standards development to the implementation of legal acts and policies.

In particular for the outcomes and best practices of projects that are not directly involved in the standards development processes, it is paramount that their efforts be captured and made sustainable beyond the lifetime of the projects.

With INSPIRE[1)], GEOSS[2)] and GMES[3)] now well established, numerous projects and activities that are (co-)funded by EU programmes are being asked to use or build upon standards and specifications in the domain of geographic information. Design methodologies, reference models, good practices in UML data model design and data model transformation, as well as standards for various services are examples of topics that are being or that have been addressed by dozens of European Union-funded projects. The paymasters and the consortia that developed these products have made investments that should be protected.

The GIGAS[4)] project (GEOSS, INSPIRE and GMES, an Action in Support), financed by the Directorate General Information Society of the European Commission, has made concrete recommendations on how this could be done. In particular, a role is proposed for CEN/TC 287 Geographic Information to maintain relevant deliverables or parts thereof, not only of the GIGAS project, but also of other EU-funded projects. This is to lead to a formal EU-level repository of reference material on interoperability, where future projects can find state-of-the-art information on interoperability. At the same token, these projects could then add new reference material as they progress in their work programmes.

This part of the Technical Report, along with the CEN/TC 287 document registry, constitutes the backbone for making the outcomes and best practices of projects sustainable.

5.2 Categories of contribution

5.2.1 Content classification

The general issue is knowledge management related to standardization processes in projects funded by the European Union programmes. More specifically, the proposed relevant practices should support the analysis of project outcomes, which in the majority of the case are documents, but it can be also IT tools, infrastructure and datasets. The core goal of this repository is strictly limited in the setup of a document registry related to the relevant outcomes of European Union funded projects. Additional extension of this registry to manage references to outcomes different from the documents will be taken into account in the future release.

The content managed by this registry can be categorized according to different aspects, applying a faceted classification. A faceted classification allows the assignments of multiple classifications to a document, enabling the classifications to be ordered in multiple ways, rather than in a single, predetermined order. A facet comprises “clearly defined, mutually exclusive, and collectively exhaustive aspects, properties or characteristics of a class or specific subject. According to this concept, the outcomes of projects related to SDI can be categorized according to different facets which are listed below. According to this approach, each document register will be classified under these different facets and the implemented registry permits to address the registers according to this combined facets. The collected documents registers refers to best practices about implementing SDI.

The following subsections provide the classification of the project outcomes in terms of the reference model components, architectural reference services, and the phase(s) of an SDI, to which a project outcome is applicable.

1) Infrastructure for Spatial Information in the European Community (INSPIRE), http://inspire.jrc.ec.europa.eu.

2) Global Earth Observation System of Systems, http://earthobservations.org/ .

3) Global Monitoring for Environment and Sustainability, http:///www.gmes.info .

4) GEOSS, INSPIRE and GMES an Action in Support (GIGAS) http://www.thegigasforum.eu/project/project.html .

5.2.2 SDI reference model components

A project outcome addresses one or more of the following SDI components:

- Data;
- Register;
- Discovery;
- View;
- Invoke;
- Download;
- GeoRM;
- Orchestration and Composition.

5.2.3 Architectural reference model services

A project outcome is characterized by one or more of the following type of services:

- Human Interaction Services;
- Model Management Services;
- Workflow/Task Services;
- System Management Services;
- Processing Services;
- Communication Services.

5.2.4 Phases of an SDI

A project outcome can focus mainly on one of the following different phases related to the SDI implementation process:

— **Concept and design**: including analyses, methodologies, reference models, state of play related to the main SDI areas;

— **Implementation**: including development methodologies, development implementation, deployment, management and maintenance;

— **Validation**: including monitoring, testing and reference standards compliance.

5.2.5 Project document types

Given the current way of delivering project results by submitting documents, this overarching goal implies taking documents pertinent to the issue required to implement an SDI, and in particular:

1) **Standards**: the reference standards analysis, applicability, implementation, testing, refinements and validation. This information must be applied.

2) **Specifications**: related to the standards or legally binding documents containing detailed description of the requirements, recommendations and where relevant open issues. Specifications provide more flexible level of documentation supporting more fixed binding documents. Specifications usually remain on more conceptual level of reality abstraction.

3) **Technical reports**: often representing overall or partial outputs of the projects. Technical reports often stands on more logical level of reality abstraction.

4) **Guidelines**: the technical documentation and guidelines related to the issues described above. Guidelines can contain practical examples, best practices of the specific SDI components implementations.

5) **Software tool**: the software component (either OSS than COTS tools) including products, API, development environment, etc.

6 Processes and procedures

6.1 Requirements from a content provider perspective

This clause defines the processes and procedures for the inclusion and update of the outcomes and best practices of projects. These processes and procedures has been determined by the analysis of the registry requirements according to a project perspective.

From a project perspective, it is expected to have a simple system to populate and to upload the register related to the best practice document. This entails:

a) being able to register the project through a wizard approach: a step-by-step process where the best practice provider enters:

   1) project details,

   2) executive abstract,

   3) contact details, etc.,

   4) link to other "persistent" Web 2.0-like information available (e.g. YouTube channel, etc.),

   5) PR material (official brochure / flyer as PDF),

   6) link to official website,

   7) project duration,

   8) gantt chart and deliverables (incl. delivery dates),

   9) other (e.g. funding programme),

   At any time the document provider should be able to "save" and continue later, and should see the remaining information needed to complete the process.

b) when uploading information minimise re-structuring of deliverables which would be time consuming and discouraging;

c) ideally the document provider would like to upload a series of pdfs and tag them through a pre-defined structure. An option could be to have online forms where to copy and paste (with all the problems this may cause) the various sections of the deliverable (like Wikipedia but it should be much more usable);

d) have facilities to access the software code by the provision of a URL or software code page or repository.

6.2 Inclusion of projects in this part Technical Report

6.2.1 Permanent call for contributions

The contributions collected and referred to in this technical report are related to the date of publication of this version of document. However, the collection of the best practice documents related to the outcomes of the European Union funded projects will continue and a permanent call for contribution will be maintained and open by the CEN/TC 287 secretariat. The upcoming requests for inclusion in the registry of new best practices references will be processed according to the procedure defined in the following paragraph, and they will be stored into the online registry managed by the CEN/TC 287 secretariat. It will be evaluated when it will be opportune to publish an updated version of this part of this technical report, including the updated reference documents and best practices collected into the on-line registry.

6.2.2 Role definitions

Regarding item registration in general, EN ISO 19135 identifies six diverse roles:

— **Register Owner**: an organization establishing the register and has the primary responsibility for the management, dissemination and intellectual content of the register.

— **Register Manager**: manages the register(s) of items.

— **Submitting Organizations**: a qualified organization to propose changes to the content of a register, or an appeal if the proposals are not accepted.

— **Control Body**: a group of technical / thematic domain experts deciding on the acceptability of the proposals and changes to the content of a register. The control body shall accept proposals from the register manager and renders a decision regarding each proposal.

— **Registry Manager**: a person or an organization responsible for the day-to-day management of a registry (an information system on which a register is maintained). The registry manager ensures the integrity of any register held in the registry and provides means of electronic access to the registry for register managers, control body(ies) and register users.

— **Register Users**: access a registry in order to use one or more of the registers. They may include any person or organization interested in accessing or influencing the content of a register. They may have a variety of requirements and therefore present different categories of users (for example developers of standards and specifications, data producers, data users, system developers). A register owner may set terms and conditions for different levels of access to the register to satisfy the requirements of different categories of users.

Multiple parties my play each of these roles and a single entity may play more than one role. These roles are summarised in Table 1.

Table 1 — Registry roles

EN ISO 19135 role	Role about best practice registry
Register Owner	CEN, OGC, ISO or the European Commission
Register Manager	CEN, OGC, ISO or the European Commission
Submitting organization	Content provider (the owner/generator of the reference document, mainly the reference project but also CEN, OGC, ISO or the European Commission)
Control body	CEN/TC 287 secretariat
Registry manager	CEN/TC 287 secretariat
Register Users	any person or organization interested in accessing or influencing the content of a register

6.2.3 Criteria for inclusion of projects and deliverables

The qualification process for the best practices providers as well as register owners in order to set-up a qualified list of enabled best practices providers is shown in Figure 1.

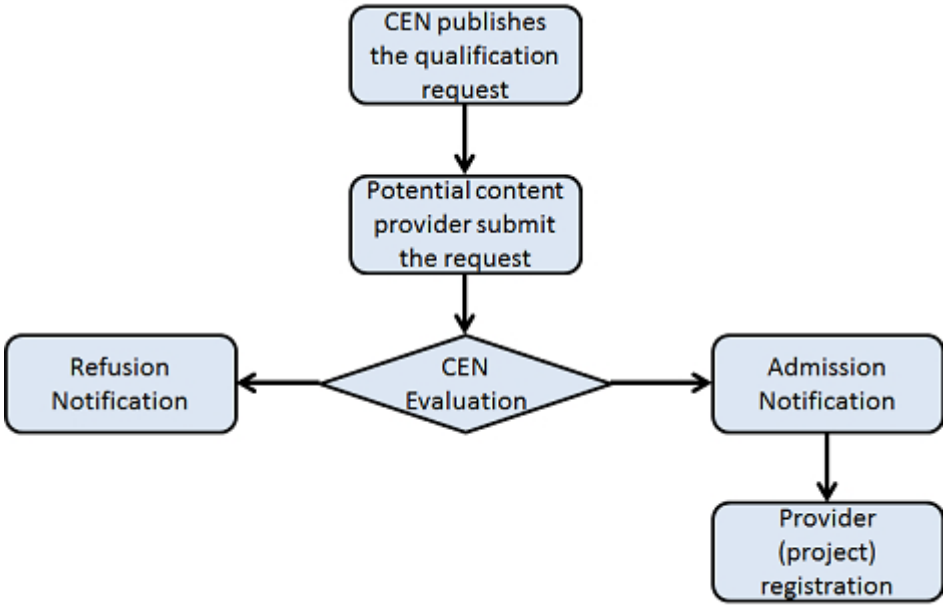

Figure 1 — Qualification process

The main steps are as follows:

1) CEN/TC 287 provide a standard form to submit a request to be qualified as a best practice provider. This form is made available both on-line and off-line. The off-line version has to be sent via email to the CEN/TC 287 secretariat.

2) The potential content provider (The project contact point, mainly the project coordinator, CEN, OGC, ISO, EC) will apply to be accepted as a submitting organisation.

3) The potential content provider is qualified (and notified) to submit project reference documents by Control Body; or

4) The request of the project contact point is refused and notified to him with the motivation of the Control Body.

An initial set of reference projects and related documents has been selected by CEN secretary jointly with the European Commission. It refers the major projects in the frame of the different funding programme (FP6, FP7, eContentplus, ICT-PSP, etc). This initial set of information is available in the on-line repository (registry) set-up by CEN secretary. This repository will be progressively increased and updated according to the future outcomes from the European Commission funding programmes.

The request for the inclusion of new upcoming reference project and/or reference document can be received by:

— the project contact point (usually the project coordinator);

— the European Commission;

— the CEN/TC 287 Secretariat;

— any other stakeholder authorised by the Control body.

6.2.4 Analysis and revision of contributions

The document candidate to be labelled as best practice and to be enclosed into the registry has to be analysed and revised by a Control Body committed to perform this action. The Control Body is designed by the CEN/TC287 WG5.

If a new release of the document has been delivered by the reference project, the Control Body will revise and validate the updated version, updating the related registered item or suggesting the creation of a new one, maintaining in this way the different versions of the document. The different version will be referred by different registers, due to the fact that these documents continue to maintain the status of “best practice” even with the presence of new updated versions.

If the new version completely updates the previous one, the old version will keep the status of “updated” and the register will refer to the new one.

6.3 CEN/TC 287 document registry

6.3.1 Submission procedure

The process for document submission is shown in Figure 2.

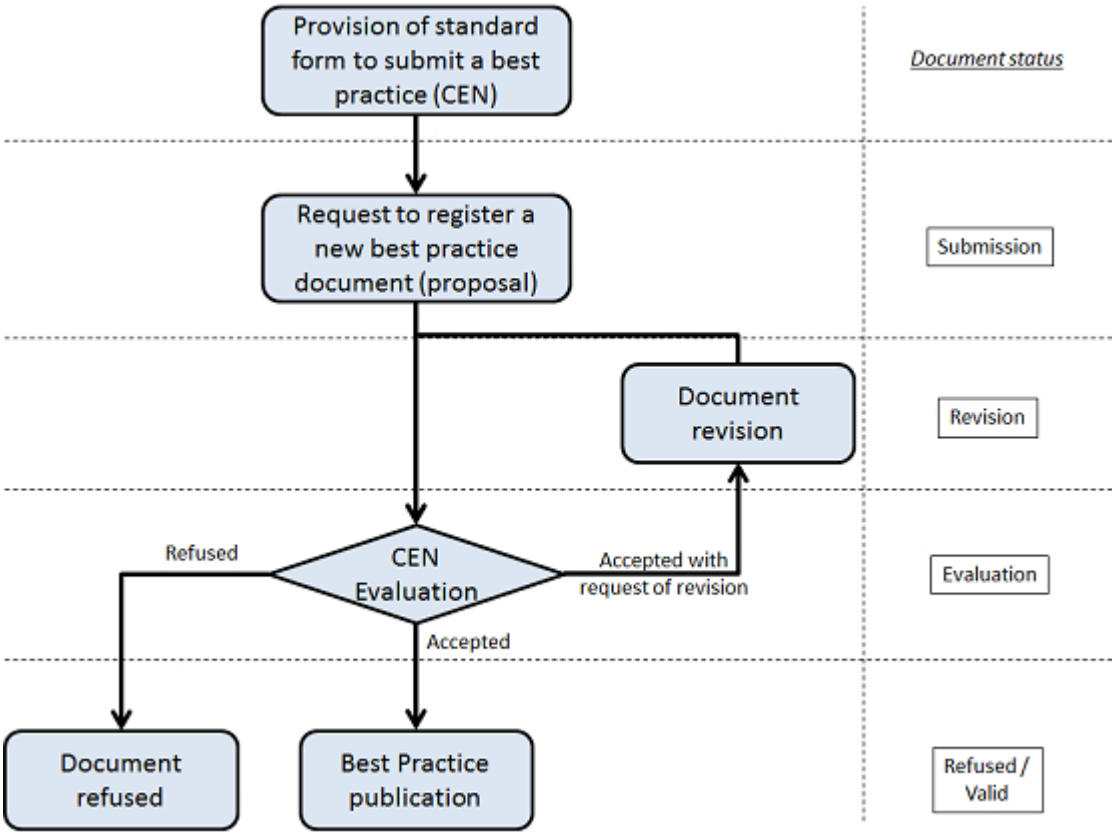

Figure 2 — Document submission process

The main steps in this process are as follows:

a) CEN/TC 287 provide a standard form to submit a best practice document reference. This standard form is put at disposal in on-line and off-line version. The off-line version have to be sent via email to the CEN/TC 287 secretariat.

b) The content provider (submitting organisation) create a new instance of register item filling the predefined form (web/excel). The submitting organisation can exploit the online form or submit the new register using the off-line form. Using the on-line form, the submitting organisation have at disposal a simple content management system in which he can manage his own register items. This tool can put at disposal to the submitting organisation the following simple commands:

   1) Insert a new register item (when a new register item is generated, this is set-up in “submission” status);

   2) Modify an existing register item (only if it is in “submission” or “revision” status);

   3) Remove an existing register item (only if it is in “submission” status);

   4) Duplicate a register item;

   5) Submit a register item for the evaluation step (only if it is in “submission” or “revision” status). When a register item is submitted for evaluation, this moves in “evaluation” status.

c) The register manager fills the full mandatory fields and submit the register item to the Control Body (CB). The register item is moved in “Evaluation” status and a notification is sent to the CEN/TC287 secretariat which is the point of contact of CB (CB-PoC). If the form is submitted in off-line way, the CB-PoC have to

insert/update the register item on the on-line database and submitting the new register item in place of submitting organisation. The submitting organisation will be notified of this submission.

d) The Control Body are responsible for the evaluation of the submitted register items which are in "submission" status. The result of the evaluation can have three results: accepted, refused, revision. In any case, a notification is sent to the submitting organisation.

   1) **Accepted**: In this case, the register item is setup in "valid" status. In this case the register item is available to the register users.

   2) **Refused**: in this case the register item is setup in "refused" status and it will be frozen and it will be not more accessible by submitting organisation and register users. The Control Body have to provide the motivation of his decision to the submitting organisation.

   3) **Revised**: The register item is requested to be revised by the register owner. The Control Body provide a list of comments/suggestions which have to be receipted by the Register Owner. The register item is setup to "revision" and the submitting organisation is notified to updated the register item and the referenced documents in order to submit again for the acceptance and publication.

6.3.2 Register user functionalities

The best practice registry is available for public view. The information can be search and analysed by the user through the entry point published on CEN/TC 287 web site. The registry interface permits to access to the registers:

— by listing the registered items;

— by a search form based on the categories described above.

A user may be required to be qualified to provide their comments on the registry content and/or propose additional entries to the Control Body. This is provided by a discussion forum moderated by the CEN/TC287 secretariat. Any users may provide comments and suggestions to the CEN/TC287 secretariat.

6.3.3 Relation to other registries

For each project and for each document, a set of categories has been defined to classify the registered items into this repository. In addition to these categories, free keywords can be used to additionally classify the documents. A reference to the INSPIRE glossary registry may be used in order to have a harmonised understanding of the free keywords used to classify the best practice reference outcomes.

6.4 Structure and content of the repository

Include a brief description of the on-line repository functionalities.

7 Description of project deliverables

7.1 Requirements from a consumer perspective

As a user (accessing information) it would be useful to be able to gather information of relevance on:

a) reference material relating to a specific topic;

b) a specific project [through a list of "indexed project"] - this requires having the possibility to identify a project and then search:

   1) executive abstract;

2) all relevant documents;

3) software/tools available;

4) list of participants (companies/institution & people);

c) specific documents through:

1) free keywords;

2) list of pre-defined list of topics (as defined in the above clause);

d) specific pieces of code/tools (relevant for software deliverables) by pointing to other source code repositories (e.g. SourceForge).

For each of the above it should be indicated if the information is "public" (and therefore to be able to download it) or if "private" (accessible only to consortium members). In the latter case in fact it would be important to know that the piece of information I am looking for exists somewhere.

In all cases there should be:

1) a link to a contact person (including reference to relevant social networks e.g. LinkedIn);

2) company/institution details.

The personal details should be automatically associated to each document according to the log-in account used for the upload. This way, if the contact person moves to another company, at least one could contact the organization to get some additional insight.

7.2 Structure of the best practices repository

The best practice repository is based on the outcomes of the European Union funded projects. The registry is setup in order to manage the information related to the project of reference, to the set of outcomes of the project maintaining also a set of information related to the involved project stakeholders (including project partners, advisory institutions, interested partners, etc).

The repository collects two types of registers:

— Reference Project: the EU funded project addressing some key aspect classified as best practice in implementation of an SDI;

— Projects outcomes: the specific project outcomes which have been classified relevant to make the project as a reference best practice.

For example, the project Nature-SDIplus has been considered a relevant project due by the following main best practice outcomes:

— Design of a thesaurus framework to harmonise the metadata content and provide semantic search facilities (deliverable D3.1);

— Operational methodology and guidelines for data harmonisation (deliverable D3.3)

— Set-up of a data model validation methodology and implementation of a validation briefcase (deliverable D5.1).

In the best practice repository, it will be registered the project Nature-SDIplus and the three main outcomes, i.e. the deliverables D3.1, D3.3 and D5.1. Then for each project it can be one or more reference outcomes.

Based on the concept of maintaining the information mainly on their original producer, the essential information related to the project and the referred documents are stored in the register metadata while the more detailed information are provided as linked information.

In this document the most relevant information has been collected and provided, while for more additional details, it has been provided the project/document link (like the project web site and the projects documents links).

7.3 Description of the project register

For each project that has been identified for being relevant for the implementation of SDI in Europe the major scopes, components and implementations are described. Components and implementations are structured according to the relevance regarding possible solutions for the implementation of the INSPIRE Implementing Rules. This covers:

- Metadata including multilingual approaches, EN ISO 19115 Metadata profiles and data collection tools.
- Network services including all kind of web services that are able to search, view and download geographic information.
- Data specifications including data models, feature concept dictionaries, codelist dictionaries, application schemas, data harmonization and information about the INSPIRE themes that are covered.
- Data sharing including licencing issues as well as pricing models.
- Possible additional approaches that could be relevant for supporting the implementation of SDI are also described.

According to the above listed requirements, the project register has been designed including the following information:

- Project ID, acronym and full name: the project ID refer to the ID assigned by the European Institution and specified in the document of work.
- URL of the project website.
- The scope of the project (executive abstract) including a brief description of the main relevance of the project which make it as a best practice of reference.
- The start and the end dates of the project.
- The main list of category which fit with the project qualification as a best practice in the SDI implementation process.
- The list of the main outcomes which have been qualified as best practices in the process of implementing an SDI.
- The details about the main contact person of the project (usually the project coordinator).
- The details about the EU project officer.

According to the above listed requirements, some information is not included into this metadata set (for example, the project partners). This are assumed to be enclosed into the project website without the need to replicate this information already collected into the project website and/or the enclosed information of the European Union funding programmes websites.

Table 2 represent the template which has been used to collect the information related to the reference projects listed in Annex A.

Table 2 — Template used to collect project information

Project ID			
Project acronym			
Project full title			
Project website			
EU funding programme	*Programme*		
Start Date		End Date	
Relevant classification	*SDI reference model components*	☐ Data ☐ Register ☐ Discovery ☐ View ☐ Invoke ☐ Download ☐ GeoRM ☐ Orchestration and Composition	
	Phases of an SDI	☐ Concept and design ☐ Implementation ☐ Validation	
	Architectural reference model services	☐ Human Interaction Services ☐ Model Management Services ☐ Workflow/Task Services ☐ System Management Services ☐ Processing Services ☐ Communication Services	
	Project document type	☐ Standards ☐ Specifications ☐ Technical reports ☐ Guidelines	
	Free Keywords		
Project scope			
Relevant outcomes			
Deliverable ID	*Titles*		*Relevant keywords*

7.4 Description of the best practice outcomes

The relevant project outcomes represent the core information of this collection. According to the identified requirements, the register structure of the project outcome includes the following main information:

- Document ID: each project outcome (deliverable) are marked with an ID unique in the project context. This ID, linked to the project acronym and/or full title will be used as a unique keyword to identify the project outcome.

- Document Title: this is the deliverable name of the outcome as fixed on the project document of work (title of the document for the document, tools name if the outcome is a software tool, etc).

- Reference Project: details related to the funded project producing the best practice outcome.
- The outcome responsible, usually the partner having in charge the delivery of the outcome.
- The main list of category which fit with the project qualification as a best practice in the SDI implementation process.
- A summary of the relevant issues addressed by the outcome.

A summary list of the relevant outcomes classified according to the identified category is exposed in Annex B. This matrix permits quick identification of the relevant outcomes related to each category. The template of the enclosed matrix is shown in Table 3.

Table 3 — Template for project outcomes

				SDI reference model components								Phases of an SDI			Architectural reference model services						Project document type			
Project ID	Project Acronym	Doc. ID	Doc. Title	Data	Register	Discovery	View	Invoke	Download	GeoRM	Orchestration and Composition	Concept and design	Implementation	Validation	Human Interaction Services	Model Management Services	Workflow/Task services	System Management Services	Processing Services	Communication Services	Standards	Specifications	Technical reports	Guidelines

The list of the document representing the best practices are listed in Annex C ordered by project and following the same project order of Annex A. The template used to describe each best practice outcome is shown in Table 4.

Table 4 — Template for recording best practice outcomes

Document ID				
Document title				
Document link				
Public	Yes / No			
Project	*ID*			
	Acronym			
	Full title			
Version			*Delivery date*	
File type				
Relevant classification	*SDI reference model components*	☐ Data ☐ Register ☐ Discovery ☐ View ☐ Invoke ☐ Download ☐ GeoRM ☐ Orchestration and Composition		
	Phases of an SDI	☐ Concept and design ☐ Implementation ☐ Validation		
	Architectural reference model services	☐ Human Interaction Services ☐ Model Management Services ☐ Workflow/Task Services ☐ System Management Services ☐ Processing Services ☐ Communication Services		
	Project document type	☐ Standards ☐ Specifications ☐ Technical reports ☐ Guidelines		
	Free Keywords			
Relevant outcomes				

8 Best practices overview

8.1 General

This clause gives a summary vision about the best practices regarding Spatial Data Infrastructures referencing to the outcomes of the projects in the frame of the European Union funding programmes according to the classification provided in Clause 5.

For each of these classifications is provided a summary of the collected best practices.

8.2 SDI reference model components

8.2.1 General

Inclusion of general statistics about the collected best practices:

— classification items;

— funded programmes.

8.2.2 Data

Number of best practices: 12

Main key aspects addressed by the collected best practices:

A lot of best practices has been collected on data and metadata analysis, affording the different aspects related to data/metadata remodelling, multilingual issues, registries definition and integrations. Some of these best practices focuses on data modelling/remodelling (see deliverable D3.5 of Nature-SDIplus project), data quality (see deliverable D5.3 of Nature-SDIplus project) as well as the registries management and common thesauri (see deliverable D3.1 of Nature-SDIplus project and D3.1.2 of TaToo project).

8.2.3 Register

Number of best practices: 5

Main key aspects addressed by the collected best practices:

8.2.4 Discovery

Number of best practices: 12

Main key aspects addressed by the collected best practices:

8.2.5 View

Number of best practices: 6

Main key aspects addressed by the collected best practices:

Deliverables D.1.1.06 and D1.1.09 of Briseide project delineate some general and operational aspects related to view services, including visual interoperability by the analysis of the cross-theme portrayal aspects. This analysis has been also well provided in deliverables D3.6 and D3.7 of GIS4EU project.

8.2.6 Invoke

Number of best practices: 4

Main key aspects addressed by the collected best practices:

8.2.7 Download

Number of best practices: 3

Main key aspects addressed by the collected best practices:

8.2.8 GeoRM

Number of best practices: 3

Main key aspects addressed by the collected best practices:

The survey provided by ToToo project (deliverable D2.2.2 Technology Survey) perform a survey on tools and services relevant for the TaToo project and usable today, with specific attention on assessing the risks involved in their adoption in the project, including IPR issues.

8.2.9 Orchestration and composition

Number of best practices: 5

Main key aspects addressed by the collected best practices:

8.3 Phases of an SDI

8.3.1 General

Inclusion of general statistics about the collected best practices

- classification items;
- funded programmes.

8.3.2 Concept design

Number of best practices: 6

Main key aspects addressed by the collected best practices:

8.3.3 Implementation

Number of best practices: 8

Main key aspects addressed by the collected best practices:

8.3.4 Validation

Number of best practices: 4

Main key aspects addressed by the collected best practices:

The “validation briefcase” (deliverable D5.1 of Nature-SDIplus project) is a document which set acts as a “tool”, providing a step-by-step guide on the necessary validation steps for both the data specification and data encoding phase for nature conservation data themes (PS, BR, HB, SD). Following these steps assure the initial data specification is in accordance with INSPIRE, and that the accompanying schemas have been created in accordance with the data specification. It also allows any Data Provider to easily self-validate their encoded data. In addition to the main document, the validation briefcase contains also:

- schematron files enabling rule-based validation;
- tutorials describing how to use 2 sw validation tools;

- templates to report the validation results;
- examples of validation reports.

The validation methodology can be easily extended and applied to any other INSPIRE data theme.

8.4 Project document type

8.4.1 Standards

Number of best practices: 4

Main key aspects addressed by the collected best practices:

Deliverable D2.1 of GIS4EU project identifies the International Standards, the INSPIRE Implementing Rules (IRs) and reference materials coming from INSPIRE-focused EU projects. The document categorizes normative and reference documents offering a kind of reference in understanding the role of International Standards and IRs in a European context.

8.4.2 Specifications

Number of best practices: 4

Main key aspects addressed by the collected best practices:

8.4.3 Technical reports

Number of best practices: 3

Main key aspects addressed by the collected best practices:

8.4.4 Guidelines

Number of best practices: 7

Main key aspects addressed by the collected best practices:

Different guidelines has been provided affording the different element of the SDI reference model, focusing mainly on data remodelling, data validation ,infrastructure architecture concept and design. A good overall reference is the deliverable D6.3 of GIS4EU project, giving an overall overview about data harmonisation and aggregation. Some new running projects are focusing their attention also on the other aspects of an SDI, with the plan to provide additional deliverables related to services provision and orchestration.

Annex A
(informative)
Projects relevant to Standards development organisations

GIGAS

Project ID	FP7-224274		
Project acronym	**GIGAS**		
Project full title	GEOSS INSPIRE and GMES an Action in Support		
Project website	http://www.thegigasforum.eu		
EU funding programme	*Programme*	*FP7*	
Start Date	01 June 2008	End Date	31 May 2010
Relevant classification	*SDI reference model components*	☒ Data ☒ Register ☒ Discovery ☒ View ☒ Invoke ☒ Download ☒ GeoRM ☒ Orchestration and Composition	
	Phases of an SDI	☒ Concept and design ☐ Implementation ☐ Validation	
	Architectural reference model services	☒ Human Interaction Services ☐ Model Management Services ☒ Workflow/Task Services ☒ System Management Services ☒ Processing Services ☒ Communication Services	
	Project document type	☒ Standards ☐ Specifications ☒ Technical reports ☐ Guidelines	
	Free Keywords	Standards development, architecture design	

Project scope

The three initiatives GEOSS, INSPIRE and GMES share commonalities, including their focus on environmental policy support, use of geomatic and geographic information, their Europe or worldwide dimension, their reliance on international standards and the advanced Spatial Data Infrastructures that are needed for their implementation. At the same time however, each initiative follows its own timeline and approach for technical development, thereby risking evolving into separate, incompatible services and not profiting from the benefits of a common approach. The GIGAS project was launched with the specific aim to assess and address interoperability gaps and opportunities for establishing bridges between the initiatives. For this, GIGAS makes use of a formal and structured approach that is driven by consensus. To support the consensus building process effectively, one of the core objectives of GIGAS is to set up a representative and sustainable stake-holder forum as central communication platform.

Relevant outcomes

Deliverable ID	*Titles*	*Relevant keywords*
D2.2b	Data harmonisation and semantic interoperability	Standards, data harmonisation

GIS4EU

Project ID	ECP-2006-GEO-310011		
Project acronym	**GIS4EU**		
Project full title	Provision of interoperable datasets to open GI to EU communities		
Project website	http://www.gis4eu.eu		
EU funding programme	*Programme*	*eContent-plus*	
Start Date	01 November 2006	End Date	31 July 2010
Relevant classification	*SDI reference model components*	☒ Data ☐ Register ☒ Discovery ☒ View ☒ Invoke ☒ Download ☐ GeoRM ☐ Orchestration and Composition	
	Phases of an SDI	☒ Concept and design ☒ Implementation ☒ Validation	
	Architectural reference model services	☐ Human Interaction Services ☒ Model Management Services ☒ Workflow/Task Services ☐ System Management Services ☐ Processing Services ☐ Communication Services	
	Project document type	☒ Standards ☒ Specifications ☒ Technical reports ☒ Guidelines	
	Free Keywords	Data harmonisation, data remodelling, standards/directives compliances	

Project scope

The GIS4EU project will organise an infrastructure to share cartographic data and layers across four INSPIRE themes, in order to make them accessible and to share the relative information, without building a central database, but sharing information and data through standard services.
The project has developed a common data model and support tools for the assessment of common standards based on INPIRE Directive implementing rules through the following activities:

- Create a systematic approach and network for all classes of stakeholders: users, scientists, technicians, data collectors.
- Resolve the critical issues in developing a common model linking together all subjects involved in the decision process.
- Generate a website for free testing of the tools and methodologies, and to share information.
- Improve communication and integration among the main actors at different data production levels.
- Generate new opportunities for sharing information and develop common technical approaches compliant with the INSPIRE Directive.

These activities provide an opportunity for operational validation of INSPIRE implementing rules. GIS4EU will produce proactive suggestions to address the complex issues in providing an operational implementation of INSPIRE. Each of the GIS4EU partners has particular experience relevant to the project's goals and technical requirements, and through knowledge exchange and interdisciplinary work the project will achieve meaningful and useful results. Partners represent:

- data providers on national, regional and local scales;
- researchers;

• technology partners; • users. The Thematic Working Groups (TWG) working on the four themes (Administrative units, Hydrography, Transport Networks, Elevation) are a sort of "clearing house" where knowledge, experience and technical aspects can find the best solution.

Relevant outcomes		
Deliverable ID	*Titles*	*Relevant keywords*
D2.1	Standards and implementation rules review	Standards, INSPIRE directive
D3.6-7	Merging-Aggregation rules – Degradation rules	Generalisation process
D6.3	Guidelines about the operational application of standards and directives	Data remodelling, aggregation, harmonisation, standards compliance

Nature-SDI*plus*

Project ID	ECP-2007-317007		
Project acronym	**Nature-SDI*plus***		
Project full title	Best Practice Network for SDI in Nature Conservation		
Project website	http://www.nature-sdi.eu		
EU funding programme	*Programme*	*eContent-plus*	
Start Date	01 October 2008	End Date	31 July 2011
Relevant classification	*SDI reference model components*	☒ Data ☐ Register ☒ Discovery ☒ View ☐ Invoke ☒ Download ☐ GeoRM ☐ Orchestration and Composition	
	Phases of an SDI	☒ Concept and design ☒ Implementation ☒ Validation	
	Architectural reference model services	☒ Human Interaction Services ☒ Model Management Services ☒ Workflow/Task Services ☐ System Management Services ☐ Processing Services ☐ Communication Services	
	Project document type	☐ Standards ☐ Specifications ☒ Technical reports ☒ Guidelines	
	Free Keywords		

Project scope
The main objective of NATURE-SDIplus is the establishment of a network open to all stakeholders operating in the nature conservation. The network aims to collect, validate and implement good practices in order to create better conditions to favour the exploitation and the re-use of data on nature conservation in Europe. This is pursued through an analysis of the state of the art on data usability and accessibility as well as of target user needs. The analysis brings to the evaluation and the implementation of the available data specification and proposes the

definition of a metadata and a data model to improve the harmonisation of available datasets, made accessible through designed web services. According to the eEContentplus objectives and rationale, the network is also expected to undertake awareness raising activities aimed at making stakeholders realise and exploit the full potential of digital contents, for management, training, communication and information purposes. NATURE-SDIplus analyses the usability and accessibility of data. The results of this analysis are used to develop the NATURE-SDIplus European metadata profile and data model for datasets on nature conservation. The project defines a common multilingual and multicultural approach for a simpler and standardised access to spatial data. A demonstration infrastructure, compliant with the INSPIRE principles and supported by web services, provides the data accessibility through a dedicated geoportal: the main gateway to available datasets and services. The main outcome of Nature-SDIplus is a long-term sustainable network of stakeholders dealing with geoinformation for nature conservation.

Relevant outcomes		
Deliverable ID	*Titles*	*Relevant keywords*
D3.1	Multilingual and multicultural issues, including Thesaurus	Multilingual, Thesaurus Framework
D3.5	Procedure for metadata profile and data model implementation	Data harmonisation
D5.1	Validation briefcase including validation reports	Validation

Briseide

Project ID	ECP-2007-317007		
Project acronym	**BRISEIDE**		
Project full title	BRIdging SErvices, Information and Data for Europe		
Project website	http://www.briseide.eu		
EU funding programme	*Programme*	*ICT-PSP*	
Start Date	01 March 2010	End Date	31 August 2012
Relevant classification	*SDI reference model components*	☐ Data ☐ Register ☒ Discovery ☒ View ☒ Invoke ☒ Download ☐ GeoRM ☒ Orchestration and Composition	
	Phases of an SDI	☒ Concept and design ☒ Implementation ☒ Validation	
	Architectural reference model services	☐ Human Interaction Services ☒ Model Management Services ☒ Workflow/Task Services ☐ System Management Services ☒ Processing Services ☐ Communication Services	
	Project document type	☐ Standards ☐ Specifications ☐ Technical reports ☐ Guidelines	
	Free Keywords	Spatio-temporal services, time, 3D geobrowsers, WPS, SOS, service	

		orchestration

Project scope

The product: BRISEIDE (BRIdging SErvices, Information and Data for Europe)" aims at delivering (1) time-aware extension of data models developed in the context of previous/ongoing EU INSPIRE related projects (e.g. in the context of GMES, eContentPlus), (2) application (e.g. Civil Protection) based on the integration of existing, user operational information and (3) value added services for spatio-temporal data management, authoring, processing, analysis and interactive visualisation.
The need for the product: The use of GI requires re-consideration of time/spatial accounting to achieve optimality geo-processing services essential in environmental management, as demanded by planners and decision makers. With a few exceptions, current guidelines & standards do not provide such a support whilst funded by EC programmes or initiatives as GMES, eContentPlus and INSPIRE. It is the aim of BRISEIDE to fill-in this gap.
Application/validation of the product: BRISEIDE will be applied, tested and validated within a Civil Protection application context, using the INSPIRE relevant themes, via a chain of stakeholders, data providers, technology partners, and downstream users. The Pilot operational phase will last 12 months and will consider real life events, with extensions in additional domains, being considered and assessed.
Target users and their needs: Civil Protection operators and Public Administrations, engaged in urban planning, resource & environmental management, need spatio-temporal processing of GI to support decision-making. Current SDIs and the ESDI, only partially address user needs as they offer no or very limited time variable management1. The integration between INSPIRE-compliant geographic datasets and operational databases, essential in domains such as environmental risk management and civil protection, is poor. Thus the present scope of services SDI can offer is somewhat limited. It is the aim of BRISEIDE to build on existing SDI's in order to provide users with more complete and adequate data and processing tools.

Relevant outcomes

Deliverable ID	*Titles*	*Relevant keywords*
D.1.1.01	User Requirements And Use Cases	User requirements and use cases
D.1.1.06	Software Architecture	Software architecture, WPS, geoprocessing services.
D.2.2.01	Metadata Model Extension	Metadata model, time
D.3.3.02	Evaluation Methodology	Validation

TaToo

Project ID	247893		
Project acronym	**TaToo**		
Project full title	Tagging Tool based on a Semantic Discovery Framework		
Project website	http://www.tatoo-fp7.eu		
EU funding programme	*Programme*	*FP7 [ICT-2009.6.4]*	
Start Date	01/01/2010	End Date	31/12/2012
Relevant classification	*SDI reference model components*	☒ Data ☒ Register ☒ Discovery ☐ View ☐ Invoke ☐ Download ☐ GeoRM ☐ Orchestration and Composition	
	Phases of an SDI	☐ Concept and design ☒ Implementation ☐ Validation	
	Architectural reference model services	☒ Human Interaction Services ☐ Model Management Services ☒ Workflow/Task Services ☐ System Management Services ☐ Processing Services ☐ Communication Services	
	Project document type	☐ Standards ☒ Specifications ☐ Technical reports ☐ Guidelines	
	Free Keywords		

Project scope
Set up a semantic Web solution to close the resource discovery gap and the gap between discovery and access of resources.

Relevant outcomes		
Deliverable ID	*Titles*	*Relevant keywords*
D2.3.2	Requirements document	Requirement, user's needs
D2.2.2	Technology Survey	Technology
D3.1.2	TaToo Semantic Service Environment and Framework Architecture	Architecture, framework

Annex B
(informative)
SDI components and project outcomes

				SDI reference model components								Phases of an SDI			Architectural reference model services						Project document type			
Project ID	Project Acronym	Doc. ID	Doc. Title	Data	Register	Discovery	View	Invoke	Download	GeoRM	Orchestration and Composition	Concept and design	Implementation	Validation	Human Interaction Services	Model Management Services	Workflow/Task services	System Management Services	Processing Services	Communication Services	Standards	Specifications	Technical reports	Guidelines
FP7-224274	GIGAS	D2.2b	Data harmonisation and semantic interoperability	X	X	X						X				X	X				X		X	
ECP-2006-GIS-310011	GIS4EU	D2.1	Standards and implementation rules review	X		X	X	X	X					X		X					X		X	
ECP-2006-GIS-310011	GIS4EU	D3.6-7	Merging-Aggregation rules – Degradation rules	X			X						X				X		X			X		X
ECP-2006-GIS-310011	GIS4EU	D6.3	Guidelines about the operational application of standards and directives	X		X	X	X	X				X	X	X	X	X							X
ECP-2007-317007	Nature-SDI*plus*	D3.1	Multilingual and multicultural issues, including Thesaurus	X	X	X						X	X		X		X						X	
ECP-2007-317007	Nature-SDI*plus*	D3.5	Procedure for metadata profile and data model implementation	X		X							X			X								X
ECP-2007-317007	Nature-SDI*plus*	D5.1	Validation briefcase including validation	X										X					X	X				X

				SDI reference model components								Phases of an SDI			Architectural reference model services						Project document type			
Project ID	Project Acronym	Doc. ID	Doc. Title	Data	Register	Discovery	View	Invoke	Download	GeoRM	Orchestration and Composition	Concept and design	Implementation	Validation	Human Interaction Services	Model Management Services	Workflow/Task services	System Management Services	Processing Services	Communication Services	Standards	Specifications	Technical reports	Guidelines
			reports																					
ECP-2007-317007	Nature-SDI*plus*	D5.3	Report on data quality evaluation	X									X			X								X
CIP-ICT-PSP.2009-250474	Briseide	D.1.1.01	User Requirements And Use Cases			X	X	X			X	X					X	X	X					X
CIP-ICT-PSP.2009-250474	Briseide	D.1.1.06	Software Architecture			X	X	X			X	X			X			X	X	X		X		
CIP-ICT-PSP.2009-250474	Briseide	D.2.2.01	Metadata Model Extension	X	X	X						X				X					X			
CIP-ICT-PSP.2009-250474	Briseide	D.3.3.02	Evaluation Methodology			X	X		X		X		X	X					X	X				X
FP7 247893	TaToo	D2.3.2	Requirements document	X	X	X							X		X		X					X		
FP7 247893	TaToo	D2.2.2	Technology Survey	X	X	X				X	X	X						X	X		X			
FP7 247893	TaToo	D3.1.2	TaToo Semantic Service Environment and Framework Architecture	X		X					X		X				X	X				X		

Annex C
(informative)
Project summaries

GIGAS

Document ID	D2.2b		
Document title	**Data harmonisation and semantic interoperability**		
Document link	http://www.thegigasforum.eu		
Public	Yes		
Project	*ID*	FP7-224274	
	Acronym	**GIGAS**	
	Full title	GEOSS INSPIRE and GMES an Action in Support	
Version	101	*Delivery date*	30/06/2009
File type	PDF document		
Relevant classification	*SDI reference model components*	☒ Data ☒ Register ☒ Discovery ☐ View ☐ Invoke ☐ Download ☐ GeoRM ☐ Orchestration and Composition	
	Phases of an SDI	☒ Concept and design ☐ Implementation ☐ Validation	
	Architectural reference model services	☐ Human Interaction Services ☒ Model Management Services ☒ Workflow/Task Services ☐ System Management Services ☐ Processing Services ☐ Communication Services	
	Project document type	☒ Standards ☐ Specifications ☒ Technical reports ☐ Guidelines	
	Free Keywords	Standards, directives, EU programmes	
Relevant outcomes			
This technical note describes the approaches to the topic of “Data Harmonisation and Semantic Interoperability” within INSPIRE, GEOSS and GMES, the standards organisations (OGC, ISO/TC 211 and CEN/TC 287) and, where known and relevant, in FP6/FP7 projects.			

GIS4EU

Document ID	D2.1		
Document title	**Standards and implementation rules review**		
Document link	http://www.gis4eu.eu		
Public	Yes		
Project	*ID*	ECP-2006-GEO-310011	
	Acronym	**GIS4EU**	
	Full title	Provision of interoperable datasets to open GI to EU communities	
Version	1.4	*Delivery date*	22/04/2008
File type	PDF document		
Relevant classification	*SDI reference model components*	☒ Data ☐ Register ☒ Discovery ☒ View ☒ Invoke ☒ Download ☐ GeoRM ☐ Orchestration and Composition	
	Phases of an SDI	☐ Concept and design ☐ Implementation ☒ Validation	
	Architectural reference model services	☐ Human Interaction Services ☒ Model Management Services ☐ Workflow/Task Services ☐ System Management Services ☐ Processing Services ☐ Communication Services	
	Project document type	☒ Standards ☐ Specifications ☒ Technical reports ☐ Guidelines	
	Free Keywords	Standards, directives, compliance	

Relevant outcomes

This document identifies the International Standards, the INSPIRE Implementing Rules (IRs) and reference materials coming from INSPIRE-focused EU projects, which shall be considered within GIS4EU to facilitate achievement of project's objectives. The document categorizes normative and reference documents based on their potential applicability to mitigate particular issues related to project activities. This document does not specify the details of using the particular standard neither the technical aspects of standard / IRs implementation. It submits to serve for starting point to GIS4EU work items as well as a kind of reference in understanding the role of International Standards and IRs in a European context.

Document ID	D3.6, D3.7		
Document title	**Merging-Aggregation rules – Degradation rules**		
Document link	http://www.gis4eu.eu		
Public	Yes		
Project	*ID*	ECP-2006-GEO-310011	
	Acronym	**GIS4EU**	
	Full title	Provision of interoperable datasets to open GI to EU communities	
Version	1.0	*Delivery date*	29/10/2008
File type	PDF document		
Relevant classification	*SDI reference model components*	☒ Data ☐ Register ☒ Discovery ☐ View ☐ Invoke ☒ Download ☐ GeoRM ☐ Orchestration and Composition	
	Phases of an SDI	☐ Concept and design ☒ Implementation ☐ Validation	
	Architectural reference model services	☐ Human Interaction Services ☐ Model Management Services ☒ Workflow/Task Services ☐ System Management Services ☒ Processing Services ☐ Communication Services	
	Project document type	☐ Standards ☒ Specifications ☐ Technical reports ☒ Guidelines	
	Free Keywords	Data Aggregation, data generalization	

Relevant outcomes

The GIS4EU Description of Work states the following specification regarding merging and degradation:

Data harmonisation/aggregation processes specifications by the definition of the rules to harmonise and aggregate data in order to:

1. Merge cross-border datasets (TWGs-A)
2. Degradation rules in order to pass to less detailed scale (TWGs-A)

Correlation at the multilingual scale by definition of rules to describe elements and to aggregate them at different scale and geographic regions. Defining the related ontology. Document D3.6 describes those rules that relate to aggregation of datasets at the same scale from different geographic regions (i.e. cross-border).

A related document, D3.7 discusses aggregation of datasets of different scales. The document presumes that the two datasets are of similar qualities, either geometric (coordinates, same geometric representation and topology) or temporal (approximately same updating dates). The document presumes that the datasets have similar feature types and attributes though potentially named differently (e.g. in different languages).

Document ID	D6.3		
Document title	**Guidelines about the operational application of standards and directives**		
Document link	http://www.gis4eu.eu		
Public	Yes		
Project	*ID*	ECP-2006-GEO-310011	
	Acronym	**GIS4EU**	
	Full title	Provision of interoperable datasets to open GI to EU communities	
Version	1.0	*Delivery date*	09/12/2009
File type	PDF document		
Relevant classification	*SDI reference model components*	☒ Data ☐ Register ☒ Discovery ☒ View ☒ Invoke ☒ Download ☐ GeoRM ☐ Orchestration and Composition	
	Phases of an SDI	☐ Concept and design ☒ Implementation ☐ Validation	
	Architectural reference model services	☒ Human Interaction Services ☒ Model Management Services ☒ Workflow/Task Services ☐ System Management Services ☐ Processing Services ☐ Communication Services	
	Project document type	☐ Standards ☐ Specifications ☐ Technical reports ☒ Guidelines	
	Free Keywords	Data Aggregation, data generalization	

Relevant outcomes

This document, according to its name -"Operational Application of Standard and Directives"- aims to provide practical guide-lines concerning geographical data harmonisation and sharing within INSPIRE framework, by means of Standards, procedures and tools and by referring to concrete Case Studies.

The scope of the present document, in fact, is to disseminate and to exploit the theoretical as well as practical GIS4EU heritage and to transfer the know-how acquired by Project partners, in order to increase the public and private sector awareness and knowledge in the field of geospatial data sharing, with the broad goal to support European spatial policies at inter-institutional and cross-border level.

Nature-SDI*plus*

Document ID	D3.1		
Document title	**Multilingual and multicultural issues, including Thesaurus**		
Document link	http://www.nature-sdi.eu		
Public	No		
Project	*ID*	ECP-2007-317007	
	Acronym	Nature-SDI*plus*	
	Full title	Best Practice Network for SDI in Nature Conservation	
Version	2.0	*Delivery date*	30/10/2010
File type	PDF document		
Relevant classification	*SDI reference model components*	☒ Data ☒ Register ☒ Discovery ☐ View ☐ Invoke ☐ Download ☐ GeoRM ☐ Orchestration and Composition	
	Phases of an SDI	☒ Concept and design ☒ Implementation ☐ Validation	
	Architectural reference model services	☒ Human Interaction Services ☐ Model Management Services ☒ Workflow/Task Services ☐ System Management Services ☐ Processing Services ☐ Communication Services	
	Project document type	☐ Standards ☐ Specifications ☒ Technical reports ☐ Guidelines	
	Free Keywords		
Relevant outcomes			
NatureSDIplus Task 3.1 proposes a multi-thesauri solution for the four data themes (Protected Sited, Biogeographical Region, Habitat & Biotopes, and Species Distribution) considered in the project: the result is a Common Thesaurus Framework for Nature Conservation where different well known knowledge organization systems (classifications, taxonomies and thesauri) for the four data themes are shared and assembled. For this purpose the framework is characterised by the properties of modularity and openness for further thesaurus extension and updating, and the ability of interconnection between thesauri and exploitability from other systems.			

Document ID	D3.5		
Document title	**Procedure for metadata profile and data model implementation**		
Document link	http://www.nature-sdi.eu		
Public	No		
Project	*ID*	ECP-2007-317007	
	Acronym	Nature-SDI*plus*	
	Full title	Best Practice Network for SDI in Nature Conservation	
Version	3.5	*Delivery date*	17/05/2011
File type	PDF document		
Relevant classification	*SDI reference model components*	☒ Data ☐ Register ☒ Discovery ☐ View ☐ Invoke ☐ Download ☐ GeoRM ☐ Orchestration and Composition	
	Phases of an SDI	☐ Concept and design ☒ Implementation ☐ Validation	
	Architectural reference model services	☐ Human Interaction Services ☒ Model Management Services ☐ Workflow/Task Services ☐ System Management Services ☐ Processing Services ☐ Communication Services	
	Project document type	☐ Standards ☐ Specifications ☐ Technical reports ☒ Guidelines	
	Free Keywords		

Relevant outcomes

The harmonisation of data sets and metadata profiles into a common model, will offer several benefits to the data providers and users of Nature Conservation information, among them, the possibility to access information from different sources and to combine these data in a common viewing. This is the aim of Nature-SDI*plus*, to provide INSPIRE/Nature SDI*plus* compliant datasets and metadata from the different partners on the Nature-SDI*plus* geoportal, as the first stage in the building of a nature conservation SDI.
The harmonisation could be a complex issue if you don't have the required knowledge and capacities (to analyse the information, to select the necessary tools and to follow the required steps). Many of the data providers for these nature conservation themes are small conservation organisations, often without GI specialist staff, and thus even more sharply excluded by the complexity of the requirements. This task is aimed at providing support for such data providers.

Solutions based on different tools that makes easier the remodelling to a common data model, were planned. The objective is facilitating the choice of the most suitable tool for every situation and indicates how to do it enumerating the steps from the existing data up to the preparation for its publication in the Geoportal. The document has been written trying to offer a user's guide perspective.

Document ID	D5.1		
Document title	**Validation briefcase**		
Document link	http://www.nature-sdi.eu		
Public	No		
Project	*ID*	ECP-2007-317007	
	Acronym	Nature-SDI*plus*	
	Full title	Best Practice Network for SDI in Nature Conservation	
Version	3.5	*Delivery date*	17/05/2011
File type	PDF document		
Relevant classification	*SDI reference model components*	☒ Data ☐ Register ☐ Discovery ☐ View ☐ Invoke ☐ Download ☐ GeoRM ☐ Orchestration and Composition	
	Phases of an SDI	☐ Concept and design ☐ Implementation ☒ Validation	
	Architectural reference model services	☐ Human Interaction Services ☐ Model Management Services ☐ Workflow/Task Services ☐ System Management Services ☒ Processing Services ☒ Communication Services	
	Project document type	☐ Standards ☐ Specifications ☐ Technical reports ☒ Guidelines	
	Free Keywords		

Relevant outcomes

Beside the set-up of ad-hoc harmonisation procedures and prototype development of the data models and the xsd application schemas for the three Annex III themes involved, one of the most effective best practices carried out in the project is the creation of the “validation briefcase”. This document set acts as a “tool”, providing a step-by-step guide on the necessary validation steps for both the data specification and data encoding phase. Following these steps assure the initial data specification is in accordance with INSPIRE, and that the accompanying schemas have been created in accordance with the data specification. It also allows any Data Provider to easily self-validate their INSPIRE encoded data.

Document ID	D5.3		
Document title	**Report on data quality evaluation**		
Document link	http://www.nature-sdi.eu		
Public	No		
Project	*ID*	ECP-2007-317007	
	Acronym	Nature-SDI*plus*	
	Full title	Best Practice Network for SDI in Nature Conservation	
Version	2.0	*Delivery date*	22/06/2011
File type	PDF document		
Relevant classification	*SDI reference model components*	☒ Data ☐ Register ☐ Discovery ☐ View ☐ Invoke ☐ Download ☐ GeoRM ☐ Orchestration and Composition	
	Phases of an SDI	☐ Concept and design ☒ Implementation ☐ Validation	
	Architectural reference model services	☐ Human Interaction Services ☒ Model Management Services ☐ Workflow/Task Services ☐ System Management Services ☐ Processing Services ☐ Communication Services	
	Project document type	☐ Standards ☐ Specifications ☐ Technical reports ☒ Guidelines	
	Free Keywords		

Relevant outcomes

In order to achieve the main objective of the task 5.3 in terms of quality evaluation, which was to assess the quality of the harmonised vs. the source datasets, a four steps methodology has been succesfully developed and applied:

Step 1: a deep analysis of the following documents has been conducted:
- the international standards EN ISO 19113, 19114, ISO/TS 19138,
- the data quality issues covered by INSPIRE,
- the NatureSDI*plus* Metadata profile,

from which the data quality elements and subelements, together with the corresponding measures and their reporting have been extracted;

Step 2: a set of guidelines enabling the quality evaluation of spatial datasets belonging to the four INSPIRE themes covered by NatureSDI*plus* (PS, BR, HB, SD) has been provided;

Step 3: starting from the guidelines developed in step 2, they have been adapted in order to use the selected data quality elements and subelements to assess the quality of the NatureSDI*plus* harmonised vs. source datasets;

Step 4: the guidelines adapted in the step 3 have been applied to 4 harmonised datasets (1 harmonised dataset for each of the four INSPIRE themes – PS, BR, HB, SD) and the quality evaluation results have been presented.

In addition, the Data Quality elements and subelements have been structured according to the EN ISO 19115 formalisms, enabling their eventual future encoding as metadata according to the CEN ISO/TS 19139.

The results presented in this deliverable can be easily applied also to the other data themes, therefore providing a basis for Data Quality issues in the INSPIRE context.

BRISEIDE

Document ID	D1.1.01		
Document title	**User Requirements and Use Cases**		
Document link	http://www.briseide.eu		
Public	No		
Project	*ID*	CIP-ICT-PSP.2009- 250474	
	Acronym	BRISEIDE	
	Full title	BRIdging SErvices, Information and Data for Europe	
Version	1.0	*Delivery date*	31/05/2010
File type	PDF document		
Relevant classification	*SDI reference model components*	☐ Data ☐ Register ☒ Discovery ☒ View ☒ Invoke ☐ Download ☐ GeoRM ☒ Orchestration and Composition	
	Phases of an SDI	☒ Concept and design ☐ Implementation ☐ Validation	
	Architectural reference model services	☐ Human Interaction Services ☐ Model Management Services ☒ Workflow/Task Services ☒ System Management Services ☒ Processing Services ☐ Communication Services	
	Project document type	☐ Standards ☐ Specifications ☐ Technical reports ☒ Guidelines	
	Free Keywords		

Relevant outcomes

This document identifies the different Use Cases foreseen by the several Pilots planned for BRISEIDE and it complements them with specific requirements.
The goal is to identify, clearly and analytically, those Use Cases that will have to be performed at operational stage, for the Pilots to be considered as successful. The overall potential for Use Cases to be included in the system is significant and their formalisation is essential in order to design and the functionalities required by a flexible yet practically usable system. The Use Cases will therefore encompass, in a comprehensive manner, all operational tasks to be performed in the context of the different scenarios.
Use Cases are complemented by requirements collected by the different users involved in BRISEIDE. These include technological, operational as well as usability issues.
The objective is to identify the services and functionalities that best comply with the needs of the users and their perceived requirements with regards to their daily activities. For this reason interviews and specifically-designed surveys have been used in order during this task, to collect essential feedback by the relevant users.
This document is the first of a series of documents related to definition of the system specifications and will be complemented by the following deliverable all due at M06 of the project:

- D1.1.02 - Services requirements
- D1.1.03 - Metadata requirements
- D1.1.04 - Survey of Existing GI and Services
- D1.1.05 - Analysis of Adaptation of Existing Data / Services
- D1.1.06 - System Architecture

Document ID	D1.1.06		
Document title	**Software Architecture**		
Document link	http://www.briseide.eu		
Public	No		
Project	*ID*	CIP-ICT-PSP.2009- 250474	
	Acronym	BRISEIDE	
	Full title	BRIdging SErvices, Information and Data for Europe	
Version	1.0	*Delivery date*	31/08/2010
File type	PDF document		
Relevant classification	*SDI reference model components*	☐ Data ☐ Register ☒ Discovery ☒ View ☒ Invoke ☐ Download ☐ GeoRM ☒ Orchestration and Composition	
	Phases of an SDI	☒ Concept and design ☐ Implementation ☐ Validation	
	Architectural reference model services	☒ Human Interaction Services ☐ Model Management Services ☐ Workflow/Task Services ☒ System Management Services ☒ Processing Services ☒ Communication Services	
	Project document type	☐ Standards ☒ Specifications ☐ Technical reports ☐ Guidelines	
	Free Keywords		

Relevant outcomes

This document details the software architecture of the BRISEIDE toolkit. The design has followed a modular methodology based on a federated approach to data collection, processing and distribution of spatio-temporal data. This allows creating a logical layer between existing services, exposing data and functionalities via SOAP or through OGC communication protocols such as WMS, WFS, and WPS etc. The framework follows a multi-level structure. At the lowest data level there will be the data repositories including those from other EU projects which are already available through OGC Web Service (OWS). The middleware level then builds on top of these low- level OWS a number of geo-processing services deployed as Web Processing Services (WPS). The different software components will be eventually packaged within a software toolbox that will allow data and service providers to create plug-and-play software services capable to expose spatio-temporal extending BRISEIDE's services.

Additionally this document also defines the detail of the BRISEIDE client. This will be a comprehensive application, also available as web-start, allowing data access and management as well as access to a number of spatio-temporal services. These features extend the concept of Spatial Data Infrastructures (SDI) to deliver a comprehensive Decision Support Systems (DDS).

The various software components are described from a technological standpoint with support of diagrams which highlight different modules, software interfaces as well as communication protocols used.

Document ID	D2.2.01		
Document title	**Metadata Model Extension**		
Document link	http://www.briseide.eu		
Public	No		
Project	*ID*	CIP-ICT-PSP.2009- 250474	
	Acronym	BRISEIDE	
	Full title	BRIdging SErvices, Information and Data for Europe	
Version	1.0	*Delivery date*	31/12/2010
File type	PDF document		
Relevant classification	*SDI reference model components*	☒ Data ☒ Register ☒ Discovery ☐ View ☐ Invoke ☐ Download ☐ GeoRM ☐ Orchestration and Composition	
	Phases of an SDI	☒ Concept and design ☐ Implementation ☐ Validation	
	Architectural reference model services	☐ Human Interaction Services ☒ Model Management Services ☐ Workflow/Task Services ☐ System Management Services ☐ Processing Services ☐ Communication Services	
	Project document type	☒ Standards ☐ Specifications ☐ Technical reports ☐ Guidelines	
	Free Keywords		

Relevant outcomes

This document focuses on definition of BRISEIDE metadata profile. To meet all requirements on metadata coming from the previous work, in particular following the deliverable D1.01.03, it is necessary to extend the INSPIRE metadata profile considering the elements contained in the EN ISO 19115 specification. The main goal is to define the profile that will allow adequate documentation of data and services provided by the various BRISEIDE stakeholders. The last part of the document is devoted to examples of BRISEIDE metadata profile in HTML and XML versions.

Document ID	D3.3.02		
Document title	**Evaluation Methodology**		
Document link	http://www.briseide.eu		
Public	No		
Project	*ID*	CIP-ICT-PSP.2009- 250474	
	Acronym	BRISEIDE	
	Full title	BRIdging SErvices, Information and Data for Europe	
Version	1.0	*Delivery date*	24/03/2011
File type	PDF document		
Relevant classification	*SDI reference model components*	☐ Data ☐ Register ☒ Discovery ☒ View ☐ Invoke ☒ Download ☐ GeoRM ☒ Orchestration and Composition	
	Phases of an SDI	☐ Concept and design ☒ Implementation ☒ Validation	
	Architectural reference model services	☐ Human Interaction Services ☐ Model Management Services ☐ Workflow/Task Services ☐ System Management Services ☒ Processing Services ☒ Communication Services	
	Project document type	☐ Standards ☐ Specifications ☐ Technical reports ☒ Guidelines	
	Free Keywords	Evaluation procedures, questionnaires	

Relevant outcomes

This document focuses on the methodology to test and assess the various BRISEIDE Pilots.
The developed evaluation strategy will enable system validation and quantification of performance indicators including relevant usability and human-computer interaction parameters, essential to identify possible weaknesses within the system that limit the potentiality of BRISEIDE.
The BRISEIDE Pilots will be evaluated through different usability assessment methods, both empirical and analytic. The methodology developed will allow identifying a wide range of issues throughout testing sessions with the involvement of end users within scenarios that represent daily operational activities.
This document describes in detail the approach defined. The methodology is initially based on the definition of so-called storyboards. This is an approach that visualizes the use cases and enables both testers and users to walk through conceptual screens so that they can easily understand the proposed features within BRISEIDE. The storyboards are descriptive texts illustrating how the user can practically accomplish to the various tasks, through the use of BRISEIDE, as defined within the D1.1.01 - User Requirements and Use Cases. These storyboards illustrate the procedure that the users will have to follow to accomplish to specific tasks during the test session.
After completion of these tasks the users' feedback will be collected through the use of several questionnaires, whose details are extensively reported within this document.

TaToo

Document ID	D2.3.2		
Document title	Requirements document		
Document link			
Public	Yes		
Project	*ID*	247893	
	Acronym	TaToo	
	Full title	Tagging Tool based on a Semantic Discovery Framework	
Version	V2	*Delivery date*	03/06/2011
File type	.pdf		
Relevant classification	*SDI reference model components*	☒ Data ☒ Register ☒ Discovery ☐ View ☐ Invoke ☐ Download ☐ GeoRM ☐ Orchestration and Composition	
	Phases of an SDI	☐ Concept and design ☒ Implementation ☐ Validation	
	Architectural reference model services	☒ Human Interaction Services ☐ Model Management Services ☒ Workflow/Task Services ☐ System Management Services ☐ Processing Services ☐ Communication Services	
	Project document type	☐ Standards ☒ Specifications ☐ Technical reports ☐ Guidelines	
	Free Keywords		

Relevant outcomes

The requirements document represents a consolidation point in the process of the TaToo requirements analysis. It describes what TaToo shall do for the Users and it is the reference for various downstream tasks, like:

- the design of the TaToo framework architecture;
- the specifications of the services and tools offered by TaToo;
- the verification and exploitation of the TaToo results.

Document ID	D2.2.2		
Document title	Technology Survey		
Document link			
Public	No		
Project	*ID*	247893	
	Acronym	TaToo	
	Full title	Tagging Tool based on a Semantic Discovery Framework	
Version	V2	*Delivery date*	23/12/2010
File type	.pdf		
Relevant classification	*SDI reference model components*	☒ Data ☒ Register ☒ Discovery ☐ View ☐ Invoke ☐ Download ☒ GeoRM ☒ Orchestration and Composition	
	Phases of an SDI	☒ Concept and design ☐ Implementation ☐ Validation	
	Architectural reference model services	☐ Human Interaction Services ☐ Model Management Services ☐ Workflow/Task Services ☒ System Management Services ☒ Processing Services ☐ Communication Services	
	Project document type	☒ Standards ☐ Specifications ☐ Technical reports ☐ Guidelines	
	Free Keywords		
Relevant outcomes			
Technical and technological survey of tools and services relevant for the TaToo project and usable today, with specific attention on assessing the risks involved in their adoption in the project, including IPR issues.			

Document ID	D3.1.2		
Document title	TaToo Semantic Service Environment and Framework Architecture		
Document link			
Public	Yes		
Project	*ID*	247893	
	Acronym	TaToo	
	Full title	Tagging Tool based on a Semantic Discovery Framework	
Version	V2	*Delivery date*	22/08/2011
File type	.pdf		
Relevant classification	*SDI reference model components*	☒ Data ☐ Register ☒ Discovery ☐ View ☐ Invoke ☐ Download ☐ GeoRM ☒ Orchestration and Composition	
	Phases of an SDI	☐ Concept and design ☒ Implementation ☐ Validation	
	Architectural reference model services	☐ Human Interaction Services ☐ Model Management Services ☒ Workflow/Task Services ☒ System Management Services ☐ Processing Services ☐ Communication Services	
	Project document type	☐ Standards ☒ Specifications ☐ Technical reports ☐ Guidelines	
	Free Keywords		

Relevant outcomes

Specification of the TaToo Framework Architecture on an implementation independent level while considering the functional and non-functional requirements identified during the requirements analysis process. The deliverable provides implementation independent descriptions and specifications of components and describes the basic information flows with the help of a set of Core Use-Cases focusing on TaToo base functionality.

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