



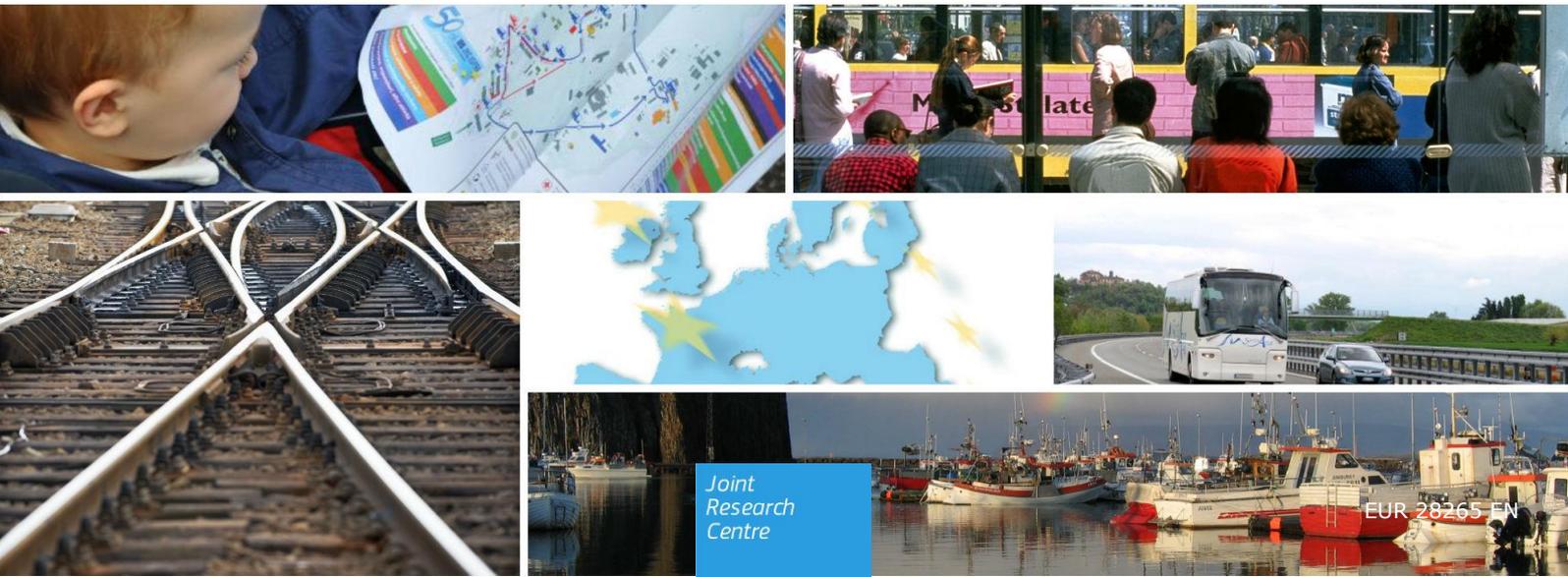
JRC TECHNICAL REPORTS

Descriptions of reusable location information solutions

*European Union
Location Framework*

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Abstract

As part of the [ISA](#) programme, the Digital Economy Unit of the European Commission (EC) Joint Research Centre (JRC) is co-ordinating ISA Action 2.13 - Establishment of a European Union Location Framework ([EULF](#)).

The goal of this analysis, carried out as part of the EULF action, was to identify a list of reusable location information solutions (including standards and specifications) which could be shared on Joinup; a list which public administrations and other geospatial data providers can leverage when developing location-enabled solutions and services.

The following activities were carried out:

1. A list of standards and specifications recommended by the Infrastructure for Spatial Information in Europe ([INSPIRE](#)) was derived from the INSPIRE Technical Guidelines, as possible input to [Joinup](#);
2. An architecture model (for a typical Spatial Data Infrastructure (SDI)) based on the European Interoperability Reference Architecture (EIRA) and on INSPIRE was developed to facilitate the identification of reusable location information solutions for data publishing;
3. Selected SDIs were analysed and their solution building blocks (SBBs) were mapped to the architecture building blocks (ABBs) of the defined architecture model;
4. An assessment of the identified SBBs was carried out to determine whether these SBBs were eligible to be included in the European Interoperability Cartography (EIC). However, given that the EIC eligibility criteria were not yet mature at the time of carrying out the analysis, this partial assessment was only done against the Joinup eligibility criteria, since the Joinup platform is envisaged to be where the EIC will reside.

The analysis resulted in the identification of 109 SBBs (policy, software, service, specification or standard, and guideline or template), out of which 49 meet the Joinup eligibility criteria, and therefore could potentially be included in the EIC, provided that these 49 SBBs would be compliant with the EIC eligibility criteria.

The work performed in the current analysis for the EULF has started to address the challenges and opportunities in identifying and classifying location information solutions that may contribute to the catalogue of reusable solutions being coordinated under the ISA and ISA² programmes. It complements the cataloguing activity of the associated ISA Action 1.17 - A Reusable INSPIRE Reference Platform ([ARE3NA](#)), which identifies relevant resources related to the steps in implementing INSPIRE.

1. Introduction

This document introduces the reader to a collection of identified reusable location information solutions (including standards and specifications) which public administrations and other geospatial data providers can leverage when developing location-enabled solutions and services. The collection is provided as input to the Joinup Catalogue of interoperable and reusable solutions. It contains a list of standards and specifications to be provided as input for Joinup. In addition, it includes a list of reusable spatial data solutions to be provided as input for the European Interoperability Cartography (EIC).

The collection of identified reusable location information solutions complements the work currently being developed by ISA Action 1.17 - A Reusable INSPIRE Reference Platform (ARE3NA): the cataloguing of tools that facilitate the sharing and usage of INSPIRE metadata, data and services and thus help to implement INSPIRE.

1.1. Target audience

The main target audience for this document is public administrations or other parties who are interested in developing location-based solutions and services and are looking for reusable location information solutions.

1.2. Structure of this document

This document consists of the following sections:

- **Section 1** (this section) describes the purpose, target audience and structure of this document and provides the context. It also explains the usage of key concepts, the approach and the scope.
- **Section 2** contains the list of identified standards and specifications to facilitate the development of location-enabled solutions and services.
- **Section 3** explains what a Spatial Data Infrastructure (SDI) is, lists the SDIs to be analysed, elaborates on the developed architecture model based on the European Interoperability Reference Architecture ([EIRA](#)) and on the Infrastructure for Spatial Information in Europe (INSPIRE), describes the identified solution building blocks, and includes the reusability assessment of these identified solution building blocks.
- **Section 4** contains the recommendations to the EIRA.
- **Section 5** provides the conclusion and next steps.
- The main sections are following by lists of **References, Abbreviations and Definitions, Figures and Tables**
- **Annex I** contains a list solution building blocks not seen as solutions in the context of Joinup.
- **Annex II** contains a list of relevant non-eligible services discovered during the identification of reusable location information solutions.
- **Annex III** contains a list of identified and assessed solutions already published on Joinup.
- **Annex IV** contains a list of solutions eligible to be published on Joinup.
- **Annex V** contains a list of geospatial solutions discovered during the identification of reusable location information solutions and which are already documented on Joinup.

1.3. Context

This subsection provides the context to better understand the approach and output, i.e. the collection of identified reusable location information solutions. It briefly explains the EULF, the EIRA, Joinup, the EIC, the ArchiMate modelling language, and the Asset Description Metadata Schema ([ADMS](#)). In addition, it elaborates on the usage of key terms within this document, such as "solution" or "building block".

1.3.1. The European Union Location Framework (EULF)

Coherent and committed action is required to remove digital barriers and realise the potential of location information in e-Government, focusing on the needs and expectations of users. A harmonising initiative is needed to guide alignment in policy and implementation, and to ensure that best practices are followed, mistakes are not repeated, and collaboration occurs where it is needed, building on INSPIRE.

To this end, under the Interoperability Solutions for European Public Administrations (ISA) programme, the Digital Economy Unit of the EC Joint Research Centre (JRC), is co-ordinating ISA Action 2.13 - Establishment of a European Union Location Framework (EULF). The objective of the EULF action is to develop an EU-wide, cross-sector and cross-border interoperability framework for the exchange, sharing and integration of location data in IT systems used to support e-Government processes and services [1]. The EULF supports the European Interoperability Framework (EIF), the Digital Single Market (DSM), and other aspects of the Digital Agenda for Europe (DAE). It is based on the information infrastructures developed at national and European levels that are being implemented in relation to the requirements of the INSPIRE Directive 2/2007 [2] and related daughter legislation.

The INSPIRE Directive establishes an infrastructure for spatial information in Europe for the purposes of EU environmental policies or activities which may have an impact on the environment. There are over 150 references to specific EU policies in the INSPIRE data specifications and, due to the nature of INSPIRE, many stakeholder organisations are involved not only in the environmental sector but also in a large number of other areas. In fact, INSPIRE is a multi-purpose infrastructure for the exchange and sharing of spatial data, meaning that it can be used for other thematic sectors as well - ranging from Transport to Marine to Energy, etc. The development of INSPIRE and its technical context have strong relationships with cross-cutting areas such as open data initiatives and similar activities related to the Public Sector Information ([PSI](#)) Directive, standardisation activities, and the service-provider industry. One area of particular note is the use of Geographical Information Systems (GIS), which offer the means to manipulate geospatial data and act as one of the key tools to exploit the content SDIs provide as well as producing some of its content.

Variations in technical approaches can create problems for interoperability, as well as activities which miss the benefits of adopting reusable solutions. Capturing details of reusable tools for sharing geospatial data and metadata can, therefore, both help to implement INSPIRE in an interoperable way, as well as offering solutions for other initiatives aiming to share or make use of geospatial data.

1.3.2. Joinup

Joinup is a collaborative platform created by the European Commission and funded by the European Union via the ISA Programme. It offers several services that aim to help e-Government professionals share their experience with each other. In addition, it enables them to find, choose, re-use, develop and implement interoperability solutions.

Joinup involves e-Government and interoperability professionals from all over Europe. Professionals from other countries outside the EU are also welcome to join. It offers relevant content and insight in various areas of interest, including among others:

- Cross-border and cross-sector interactions between public administrations;
- Pan-European electronic public services;
- Legal information on usage and development of open-source software within public administrations;
- Interoperability impact of EU regulations and actions;
- Access to a repository of reusable interoperability solutions;
- Methodologies and practice aids on the development of interoperability solutions;
- Pan-European e-Government projects.

1.3.3. The European Interoperability Reference Architecture (EIRA) and the European Interoperability Cartography (EIC)

The European Commission aims to further support coordination between public administrations in EU institutions and/or Member States on ICT solutions to avoid the risk of creating new digital barriers¹ for administrations, businesses, and citizens, such as the difficulty of data sharing due to processes, data or IT solutions being not interoperable. The ISA² Programme [3] supports the development and maintenance of the **EIRA** [4] and the **EIC**. The EIRA is derived from the European Interoperability Strategy (EIS) and the EIF. The solutions within the EIC follow the EIF principles and comply with specific criteria that can be represented on the EIRA. The EIRA and the EIC are strong enablers to bring about coordination in terms of technical and organisational interoperability, as:

- The **EIRA** defines a common architectural view based on a service oriented reference architecture to cover cross-border and cross-sectorial interoperability needs at European level; and
- The **EIC** is an instrument to map and analyse the interoperability landscape in Europe and to identify solutions that are available and those that are still lacking.

The consistent use of the EIRA and the EIC will create a fuller picture of existing solutions and provide a means to enhance the coordination between public administrations at EU level and/or in Member States in terms of the technologies they are adopting. Better coordination and reusable technologies are envisaged to lead to more interoperable, coherent, effective and efficient digital public services. Such improvements should result in reduced administrative burden and create better services for EU citizens and businesses, while offering cost savings for the taxpayer as public sector efficiency increases and IT spending can potentially be reduced. The EIRA and the EIC will contribute to the DSM and help reduce digital barriers.

The Joinup platform (ISA Action 8.9 – European Collaborative Platform and Catalogue) is envisaged to be where the EIC will reside; thus acting as a one-stop shop for re-usable solutions and examples of best practices.

1.3.4. The ArchiMate modelling language and the Asset Description Metadata Schema (ADMS)

ArchiMate and the ADMS are two languages used to create and describe interoperability building blocks. The EIRA adopts a service oriented architecture style and promotes ArchiMate as a modelling notation. In fact, the architecture building blocks (ABBs) of the EIRA can be seen as an extension of the model concepts in ArchiMate.

The ISA Programme created the ADMS [5] in 2011. The ADMS is a common vocabulary to describe interoperability assets and make them searchable and readily explored by ICT developers.

An application profile of ADMS was developed to extend the use of ADMS for the description of other types of interoperability solutions, meaning solutions covering the political, legal, organisational, information and technical interoperability layers, as defined by the EIF.

1.4. Usage of key concepts

This subsection defines several key concepts and how they are used in the context of this document. The following figure includes these key concepts and depicts their relationships.

¹https://joinup.ec.europa.eu/sites/default/files/isa_field_path/study_presentation_towards_faster_take_up_of_new_egovernment_services.pdf

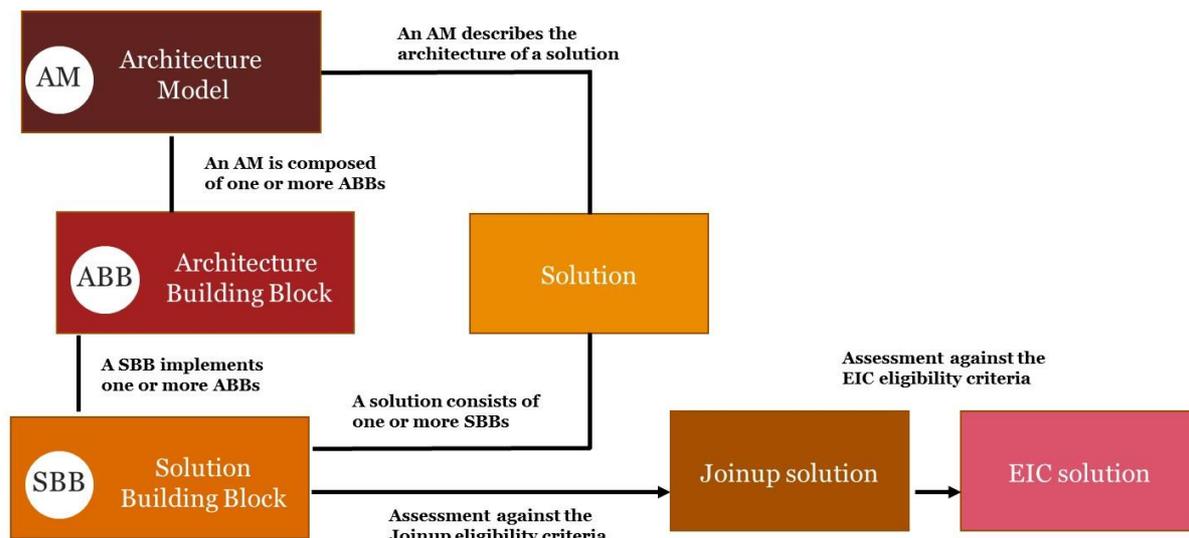


Figure 1: Usage of key concepts

These key concepts are defined as follows:

- **A solution**² is a collection of components organised to accomplish a specific function or set of functions.
- **An architecture model**³ is a formal description of a solution, or a detailed plan of the solution at component level to guide its implementation.
- **An ABB**⁴ typically describes required capability/functionality and shapes the specification of solution building blocks (SBBs).
- **An SBB**⁵ represents components that will be used to implement the required capability/functionality of one or more ABBs.
- **A Joinup solution**⁶ is a solution facilitating cooperation between organisations, either autonomously funded and developed by the ISA² Programme or developed in cooperation with other EU initiatives, based on identified requirements of European public administrations. Solutions have to meet a set of eligibility criteria⁷ to be included within the Joinup catalogue. Currently, Joinup considers the following type of solutions: policy, software, service, specification or standard and guideline or template.
- **An EIC solution**⁸ is a high quality solution that is relevant for and reusable by public administrations, presented in a common format and complying with specific re-usability and interoperability criteria that can be represented on the EIRA. At the time of writing this report the scope of the EIC is being defined. Consequently, it has been considered that the EIC will include the same type of solutions that Joinup includes.

² The Open Group, 'The Open Group Architecture Framework (TOGAF)', 2011: http://pubs.opengroup.org/architecture/togaf9-doc/arch/chap35.html#tag_35

³ The Open Group, 'The Open Group Architecture Framework (TOGAF)', 2011: http://pubs.opengroup.org/architecture/togaf9-doc/arch/chap03.html#tag_03

⁴ The Open Group, 'The Open Group Architecture Framework (TOGAF)', 2011: <http://pubs.opengroup.org/architecture/togaf9-doc/arch/index.html>

⁵ The Open Group, 'The Open Group Architecture Framework (TOGAF)', 2011: <http://pubs.opengroup.org/architecture/togaf9-doc/arch/index.html>

⁶ [2] DECISION (EU) 2015/2240 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL. Article 2, Definitions: <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1449478436536&uri=CELEX:32015D2240>

⁷ Joinup eligibility criteria non-extended version: <https://joinup.ec.europa.eu/page/scope-statement-and-eligibility-criteria>. Joinup eligibility criteria extended version (this document has not been officially published): <https://webgate.ec.europa.eu/CITnet/confluence/display/SEMIC/D02.02+-Updated+Scope+and+eligibility+criteria>

⁸ EIC eligibility criteria (this document has not been officially published): <https://webgate.ec.europa.eu/CITnet/confluence/display/SEMIC/D03.01+-Scoping+Criteria+for+EIC>

1.5. Approach

This subsection briefly explains the approach used to produce the collection of identified reusable location information solutions.

- **Step 1** – Analyse the INSPIRE Technical Guidelines and derive a **list of standards and specifications recommended by INSPIRE** which a) support the development of location-based services or solutions and b) are potential candidates for the Joinup Catalogue of interoperable and reusable solutions (see Section 2).
- **Step 2** – Produce a **list of SDIs** to be investigated for identifying reusable location information solutions (see Section 3.1).
- **Step 3** – Develop an EIRA and INSPIRE based architecture model of a typical SDI to identify reusable location information solutions for publishing location-based data (see Section 3.2).
- **Step 4** – Analyse each of the selected SDIs with the help of the developed EIRA and INSPIRE based architecture model. Identify solution building blocks which realise the architecture model's ABBs, resulting in a **set of SBBs which could potentially be reused** when developing location-enabled solutions and services (see Section 0 and Annexes).
- **Step 5** – Assess the identified SBBs against Joinup's eligibility criteria to derive a **set of reusable location information solutions**, eligible to be published in the Joinup catalogue (see Section 3.4 and Annexes).
- **Step 6** – Derive **recommendations on how the EIRA can be improved** to better reflect concerns related to location, such as ABBs relevant in the context of SDIs (see Section 4).
- **Step 7** – Formulate a **conclusion and next steps** (see Section 5).

1.6. Scope

The work produced in the context of this document is based on the following scope. Two different sources were used to identify reusable location information solutions (see also Figure 2):

- **The INSPIRE Technical Guidelines.** These guidelines are non-binding Technical Guidance (TG) documents which describe detailed implementation aspects and relationships with existing standards, technologies, and practices [6]. Therefore, the INSPIRE TGs were selected as a source to identify standards and specifications, recommended by INSPIRE, as potential candidates to be published in the Joinup Catalogue of interoperable and reusable solutions.
- **A list of identified SDIs.** For the scope of the analysis, a total of 8 SDIs were selected (Section 3.1). These SDIs were then analysed with the help of a developed EIRA and INSPIRE based architecture model to identify reusable solutions to be proposed as candidates for the EIC.

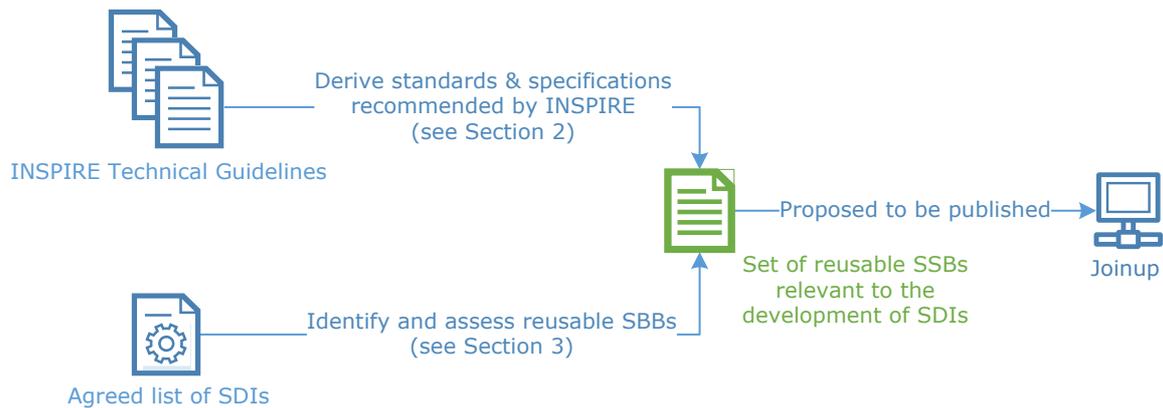


Figure 2: Sources and process to identify solutions proposed to be included on Joinup

2. List of identified standards and specifications based on the INSPIRE Technical Guidelines

This section contains a list of identified standards and specifications, recommended by INSPIRE, to facilitate the development of location-enabled solutions and services. This list is the outcome of the INSPIRE Technical Guidelines analysis.

The **INSPIRE Directive**, Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007, establishes an Infrastructure for Spatial Information in the European Community (INSPIRE) [2]. INSPIRE is one of the largest data harmonisation efforts ever undertaken in Europe, whose main focus is on the sharing and re-use of spatial data and services in support of European environmental policies and policies that affect the environment.

To ensure that Member States' spatial data infrastructures are compatible and usable in a Community and transboundary context, the **Directive requires that common Implementing Rules (IR) are adopted in a number of specific areas** (e.g. Metadata, Data Specifications, Network Services, Data and Service Sharing and Monitoring and Reporting). These IRs are adopted as Commission Decisions or Regulations, and are binding in their entirety.

In addition, **INSPIRE offers non-binding Technical Guidance documents** that describe detailed implementation aspects and relationships with existing standards, technologies, and practices, which in turn are supported by common ABBs and a range of software tools. Variations in technical approaches can create problems for interoperability, as well as activities which miss the benefits of adopting reusable solutions. Capturing details of reusable tools for sharing geospatial data and metadata can, therefore, both help to implement INSPIRE in an interoperable way, as well as offering evidence for other initiatives aiming to share or make use of geospatial data.

In a nutshell, INSPIRE, seen from a legal point of view, can be summarised as a Directive which requires the adoption of regulations and IRs. Non-legally binding Technical Guidelines have been developed to support Member States in implementing the IRs, which can be represented in the EIRA (see Figure 3).

More information about the INSPIRE Directive, Technical Guidelines, IRs, etc. can be found on the [INSPIRE website](#).

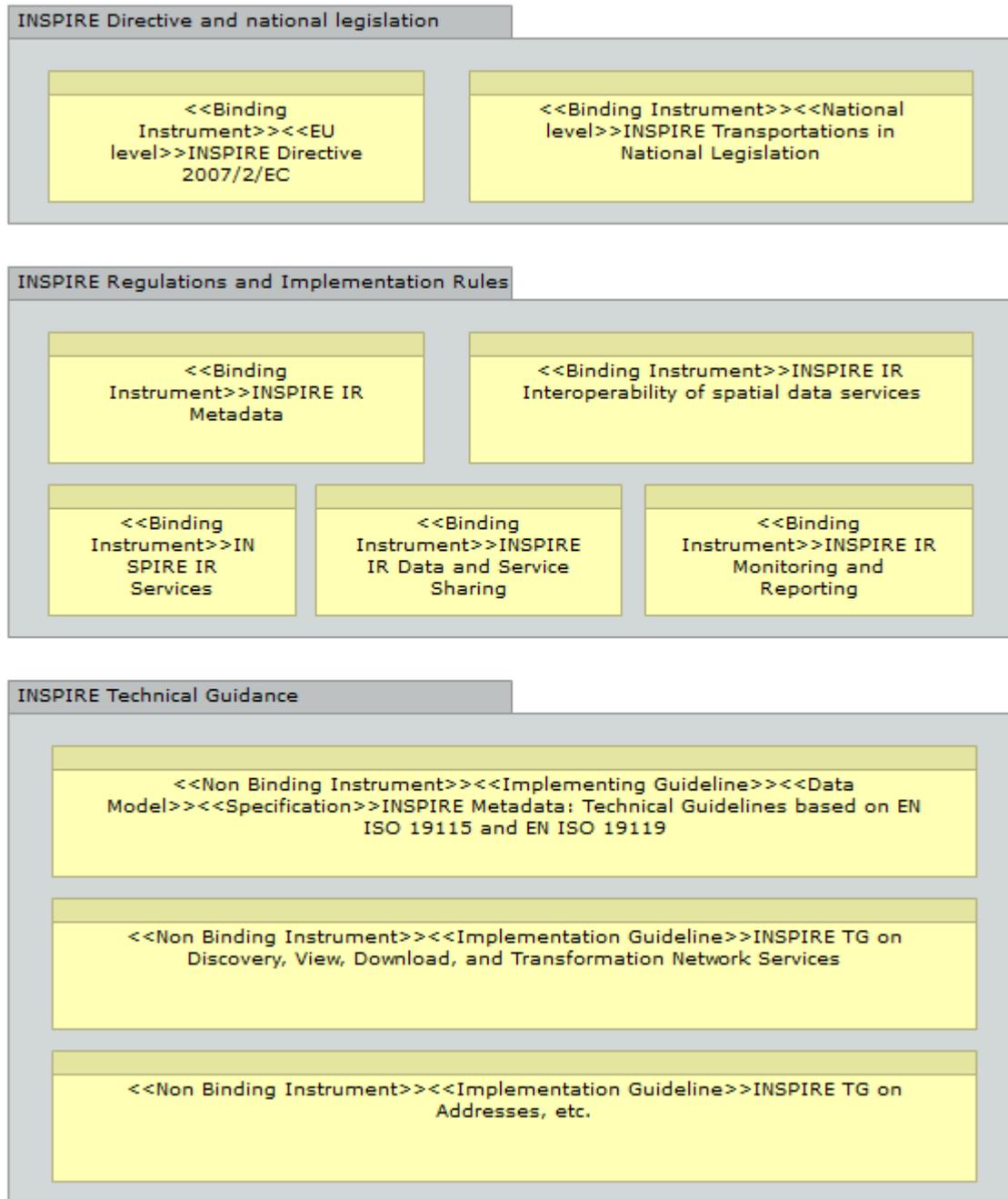


Figure 3: INSPIRE Legal view using ArchiMate and EIRA

The analysis of the INSPIRE Technical Guidelines identified a total of 32 standards and specifications, listed in the table below. These standards and specifications recommended by INSPIRE could be proposed for publishing in the Joinup Catalogue of reusable and interoperable solutions. Note that each standard and specification needs to be assessed against Joinup's eligibility criteria. They can only be published on Joinup, if they meet these criteria.

Table 1: List of identified standards and specifications based on the INSPIRE Technical Guidelines

	Standard / specification	Example Technical Guidelines document
1	EN ISO 19115	Metadata
2	EN ISO 19119	Metadata
3	ISO 639-2/B	Monitoring and Reporting
4	ISO 19131 Geographic information - Data product specifications	Data Specifications
5	ISO 19156 - Observations and Measurements standard	Data Specifications
6	ISO 2533:1975 - International Standard Atmosphere	Data Specifications
7	ISO 8601 - Data elements and interchange formats	Data Specifications
8	ISO 19118	Data Specifications
9	UML – Unified Modelling Language	Data Specifications
10	GML - Geography Markup Language	Data Specifications, Network services
11	OCL – Object Constraint Language	Data Specifications
12	Universal Postal Union (UPU) standard S.42 - International postal address ABBs and templates	Data Specifications - Addresses
13	EN ISO 19111	Data Specifications - Addresses
14	ISO/DS 19152 – Geographical Information, Land Administration Domain Model	Data Specifications – Cadastral Parcels
15	ISO/CEN 19152	Data Specifications – Cadastral Parcels
16	ISO/CEN LADM	Data Specifications – Cadastral Parcels
17	GRIB - WMO standard for gridded data exchange GRIdded Binary	Data Specifications – Geographical Grid Systems

	Standard / specification	Example Technical Guidelines document
18	NetCDF – Network Common Data Form	Data Specifications – Geographical Grid Systems
19	European Grid	Data Specifications – Geographical Grid Systems
20	IHO - Transfer Standard for digital Hydrographic Data	Data Specifications – Hydrography
21	ISO 19148 - Linear referencing	Data Specifications – Transport Networks
22	SOAP Framework	Network services
23	WSDL request	Network services
24	Web Services Addressing	Network services
25	RIF – Rule Interchange Format	Network services
26	Open Geospatial Consortium (OGC) Simple Features Interface Standard (SFS)	Network services
27	ebXML – Electronic Business using eXtensible markup	Network services
28	MOF – Meta-Object Facility	Network services
29	QVT – Query/View/Transform	Network services
30	UUID – Universally Unique Identifier	Network services
31	XMI – XML Metadata Interchange	Network services
32	ISO/TS 19139	Data specification

3. Reusable ABBs and solutions for spatial data infrastructures

This section first explains what an SDI is and lists the analysed SDIs (Section 3.1). It then defines an EIRA and INSPIRE based architecture model (for a typical SDI) used to identify reusable location information solutions (for publishing location-based data) from the selected SDIs (Section 3.2). In addition, this section lists the identified SBBs (Section 0) and includes their reusability assessment (Section 3.4).

The following figure illustrates the approach followed to identify reusable location information solutions from real-life implemented SDIs with the help of the developed EIRA and INSPIRE based architecture model.

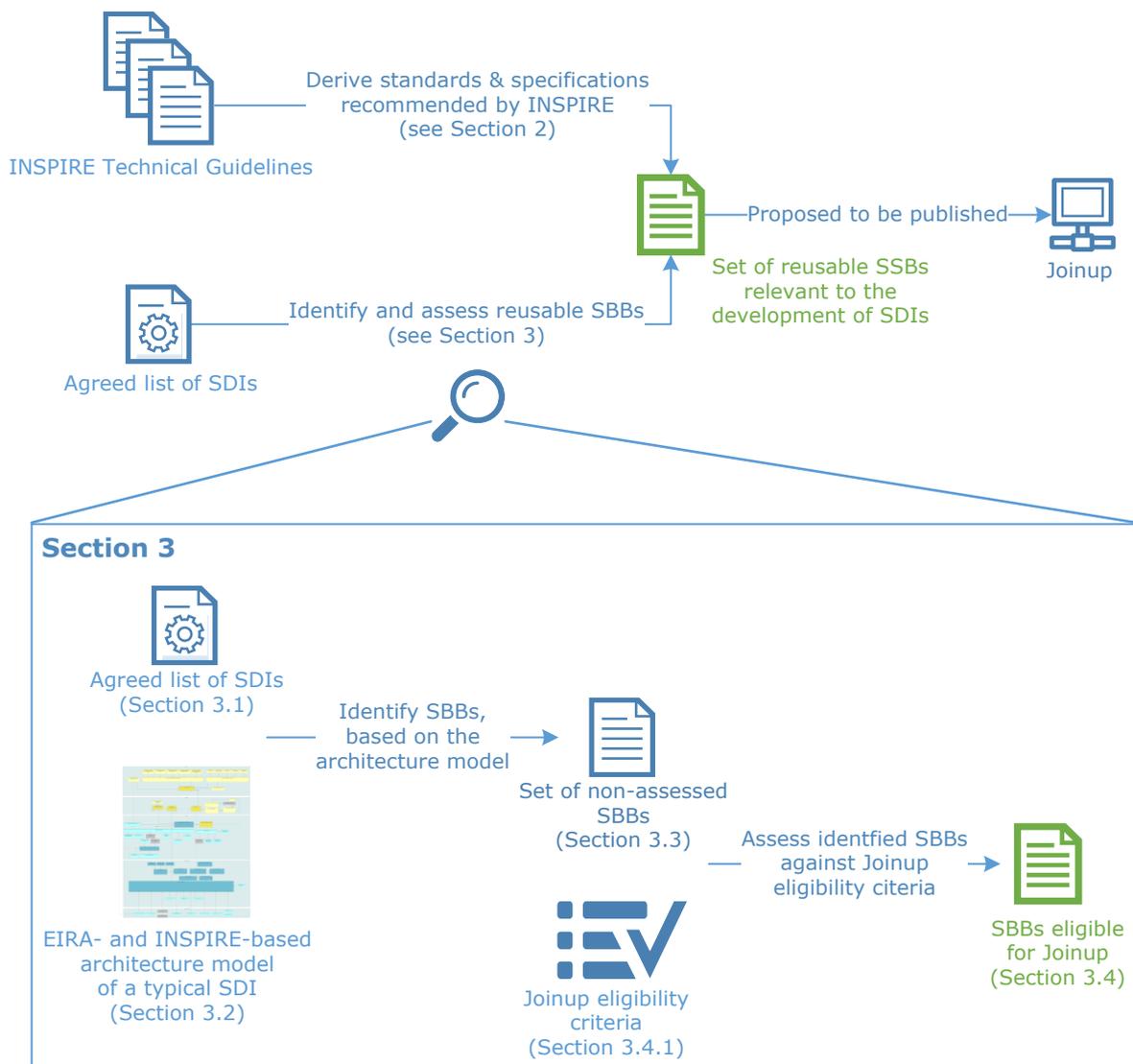


Figure 4: Approach to identify reusable location information solutions from implemented SDIs

3.1. Spatial Data Infrastructures

According to the [Global Spatial Data Infrastructure](#) (GSDI) association, an SDI “hosts geographic data and attributes, sufficient documentation (metadata), a means to discover, visualise, and evaluate the data (catalogues and web mapping), and some method to provide access to the geographic data. Beyond this are additional services or software to support application of the data. To make an SDI functional, it must also include the organisational agreements needed to coordinate and administer it on a local, regional, national, and or trans-national scale.” [7]. SDIs also exist for thematic communities (e.g. marine, geology, space). They may stand alone as infrastructures or be part of (= embedded in) national information infrastructures (e.g. UK) or international information infrastructures (e.g. data accessible through the European Data Portal).

According to Longley et al. [8] there are over 150 SDIs identified in literature. However only a subset was selected to be in scope for identifying reusable location information solutions.

Note: Global SDIs were considered as out of scope for this analysis. However the list of SDIs to be analysed had to include both national and cross-borders SDIs. In addition, the INSPIRE Directive was included, as it supports the establishment of an SDI at the European level and because most of the ABBs of the developed architecture model are derived from the INSPIRE Directive and related documentation.

Table 2 lists the SDIs that were selected for analysis. The sources to identify reusable location information solutions are included in the “Documentation studied” column. In addition, the SDI’s official websites were checked.

Table 2: List of SDIs to be analysed

	Level	SDI	In scope?	Documentation studied
1	European	INSPIRE	Y ⁹	http://inspire.ec.europa.eu
2	National	Czech Republic – National Geo-Information Structure	Y	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11CZv112.pdf
3	National	Denmark - Danish Academy for Spatial Information (DAiSI)	Y	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11DKv123.pdf
4	National	The Netherlands Geonovum (NGII)	Y	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11NLv123.pdf
5	National	UK – The UK Location Infrastructure (UKLI)	Y	https://data.gov.uk/location
6	National	UK - The UK Location Strategy	Y	https://data.gov.uk/sites/default/files/uk-location-strategy_10.pdf

⁹ INSPIRE served as input for the architecture model used to identify reusable location information solutions from real-life implemented SDIs (see Section 3.2)

	Level	SDI	In scope?	Documentation studied
				http://inspire.ec.europa.eu/events/conferences/inspire_2011/presentations/238.pdf
7	Cross-border	Danube Reference Data and Service Infrastructure (DRDSI)	Y	https://ec.europa.eu/jrc/sites/default/files/jrc-danube-reference-data-service-infrastructure.pdf http://www.geo-solutions.it/portfolio/jrc-portal-mapstore-ckan/
8	Cross-border	Geomatic Regional Partnership project (GRISI)	Y	http://www.grisi.org
9	Cross-border	North-Rhine Westphalia SDI	Y	http://www.ec-gis.org/Workshops/9ec-gis/papers/pd_portele.pdf
10	Cross-border	X-Border-GDI project	Y	http://inspire.ec.europa.eu/events/conferences/inspire_2010/presentations/WS-eSDI-Net+-X-border-GDI.pdf

Next to these identified SDIs, [eSDI-NET+](#) should be mentioned. eSDI-NET+ is a network part of the eSDI-NET project and aims to promote cross-border dialogue and exchange of best practices on SDIs throughout Europe. It offers the SDI Best Practice Database, i.e. a database that summarises the results of the SDI analysis and selection process performed by eSDI-Net+. This public version of the database contains a subset of the collected data of the SDIs analysed, approved by the SDI owners. European SDI Best Practices are documented and categorised according to the criteria and indicators based on the common methodology for the evaluation of SDI solutions.

3.2. EIRA and INSPIRE based architecture model of a typical SDI

This subsection describes the developed EIRA and INSPIRE based architecture model (of a typical SDI) used as a basis to assess the selected SDIs and to identify SBBs (for publishing location-based data) which could potentially be reused.

As discussed in Section 1.4, an architecture model consists of one or more ABBs. An SBB can be defined as a concrete element that implements the required capabilities / functionalities of one or more ABBs.

An SDI can be described with the help of an architecture model which consists of a set of important ABBs needed to fulfil the SDI's objective [9]. This set of ABBs covers people (users), standards, policies, access network, data and financial resources.

The architecture model uses ArchiMate as the modelling language and consists of the EIRA ABBs. Where needed, the architecture model was extended with non-EIRA ABBs, mostly derived from INSPIRE, to ensure the model sufficiently addresses the aspects related to location. These non-EIRA ABBs have been coloured in grey in Figure 6 and have been identified as I and SK in Table 3. Hence, the architecture model identifies the most commonly used ABBs that an INSPIRE-based SDI could have.

Note: The sole purpose of this architecture model is to decompose SDIs via ABBs to help identify reusable location information solutions. In addition, the architecture model is only focusing on the provision of location information (see v1.0 in Figure 5). Other aspects, such as the usage of location information or governance, are currently out of scope. It also does not describe a complete INSPIRE SDI reference model. However, the architecture model could be extended in the future (see v2.0 in Figure 5).

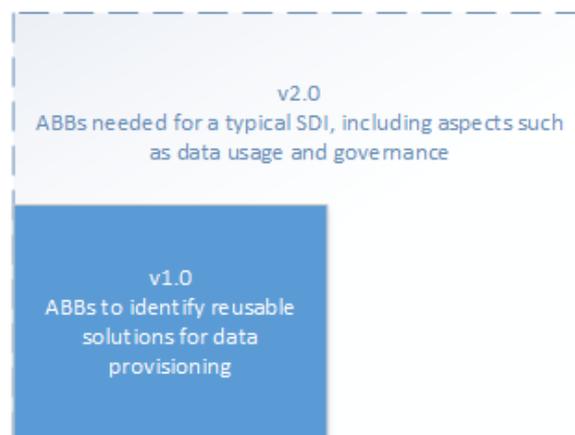


Figure 5: Architecture model – versions and scope

Figure 6 depicts a high-level view of the developed architecture model. A PDF-version and the corresponding ArchiMate file of this architecture model can be found on Confluence¹⁰. Being based on the EIRA, the architecture model consists of a) the different EIRA views (large grey horizontal boxes), i.e. the legal, organisational, semantic and technical (application and infrastructure) views, and b) their respective ABBs.

¹⁰ <https://webgate.ec.europa.eu/CITnet/confluence/x/J4M2Hq>

Table 3: ABB source classification

Identification	Name	Explanation
I&E	INSPIRE and EIRA	ABB is defined by INSPIRE and is mapped to a corresponding EIRA ABB.
I	INSPIRE	ABB is defined by INSPIRE, but does not have a corresponding ABB within the EIRA. A new ABB has been added to the model.
SK&E	SDI knowledge and EIRA	ABB is defined with the help of SDI knowledge (not based on INSPIRE) and is mapped to a corresponding EIRA ABB.
SK	SDI knowledge	ABB is defined with the help of SDI knowledge (not based on INSPIRE). However, neither a corresponding INSPIRE definition nor a corresponding ABB within the EIRA exists. A new ABB has been added to the model.

3.2.1. Legal view

This subsection provides a source (first table) and definition (second table) for each ABB of the legal view.

Table 4: List of ABBs/sources – Legal view

Building Block Name	EIRA	INSPIRE	SDI Knowledge
INSPIRE Framework Documents	X	X	
INSPIRE Technical Guidance	X	X	
INSPIRE Metadata: Technical Guidelines based on EN ISO 19115 and EN ISO 19119	X	X	
Methodology for the development of data specification	X	X	
INSPIRE TG on Discovery, View, Download, and Transformation Network Services	X	X	
TG for INSPIRE Spatial Data Services and services allowing spatial data services to be invoked	X	X	
INSPIRE Regulations and Implementing Rules	X	X	
INSPIRE IR Metadata	X	X	

Building Block Name	EIRA	INSPIRE	SDI Knowledge
INSPIRE IR Interoperability of spatial data services	X	X	
INSPIRE IR Network services	X	X	
INSPIRE IR Data and Service Sharing	X	X	
INSPIRE IR Monitoring and Reporting	X	X	
INSPIRE Directive 2007/2/EC	X	X	
INSPIRE Policy	X	X	

Table 5: List of ABBs/definitions – Legal view

Building Block Name	Definition
INSPIRE Framework Documents (I&E)	<p>Source: INSPIRE Data Specification - Framework documents: http://inspire.ec.europa.eu/index.cfm/pageid/2 Network Services - Framework documents: http://inspire.ec.europa.eu/index.cfm/pageid/5</p> <p>Based on EIRA Building Block (BB) Non-Binding Instrument (A Non-binding Instrument is a set of recommendations and opinions, as well as rules governing how EU institutions and programmes work, etc.) and Implementation Guideline (An Implementing Guideline is a set of instructions that provides insight into how to implement a policy).</p>
INSPIRE Technical Guidance (I&E)	<p>Source: INSPIRE Technical guidelines for the implementation of INSPIRE. http://inspire.ec.europa.eu/Technical-Guidelines/Data-Specifications/2892</p> <p>Based on EIRA BB Non-Binding Instrument (A Non-binding Instrument is a set of recommendations and opinions, as well as rules governing how EU institutions and programmes work, etc.) and Implementation Guideline (An Implementing Guideline is a set of instructions that provides insight into how to implement a policy).</p>
INSPIRE Metadata: Technical	<p>Source : INSPIRE http://inspire.ec.europa.eu/documents/Metadata/MD_IR_and_ISO_20131029.pdf</p>

<p>Guidelines based on EN ISO 19115 and EN ISO 19119 (I&E)</p>	<p>Based on EIRA BB Non-Binding Instrument (A Non-binding Instrument is a set of recommendations and opinions, as well as rules governing how EU institutions and programmes work, etc.), Implementation Guideline (An Implementing Guideline is a set of instructions that provides insight into how to implement a policy), Data Model (A Data Model includes formal data names, comprehensive data definitions, proper data structures and precise data integrity rules) and Specification (A Technical Specification is a document describing the functional/technical specifications of a solution).</p>
<p>Methodology for the development of data specification (I&E)</p>	<p>Source: INSPIRE http://inspire.ec.europa.eu/index.cfm/pageid/2</p> <p>Based on EIRA BB Non-Binding Instrument (A Non-binding Instrument is a set of recommendations and opinions, as well as rules governing how EU institutions and programmes work, etc.) and Implementation Guideline (An Implementing Guideline is a set of instructions that provides insight into how to implement a policy).</p>
<p>INSPIRE TG on Discovery, View, Download, and Transformation Network Services (I&E)</p>	<p>Source: INSPIRE http://inspire.ec.europa.eu/index.cfm/pageid/5</p> <p>Based on EIRA BB Non-Binding Instrument (A Non-binding Instrument is a set of recommendations and opinions, as well as rules governing how EU institutions and programmes work, etc.) and Implementation Guideline (An Implementing Guideline is a set of instructions that provides insight into how to implement a policy).</p>
<p>TG for INSPIRE Spatial Data Services and services allowing spatial data services to be invoked (I&E)</p>	<p>Source: INSPIRE http://inspire.ec.europa.eu/documents/Spatial_Data_Services/TG_for_INSPIRE_SDS_3_1.pdf</p> <p>Based on EIRA BB Non-Binding Instrument (A Non-binding Instrument is a set of recommendations and opinions, as well as rules governing how EU institutions and programmes work, etc.) and Implementation Guideline (An Implementing Guideline is a set of instructions that provides insight into how to implement a policy).</p>
<p>INSPIRE Regulations and Implementing Rules (I&E)</p>	<p>Source: INSPIRE http://inspire.ec.europa.eu/inspire-implementing-rules/51763</p> <p>To ensure that the spatial data infrastructures of the Member States are compatible and usable in a Community and</p>

	<p>transboundary context, the Directive requires that common IR are adopted in a number of specific areas:</p> <ul style="list-style-type: none"> - Metadata - Interoperability of spatial data services - Data Specifications - Network Services - Data and Service Sharing - Monitoring and Reporting <p>These IRs were adopted as Commission Decisions or Regulations, and are binding in their entirety. The Commission was assisted in the process of adopting such rules by a regulatory committee composed of representatives of the Member States and chaired by a representative of the Commission.</p> <p>http://inspire.ec.europa.eu/inspire-implementing-rules/51763</p> <p>Based on EIRA BB Binding Instrument (A Binding Instrument is a legal instrument that expresses something which is obligatory).</p>
<p>INSPIRE IR Metadata (I&E)</p>	<p>Source: INSPIRE http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008R1205&from=EN</p> <p>Based on EIRA BB Binding Instrument.</p>
<p>INSPIRE IR Interoperability of spatial data services (I&E)</p>	<p>Source: INSPIRE http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R1312&from=EN</p> <p>Based on EIRA BB Binding Instrument.</p>
<p>INSPIRE IR Network services (I&E)</p>	<p>Source: INSPIRE http://inspire.ec.europa.eu/index.cfm/pageid/5 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009R0976&from=EN</p> <p>Based on EIRA BB Binding Instrument.</p>
<p>INSPIRE IR Data and Service Sharing (I&E)</p>	<p>Source: INSPIRE http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010R0268&from=EN</p> <p>Based on EIRA BB Binding Instrument.</p>
<p>INSPIRE IR Monitoring and Reporting (I&E)</p>	<p>Source: INSPIRE http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:148:0018:0026:EN:PDF</p>

	Based on EIRA BB Binding Instrument .
INSPIRE Directive 2007/2/EC (I&E)	<p>Source: INSPIRE http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32007L0002&from=EN http://inspire.ec.europa.eu/index.cfm</p> <p>Based on EIRA BB Binding Instrument.</p>
INSPIRE Policy (I&E)	<p>Source: INSPIRE http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32007L0002&from=EN http://inspire.ec.europa.eu/index.cfm</p> <p>Needed EIRA focal ABB, creating the interconnections to the Organisational view.</p> <p>Based on EIRA BB Public Policy (A Public Policy is the whole of actions under a policy domain taken by a public authority to bring about social change in the medium and long term. It is based on certain values and objectives and is implemented using a variety of methods. It applies on the territory within which the authority is authorised to act).</p>

3.2.2. Organisational view

This subsection provides a source (first table) and definition (second table) for each ABB of the organisational view.

Table 6: List of ABBs/sources – Organisational view

Building Block Name	EIRA	INSPIRE	SDI Knowledge
Spatial data set	X	X	
Administrative Units	X	X	
Business Capability	X		X
Business Information Exchange	X		X
Public Service	X		X
Partner Organisations	X		X
Service Delivery Model	X		X
Partnering agreement / Service level agreement (SLA) / Terms of agreement	X		X

Building Block Name	EIRA	INSPIRE	SDI Knowledge
Public Service Provider / Data provider	X	X	X
Consumer	X		X

Table 7: List of ABBs/definitions – Organisational view

Building Block Name	Definition
Spatial data set (I&E)	<p>Source: INSPIRE An identifiable collection of spatial data.</p> <p>Needed EIRA focal ABB, creating the interconnections to the Semantic view.</p> <p>Based on EIRA BB Business Information (Business Information is a piece of business data or a group of pieces of business data with a unique business semantics definition in a specific business context).</p>
Administrative Units (I)	<p>Source: INSPIRE Units of administration, dividing areas where Member States have and/or exercise jurisdictional rights, for local, regional and national governance, separated by administrative boundaries.</p>
Business Capability (SK&E)	<p>Source: SDI Knowledge Needed EIRA focal ABB, creating the interconnections to the Technical – application view.</p> <p>Based on EIRA BB Business Capability (Business Capability is the expression or the articulation of the capacity, materials and expertise an organisation needs to perform core functions. Enterprise architects use business capabilities to illustrate the overarching needs of the business to better strategise IT solutions that meet those business needs).</p>
Business Information Exchange (SK&E)	<p>Source: SDI Knowledge Needed EIRA focal ABB, creating the interconnections to the Technical – application view.</p> <p>Based on EIRA BB Business Information Exchange (A Business Information Exchange is an interaction between two or more public administrations, businesses or citizens).</p>
Public Service (SK&E)	<p>Source: SDI Knowledge</p>

Building Block Name	Definition
	<p>Needed EIRA focal ABB, creating the interconnections to the Legal view and Technical – application view.</p> <p>Based on EIRA BB Public Service (A public service is an economic activity that public authorities identify as being of particular importance to citizens, businesses and public administrations and that would not be supplied (or would be supplied under different conditions) if there were no public intervention. A public service is also the capacity to carry out a procedure and exists whether it is used or not. It is a set of deeds and acts performed by or on behalf of a public agency for the benefit of a citizen, a business or another public agency).</p> <p>http://ec.europa.eu/competition/state_aid/overview/public_services_en.html</p> <p>https://joinup.ec.europa.eu/site/core_public_service/rdfs.html#PublicService</p>
Partner Organisations (SK&E)	<p>Source: SDI Knowledge</p> <p>Based on EIRA BB Organisation (An Organisation is an entity that provides and/or consumes Public Services), Business (A Business is an organisational entity that provides and/or consumes Public Services. This includes non-governmental organisations and not-for-profit organisations) and Citizen (A Citizen is a consumer of Public Services).</p>
Service Delivery Model (SK&E)	<p>Source: SDI Knowledge</p> <p>Based on EIRA BB Service Delivery Model (A Service Delivery Model defines how the organisation arranges the delivery of its services to service consumers. This includes:</p> <ul style="list-style-type: none"> - How will the service be delivered (e.g. multi-channel, SPOCs, only once)? - How will the interaction between the service provider and service consumer take place? - How will certain situations be handled (e.g. incident management)? - What will the support & maintenance look like? [ITIL v3]).
Partnering agreement / SLA / Terms of agreement (SK&E)	<p>Source: SDI Knowledge</p> <p>Based on EIRA BB (An Interoperability Agreement is the means through which organisations (public administrations, or businesses) formalise the cooperation with one another. These agreements aim at the development of interoperability solutions, which meets the functional / technical requirements and needs of one another.)</p>

Building Block Name	Definition
	<p>The EIRA differentiates the following Interoperability Agreements:</p> <ul style="list-style-type: none"> - Interoperability Service Agreement (between Public Service Consumers and Public Service Providers; - Interoperability Collaboration Agreement (between Organisations); or - Interoperability Provider Agreement (between Public Service Providers).
Data provider (SK&E)	<p>Source: SDI Knowledge http://ec.europa.eu/competition/state_aid/overview/public_services_en.html</p> <p>Based on EIRA BB Public Service Provider (A Public Service Provider is a Public Administration or Business providing Public Services financed through public resource).</p>
Consumer (SK&E)	<p>Source: SDI Knowledge based on EIF 2.0 http://ec.europa.eu/isa/documents/isa_annex_ii_eif_en.pdf</p> <p><u>Based on EIRA BB Public Service Consumer</u> (A Public Service Consumer is a Public Administration, Business or Citizen consuming public services).</p>

3.2.3. Semantic view

This subsection provides a source (first table) and definition (second table) for each ABB of the semantic view.

Table 8: List of ABBs/sources – Semantic view

Building Block Name	EIRA	INSPIRE	SDI Knowledge
INSPIRE framework documents	X	X	
INSPIRE data specifications	X	X	
Reference systems, units of measure and geographic grid systems	X	X	
Encoding	X		X
Identifier Management	X	X	
Data Quality	X	X	
Portrayal	X		X

Building Block Name	EIRA	INSPIRE	SDI Knowledge
Representation	X		X
Organisation data policy on privacy, licensing....	X		X
Data Model	X	X	X
ISO/OGC/CEN standards (Foundation schemas)	X	X	
INSPIRE RDF and metadata RDF vocabularies (Linked Data)	X	X	
INSPIRE GML application schema's and metadata ISO/xml schemas (INSPIRE)	X	X	
Metadata schema			X
Metadata		X	
INSPIRE Discovery Metadata	X	X	
INSPIRE Evaluation and Use Metadata		X	
Data	X	X	X
SDI Registry	X	X	
Spatial Data set / Authentic Data source	X	X	

Table 9: List of ABBs/definitions – Semantic view

Building Block Name	Definition
INSPIRE framework documents (I&E)	<p>Source: INSPIRE</p> <p>The INSPIRE infrastructure involves a number of items, which require clear descriptions and the possibility to be referenced through unique identifiers. Examples for such items include INSPIRE themes, code lists, application schemas or discovery services. Registers provide a means to assign identifiers to items and their labels, definitions and descriptions (in different languages). The INSPIRE registry provides a central access point to a number of centrally managed INSPIRE registers. The content of these registers are based on the INSPIRE Directive, Implementing Rules and Technical Guidelines.</p> <p>http://inspire.ec.europa.eu/registry</p>

Building Block Name	Definition
	Based on EIRA BB Data Standard Catalogue (A Data Standard Catalogue is a catalogue of Data Standards).
INSPIRE data specifications (I&E)	<p>Source: INSPIRE INSPIRE Technical Guidelines on data specifications e.g. Addresses, Administrative Units, Cadastral Parcels, Coordinate Reference Systems, Geographical Grid Systems, Geographical Names, Hydrography, Protected Sites and Transport Networks. http://inspire.ec.europa.eu/data-specifications/2892</p> <p>Based on EIRA BB Data Standard (A data standard is a structural metadata specification that describes or defines other data).</p>
Reference systems, units of measure and geographic grid systems (I&E)	<p>Source: INSPIRE Systems for uniquely referencing spatial information in space as a set of coordinates (x, y, z) and/or latitude and longitude and height, based on a geodetic horizontal and vertical datum.</p> <p>Based on EIRA BB Data Standard (A data standard is a structural metadata specification that describes or defines other data).</p>
Encoding (SK&E)	<p>Source: SDI Knowledge</p> <p>Based on EIRA BB Syntax Encoding Scheme (A Syntax Encoding Scheme indicates that the value is a string formatted in accordance with a formal notation).</p>
Identifier Management (I&E)	<p>Source: INSPIRE It is important for the INSPIRE ID and the work on RDF and PIDs in ARE3NA.</p> <p>Based on EIRA BB Data Standard (A data standard is a structural metadata specification that describes or defines other data).</p>
Data Quality (I&E)	<p>Source: INSPIRE http://inspire.ec.europa.eu/documents/INSPIRE/_JRC83209_Online_Data_quality_in_INSPIRE.pdf</p> <p>Based on EIRA BB Data Standard (A data standard is a structural metadata specification that describes or defines other data).</p>
Portrayal (SK&E)	<p>Source: SDI Knowledge</p> <p>Based on EIRA BB Data Standard (A data standard is a structural metadata specification that describes or defines other data).</p>
Representation (SK&E)	<p>Source: SDI Knowledge XML, (Geo) JSON, N3 Triples, TIFF, JPEG...</p>

Building Block Name	Definition
	<p>Needed EIRA focal ABB, creating the interconnections to the Organisational and Technical – application view.</p> <p>Based on EIRA BB Representation (A Representation is a physical embodiment or manifestation of data).</p>
<p>Organisation data policy on privacy, licensing.... (SK&E)</p>	<p>Source: SDI Knowledge</p> <p>Needed EIRA focal ABB, creating the interconnections to the Organisational view.</p> <p>Based on EIRA BB Data Policy (A data policy is a short statement of management intent and fundamental rules governing the creation, acquisition, integrity, security, quality, and use of data and information). A data policy can be among others the following:</p> <ul style="list-style-type: none"> - Information security policy; - Privacy policy; - Licensing and charging policy; - Data quality policy; - Metadata management policy.
<p>Data Model (I&E)</p>	<p>Source: INSPIRE</p> <p>Chapter 5 of INSPIRE Data Specifications, i.e. Data content & structure.</p> <p>Based on EIRA BB Data Model (A Data Model includes formal data names, comprehensive data definitions, proper data structures and precise data integrity rules).</p>
<p>ISO/OGC/CEN standards (Foundation schemas) (I&E)</p>	<p>Source: INSPIRE</p> <p>Based on EIRA BB Core Data Model (A context-neutral data model that captures the fundamental characteristics of an entity).</p>
<p>INSPIRE RDF and metadata RDF vocabularies (Linked Data) (I&E)</p>	<p>Source: INSPIRE</p> <p>Based on EIRA BB Data Model (A Data Model includes formal data names, comprehensive data definitions, proper data structures and precise data integrity rules).</p>
<p>INSPIRE GML application schema's and</p>	<p>Source: INSPIRE</p>

Building Block Name	Definition
metadata ISO/xml schemas (INSPIRE) (I&E)	Based on EIRA BB Data Model (A Data Model includes formal data names, comprehensive data definitions, proper data structures and precise data integrity rules).
Metadata schema (SK)	Source: SDI Knowledge Data model by which the metadata is structured, e.g. DCAT/GeoDCAT.
Metadata (I)	Source: INSPIRE It means information describing spatial data sets and spatial data services and making it possible to discover, inventory and use them. According to INSPIRE Generic Conceptual Model (GCM), this ABB will cover metadata on the following levels: - Discovery - Evaluation - Use Metadata associated with individual spatial objects will be described as part of the application schemas.
INSPIRE Discovery Metadata (I&E)	Source: INSPIRE According to INSPIRE GCM, this ABB will cover metadata on the discovery level. Based on EIRA BB Descriptive Metadata (Descriptive metadata describes a resource for purposes such as discovery and identification. It can include elements such as title, abstract, author, and keywords).
INSPIRE Evaluation and Use Metadata (I)	Source: INSPIRE According to INSPIRE GCM, this ABB will cover metadata on the evaluation and use levels.
Data (I&E)	Source: INSPIRE Based on EIRA BB Data (Data are facts represented as text, numbers, graphics, images, sound, video or geometric objects).
SDI Registry (I&E)	Source: INSPIRE INSPIRE Registry is a specialisation of an SDI Registry. Based on EIRA BB Reference Data (Reference Data is any data used to organise or categorise other data, or for relating data to information both within and beyond the boundaries of the enterprise).

Building Block Name	Definition
Spatial Data set / Authentic Data source (I&E)	<p>Source: INSPIRE</p> <p>Published quality levels of each spatial data set using the criteria defined in the ISO 19100 series of standards, including completeness, consistency, currency and accuracy. This will include methods of best practice in publishing:</p> <ul style="list-style-type: none"> - Acceptable quality levels of each spatial data set - Attainment against those levels for reach spatial data set. <p>Quality information associated with individual spatial objects is part of the metadata associated with respective spatial objects (see ABB "Metadata") and will in general be described as part of the application schema.</p> <p>Based on EIRA BB Data Set (A Data Set is a collection of data, published or curated by a single agent, and available for access or download in one or more formats).</p>

3.2.4. Technical view – Application

This subsection provides a source (first table) and definition (second table) for each ABB of the technical - application view.

Table 10: List of ABBs/sources – Technical view – Application

Building Block Name	EIRA	INSPIRE	SDI Knowledge
Spatial Data Service	X	X	
API	X		X
Web interface / Desktop / Mobile	X		X
SDI	X		X
GIS Application	X		X
Data Portal	X		X
Geoportal	X		X
Sector based Geoportal (not INSPIRE)	X		X
National Geoportal (not INSPIRE)	X		X
INSPIRE EU Geoportal	X	X	
Discovery of services	X	X	
Data validator (Conformance)	X		X

Building Block Name	EIRA	INSPIRE	SDI Knowledge
Transformation service	X	X	

Table 11: List of ABBs/definitions – Technical view – Application

Building Block Name	Definition
Spatial Data Service (I&E)	<p>Source: INSPIRE</p> <p>Operations which may be performed, by invoking a computer application, on the spatial data contained in spatial data sets or on the related metadata.</p> <p>Based on EIRA BB Application Service (An Application Service is an externally visible unit of functionality, provided by one or more application ABBs).</p>
API (SK&E)	<p>Source: SDI Knowledge</p> <p>Based on EIRA BB Machine to Machine Interface (A Machine to Machine Interface is a description of a boundary between a system and other systems, usually including the mechanisms by which information is transferred).</p>
Web interface / Desktop / Mobile (SK&E)	<p>Source: SDI Knowledge</p> <p>Based on EIRA BB Human Interface (A Human Interface is a specific interface between the human users of an IT system and the programs providing screen or printed results).</p>
SDI (SK&E)	<p>Source: SDI Knowledge</p> <p>Hosts geographic data and attributes, sufficient documentation (metadata), a means to discover, visualise, and evaluate the data (catalogues and Web mapping), and some method to provide access to the geographic data.</p> <p>Needed EIRA focal ABB, creating the interconnections to the Technical - application view.</p> <p>Based on EIRA BB Interoperable European Solution (An Interoperable European Solution (IES) is a solution, developed by Public Administrations that facilitate the delivery of electronic Public Services and cross-border exchange of information between Public Administrations (or Citizens) in support to the implementation and advancement of EU, national or local Public Policies).</p>
GIS Application (SK&E)	<p>Source: SDI Knowledge</p>

Building Block Name	Definition
	<p>A Geographical Information System (GIS) is a system designed to capture, store, manipulate, analyse, manage, and present all types of spatial or geographical data.</p> <p>Based on EIRA BB Application Service (An Application Service is an externally visible unit of functionality, provided by one or more application ABBs).</p>
Data Portal (SK&E)	<p>Source: SDI Knowledge</p> <p>Web portal used to find and access information via the Internet, not only associated to geographic services (display, analysis, and in some cases content editing, e.g. OpenStreetMap), but with the publication of any type of data. It may also contain transactional capabilities, such as public service applications.</p> <p>Based on EIRA BB Application Service (An Application Service is an externally visible unit of functionality, provided by one or more application ABBs).</p>
Geoportal (SK&E)	<p>Source: SDI Knowledge</p> <p>A geoportal is a type of web portal used to find and access geographic information (geospatial information) and associated geographic services (display, editing, analysis, etc.) via the Internet. Geoportals are important for the effective use of GIS and a key element of SDIs. The EU INSPIRE Geoportal is an example of this ABB.</p> <p>Based on EIRA BB Application Service (An Application Service is an externally visible unit of functionality, provided by one or more application ABBs).</p>
Sector based Geoportal (not INSPIRE) (SK&E)	<p>Source: SDI Knowledge</p> <p>Geoportal oriented to a certain sector.</p> <p>Based on EIRA BB Application Service (An Application Service is an externally visible unit of functionality, provided by one or more application ABBs).</p>
National Geoportal (not INSPIRE) (SK&E)	<p>Source: SDI Knowledge</p> <p>Geoportal oriented to a certain country.</p> <p>Based on EIRA BB Application Service (An Application Service is an externally visible unit of functionality, provided by one or more application ABBs).</p>
INSPIRE EU Geoportal	<p>Source: INSPIRE</p>

Building Block Name	Definition
(I&E)	<p>The INSPIRE geoportal provides the means to search for spatial data sets and spatial data services, and subject to access restrictions, to view spatial data sets from the EU Member States within the framework of the INSPIRE Directive.</p> <p>Based on EIRA BB Application Service (An Application Service is an externally visible unit of functionality, provided by one or more application ABBs).</p>
Discovery of services (I&E)	<p>Source: INSPIRE</p> <p>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.</p> <p>Based on EIRA BB Service Discovery Service (A Service Discovery Service allows the automatic discovery of other services).</p>
Data validator (Conformance) (SK&E)	<p>Source: SDI Knowledge</p> <p>Based on EIRA BB Data Validation Service (A Data Validation Service is used to validate data against predefined semantic and syntactic constraints). Assume this covers data validation, metadata validation, and service validation, all relevant to INSPIRE publication.</p>
Transformation service (I&E)	<p>Source: INSPIRE</p> <p>Transformation services, enabling spatial data sets to be transformed with a view to achieving interoperability.</p> <p>Based on EIRA BB Data Transformation Service (A Data Transformation Service converts data. This includes the conversion from one data format to another).</p>

3.2.5. Technical view – Infrastructure

This subsection provides a source (first table) and definition (second table) for each ABB of the technical - infrastructure view.

Table 12: List of ABBs/sources – Technical view – Infrastructure

Building Block Name	EIRA	INSPIRE	SDI Knowledge
Service Registration	X		X
Registry service	X	X	
Data Collector Service			X
Sensor Observation Service		X	
Discovery of metadata	X	X	
Administration and Monitoring Service	X	X	
Download services	X	X	
View services	X	X	
Search service	X		X
Gazetteer	X	X	

Table 13: List of ABBs/definitions – Technical view – Infrastructure

Building Block Name	Definition
Service Registration (SK&E)	<p>Source: SDI Knowledge To document/describe the service in a catalogue. Also contained in INSPIRE metadata for services.</p> <p>Based on EIRA BB Service Registration Service (A Service Registration Service provides a mechanism to register the system service within a catalogue to be discovered by other services).</p>
Registry service (I&E)	<p>Source: INSPIRE Service to access and make use of the registers.</p> <p>Based on EIRA BB Data Publication Service (A Data Publication Service makes data available to other services or users).</p>
Data Collector Service (SK)	<p>Source: SDI Knowledge Service to collect data from different sources.</p>

Building Block Name	Definition
Sensor Observation Service (I)	<p>Source: INSPIRE</p> <p>Online sensors delivering spatio-temporal data have emerged in many sectors. To have comparable, efficient, real time data flows coming from devices, ARE3NA has developed guidelines, demonstrators and updates to open source tools using the OGC SOS standard for a potential new INSPIRE data download service direct from sensor devices.</p> <p>https://joinup.ec.europa.eu/software/are3nasos/description</p>
Discovery of metadata (I&E)	<p>Source: INSPIRE</p> <p>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.</p> <p>http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008R1205&from=EN</p> <p>Based on EIRA BB Metadata Management Service (A Metadata Management Service enables the creation, storage, categorisation and retrieval of metadata).</p>
Administration and Monitoring Service (I&E)	<p>Source: INSPIRE</p> <p>This ABB will define best practice in ensuring that spatial data can be managed against updates of reference information without interruption of services. This will require, where practicable, the definition of mechanism by different stakeholder areas to manage where this is required and it is feasible.</p> <p>Based on EIRA BB Administration and Monitoring Service (An Administration and Monitoring Service enables the administration and monitoring of services offered by the different ABBs).</p>
Download services (I&E)	<p>Source: INSPIRE</p> <p>Download services, enabling copies of spatial data sets, or parts of such sets, to be downloaded and, where practicable, accessed directly. Includes sensor observation data, as noted above.</p> <p>Based on EIRA BB Data Publication Service (A Data Publication Service makes data available to other services or users).</p>
View services (I&E)	<p>Source: INSPIRE</p> <p>View services 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.</p> <p>Based on EIRA BB Data Publication Service (A Data Publication Service makes data available to other services or users).</p>

Building Block Name	Definition
Search service (SK&E)	<p>Source: SDI Knowledge Service to search for addresses, geonames, etc.</p> <p>Based on EIRA BB Data Publication Service (A Data Publication Service makes data available to other services or users).</p>
Gazetteer (I&E)	<p>Source: INSPIRE A gazetteer is a register of features of a country, region, continent etc. containing information on their geographical position. http://www.iso.org/iso/catalogue_detail.htm?csnumber=26017 http://inspire.ec.europa.eu/metadata-codelist/SpatialDataServiceCategory/infoGazetteerService</p> <p>Based on EIRA BB Data Publication Service (A Data Publication Service makes data available to other services or users).</p>

3.3. List of Solution Building Blocks

This subsection contains the identified SBBs realising ABBs of the EIRA and INSPIRE based architecture model. The SBBs are presented in a table per SDI. These tables consist of three columns:

- **SBB name** – name of the SBB identified;
- **ABB mapping** – mapping to the ABB from the architecture model;
- **URL** – link to additional information about the SBB in the SDI documentation.

Note: An official source has not been found for every SBB. However, the SBBs are documented on the SDI. For these SBBs, the SDI source is included and highlighted with a (*), meaning that the information comes only from the definition of the SBB on the SDI documentation and not from the SBB source.

The approach followed to identify SBBs within the selected SDIs is the following:

1. Analyse the existing documentation of the SDI. The link to the documents analysed for each SDI is collected in Table 2. For example, read the existing description of the Danish Academy for Spatial Information (DAiSI) SDI.
2. Identify SBBs by thoroughly reading throughout the SDI documentation. For example, the DAiSI documentation mentions that “the KMS web-based services are based on the OGC Web Map Service standards”. Therefore, “OGC Web Map Service standards” were identified as an SBB. In addition, “KMW services” are further explained in the documentation as a generalisation of services: KMSTrans, MIFTrans, etc. In this case, “KMSTrans” and “MIFTrans” were identified as SBBs, not the “KMS services”.
3. Create the mapping between the identified SBBs and the ABBs from the data model developed previously (see Section 3.2). The SBBs were mapped by selecting which ABB complies better with the description of the SBB documented in the SDI documentation. When needed, desk research was performed to better understand the SBB and do the mapping. Every source used for this mapping is indicated in the SBB documentation (column “URL” in the subsections below). For example, the OGC Web Map Service standards is mapped to the ABB “Core Data Model”.

The subsections below collect the results obtained from the SDIs analysis, i.e. the list of SBBs identified for each SDI.

3.3.1. SBBs from national SDIs

This section contains the SBBs identified from the SDIs listed in Section 3.1.

3.3.1.1. Czech Republic - National Geo-Information Structure

This section lists the SBBs identified in the Czech Republic National Geo-Information Structure SDI.

Table 14: Identification of SBBs – Czech Republic National Geo-Information Structure

SBB name	ABB mapping	URL
Law 183/2006 Sb. on landscape planning and building regulations	Binding instrument	http://ggim.un.org/knowledgebase/Print51525.aspx
State Statistical Act	Binding Instrument	http://ggim.un.org/knowledgebase/Print51525.aspx

Act on Freedom of Access to Environmental Information	Binding Instrument	http://ggim.un.org/knowledgebase/Print51525.aspx
Act 106/1999	Binding Instrument	http://ggim.un.org/knowledgebase/Print51525.aspx
Copyright Act	Non-Binding Instrument	http://portal.unesco.org/culture/es/files/30389/11424310803cz_copyright_en_2000.pdf/cz_copyright_en_2000.pdf
GML	Data standard	http://www.opengeospatial.org/standards/gml
SHP	Representation	https://en.wikipedia.org/wiki/Shapefile
SABE	Data Set	http://www.eurogeographics.org/documents/ug2001v11_final.pdf
ZABAGED	SDI Registry	http://geoportal.cuzk.cz/(S(rsdduxorzvzf2zz0hh34fgh))/Default.aspx?lng=EN&mode=TextMeta&side=vyskopis&metadataID=CZ-CUZK-ZABAGED-VV&mapid=8&menu=304
3D contours	Data Set	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11CZv112.pdf (*)
(digital raster data) RZM	Data Set	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11CZv112.pdf (*)
OGC Web Services (OWS)	Core Data Model	http://www.opengeospatial.org/standards/owc
GIS standards	Data Standard	http://www.esri.com/library/whitepapers/pdfs/spatial-data-standards.pdf
Specialised dictionary of the Czech Office for Surveying, Mapping and Cadastre and the Authority of Geodesy, Cartography and Cadastre of the Slovak Republic	SDI Registry / Metadata	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11CZv112.pdf (*)

Glossary of the Czech Association of Geoinformation and the Ministry of Informatics	SDI Registry / Metadata	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11CZv112.pdf (*)
General Multilingual Environmental Thesaurus (GEMET)	SDI Registry	https://www.eionet.europa.eu/gemet/
ISO 8859P2	Standard	http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=28246
Mapmaker	Discovery of Services	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11CZv112.pdf (*)
INSPIRE geoportal	Discovery of Metadata	http://inspire-geoportal.ec.europa.eu/
MoE Metadata portal	Discovery of Metadata	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11CZv112.pdf (*)
ISO 19119	Standard	http://www.iso.org/iso/home/store/catalogue_ics/catalogue_detail_ics.htm?csnumber=59221 INSPIRE recommended: http://inspire.ec.europa.eu/documents/Metadata/MD_IR_and_ISO_20131029.pdf
ISO 19130	Standard	http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=51789
MIDAS-metadata catalogue	Discovery of Metadata	https://midas3.kitware.com/midas/
Metainformation system MIS	Discovery of Metadata	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11CZv112.pdf (*)
Czech national geo-portal (CENIA)	Discovery of Metadata / View service	http://www.czechspaceportal.cz/en/ministries/ministry-of-the-environment-of-the-czech-republic/cenia-czech-

		environmental-information-agency/
WMS	Discovery of Metadata / View service / Data Validator	http://www.geology.cz/externet-eng/maps/online/wms
COSMC geo-portal	Portal	http://geoportal.cuzk.cz/(S(ogygkqbvn5c3vvzry23fbwua))/Default.aspx?lng=EN&headtab=sekce-00-gp&mode=TextMeta&text=uvod_uvod&menu=01&news=yes&UvodniStrana=yes
MIS Catalogue service	Discovery of Services	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11CZv112.pdf (*)
OGC CSW discovery service of the INSPIRE geoportal	Discovery of Services	http://inspire-geoportal.ec.europa.eu/discovery/
Portal of geohazards	Discovery of Services	http://www.geology.cz/externet-eng/maps/online/map-applications
CUZK portal	Discovery of Services	http://geoportal.cuzk.cz/(S(kft3piyu3gq3l1rljlvpirgr))/Default.aspx?headtab=sekce-00-gp&mode=TextMeta&text=uvod_uvod&menu=01&news=yes&UvodniStrana=yes
COSMC view services	View services	http://geoportal.cuzk.cz/(S(ogygkqbvn5c3vvzry23fbwua))/Default.aspx?mode=TextMeta&side=WMS.uvod&text=WMS.uvod&headtab=sekce-03-gp&menu=31
UNSDI portal	Portal	http://www.unqiwg.org/content/united-nations-spatial-data-infrastructure-unsdi
UNSDI applications	Search service / View service	http://www.unqiwg.org/content/links

WCT Transformation Service	Transformation service	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11CZv112.pdf (*)
Mapmaker	View service	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11CZv112.pdf (*)
Public administration portal	Discovery of services	http://geoportal.cenia.cz
Data store of forestry data	View service	http://www.uhul.cz/

3.3.1.2. Denmark - Danish Academy for Spatial Information (DAiSI)

This section lists the SBBs identified in DAiSI SDI.

Table 15: Identification of SBBs – Danish Academy for Spatial Information (DAiSI)

SBB name	ABB mapping	URL
Law on Infrastructure for Spatial Information	Public Policy	https://www.google.be/url?sa=t&rc=t=j&q=&esrc=s&source=web&cd=3&ved=0ahUKEwj1wYOB-bnQAhWBC8AKHQ6vCokQFggwMAI&url=http%3A%2F%2Fggim.un.org%2Fknowledgebase%2FExportPDF51514.aspx&usq=AFQjCNHTMzzmKiuHehZjmHvUEYUvmCkHIA&sig2=nSJRwElZZkEznhkMOpUKag&bvm=bv.139250283,d.ZGg&cad=rja
Access to Environmental Information Act	Binding Instrument	https://www.google.be/url?sa=t&rc=t=j&q=&esrc=s&source=web&cd=3&ved=0ahUKEwj1wYOB-bnQAhWBC8AKHQ6vCokQFggwMAI&url=http%3A%2F%2Fggim.un.org%2Fknowledgebase%2FExportPDF51514.aspx&usq=AFQjCNHTMzzmKiuHehZjmHvUEYUvmCkHIA&sig2=nSJRwElZZkEznhkMOpUKag&bvm=bv.139250283,d.ZGg&cad=rja
TOP10DK (digital national topographic database)	Data base	http://www.gisgeo.dk/copenhagen/arcex.htm
KMS Map Supply API (kortforsyningen)	API	http://kortforsyningen.dk/

SBB name	ABB mapping	URL
DAV (Danish Address Road Register)	Registry service	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11DKv123.pdf (*)
Address Project	Registry service	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11DKv123.pdf (*)
KMS FLAT	Registry service	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11DKv123.pdf (*)
DD0	Registry service	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11DKv123.pdf (*)
KMS geo-referenced building ids.	Registry service	http://kortforsyningen.dk/
ETRS89	Reference system	http://etrs89.ensg.ign.fr/
KMSTrans (KMS Transformation tool)	Transformation service / tool	http://kortforsyningen.dk/
MIFTrans	Transformation service / tool	http://kortforsyningen.dk/
SHPTans	Transformation service / tool	http://kortforsyningen.dk/
DWGTrans	Transformation service / tool	http://kortforsyningen.dk/
KMSTrLib	Transformation service / tool	http://kortforsyningen.dk/
UTM/EUREF89	Reference system	https://www.google.be/url?sa=t&rc t=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwjv7eSN-7nQAhWIAMAKHWpZBRIQFggBMAA&url=http%3A%2F%2Fwww.euref.eu%2Fsymposia%2Fbook2004%2F6-7-denmark.pdf&usq=AFQjCNEaDyEFqIU4zYtt2AmOq9EkJ4NEjw&sig2=Oy40K1mQt0o0MIs4ga4nXw&bvm=bv.139250283,d.ZGg&cad=rja

SBB name	ABB mapping	URL
DVR90	Reference system	http://georepository.com/crs_5799/DVR90-height.html
MIA	Data quality assessment	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11DKv123.pdf (*)
miniMAKS	Data quality assessment	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11DKv123.pdf (*)
DSFL	Encoding	https://docs.safe.com/fme/html/FME_Desktop_Documentation/FME_ReadersWriters/dsfl/dsfl.htm
FOT specification	Specification	http://www.geodanmark.dk/Materiale/files/FOTspecifikation/FOT4+specifikation_UK.pdf
KMS official place names database	Gazetteer	http://kortforsyningen.dk/
Geodata-info.dk (national geoportal)	Portal / View service	http://geodata-info.dk/Portal/
ISO 19115	Standard	http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=32579 INSPIRE recommended: http://inspire.ec.europa.eu/documents/Metadata/MD_IR_and_ISO_20131029.pdf
ISO 19139	Standard	http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=32557
Geodata-info.dk (national geoportal) – Metadata service	Discovery of metadata	http://geodata-info.dk/Portal/
The Environmental Portal	Portal / View service	http://kort.arealinfor.dk/
The Public Information Online (OIS)	Portal / View service	https://www.ois.dk/
on-line Danish access service for metadata on reference data and core	Discovery of metadata	http://geodata-info.dk/Portal/

SBB name	ABB mapping	URL
thematic data of the national geoportal		
KMS.dk/sepaakort	View service	http://kmswww3.kms.dk/kortpaanettet/
KMS.dk/sepaakort – Download service	Download service	http://kortforsyningen.dk/
Matriculation (=basis for property registration in Denmark; it consists of the land registry, cadastral map and cadastral archive)	Registry service	http://kmswww3.kms.dk/kortpaanettet/index.htm?map=mat
The Nature and Environment Portal – Download service	Download service	http://www.miljoportal.dk/Arealinformation/Vejledninger/
Vis Stedet (“Show the location”)	View service	http://visstedet.kms.dk/
Vis Kort (“Show map”)	View service - Tool	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11DKv123.pdf (*)
OGC Web Services (OWS)	Core Data Model	http://www.opengeospatial.org/standards/owc
PlansystemDK	Data set	http://www.plansystemdk.dk/
FOTdanmark	Data set - Tool	http://translate.googleusercontent.com/translate_c?hl=en&sl=auto&tl=en&u=http://kortforsyningen.dk/&rurl=translate.google.com&usq=ALkJrhiIm0DWA5m5Mfw0_wPPNiUqBxTMZA
Danish Area Information System (AIS)	Data set catalogue – Download service	http://www.dmu.dk/1_Viden/2_Miljoe-tilstand/3_samfund/AIS/index_en.htm

3.3.1.3. The Netherlands Geonovum (NGII)

This section lists the SBBs identified in the SDI from NGII.

Table 16: Identification of SBBs – The Netherlands Geonovum (NGII)

SBB name	ABB mapping	URL
Nationaal Georegister	Geoportal/SDI	http://www.nationaalgeoregister.nl/geonetwork/srv/nl/main.home
Dutch version of the European Directive on the legal protection of databases (96/9/EC)	Public Policy	http://eur-lex.europa.eu/lexUriServ/LexUriServ.do?uri=CELEX:31996L0009:EN:HTML
Government Information Public Access Act	Binding Instrument	http://eur-lex.europa.eu/lexUriServ/LexUriServ.do?uri=CELEX:31996L0009:EN:HTML
The Netherlands Data Registration Act	Binding Instrument	http://eur-lex.europa.eu/lexUriServ/LexUriServ.do?uri=CELEX:31996L0009:EN:HTML
Personal Data Protection Act	Binding Instrument	http://eur-lex.europa.eu/lexUriServ/LexUriServ.do?uri=CELEX:31996L0009:EN:HTML
EU Directive 2002/58 on privacy and electronic communications	Public Policy	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32002L0058:en:HTML
Geo gedeeld	Data Policy	http://geogedeeld.geonovum.nl/
13 basic registers – 5 spatial in nature	Data Set	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11NLv123.pdf (*)
Rijksdriehoeksstelsel (RD)	Reference system	http://www.kadaster.nl/rijksdriehoeksstelsel
Lambert conformal conical	Reference system	https://en.wikipedia.org/wiki/Lambert_conformal_conic_projection
Geographic	Reference system	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11NLv123.pdf (*)
ETRS	Reference system	http://etrs89.ensg.ign.fr/

SBB name	ABB mapping	URL
Framework for standards	Implementing guideline	http://wiki.geonovum.nl/index.php?title=1_Framework_geostandards
National validation service	Data Validation Service	http://www.geonovum.nl/diensten/valideren
The Nationaal Georegister	Discovery of metadata	http://www.nationaalgeoregister.nl/geonetwork/srv/nl/main.home
OGC standards	Metadata schema	http://www.opengeospatial.org/standards
NODC (National Oceanographic Data Committee of the Netherlands) metadata catalogue	Discovery of metadata	http://www.nodc.nl/
NODC data catalogue	Discovery of services	http://www.nodc.nl/content/content.asp?lang=0&menu=4&submenu=4
data.overheid.nl	Discovery of metadata	https://data.overheid.nl/
Geonovum services	Discovery of services / Network services	http://www.geonovum.nl/onderwerpen/services
The Nationaal Georegister – View service	View service	http://www.nationaalgeoregister.nl/geonetwork/srv/eng/search
National Atlas	View service	http://www.nationaleatlas.nl/
36 download services	Download services	http://inspire.ec.europa.eu/reports/stateofplay2011/rcr11NLv123.pdf (*)
GML3	Data standard	http://www.opengeospatial.org/standards/gml
Dutch ISO 19115 metadata	Metadata schema	http://www.geonovum.nl/sites/default/files/Nederlands%20metadata%20profiel%20op%20ISO%2019115%20voor%20geografie%20-%20v1.3.1%20def.pdf
KNMI (Royal	Catalogue of data collector service	http://www.knmi.nl/over-het-knmi/about

SBB name	ABB mapping	URL
Netherlands Meteorological Institute) Catalog of basic data		
stelselcatalogus	Reference system	http://www.stelselcatalogus.nl/

3.3.1.4. UK - The UK Location Infrastructure (UKLI)

This section lists the SBBs identified in the SDI from the UKLI.

Table 17: Identification of SBBs – The UK location strategy (UKLI)

SBB name	ABB mapping	URL
Digital National Framework (UK)	Implementing guideline / Standard	http://geospatial.bcs.org/lisg/digital-national-framework
Cm7157 Government response to the Power of Information Review	Binding-instrument	https://www.gov.uk/government/publications/government-response-to-the-power-of-information-review
UK GEMINI	Metadata standard	http://www.agi.org.uk/agi-group/standards-committee/uk-gemini
data.gov.uk	Portal	https://data.gov.uk/
data.gov.uk – Registry	Service registration	https://data.gov.uk/publisher/land-registry
UK Location Infrastructure (UKLI)	Non-binding instrument	https://data.gov.uk/location/uk-location-infrastructure
UKLI – Data and Search Publishing	Discovery of services	https://data.gov.uk/sites/default/files/UKLII-Roadmap-20100208-v1-3_10.pdf
UKLI – Search and Evaluation	Search service	https://data.gov.uk/sites/default/files/UKLII-Roadmap-20100208-v1-3_10.pdf
UK Location Discovery Metadata Service - Operational Guide	Technical guidance	https://data.gov.uk/library/uk-location-discovery-metadata-service-operational-guide
UKLI – Discovery Metadata Service (DMS)	Discovery metadata	https://data.gov.uk/sites/default/files/DMS%20Operational%20Guide%202-2_10.pdf

UKLI – Access and Exploitation	View service / Download service / Transformation service	https://data.gov.uk/sites/default/files/UKLII-Roadmap-20100208-v1-3_10.pdf
UKLP Download Services Operational Guidance	Technical guidance	https://data.gov.uk/library/uklp-download-services-operational-guidance-v11
UK Location Getting Started Guide	Technical guidance	https://data.gov.uk/library/uk-location-getting-started-guide-0-the-uk-implementation-of-inspire
UK Location View Service Operational Guide	Technical guidance	https://data.gov.uk/library/uk-location-view-service-operational-guide
Ordnance Survey gazetteer service	Gazetteer	https://www.ordnancesurvey.co.uk/business-and-government/products/50k-gazetteer.html

3.3.2. SBBs from cross-border SDIs

The subsections below gather the identified SBBs of the SDIs classified as cross-border SDIs. However, the information available of these SDIs is not very detailed. Therefore, the number of SBBs identified for the list of cross-border SDIs is less than the number of SBBs identified at national level.

3.3.2.1. Danube Reference Data and Service Infrastructure (DRDSI)

This section lists the SBBs identified in the DRDSI.

Table 18: Identification of SBBs – Danube Reference Data and Service Infrastructure (DRDSI)

SBB name	ABB mapping	URL
DRDSI Datasets	Spatial data sets catalogue	http://drdsi.jrc.ec.europa.eu/dataset?sort=sort_criteria+desc
CKAN-based catalogue	Registry service	http://ckan.org/
CKAN-based metadata search	Search service	http://ckan.org/
MapStore-based browser of geographic data on the map	View service	http://mapstore.geo-solutions.it/mapstore/ http://demo.geo-solutions.it/share/JRC/deliverables/documentation/online/install/mapstore_config.html

SBB name	ABB mapping	URL
		http://demo.geo-solutions.it/share/JRC/deliverables/documentation/online/install/mapstore_config.html

3.3.2.2. Geomatic Regional Partnership project (GRISI)

This section lists the SBBs identified in the GRISI project.

Table 19: Identification of SBBs – Geomatic Regional Partnership project (GRISI)

SBB name	ABB mapping	URL
Good Practices for the Development of Rural Areas	Non-binding instrument / Implementing guideline	http://www.grisiplus.eu/data/upload/GOOD_PRACTICES_GUIDE_in_English_language.pdf

3.3.2.3. North-Rhine Westphalia SDI

This section lists the solutions identified in the North-Rhine Westphalia SDI.

Table 20: Identification of solutions – North-Rhine Westphalia SDI

Solution name	Type of solution	URL
ETRS89	Reference system	http://etrs89.ensg.ign.fr/
UTM	Reference system	https://en.wikipedia.org/wiki/Universal_Transverse_Mercator_coordinate_system
Centre for Geoinformation (CeGI) – Web Catalogue Services (WCatS)	Discovery of metadata	http://www.ec-gis.org/Workshops/9ec-gis/papers/pd_portele.pdf (*)
Dutch National Clearing House for Geoinformation (NCGI)	Discovery of metadata	http://www.ec-gis.org/Workshops/9ec-gis/papers/pd_portele.pdf (*)
Institute for Geoinformatics at Münster University (IFGI) – Multilingual web mapping client	Application service	http://www.ec-gis.org/Workshops/9ec-gis/papers/pd_portele.pdf (*)
GDI NRW - GeoViewer	View service	https://www.geoportal.nrw/
Guidelines for metadata capture for the GDI-NW	Technical guideline	https://apps.geoportal.nrw.de/terraCatalog
GEOkatalog	Service registration	http://www.geokatalog.de/

3.3.3. X-Border-GDI project

After a preliminary analysis, the X-Border-GDI project was not considered as an SDI but as a programme framework for a large number of particular activities along the entire border region Netherlands-Germany. The analysis of the available documentation did not reveal any SDI SBBs.

3.4. Reusability assessment

This subsection defines the criteria used for assessing reusability and elaborates on the assessment of SBBs against these criteria to determine the set of reusable location information solutions (see also Figure 4 above).

3.4.1. Joinup eligibility criteria used for the reusability assessment

A set of existing reuse criteria has been applied, to determine which of the identified SBBs listed in Section 0 can be reused to develop location-based solutions and services.

The initial goal was to derive a set of reusable location information solutions for the EIC (= EIC solutions), however the EIC eligibility criteria were not yet mature by the time the assessment was performed. As described in Section 1.4, each EIC solution has to meet the Joinup eligibility criteria which already exist and are regularly applied. Hence, the existing Joinup eligibility criteria were used to derive from the set of identified SBBs a set of reusable location information solutions in the form of eligible candidates for Joinup.

These Joinup eligibility criteria are defined as follows [10]:

- **Language:** every solution description must be at least in English;
- **Licence or agreement:** solutions must be published under a licence, except services which should have some type of agreement (terms of use, SLA);
- **Relevance:** every solution has to be relevant for public administrations;
- **Quality:** the solutions must be described in conformance to the latest official release of the ADMS Application Profile (ADMS-AP);
- **Interface:** services must be provided through digital channels such as web-interface, machine-to-machine or other type of digital (stable) interfaces;
- **Unicity:** solutions on Joinup should be unique;
- **Location:** services must at least be applicable at European level, as explained in the example below.

Next to these criteria, the assessment used the following rules and guidelines:

- **Solutions:** only solutions related to policy, software, service, specification or standard and guideline or template are considered eligible to be on Joinup. SBBs, such as portals, data sets, data bases, representations, etc. are not considered to match any of the Joinup solution types and therefore are excluded from the scope of the current analysis.
- **Unicity:** Joinup prevents the introduction of duplicate solutions. The "Unicity" criterion has been assessed through a Joinup search, confirming whether the eligible solutions are already shared on Joinup. Eligible solutions which are not yet published are candidates to be published on Joinup and included in the EIC, depending on their compliance with the EIC eligibility criteria.
- **Language:** every solution is described in English in the SDI documentation where it was identified. Therefore, it is considered that every solution fulfils the "Language" criterion and thus no detailed assessment for this criterion was performed.
- **Quality:** the criterion "Quality" is not applied and will not be scored, as it is related to the publication of the solution on Joinup. It is the responsibility of the Joinup operational team to determine if the proposed solution to be published accomplishes the "Quality" criterion or not.
- **Location:** Joinup only includes basic and shared service building blocks that can be used by public administrations to develop European public services. This means that all services offered by Joinup are cross-border services and are usable by all

Member States (e.g. eID, the European Commission Authentication Service (ECAS), Machine Translation). Given that the assessed services only have a national coverage, they are considered as services not fulfilling the "Location" criterion. This assumption could, however, be debated in that national geodata services (e.g. INSPIRE services) form part of a European infrastructure and can be combined with data from other national services to form cross-border solutions.

- **Knock-out criteria:** Each criterion is treated as a knock-out criterion, i.e. the assessment of a solution will stop, if the solution does not comply with a criterion. The knock-out appliance follows the criteria order described below:
 1. Solution type (policy, software, service, specification or standard and guideline or template);
 2. Location (only applies to services);
 3. Relevance;
 4. Interface (only applies to services);
 5. Licence or agreement;
 6. Unicity – Not yet published on Joinup.

The reusability assessment approach is summarised below, using the assessment of the SBB "OGC Web Map Service (OWS) standards" as a concrete example. This SBB was identified during the analysis of the DAiSI SDI.

1. **Analyse the existing documentation of the SBB**, i.e. the description of the SBB in the SDI documentation, and the additional sources for each SBB, listed in Section 0.
2. **Check if the SBB could be a solution on Joinup**, i.e. if it would be considered as a policy, software, service, specification or standard and guideline or template. For instance, Joinup would consider the OWS standards as a solution. The solution would be regarded as "standard" (indicated by an "S" in the assessment table).
3. **Check if the SBB meets the "Location" criterion.** This criterion is only applicable for services. As the OWS is a standard, this criterion does not apply.
4. **Check if the SBB meets the "Relevance" criterion.** In general, all the solutions are used by public administrations because they are part of SDIs in whose development public administrations participated. Therefore, all the solutions are considered relevant.
5. **Check if the SBB meets the "Interface" criterion.** This criterion only applies to services, thus this criterion does not apply to the OWS standards.
6. **Check if the SBB meets the "License or agreement" criterion.** By analysing the information of the solution, it should be specified if they have an open license or usage agreement. However, the Joinup eligibility criteria accept some exceptions for endorsed solutions. By endorsement, it is meant that a national public administration has recommended the use of the solution. It can also mean that the solution is funded by the European Commission or a national public administration. Going back to step 4, it is considered that by making use of the solution, every solution is endorsed by public administrations, thus the solutions assessed fulfil this criterion. For the OWS example, these standards are created by the Open

Geospatial Consortium (OGC¹¹), i.e. an international not for profit organisation committed to making quality open standards for the global geospatial community. Therefore, the OWS standards have an open license and thus fulfil this criterion.

7. **Finally, check if the SBB is already published on Joinup.** To do so, a search on Joinup was done, using the title of the solution, keywords from the definition, etc. For the OWS example, no solution was found. However, during this research, other geospatial solutions than the ones identified in the SDI analysis were found. These solutions are listed in Annex V – List of geospatial solutions on Joinup, as they could be relevant for public administrations developing SDIs or location-related solutions or services.

Each subsection below contains the assessment of the different SBBs identified from national and cross-border SDIs. The assessment tables use the following values:

- Solution types:
 - **L:** indicates that the solution is a policy;
 - **G:** indicates that the solution is a guideline or template;
 - **P:** indicates that the solution is a public service;
 - **S:** indicates that the solutions is a specification or standard; and
 - **T:** indicates that the solution is a software solution.
- Assessment outcome:
 - **Y:** compliance with Joinup eligibility criteria;
 - **N:** non-compliance with Joinup eligibility criteria.

3.4.2. National SDI assessment

This section contains the assessment of SBBs that were identified in Section 3.3.1 from national SDIs.

3.4.2.1. Czech Republic - National Geo-Information Structure

This section assesses the SBBs identified in The Czech Republic National Geo-Information Structure (Section 3.3.1.1) against the Joinup eligibility criteria.

Table 21: Assessment of SBBs – Czech Republic National Geo-Information Structure

SBB name	ABB	Solution	Location	Relevance	Interface	Licence or agreement	Unicity – Not on Joinup
Law 183/2006 Sb. on landscape planning and building regulations	Binding instrument	L	-	Y	-	Y	Y
State Statistical Act	Binding Instrument	L	-	Y	-	Y	Y

¹¹ <http://www.opengeospatial.org>

Act on Freedom of Access to Environmental Information	Binding Instrument	L	-	Y	-	Y	Y
Act 106/1999	Binding Instrument	L	-	Y	-	Y	Y
Copyright Act	Non-Binding Instrument	L	-	Y	-	Y	Y
GML	Data standard	S	-	Y	-	Y	Y
SHP	Representation	N					
SABE	Data Set	N					
ZABAGED	SDI Registry	N					
3D contours	Data Set	N					
(Digital raster data) RZM	Data Set	N					
OGC Web Services (OWS)	Core Data Model	S	-	Y	-	Y	Y
GIS standards	Data Standard	S	-	Y	-	Y	Y
Specialized dictionary of the Czech Office for Surveying, Mapping and Cadastre and the Authority of Geodesy, Cartography and Cadastre of the Slovak Republic	SDI Registry / Metadata	P	N				
Glossary of the Czech Association of Geoinformation and the Ministry of Informatics	SDI Registry / Metadata	P	N				
General Multilingual Environmental Thesaurus (GEMET)	SDI Registry	P	N				
ISO 8859P2	Standard	S	-	Y	-	Y	Y
Mapmaker	Discovery of Services	P	N				
INSPIRE geoportal	Discovery of Metadata	P	N				
MoE Metadata portal	Discovery of Metadata	P	N				
ISO 19119	Standard	S	-	Y	-	Y	Y

ISO 19130	Standard	S	-	Y	-	Y	Y
MIDAS-metadata catalogue	Discovery of Metadata	P	N				
Metainformation system MIS	Discovery of Metadata	P	N				
Czech national geo-portal (CENIA)	Discovery of Metadata / View service	P	N				
WMS	Discovery of Metadata / View service / Data Validator	P	N				
COSMC geo-portal	Portal	N					
MIS Catalogue service	Discovery of Services	P	N				
OGC CSW discovery service of the INSPIRE geoportal	Discovery of Services	P	N				
Portal of geohazards	Discovery of Services	P	N				
CUZK portal	Discovery of Services	P	N				
COSMC view services	View services	P	N				
UNSDI portal	Portal	N					
UNSDI applications	Search service / View service	P	N				
WCT Transformation Service	Transformation service	P	N				
Mapmaker	View service	P	N				
Public administration portal	Discovery of services	P	N				
Data store of forestry data	View service	P	N				

3.4.2.2. Denmark - Danish Academy for Spatial Information (DAiSI)

This section assesses the SBBs identified in The Danish SDI (Section 3.3.1.2) against the Joinup eligibility criteria.

Table 22: Assessment of SBBs – Danish Academy for Spatial Information (DAiSI)

SBB name	ABB	Solution	Location	Relevance	Interface	Licence or agreement	Unicity – Not on Joinup
Law on Infrastructure for Spatial Information	Public Policy	L	-	Y	-	Y	Y
Access to Environmental Information Act	Binding Instrument	L	-	Y	-	Y	Y
TOP10DK (digital national topographic database)	Data base	N					
KMS Map Supply API (kortforsyningen)	API	P	N				
DAV (Danish Address Road Register)	Registry service	P	N				
Address Project	Registry service	P	N				
KMS FLAT	Registry service	P	N				
DD0	Registry service	P	N				
KMS geo-referenced building ids.	Registry service	P	N				
ETRS89	Reference system	N					
KMSTrans (KMS Transformation tool)	Transformation service / tool	T	-	Y	-	Y	Y
MIFTrans	Transformation service / tool	T	-	Y	-	Y	Y
SHPTans	Transformation service / tool	T	-	Y	-	Y	Y
DWGTrans	Transformation service / tool	T	-	Y	-	Y	Y

SBB name	ABB	Solution	Location	Relevance	Interface	Licence or agreement	Unicity – Not on Joinup
KMSTrLib	Transformation service / tool	T	Y	Y	-	Y	Y
UTM/EUREF89	Reference system	N					
DVR90	Reference system	N					
MIA	Data quality	S	-	Y	-	Y	Y
miniMAKS	Data quality	S	-	Y	-	Y	Y
DSFL	Encoding	N					
FOT specification	Specification	S	-	Y	-	Y	Y
KMS official place names database	Gazetteer	P	N				
Geodata-info.dk (national geoportal)	Portal / View service	P	N				
ISO 19115	Standard	S	-	Y	-	Y	Y
ISO 19139	Standard	S	-	Y	-	Y	Y
Geodata-info.dk (national geoportal) – Metadata service	Discovery of metadata	P	N				
The Environmental Portal	Portal / View service	P	N				
The Public Information Online (OIS)	Portal / View service	P	N				
on-line Danish access service for metadata on reference data and core thematic data of the national geoportal	Discovery of metadata	P	N				
KMS.dk/sepaakort	View service	P	N				
KMS.dk/sepaakort – Download service	Download service	P	N				

SBB name	ABB	Solution	Location	Relevance	Interface	Licence or agreement	Unicity – Not on Joinup
Matriculation	Registry service	P	N				
The Nature and Environment Portal – Download service	Download service	P	N				
Vis Stedet (“Show the location”)	View service	P	N				
Vis Kort (“Show map”)	View service / Tool	T	-	Y	-	Y	Y
OGC Web Services (OWS)	Core Data Model	S	-	Y	-	Y	Y
PlansystemDK	Data set	N					
FOTdanmark	Data set / Tool	T	-	Y	-	Y	Y
Danish Area Information System (AIS)	Data set catalogue / Download service	P	N				

3.4.2.3. The Netherlands Geonovum (NGII)

This section assesses the SBBs identified in The Netherlands Geonovum SDI (Section 0) against the Joinup eligibility criteria.

Table 23: Assessment of SBBs – The Netherlands Geonovum (NGII)

SBB name	ABB	Solution	Location	Relevance	Interface	Licence or agreement	Unicity – Not on Joinup
Nationaal Georegister	Geoportal/SDI	N					
Dutch version of the European Directive on the legal protection of databases (96/9/EC)	Public Policy	L	-	Y	-	Y	Y
Government Information Public Access Act	Binding Instrument	L	-	Y	-	Y	Y

The Netherlands Data Registration Act	Binding Instrument	L	-	Y	-	Y	Y
Personal Data Protection Act	Binding Instrument	L	-	Y	-	Y	Y
EU Directive 2002/58 on privacy and electronic communications	Public Policy	L	-	Y	-	Y	Y
Geo gedeeld	Data Policy	L	-	Y	-	Y	Y
13 basic registers – 5 spatial in nature	Data Set	N					
Rijksdriehoeksstelsel (RD)	Reference system	N					
Lambert conformal conical	Reference system	N					
Geographic	Reference system	N					
ETRS	Reference system	N					
Framework for standards	Implementing guideline	G	-	Y	-	Y	N
National validation service	Data Validation Service	P	N				
The Nationaal Georegister	Discovery of metadata	P	N				
OGC standards	Metadata schema	S	-	Y	-	Y	Y
NODC (National Oceanographic Data Committee of the Netherlands) metadata catalogue	Discovery of metadata	P	N				
NODC data catalogue	Discovery of services	P	N				
data.overheid.nl	Discovery of metadata	P	N				
Geonovum services	Discovery of services / Network services	P	N				

The Nationaal Georegister – View service	View service	P	N				
National Atlas	View service	P	N				
36 download services	Download services	P	N				
GML3	Data standard	S	-	Y	-	Y	Y
Dutch ISO 19115 metadata	Metadata schema	S	-	Y	-	Y	Y
KNMI (Royal Netherlands Meteorological Institute) Catalog of basic data	Catalogue of data collector service	P	N				
stelselcatalogus	Reference system	N					

3.4.2.4. UK - The UK Location Infrastructure (UKLI)

This section assesses the SBBs identified in The UKLI SDI (Section 3.3.1.4) against the Joinup eligibility criteria.

Table 24: Assessment of SBBs – The UK location infrastructure (UKLI)

SBB name	ABB	Solution	Location	Relevance	Interface	Licence or agreement	Unicity – Not on Joinup
Digital National Framework (UK)	Implementing guideline/Standard	G/S	-	Y	-	Y	Y
Cm7157 Government response to the Power of Information Review	Binding-instrument	L	-	Y	-	Y	Y
UK GEMINI	Metadata standard	S	-	Y	-	Y	Y
data.gov.uk	Portal	N					
data.gov.uk – Registry	Service registration	P	N				
UK Location Infrastructure (UKLI)	Non-binding instrument	L	-	Y	-	Y	Y

UKLI – Data and Search Publishing	Discovery of services	P	N				
UKLI – Search and Evaluation	Search service	P	N				
UK Location Discovery Metadata Service - Operational Guide	Technical guidance	G	-	Y	-	Y	Y
UKLI – Discovery Metadata Service (DMS)	Discovery metadata	P	N				
UKLI – Access and Exploitation	View service / Download service / Transformation service	P	N				
UKLP Download Services Operational Guidance	Technical guidance	G	-	Y	-	Y	Y
UK Location Getting Started Guide	Technical guidance	G	-	Y	-	Y	Y
UK Location View Service Operational Guide	Technical guidance	G	-	Y	-	Y	Y
Ordnance Survey gazetteer service	Gazetteer	P	N				

3.4.3. Cross-border SDI assessment

The subsections below assesses the SBBs identified under Section 3.3.2 from the SDIs classified as cross-border SDIs.

3.4.3.1. Danube Reference Data and Service Infrastructure (DRDSI)

This section assesses the SBBs identified in DRDSI (Section 3.3.2.1) against the Joinup eligibility criteria.

Table 25: Assessment of SBBs – Danube Reference Data and Service Infrastructure (DRDSI)

SBB name	ABB	Solution	Location	Relevance	Interface	Licence or agreement	Unicity – Not on Joinup
DRDSI Datasets	Spatial data sets catalogue	P	Y	Y	Y	Y	Y
CKAN-based catalogue	Registry service	T	-	Y	-	Y	Y

CKAN-based metadata search	Search service	T	-	Y	-	Y	Y
MapStore-based browser of geographic data on the map	View service	T	-	Y	-	Y	Y

3.4.3.2. Geomatic Regional Partnership project (GRISI)

This section assesses the SBBs identified in the GRISI (Section 3.3.2.2) against the Joinup eligibility criteria.

Table 26: Assessment of SBBs – Geomatic Regional Partnership project (GRISI)

SBB name	ABB	Solution	Location	Relevance	Interface	Licence or agreement	Unicity – Not on Joinup
Good Practices for the Development of Rural Areas	Non-binding instrument / Implementing guideline	G	-	Y	-	Y	Y

3.4.3.3. North-Rhine Westphalia SDI

This section assesses the SBBs identified in the North-Rhine Westphalia SDI (Section 3.3.2.3) against the Joinup eligibility criteria.

Table 27: Assessment of SBBs – North-Rhine Westphalia SDI

SBB name	ABB	Solution	Location	Relevance	Interface	Licence or agreement	Unicity – Not on Joinup
ETRS89	Reference system	N					
UTM	Reference system	N					
Centre for Geoinformation (CeGI) – Web Catalogue Services (WCatS)	Discovery of metadata	P	N				
Dutch National Clearing House for Geoinformation (NCGI)	Discovery of metadata	P	N				
Institute for Geoinformatics at Münster University (IFGI)	Application service	P	N				

SBB name	ABB	Solution	Location	Relevance	Interface	Licence or agreement	Unicity - Not on Joinup
- Multilingual web mapping client							
GDI NRW - GeoViewer	View service	P	N				
Guidelines for metadata capture for the GDI-NW	Technical guideline	G	-	Y	-	Y	Y
GEOkatalog	Service registration	P	N				

3.5. Assessment summary

A total of 132 discreet SBBs were assessed, out of which 109 are seen as solutions in the context of Joinup. The remaining 23 SBBs could not be mapped to any of the Joinup solution types (i.e. policy, guideline, standard, service or software). However, these 23 SBBs (i.e. specific data sets, portals or reference systems) might still be of interest to SDI developers and are therefore listed in Annex I – List of SBBs not considered as solutions in the context of Joinup.

Of the 109 SSBs classified as solutions in the context of Joinup, 98 are from national SDIs and 11 from cross-border SDIs. Most of these SBBs are extracted from the national SDIs as more (detailed) documentation for these SDIs was available.

59 (54 from national SDIs and 5 from cross-border SDIs) of these 109 SSBs are services which do not meet the Joinup criteria. They do not have a European coverage and are therefore assessed as solutions not eligible for Joinup. However, these SBBs could be interesting when developing location-based services and solutions and are therefore listed in Annex II – List of relevant non-eligible services.

In addition, 1 of the 109 SSBs, the Framework of Standards of The Netherlands Geonovum SDI, is already shared on Joinup (see also Annex III – List of solutions already published on Joinup). Thus it could be included into the EIC, if it complies with the EIC eligibility criteria. It should be noted, that solutions of the EIC need to comply with the Joinup eligibility criteria and the EIC eligibility criteria, as described in Section 1.4. However, the EIC eligibility criteria were not yet mature by the time the assessment was performed.

49 (43 from national SDIs and 6 from cross-border SDIs) of these 109 SSBs meet the Joinup criteria and are therefore assessed as solutions eligible to be published on Joinup, potentially eligible solutions to be published on the EIC. These SBBs are listed in Annex IV – List of eligible solutions for EIC.

The table below provides the corresponding overview of the identified and assessed SBBs (listed in Sections 3.4.2 and 3.4.3), including the eligible Joinup solutions and thus the possible candidates to be included in the EIC.

Table 28: Summary of identified and assessed SBBs

Identified and assessed SBBs	National SDIs	Cross-border SDIs	Total
No solutions in the context of Joinup	21 (out of 119)	2 (out of 13)	23 (out of 132)
Solutions in the context of Joinup	98 (out of 119)	11 (out of 13)	109 (out of 132)
Non-eligible Joinup solutions	54 (out of 98)	5 (out of 11)	59 (out of 109)
Eligible Joinup solutions	44 (out of 98)	6 (out of 11)	50 (out of 109)
Policies	15 (out of 15)	<i>no policies identified</i>	15 (out of 15)
Guidelines or templates	6¹² (out of 6)	2 (out of 2)	8 (out of 8)
Public services	0 (out of 54)	1 (out of 6)	1 (out of 60)
Specifications or standards	16 (out of 16)	<i>no specifications or standards identified</i>	16 (out of 16)
Software solutions	7 (out of 7)	3 (out of 3)	10 (out of 10)

As a final step of the assessment, Joinup was checked to see if SBBs were already available on Joinup (to avoid publishing duplication; Unicity criteria). This check led to the identification of additional reusable location information solutions already published on Joinup. This list of reusable location information solutions can be found in Annex V – List of geospatial solutions on Joinup. Note that these solutions were merely collected, no selection criteria were applied.

¹² This includes the SSB “Framework of Standards” (from The Netherlands Geonovum SDI) already published on Joinup.

4. Recommendations for the EIRA

This section contains the recommendations on how the EIRA can be improved to better reflect aspects related to location information. These recommendations are based on a) the development of the EIRA and INSPIRE based architecture model and b) the model's application to identify reusable location information solutions.

In the exercise performed under Section 3, some ABBs of a generic SDI architecture model were mapped to the EIRA model. However, the EIRA model was created to model the essential ABBs of Interoperable European Solutions, not only SDIs. As a result, not all location-related aspects are covered by the current EIRA version, i.e. version 1.0¹³, for example in terms of geospatial creation and management, as well as tools for analysis and application development/data publication.

The following recommendations, collected while building the architecture model, can help to improve the EIRA for what concerns location / geospatial data and information.

Recommendation 1: Provide guidelines and best practices on how to apply the EIRA for developing EIRA-based architecture models.

During the development of the EIRA and INSPIRE based architecture model for a typical SDI, the need for (better) guidelines and best practices on how to apply the EIRA was evident. Such guidelines and best practices / worked examples could facilitate modelling discussions, improve the modelling experience and reduce the development time. This could include a glossary of key EIRA terms, which could facilitate the mapping of EIRA concepts to specific domains, such as activities related to geospatial data.

Recommendation 2: Include ABBs to model physical sensors.

Location data is created from different sources, varying from field surveys to sensors, as well as the re-combination of existing geospatial data to make new derived datasets, often from quite heterogeneous data formats and sources. One means of generating data is from physical devices – equipped with sensors – that capture for example environmental conditions (noise, air quality, temperature ...). The EIRA is missing the ability to model the content of these physical devices. Therefore, it is recommended that the EIRA includes ABBs to model physical sensors. Figure 7 below depicts such a reference architecture for sensors, devices and aggregators.

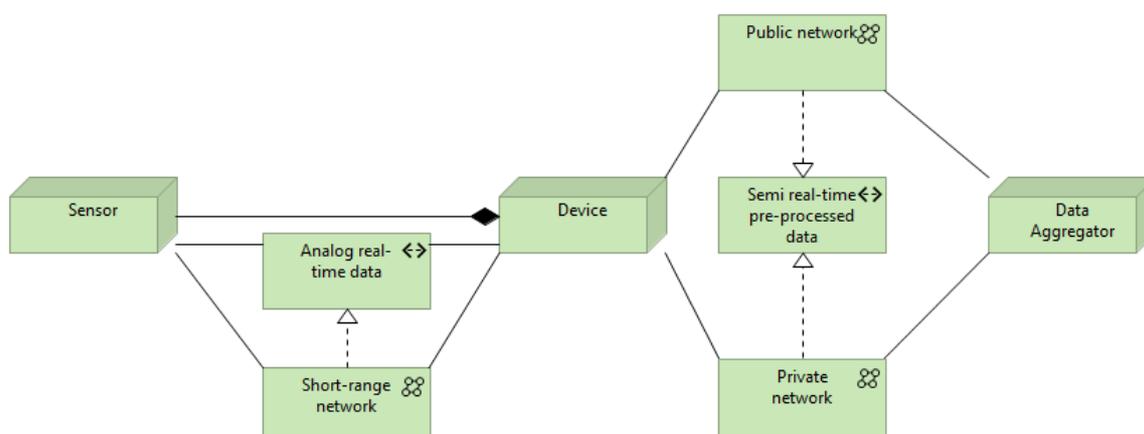


Figure 7: Reference architecture for physical devices with sensors and data aggregator

¹³ https://joinup.ec.europa.eu/asset/eia/asset_release/eira-v100

Recommendation 3: Facilitate the modelling of the data flow.

It is difficult from the EIRA model to represent who are the data subjects, data consumers, and data managers in a process. Within the EIRA model, the data flow modelling is done on the organisational view, but only at the service level and not at the process level.

However, the modelling of the data flow is important when designing location-enabled services as the (up-to-date) data involved is normally coming from multiple sources (which is in part one of the drivers for creating SDIs) and involves multiple roles. Data flows help to understand in what steps of the process data is being manipulated and by whom.

For example, data may be collected from a monitoring station to measure air quality. Measurements are processed and fed to a service that creates, averages and publishes them on a website for consumption by citizens, including related maps to show the location of polluted places. At the same time, raw data are processed by the monitoring organisation and then sent to another body for quality assurance and quality control, before being sent to the public administration for reporting purposes on a monthly and annual basis, according to policy requirements.

The same time-series data can also be registered as an INSPIRE dataset and the appropriate metadata created to register it in the INSPIRE Geoportal, allowing the content to be discovered for policy/analytical purposes, as well as cases where open data policies allow the data to be accessed and used to build new end-user applications combining this dataset with data coming from other sources.

Such data flows could be defined in a related modelling activity (see related EULF document: Use Case Methodology applied to Traffic Safety Monitoring). The EIRA should support the possibility to link these modelled data flows (incl. actors and datasets, and potentially defined business processes or specific e-government service patterns) to the corresponding EIRA ABBs.

Recommendation 4: Foresee the possibility to create a link between the legal view and its realisation on the technical view.

Compliance with data protection and privacy law is mandatory and crucial to any service, including certain cases involving location data. The EIRA has loose links between its legal view and the concrete realisation of a Directive, Regulation or technical guidelines on the application and infrastructure view, i.e. all legal ABBs are associated to the Public Service ABB. This complicates the visualisation of the impact of the legal view on the underlying application views. On the application view, the EIRA offers two ABBs that could implicitly cover more or less the implementation of legal requirements: Operational Procedure and the Technical Specification.

Even though it is possible to draw associations on the model between legal ABBs and their realisation, the EIRA would benefit from encouraging users of the architecture to draw more explicit links. This would allow organisations to demonstrate how content-related compliance rules are being followed and implemented (e.g. validation of a service's operation, correct entry of metadata or appropriate form of the data). This is both reflecting the organisational activities involved in developing or using, for example, data infrastructures, as well as the technical development activities to support them.

Recommendation 5: Provide a list of relevant standards and specifications.

The EIRA should have the list of relevant standards and specifications built within its collection of re-usable SBBs. This would allow architects to select the most appropriate standards and use them directly in their models. The management of this information could relate to the ICT standardisation programme of DG GROW. Technical resources such as the Re3gistry software (developed by ARE3NA and already used for the core vocabularies in Joinup) could be used to manage the authentic code list of such standards

and specifications. In the geospatial arena, the EULF Architectures and Standards for SDIs and e-Government would be a relevant source of content.

Recommendation 6: Promote the use of controlled vocabularies for the dct:spatial attribute.

The EIRA allows leveraging the dct:spatial property also used in the [DCAT vocabulary](#) to indicate the spatial coverage of a SBB. However, it does not recommend how to document this property. As location services use different forms of location referencing (names, coordinates, relative distances), the EIRA should recommend controlled vocabularies for dct:spatial to prevent SBBs having heterogeneous dct:spatial values for the same entity. These controlled vocabularies should support different levels of granularity (e.g. regions, countries, cities or specific points), as well as more formal terms for certain entities, such as an Administrative Unit or Protected Site (as defined by INSPIRE data specifications).

Recommendation 7: More specific definitions for the ABBs.

As a general note, the definitions of many ABBs are too generic and it is difficult to understand exactly the purpose of an ABB. Users making reference architectures should have both definitions (INSPIRE and EIRA) to ensure re-users understand the purpose of ABBs. A first step into this direction has already been done with the creation of an EIRA and INSPIRE based architecture model for a typical SDI.

For example, the stereotype of the ABB "<<Data Publication Service>>Registry service" should indicate the EIRA definition and the INSPIRE definition to help developers understand the ABB.

- EIRA definition: A Data Publication Service makes data available to other services or users. This covers all types of data.
- INSPIRE: service to access and make use of the registers. This is one type of data in INSPIRE, mainly related to official reference codes, but INSPIRE also includes data at an object level (as defined in the data specifications / models) and the content of INSPIRE metadata about datasets and services, which could also be seen as data.

In general, more work could be done to create domain specific forms of ICT solutions, such as those coming from the geospatial domain, where this report has mainly focussed on components of an SDI but has not addressed where such data (etc.) can be consumed in systems and applications, including but not limited to GIS.

Recommendation 8: Review the scope of eligible solutions for the EIC

Finally, extending the scope of eligible solutions for the EIC should be considered. There may be national solutions that can be re-used in other countries or combined with solutions from other countries to create multi-national solutions. The latter point is part of the purpose of INSPIRE, where one of the aims is to be able to combine data from different countries to undertake cross-border environmental analysis.

5. Conclusion

The goal of this analysis was to identify a list of reusable location information solutions (including standards and specifications) which could be shared on Joinup; a list which public administrations and other geospatial data providers can leverage when developing location-enabled solutions and services.

The following activities were carried out:

1. A list of INSPIRE-recommended standards and specifications was derived from the INSPIRE Technical Guidelines, as possible input for Joinup.
2. An EIRA and INSPIRE based architecture model (for a typical SDI) was developed to facilitate the identification of reusable location information solutions for data publishing.
3. Selected SDIs were analysed and their SBBs were mapped to the ABBs of the defined architecture model.
4. An assessment of the identified SBBs was carried out to determine whether these SBBs were eligible to be included in the EIC. However, given that the EIC eligibility criteria were not yet mature at the time of carrying out the analysis, this partial assessment was only done against the Joinup eligibility criteria, since the Joinup platform is envisaged to be where the EIC will reside.

The analysis resulted in the identification of 132 discreet SBBs, out of which 109 SBBs were classified as solutions in the context of Joinup (i.e. policy, software, service, specification or standard and guideline or template). 49 of the 109 SBBs meet the Joinup eligibility criteria. One additional SBB has already been published on Joinup: the Framework of Standards from The Netherlands Geonovum SDI.

These 50 SBBs are split as follows: 15 policies, 8 guidelines/templates, 1 service, 16 standards/specifications and 10 software solutions. They could potentially be included in the EIC, provided that they would be compliant with the EIC eligibility criteria.

The other 59 out of the 109 solutions are not eligible for Joinup, given that they are services with a national geographical coverage. According to the Joinup eligibility criteria, services need a European coverage to be published as Joinup solutions. Nevertheless, those services can still be useful for public administrations by sharing metadata of potential cross-border services on national and European level promoting cross-border cooperation. For instance, these services could be used to retrieve national data, to consult and integrate available maps into solutions, and to leverage the national gazetteer. In addition, sharing metadata of potential cross-border services on national and European level promotes cross-border cooperation.

This analysis and search for reusable location information solutions was limited to the SDIs in scope. Should this work be taken further, the recommendations are to a) enlarge the scope by covering more SDIs, and b) to conduct interviews with the SDI owners to collect additional detailed information that might not always be published or available online. For example, collecting input about a) the type of licence that the solution uses, b) the level of the data authenticity in case the information does not originate from official sources, or c) the maturity of the solution should be facilitated through interviews.

In addition, to enlarge the list of solutions, the three EULF pilots could be thoroughly studied to look for reusable solutions to be published in the EIC. In the ARE3NA ISA Action (1.17) related work has created a vocabulary to define the tasks public administrations need to perform when implementing the Directive and asks implementers and solution providers to highlight which tools are being used in practice. Further work could make use of this process to map tasks and related solutions to the EIRA to ensure a full coverage of an SDI (at least in the case of INSPIRE) can be analysed. Such work could also help to

select candidates for full tool documentation in ADMS, as examples in ARE3NA's inventories are being used in practice but are only documented lightly to point interested parties to where they may find more information about the tools.

Furthermore, once the EIC eligibility criteria are mature, the identified solutions should be assessed against them. Once completed, this test would help to progress their publication on Joinup, following the ADMS-AP¹⁴ specifications.

The focus of this study has placed an emphasis on ABBs related to spatial data, metadata and service provision. However, for an exhaustive comprehensive modelling analysis the current EIRA and INSPIRE based architecture model for a typical SDI should be extended with additional ABBs covering areas such as data usage and governance. In addition, the assessment of the software and service components developed by ARE3NA (e.g. the Re3gistry, available on Joinup) could be considered. In addition, it should be noted that SDI implementation, management and use are only one dimension of location interoperability and there are many more occasions where location information performs a role in cross-sector and cross-border services and policies. Some of these may include data for inclusion in SDIs but the work could also be extended to see how location information is being managed and exchanged in other domains related to e-government or ICT innovation in the private sector or even voluntary sectors, including the creation of citizen-generated resources such as OpenStreetMap and its related technologies.

To conclude, the work performed in the current analysis for the EULF and in ARE3NA have partially addressed the challenges and opportunities in location-related interoperability and put in place processes to explore and address them.

As a next step, the JRC-led European Location Interoperability Solutions for e-Government ISA² Action (4.1) will continue and build on the work of the EULF and ARE3NA Actions from the ISA programme. The interoperability solutions produced by ELISE will include guidance and tools for data publication and access, building on INSPIRE (e.g. approaches to help build the European data economy envisaged in the Digital Single Market strategy) and explore patterns of e-government services that make use of location information in detail. This work could help consolidate some of the work from both EULF and ARE3NA and provide an update to this mapping against the EIRA. ELISE will also act as the "geo knowledge base" for ISA² and Commission services for aspects of legal, organisational, semantic and technical interoperability, where "location" is an important characteristic, helping also to promote ISA/ISA² solutions, like the EIRA, with Member States' organisations working with geospatial data and INSPIRE, and the ISA² Working Group on Geospatial Solutions.

¹⁴ <https://joinup.ec.europa.eu/asset/adms/description>

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List of abbreviations and definitions

Table 29: List of abbreviations and definitions

Term / Acronym	Description
Architecture building block (ABB)	An architecture building block typically describes required capability/functionality and shapes the specification of solution building blocks (SBBs) (TOGAF [11]).
Architecture model	An architecture model ¹⁵ is a formal description of a solution, or a detailed plan of the solution at component level to guide its implementation.
ARE3NA platform	A reusable tool being tested in the context of implementing and using INSPIRE to connect policy implementation tasks to practical examples in public administrations and software support tools
Asset Description Metadata Schema (ADMS)	The Asset Description Metadata Schema (ADMS) [5] is a vocabulary to describe interoperability assets making it possible for ICT developers to explore and search for interoperability assets.
Core data model	A context-neutral data model that captures the fundamental characteristics of an entity. The Core Vocabularies are at this level.
Core Vocabularies	Simplified, re-usable, and extensible data models that capture the fundamental characteristics of a data entity in a context-neutral fashion [12].
Domain model	A data model of a particular domain (e.g. the justice domain, the healthcare domain) that identifies the entities involved and their relationships.
European Interoperability Reference Architecture (EIRA)	Generic structure, comprising principles and guidelines applying to the implementation of interoperability solutions in the Union.
European Interoperability Cartography (EIC)	An instrument to map and analyse the interoperability landscape in Europe and to identify solutions that are available and those that are still lacking.
EIC solutions	High quality solutions that are relevant for and reusable by public administrations, presented in a common format and complying with specific re-usability and interoperability criteria that can be represented on the EIRA.

¹⁵ The Open Group, 'The Open Group Architecture Framework (TOGAF)', 2011: http://pubs.opengroup.org/architecture/togaf9-doc/arch/chap03.html#tag_03

Term / Acronym	Description
Information exchange specification	A data model that defines and describes the structure and content of information that is exchanged in a specific information exchange context.
INSPIRE Technical Guidelines (TG)	Non-binding Technical Guidance documents which describe detailed implementation aspects and relations with existing standards, technologies, and practices.
Interoperability	According to the ISA Decision, interoperability means the ability of disparate and diverse organisations to interact towards mutually beneficial and agreed common goals, involving the sharing of information and knowledge between the organisations, through the business processes they support, by means of the exchange of data between their respective ICT systems.
Interoperability framework	An interoperability framework is an agreed approach to interoperability for organisations that wish to work together towards the joint delivery of public services. Within its scope of applicability, it specifies a set of common elements such as vocabulary, concepts, principles, policies, guidelines, recommendations, standards, specifications and practices.
Interoperable European Solution	An Interoperable European Solution (IES) is a solution, developed by public administrations that facilitate the delivery of electronic Public Services and cross-border exchange of information between public administrations (or Citizens) in support to the implementation and advancement of EU, national or local Public Policies. Source: This IES definition was derived from the Trans-European Systems definition.
Joinup	Joinup is a collaborative platform created by the European Commission and funded by the European Union via the Interoperability Solutions for European Public Administrations (ISA) Programme. It offers several services that aim to help e-Government professionals share their experience with each other. It also aims to support them to find, choose, re-use, develop and implement interoperability solutions.
Joinup solution	Solutions facilitating cooperation between organisations, either autonomously funded and developed by the ISA2 Programme or developed in cooperation with other Union initiatives, based on identified requirements of European public administrations. Joinup considers the following type of solutions: policy, software, service, specification or standard and guideline or template.
Reusable	Reuse means that public administrations confronted with a specific problem seek to benefit from the work of others by looking at what is available, assessing its usefulness or relevance to the problem at

Term / Acronym	Description
	hand, and deciding to use solutions that have proven their value elsewhere [13].
Solution	A solution ¹⁶ is a collection of components organised to accomplish a specific function or set of functions.
Solution building block (SBB)	A solution building block (SBB) represents components that will be used to implement the required capability/functionality of one or more architecture building blocks (TOGAF [11]).
Spatial Data Infrastructure (SDI)	An SDI hosts geographic data and attributes, sufficient documentation (metadata), a means to discover, visualise, and evaluate the data (catalogues and Web mapping), and some method to provide access to the geographic data.

¹⁶ The Open Group, 'The Open Group Architecture Framework (TOGAF)', 2011: http://pubs.opengroup.org/architecture/togaf9-doc/arch/chap35.html#tag_35

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Annex I – List of SBBs not considered as solutions in the context of Joinup

During the assessment of the identified SSBs, 23 SBBs could not be mapped to any of the Joinup solution types (i.e. policy, guideline, standard, service or software) are therefore not seen as solutions in the context of Joinup. However, these SBBs (i.e. specific data sets, portals or reference systems) might still be of interest to SDI developers. The following table lists these 23 SBBs.

Table 30: List of SBBs not considered as solutions in the context of Joinup

Ref.	SDI name	SBB name	ABB Mapping
1	Cross-Border – North-Rhine Westphalia SDI	ETRS89	Reference system
2	Cross-Border – North-Rhine Westphalia SDI	UTM	Reference system
3	National – Czech Republic National Geo-Information Structure	SHP	Representation
4	National – Czech Republic National Geo-Information Structure	SABE	Data Set
5	National – Czech Republic National Geo-Information Structure	ZABAGED	SDI Registry
6	National – Czech Republic National Geo-Information Structure	3D contours	Data Set
7	National – Czech Republic National Geo-Information Structure	(Digital raster data) RZM	Data Set
8	National – Czech Republic National Geo-Information Structure	COSMC geo-portal	Portal
9	National – Czech Republic National Geo-Information Structure	UNSDI portal	Portal
10	National – Danish Academy for Spatial Information	TOP10DK (digital national topographic database)	Data base

Ref.	SDI name	SBB name	ABB Mapping
11	National – Danish Academy for Spatial Information	ETRS89	Reference system
12	National – Danish Academy for Spatial Information	UTM/EUREF89	Reference system
13	National – Danish Academy for Spatial Information	DVR90	Reference system
14	National – Danish Academy for Spatial Information	DSFL	Encoding
15	National – Danish Academy for Spatial Information	PlansystemDK	Data set
16	National – The Netherlands Geonovum	Nationaal Georegister	Geoportal/SDI
17	National – The Netherlands Geonovum	13 basic registers – 5 spatial in nature	Data Set
18	National – The Netherlands Geonovum	Rijksdriehoeksstelsel (RD)	Reference system
19	National – The Netherlands Geonovum	Lambert conformal conical	Reference system
20	National – The Netherlands Geonovum	Geographic	Reference system
21	National – The Netherlands Geonovum	ETRS	Reference system
22	National – The Netherlands Geonovum	stelselcatalogus	Reference system
23	National – The UK location strategy	data.gov.uk	Portal

Annex II – List of relevant non-eligible services

During the assessment of the identified SBBs, 59 services were assessed as not eligible to be shared on Joinup. However, these SBBs could be interesting when developing location-based services and solutions. These non-eligible services are listed in the following table.

Table 31: List of relevant non-eligible services

Ref	SDI name	SBB name	Type of service
1	National – The Netherlands Geonovum	National validation service	Data Validation Service
2	National – The Netherlands Geonovum	The Nationaal Georegister	Discovery of metadata
3	National – The Netherlands Geonovum	NODC (National Oceanographic Data Committee of the Netherlands) metadata catalogue	Discovery of metadata
4	National – The Netherlands Geonovum	NODC data catalogue	Discovery of services
5	National – The Netherlands Geonovum	data.overheid.nl	Discovery of metadata
6	National – The Netherlands Geonovum	Geonovum services	Discovery of services / Network services
7	National – The Netherlands Geonovum	The Nationaal Georegister – View service	View service
8	National – The Netherlands Geonovum	National Atlas	View service
9	National – The Netherlands Geonovum	36 download services	Download services
10	National – The Netherlands Geonovum	KNMI (Royal Netherlands Meteorological Institute) Catalog of basic data	Catalogue of data collector service

Ref	SDI name	SBB name	Type of service
11	National – Czech Republic National Geo-Information Structure	Specialized dictionary of the Czech Office for Surveying, Mapping and Cadastre and the Authority of Geodesy, Cartography and Cadastre of the Slovak Republic	Reference Data / Metadata
12	National – Czech Republic National Geo-Information Structure	Glossary of the Czech Association of Geoinformation and the Ministry of Informatics	Reference Data / Metadata
13	National – Czech Republic National Geo-Information Structure	General Multilingual Environmental Thesaurus (GEMET)	Reference Data
14	National – Czech Republic National Geo-Information Structure	Mapmaker	Discovery of Services
15	National – Czech Republic National Geo-Information Structure	INSPIRE geoportal	Discovery of Metadata
16	National – Czech Republic National Geo-Information Structure	MoE Metadata portal	Discovery of Metadata
17	National – Czech Republic National Geo-Information Structure	MIDAS-metadata catalogue	Discovery of Metadata
18	National – Czech Republic National Geo-Information Structure	Metainformation system MIS	Discovery of Metadata
19	National – Czech Republic National Geo-Information Structure	Czech national geo-portal (CENIA)	Discovery of Metadata / View service

Ref	SDI name	SBB name	Type of service
20	National – Czech Republic National Geo-Information Structure	WMS	Discovery of Metadata / View service / Data Validator
21	National – Czech Republic National Geo-Information Structure	MIS Catalogue service	Discovery of Services
22	National – Czech Republic National Geo-Information Structure	OGC CSW discovery service of the INSPIRE geoportal	Discovery of Services
23	National – Czech Republic National Geo-Information Structure	Portal of geohazards	Discovery of Services
24	National – Czech Republic National Geo-Information Structure	CUZK portal	Discovery of Services
25	National – Czech Republic National Geo-Information Structure	COSMC view services	View services
26	National – Czech Republic National Geo-Information Structure	UNSDI applications	Search service / View service
27	National – Czech Republic National Geo-Information Structure	WCT Transformation Service	Transformation service
28	National – Czech Republic National Geo-Information Structure	Mapmaker	View service
29	National – Czech Republic National	Public administration portal	Discovery of services

Ref	SDI name	SBB name	Type of service
	Geo-Information Structure		
30	National – Czech Republic National Geo-Information Structure	Data store of forestry data	View service
31	National – Danish Academy for Spatial Information	KMS Map Supply API (kortforsyningen)	API
32	National – Danish Academy for Spatial Information	DAV (Danish Address Road Register)	Registry service
33	National – Danish Academy for Spatial Information	Address Project	Registry service
34	National – Danish Academy for Spatial Information	KMS FLAT	Registry service
35	National – Danish Academy for Spatial Information	DD0	Registry service
36	National – Danish Academy for Spatial Information	KMS geo-referenced building ids.	Registry service
37	National – Danish Academy for Spatial Information	KMS official place names database	Gazetteer
38	National – Danish Academy for Spatial Information	Geodata-info.dk (national geoportal)	Portal / View service

Ref	SDI name	SBB name	Type of service
39	National – Danish Academy for Spatial Information	Geodata-info.dk (national geoportal) – Metadata service	Discovery of metadata
40	National – Danish Academy for Spatial Information	The Environmental Portal	Portal / View service
41	National – Danish Academy for Spatial Information	The Public Information Online (OIS)	Portal / View service
42	National – Danish Academy for Spatial Information	on-line Danish access service for metadata on reference data and core thematic data of the national geoportal	Discovery of metadata
43	National – Danish Academy for Spatial Information	KMS.dk/sepaakort	View service
44	National – Danish Academy for Spatial Information	KMS.dk/sepaakort – Download service	Download service
45	National – Danish Academy for Spatial Information	Matriculation	Registry service
46	National – Danish Academy for Spatial Information	The Nature and Environment Portal – Download service	Download service
47	National – Danish Academy for Spatial Information	Vis Stedet (“Show the location”)	View service
48	National – Danish Academy	Danish Area Information System (AIS)	Data set catalogue – Download service

Ref	SDI name	SBB name	Type of service
	for Spatial Information		
49	National – The UK location strategy	data.gov.uk – Registry	Service registration
50	National – The UK location strategy	UKLI – Data and Search Publishing	Discovery of services
51	National – The UK location strategy	UKLI – Search and Evaluation	Search service
52	National – The UK location strategy	UKLI – Discovery Metadata Service (DMS)	Discovery metadata
53	National – The UK location strategy	UKLI – Access and Exploitation	View service / Download service / Transformation service
54	National – The UK location strategy	Ordnance Survey gazetteer service	Gazetteer
55	Cross-Border – North-Rhine Westphalia SDI	Centre for Geoinformation (CeGI) – Web Catalogue Services (WCatS)	Discovery of metadata
56	Cross-Border – North-Rhine Westphalia SDI	Dutch National Clearing House for Geoinformation (NCGI)	Discovery of metadata
57	Cross-Border – North-Rhine Westphalia SDI	Institute for Geoinformatics at Münster University (IFGI) – Multilingual web mapping client	Application service
58	Cross-Border – North-Rhine Westphalia SDI	GDI NRW - GeoViewer	View service
59	Cross-Border – North-Rhine Westphalia SDI	GEOkatalog	Service registration

Annex III – List of solutions already published on Joinup

During the assessment of the identified SBBs, one SBB met all Joinup eligibility criteria, except the Unicity criteria as it was already published on Joinup. This potentially eligible solution to be published on the EIC is contained in the following table.

Table 32: List of solutions already published on Joinup

Ref	SDI type	SBB name	ABB Mapping
1	National – The Netherlands Geonovum	Framework for standards	Implementing guideline

Annex IV – List of eligible solutions for EIC

During the assessment of the identified SBBs, 49 SBBs met the Joinup criteria and are therefore assessed as solutions eligible to be published on Joinup, potentially eligible solutions to be published on the EIC. The following table contains these SBBs.

Table 33: List of eligible solutions for EIC

Ref	SDI name	SBB name	ABB Mapping
1	Cross-Border – Danube Reference Data and Service Infrastructure	DRDSI Datasets	Spatial data sets catalogue
2	Cross-Border – Danube Reference Data and Service Infrastructure	CKAN-based catalogue	Registry service
3	Cross-Border – Danube Reference Data and Service Infrastructure	CKAN-based metadata search	Search service
4	Cross-Border – Danube Reference Data and Service Infrastructure	MapStore-based browser of geographic data on the map	View service
5	Cross-Border – Geomatic Regional Partnership project	Good Practices for the Development of Rural Areas	Non-binding instrument / Implementing guideline
6	Cross-Border – North-Rhine Westphalia SDI	Guidelines for metadata capture for the GDI-NW	Technical guideline
7	National – Czech Republic National Geo-Information Structure	Law 183/2006 Sb. on landscape planning and building regulations	Binding instrument
8	National – Czech Republic National Geo-Information Structure	State Statistical Act	Binding instrument
9	National – Czech Republic National Geo-Information Structure	Act on Freedom of Access to Environmental Information	Binding instrument
10	National – Czech Republic National Geo-Information Structure	Act 106/1999	Binding instrument

Ref	SDI name	SBB name	ABB Mapping
11	National – Czech Republic National Geo-Information Structure	Copyright Act	Non-Binding Instrument
12	National – Czech Republic National Geo-Information Structure	GML	Data standard
13	National – Czech Republic National Geo-Information Structure	OGC Web Services (OWS)	Core Data Model
14	National – Czech Republic National Geo-Information Structure	GIS standards	Data Standard
15	National – Czech Republic National Geo-Information Structure	ISO 8859P2	Standard
16	National – Czech Republic National Geo-Information Structure	ISO 19119	Standard
17	National – Czech Republic National Geo-Information Structure	ISO 19130	Standard
18	National – Danish Academy for Spatial Information	Law on Infrastructure for Spatial Information	Public Policy
19	National – Danish Academy for Spatial Information	Access to Environmental Information Act	Binding Instrument
20	National – Danish Academy for Spatial Information	KMSTrans (KMS Transformation tool)	Transformation service / tool
21	National – Danish Academy for Spatial Information	MIFTrans	Transformation service / tool
22	National – Danish Academy for Spatial Information	SHPTans	Transformation service / tool
23	National – Danish Academy for Spatial Information	DWGTrans	Transformation service / tool
24	National – Danish Academy for Spatial Information	KMSTrLib	Transformation service / tool

Ref	SDI name	SBB name	ABB Mapping
25	National – Danish Academy for Spatial Information	MIA	Data quality
26	National – Danish Academy for Spatial Information	miniMAKS	Data quality
27	National – Danish Academy for Spatial Information	FOT specification	Specification
28	National – Danish Academy for Spatial Information	ISO 19115	Standard
29	National – Danish Academy for Spatial Information	ISO 19139	Standard
30	National – Danish Academy for Spatial Information	Vis Kort (“Show map”)	View service / Tool
31	National – Danish Academy for Spatial Information	OGC Web Services (OWS)	Core Data Model
32	National – Danish Academy for Spatial Information	FOTdanmark	Data set / Tool
33	National – The Netherlands Geonovum	Dutch version of the European Directive on the legal protection of databases (96/9/EC)	Public Policy
34	National – The Netherlands Geonovum	Government Information Public Access Act	Binding Instrument
35	National – The Netherlands Geonovum	The Netherlands Data Registration Act	Binding Instrument
36	National – The Netherlands Geonovum	Personal Data Protection Act	Binding Instrument
37	National – The Netherlands Geonovum	EU Directive 2002/58 on privacy and electronic communications	Public Policy
38	National – The Netherlands Geonovum	Geo gedeeld	Data Policy
39	National – The Netherlands Geonovum	OGC standards	Metadata schema

Ref	SDI name	SBB name	ABB Mapping
40	National – The Netherlands Geonovum	GML3	Data standard
41	National – The Netherlands Geonovum	Dutch ISO 19115 metadata	Metadata schema
42	National – The UK location strategy	Digital National Framework (UK)	Implementing guideline/Standard
43	National – The UK location strategy	Cm7157 Government response to the Power of Information Review	Binding-instrument
44	National – The UK location strategy	UK GEMINI	Metadata standard
45	National – The UK location strategy	UK Location Infrastructure (UKLI)	Non-binding instrument
46	National – The UK location strategy	UK Location Discovery Metadata Service - Operational Guide	Technical guidance
47	National – The UK location strategy	UKLP Download Services Operational Guidance	Technical guidance
48	National – The UK location strategy	UK Location Getting Started Guide	Technical guidance
49	National – The UK location strategy	UK Location View Service Operational Guide	Technical guidance

Annex V – List of geospatial solutions on Joinup

As a by-product of the SBB assessment, 14 reusable geospatial related solutions, already published on Joinup, were identified. These solutions might be of interest to public administrations or other parties developing location-based solutions and services. Hence they are included as an annex. The following table lists these identified Joinup solutions. No criteria were applied. **Note:** The table does not comprise all geospatial solutions published on Joinup, but only a subset.

Table 34: List of geospatial solutions on Joinup

	Solution	Link
1	GeoNetwork opensource	https://joinup.ec.europa.eu/software/geonetwork/description
2	GeoServer	https://joinup.ec.europa.eu/software/geoserver/description
3	GET SDI Portal	https://joinup.ec.europa.eu/software/get_sdi_portal/description
4	SDI Analyzer	https://joinup.ec.europa.eu/software/sdianalyzer/description
5	GeoDCAT-AP Implementations	https://joinup.ec.europa.eu/asset/dcat_application_profile/document/geodcat-ap-implementations
6	Spain in Georeferencing	https://joinup.ec.europa.eu/catalogue/asset_release/spain-georeferencing
7	CatMDEdit - metadata editor	https://joinup.ec.europa.eu/software/catmdedit/description
8	ARE3NA Reusing INSPIRE	https://joinup.ec.europa.eu/asset/are3na-reuse/description
9	ARE3NA Sensor Observation Service	https://joinup.ec.europa.eu/software/are3nasos/description
10	ARE3NA Re3ference Platform	https://joinup.ec.europa.eu/asset/are3na-re3reference-platform/description
11	ARE3NA study on AAA for Data and Services	https://joinup.ec.europa.eu/asset/are3na-aaa/description
12	Esri Geoportal Server	https://joinup.ec.europa.eu/software/inspire/description
13	deegree	https://joinup.ec.europa.eu/software/deegree/description
14	GRASS GIS	https://joinup.ec.europa.eu/software/grassgis/description

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