JRC TECHNICAL REPORTS

European Union Location Framework Guidelines for public procurement of geospatial technologies

Version 1.1

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2016

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ABSTRACT

These guidelines focus on the procurement of location information products and services, such as the acquisition of new location data to support applications, the acquisition of solutions for using location data and services in e Government processes and products and/or services for making data interoperable and/or accessible. The procurement can take place as part of the development of a Spatial Data Infrastructure (SDI), the implementation of the INSPIRE regulation, or any other Directive in which such information and services are important, or within the context of regular activities of spatial data and service providers and users (e.g. Mapping and Cadastre Agencies, Government departments, local public administrations). The guidelines provide recommendations on elements of best practice in procurement in which location information and location enabled services are important, with some practical examples; and describe some concrete sample texts that could be used in invitations to tender when reference is made to location information and location enabled service requirements. The procurement process is also explained as part of a potential future e-procurement platform in which the application and updating of geospatial standards (through change requests) could be integrated as well.

1. INTRODUCTION

1.1   The European Union Location Framework

Over the past ten years important efforts have been made to improve the access to and sharing of, location information, e.g. through the INSPIRE[1] and the GMES/ Copernicus[2] legal acts at European level, and the development of Spatial Data Infrastructures at national and regional level. However, it is expected that European Union institutions, Member State public administrations, the private sector, and eventually citizens could all benefit from a consistent and coherent use of location information in e-Government processes.

In the context of the Interoperability Solutions for European Public Administrations (ISA) programme[3], the Action "Establishment of a European Union Location Framework" (EULF)[4] is identifying barriers and possible solutions for a consistent and interoperable use of location information and services, while promoting the re-use of INSPIRE where possible and feasible. The ISA programme supports the identification, sharing and re-use of interoperability solutions among European Public Administrations through the creation of frameworks, architectures and re-usable components to enable more cost effective e-Government services and support cross-border applications. The EULF aims to deliver the location framework that underpins this broader vision.

The EULF builds further upon the INSPIRE Directive which aims at establishing an infrastructure for spatial information in Europe to support Community environmental policies, and policies or activities which may have an impact on the environment (European Commission, 2007). The focus of INSPIRE is on the harmonisation and interoperability of the many spatial data resources available in the Member States in order to enable their cross-border use. The data are made accessible through so called network services which allow discovering, viewing and downloading them. Member States already make many location information and services available. However, the uptake and integration of this information and the services in e-Governmental business processes remains relatively weak. The EULF wants to stimulate this uptake and foster the creation of new location enabled e-Government services for citizens, businesses and governments. EULF also aims to promote the application of INSPIRE methods to improve semantic and technical interoperability in other thematic sectors.

The vision for the EULF can be summarised as follows: *"More effective services, savings in time and money, and increased growth and employment will result from adopting a coherent European framework of guidance and actions to foster cross-sector and cross-border interoperability and use of location information in e-government, building on INSPIRE"*.

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[1] http://inspire.ec.europa.eu/
[2] http://www.copernicus.eu
[3] http://ec.europa.eu/isa/
[4] http://ec.europa.eu/isa/actions/02-interoperability-architecture/2-13action_en.htm

The framework is divided into five 'focus areas' which are critical to the successful re-use of location information and delivery of services using this information, as shown in Figure 1.

Figure 1: *EULF Focus Areas*

Policy and Strategy Alignment:
Consistent EU and Member States policy and legislative approach

Return on Investment:
Strategic funding and procurement, compelling business cases and good evidence of benefits

Effective Governance and Partnerships:
Decision making, collaboration, awareness and skills to share and apply best practices

e-Government Integration:
Location is a key enabler in e-Government services, addressing user needs and expectations

Standardisation and Interoperability:
Standards and technologies for interoperability and re-use are consistently applied

The shared vision and rationale for a European Union Location Framework, the scope, the key changes that are being targeted, and the stakeholder and governance approach are defined in the '**EULF Strategic Vision** (Pignatelli et al, 2014)[5]. Moreover, an Assessment of the state of play in the five priority focus areas has been undertaken, providing an overview of 'location-enabled government' maturity in Europe (Vandenbroucke et al, 2014). This **Assessment of the Conditions of the EULF** provided the necessary input to formulate recommendations, to define the required guidance documents and the actions needed to put the EULF in place. This is done in the **EULF Blueprint** document, complemented by several guidance documents focusing on particular aspects of EULF implementation, including this document, '**EULF Guidelines for public procurement of geospatial technologies**'[6].

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[5] http://ec.europa.eu/isa/documents/eulf-strategic-vision-lite-v1-0_pubsy_en.pdf

[6] Other documents that have been elaborated include: "Architecture and Standards for SDIs and e-Government"; "EULF Benefits Approach"; "Guidelines on methodologies for the creation of RDF vocabularies representing the INSPIRE data models and the transformation of INSPIRE data into RDF" and "Authentication, Authorisation and Accounting for Data and Services in EU Public Administrations: Analysing standards and technologies for AAA" (the latter two as part of the ARE3NA action).

1.2 Objectives, scope and target audience

1.2.1 Objectives

The need for specific guidance on the procurement of location information and location enabled e-Government services was identified in the Assessment of the Conditions for the EULF and by Member States' stakeholders. The Blueprint Overview also highlighted the importance of applying a best-practice standards-based procurement approach. As a result, this guidance document has been prepared which aims to complement existing guidance for the procurement of standards-based ICT, and support EU and Member States' institutions in conducting a procurement process, including specific references on how to refer to INSPIRE, location information in general, and geospatial standards. The objectives of the document are as follows:

1) To provide a better insight in the procurement process and general rules for developing high quality procurement documents;

2) To understand and provide practical guidance to develop tender documents in which location information and/or location enabled e-Government services are (an important) part;

3) To explain how the procurement process related to location information and/or location enabled e-Government services can become part of a more general e-Procurement process;

4) In more general terms to minimise the risk of becoming locked in to particular suppliers and to make the best use of geospatial standards;

5) To support public authorities in finding the skills and expertise needed to perform location information services and/or deliver location information products.

1.2.2 Scope

The guidelines focus on the procurement of location information products and services, such as the acquisition of new location data to support applications, the acquisition of solutions for using location data and services in e-Government processes and products and/or services for making data interoperable and/or accessible. The procurement can take place as part of the development of a Spatial Data Infrastructure (SDI), the implementation of the INSPIRE regulation, or any other Directive in which such information and services are important, or within the context of regular activities of spatial data and service providers and users (e.g. mapping and cadastre agencies, users in public administrations). The guidelines provide:

- Recommendations on elements of best practice in procurement in which location information and location enabled services are important, with some practical examples;

- Describe some concrete sample texts that could be used in invitations to tender when reference is made to location information and location enabled service requirements;

- References to sources of more detailed procurement guidance and information.

The Guide does not give a list of recommended standards for use by public authorities when planning and procuring ICT goods and services, nor a step-by-step approach for

elaborating the details of a procurement document. This would not be possible since the standards most relevant to each awarding authority will vary according to the particular functions needed and to the ICT strategies that have been adopted. Moreover, there are other handbooks that describe the legal requirements, and the mandatory and optional parts of procurement documents.

1.2.3 Target audience

The guide is designed for use within public organisations by ICT/geospatial procurement officers, ICT managers and architects, developers of e-Government and SDI/INSPIRE strategies, and by policy makers at a wider government level. The Guide is intended to help these actors who are responsible for both planning and purchasing ICT systems and services under the EU Procurement Directives to ensure fully effective competition following best procurement practice.

1.2.4 Structure of the document

The guidelines consist of six sections. After this introductory section 1, section 2 describes the alignment challenge with regard to the integration of location information in e-Government, and how this translates into procurement. Section 3 provides an analysis of current practices based on a series of use cases. In section 4 the general rules on standards-based ICT procurement are summarised and an approach is proposed to improve procurement documents referring to INSPIRE, Geographic Information standards and conformity requirements. Section 5 presents the first ideas on how the procurement process could be linked to the GI standardisation process, while the main conclusions are presented in section 6.

2. ALIGNMENT THROUGH PROCUREMENT

The procurement of geospatial technologies is part of the challenge of aligning location information policies and legislation. In this section we briefly discuss the alignment challenge and the importance of ICT procurement, present an overview of the new generation of European Directives on public procurement and examine how other actions of the ISA programme are dealing with digital procurement.

2.1   The alignment challenge

While non-alignment of policies and policy programmes may result in procurement of systems and services that are not interoperable and sustainable, the procurement process itself can also be an instrument to improve alignment. The alignment of policies and strategies is a major challenge for public authorities. The European Union and its Member States are continuously developing new legislation, and existing legislation is regularly revised. Such developments and updates must always take into account existing legislation in the same policy field, and legislation in other fields whenever its content is relevant.

In several policy areas, many European Directives exist that refer directly to the creation, maintenance and provision of spatial data and information that is linked to such data. In the environmental field, the Birds Directive (2009/147/EC), the Habitats Directive (EEC/92/43) together with the Natura 2000 Standard Data Form define how Member States must delineate and document protected sites in order to form one European ecological network, the Floods Directive (2007/60/EC) aims to assess and prepare measures for all the areas of European river basins that are at risk for flooding, and the Marine Strategy Framework Directive (2008/56/EC) aims to protect more effectively the marine environment across Europe. Non-environmental Directives also refer to location information, e.g. the Intelligent Transport Systems Directive (2010/40/EU) in the field of road transport refers to road network data, traffic and travel information and interfaces that can support such systems. Also, in the area of statistics, regulation on the common classification of territorial units for statistics, called NUTS, describes a hierarchical definition of administrative boundaries (1059/2003). Moreover, many of these Directives refer to each other, which makes any change over time a complex task. It is obvious that non-alignment of policies and related actions might lead to duplication of effort, non-coherent results and even contradictions. This will be reflected in the information and information systems that are developed throughout those actions.[7]

Alignment becomes even more difficult, and important at the same time, because other framework Directives focus on data policy aspects, such as the Directive 2007/2/EC establishing an Infrastructure for Spatial Information in the European Community (INSPIRE), Directive 2013/37/EU on the re-use of Public Sector Information (PSI) and Directive 2003/4/EC on public access to environmental information. They all aim at improving access, sharing and use of data and information in one way or another, but they all have particular perspectives and objectives (see table 1 for a comparison). All these Directives are also relevant for and have an impact on the thematic Directives discussed above.

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[7]   A good example that is well documented is the multitude of systems to disseminate environmental information. See *"Active dissemination of environmental information in relation to the Birds and Habitats Directive: Workshop Report (ENV.D.4/ETU/2013/0063r)"*.

**Table 1:** *EULF Service Opportunities (based on Janssen, 2009)*

	INSPIRE (2007/2/EC)	PSI (2013/37/EU)	Access (2003/4/EC)
Objective	Data sharing for public tasks with an impact on the environment	Re-use for commercial and non-commercial purposes	Access of the citizen on request
	Public access to network services		Dissemination to the public
Scope	Spatial data sets and services with an impact of environment	Public sector documents	Environmental information
	Public authorities	Public sector bodies	Public authorities
Obligation	Yes	Yes (in most cases)	Yes
Electronic/paper	Only electronic	Electronic / Paper	Paper / Electronic
		Electronic where possible	Electronic where possible
Limitations	Data sharing: e.g. national defence	Yes: e.g. security, defence, IPR	Similar to INSPIRE
	Public access: e.g. IPR		
Charges	Not for reporting obligations	Yes, at marginal cost (with exceptions for certain public sector bodies)	Yes, but reasonable amount
	Not for discovery and view services (with some possible exceptions for the latter)		
Time limits	N/A	< 20 days of request	< 1 month of request

For example, in the context of INSPIRE additional legislation has been developed, called Implementing Rules that specify the technical specifications for data, network services and their metadata. The development of these rules, such as the Regulation on the interoperability of spatial data sets and services (n°1089/2010) which defines the data content for many thematic areas, is partially based on the thematic legislation described earlier. However, the content of thematic regulation changes over time, which might have an impact on the INSPIRE regulation. The opposite might also be true: INSPIRE specifications might include elements that were not yet integrated in the thematic legislation at the time of drafting/adoption. An example of evolving thematic regulation is the Natura 2000 Standard Data Form which was modified in 2011 (the first version was designed in 1996). The form is based on existing nomenclature, code lists, etc., all of which have changed over time. For the revision of 2011, for the first time reference was made to the inclusion of an INSPIRE Identifier based on regulation n° 1089/2010. Nevertheless, other changes might be needed that are not yet reflected in the INSPIRE Data Specifications but which might require changes in that legislation as well.

In the transport and mobility domain, the ITS Directive is defining particular needs regarding traffic and travel data linked to information on the road infrastructure of which the specifications can be found in the same INSPIRE regulation n°1089/2010. In addition to the specifications as defined by the ITS Directive, several industry standards (such as

Geographic Data Files) need to be taken into account and also multimodal reference models (e.g. Transmodel, IFOPT) are in place. All these examples demonstrate the complexity and ongoing nature of the alignment process covering technological as well as non-technological aspects. It becomes clear also that alignment processes are already integral part of legal and other initiatives at the European level[8].

Figure 2: *A schematic view of the architecture reference model of an SDI with the most important GI-standards relevant for its components (based on Smits et al., 2002).*
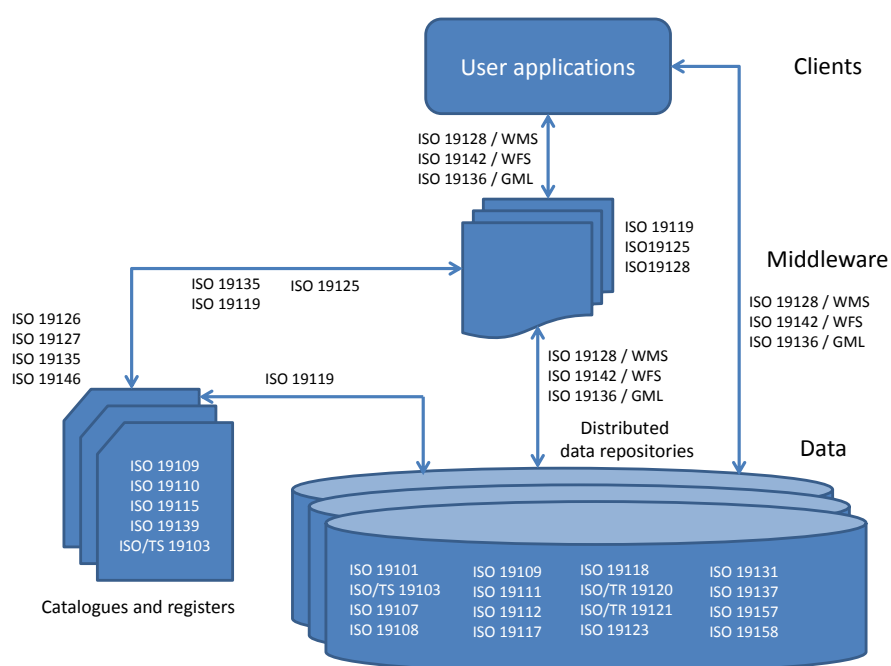
Another alignment challenge – besides the alignment between thematic and horizontal policies – is the alignment of existing policy and legislation with changing societal and technological developments. In the context of INSPIRE, it is absolutely important to align INSPIRE with changing and emerging GI standards, as INSPIRE is based on existing standards from CEN TC287, ISO TC211, OGC and other ICT standards (e.g. from OASIS, W3C). To realise conformity with these normative standards, it is essential that in case standards or specifications which INSPIRE are built upon, are updated, INSPIRE is able to adapt accordingly. The INSPIRE Maintenance and Implementation Framework (MIF)[9] is taking this into account.

The Assessment of the Conditions for a European Union Location Framework[10] in the Member States has shown that within existing (thematic) policies, legislation, and strategies, location aspects are often addressed in an insufficient or inconsistent way, causing duplications, contradictions, and gaps (Vandenbroucke et al., 2014). While in some of the EU policies and legislation reference is made to the INSPIRE Directive 2007/2/EC and related legislation, in many other policy areas this is not the case. But even a general reference to INSPIRE is in fact not enough, and additional effort is needed to define in more detail how alignment and interoperability can be achieved from the legal, organisational and technological perspectives. Also in procurement the way

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[8] Such efforts do exist at national and sub-national levels as well.
[9] http://inspire.ec.europa.eu/index.cfm/pageid/5160
[10] http://ec.europa.eu/isa/documents/assessment-of-the-conditions-for-an-eulf-v1_en.pdf

reference is made to INSPIRE and/or location information is very variable and often rather vague. Key documents related to INSPIRE are often not mentioned and sometimes requirements are formulated to define new data models or to collect data without making use of existing INSPIRE framework documents or components. However, this is not surprising since in most cases procurement activities are the result of policy actions and of the operational programmes that support these policy areas.

2.2   The new Procurement Directives

On 17 April 2014 the new EU Directives on Public Procurement came into force with the aim of modernising existing EU public procurement rules by simplifying the procedures and making them more flexible. This package of Directive includes:

- Directive 2014/23/EU on the award of concession contracts

- Directive 2014/24/EU on public procurement

- Directive 2014/25 EU on procurement by entities operating in the water, energy, transport and postal service sectors.

These three Directives can be considered as the fourth generation of European Directives on public procurement (Medeiros, 2014). Since 1962 several generations of Directives on Public Procurement have been implemented. An important milestone was the adoption of the Directives of 2004[11], which introduced some important innovations dealing with new trends in public law, procurement methods and digital technologies (Tavares, 2014). Among these innovations were the possibility of using electronic public procurement, the introduction of different procedures, the advanced formulation of the method to evaluate tenders on a multi-criteria formulation, and the comprehensive definition of public contracting authorities.

In 2010, the Commission launched the 'Europe 2020 Strategy for smart, sustainable and inclusive growth', in which several measures related to public procurement at EU and member state level were put forward as initiatives for realising smart, sustainable and inclusive growth. For instance, at national level, Member States will need "to improve the business environment especially for innovative SMEs, including through public sector procurement to support innovation incentives". On the other hand, "public procurement policy must ensure the most efficient use of public funds and procurement markets must be kept open EU-wide". One year later, the Commission published the Green paper on the modernisation of EU public procurement policy 'Towards a more efficient European Procurement Market', launching a public consultation on a set of possible measures on the modernisation of public procurement. Also in 2011, the Commission presented the Single Market Act, identifying twelve instruments ("12 levers") for stimulating growth and boosting citizens' confidence. One of these 12 levers was the adoption of a revised and modernised public procurement legislative framework, "with a view to underpinning a balanced policy which fosters demand for environmentally sustainable, socially responsible and innovative goods, services and works". It was stated that the revision of the legislative framework on public procurement "should also result in simpler and more flexible procurement procedures for contracting authorities and provide easier access for

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[11]   Directive 2004/17/EC coordinating the procurement procedures of entities operating in the water, energy, transport and postal services sectors and Directive 2004/18/EC on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts

companies, especially SMEs". These driving documents were the basis for the development of the three new Directives on EU Public Procurement.

According to Tavares (2014), the new Directives on Public Procurement aim to rationalise and aggregate public purchases, as they present several important advances to cope with the needs of the Member States, as well as to meet the 2020 objectives of the EU and to meet the most recent societal and technological challenges. Although the new Directives do not bring radical changes in existing major concepts and principles of administrative laws, they include important developments on seven different areas of public procurement: higher accessibility and e-public procurement, promotion of innovation, the consistency of legal requirements to be fulfilled by contractors, simplification of participation procedures and increased participation of SMEs, a more comprehensive approach that should lead to better value for money, a wide diversity of procedures and the aggregation of public demand through scaling.

An interesting evolution from the perspective of standardisation is the aim of the new Public Procurement Directives to encourage the use of "specific electronic tools, such as building information modelling electronic tools or similar". Building information modelling (BIM) is the process involving the generation and management of digital representations of physical and functional characteristics of places. In several EU Member States (UK, The Netherlands, Denmark, Finland), the use of BIM for publically funded building projects is already required, or will be required in the short term. Although the use of BIM is not mandatory throughout the EU, the new EU Public Procurement Directives clearly encourage Member States to recommend or specify the use of BIM. The procurement Directives also pay attention to the general problem of interoperability. In fact the drive for interoperability to avoid expensive investment to adapt existing (information) systems is one of the key motivations for these Directives.

2.3   Procurement and the ISA Programme

The ISA programme has defined several actions regarding digital procurement as part of e-Government developments.

Action 1.6 - CIPA - Common Infrastructure for Public Administrations Sustainability (Including PEPPOL[12]) – formerly called "PEPPOL Sustainability" (former Action 1.19).

PEPPOL has been set up to link national systems of electronic public procurement, so that any company in the EU is able to communicate online with any public administration in the EU. Government purchasing represents a massive 16% of the EU's GDP. eProcurement offers major potential economic benefits. However, its use across the EU varies widely and the transition to 100% eProcurement is far from complete. In recent years, pilots have been implemented to demonstrate the interoperability of national solutions leading to the launch of PEPPOL. Furthermore, PEPPOL's technology and technical standards can be reused across sectors e.g. the Business Documents Exchange protocol. Action 1.6 specifically focuses on the online delivery of documents.

Action 1.7 - Promoting the take-up of pan-European electronic procurement: e-PRIOR electronic procurement platform

The e-PRIOR Open Source eProcurement services platform is being developed in parallel with the PEPPOL eProcurement project. The aim is to enable public administrations to connect to the PEPPOL network, which has moved towards the operational stage. Under

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[12] PEPPOL: Pan-European Public Procurement OnLine.

development since 2007, e-PRIOR has already been successfully deployed within the European Commission, equipping it with one of the most mature electronic services platforms in the eProcurement domain. The challenge is to stimulate the take-up of cross border electronic procurement by Member States' administrations by using e-PRIOR as a 'bridge' to facilitate and accelerate European Public Administrations' connection to PEPPOL. As the private sector gets on board, e-PRIOR will also serve as a learning tool for private companies to develop their own eProcurement commercial solutions, based on European standards. Since the core elements are already in place and tested at the Commission, participation in the pilot can be achieved within a relatively short timeframe.

Action 2.11 - Supporting EU-wide cross-border accessibility and interoperability: Integrating EU eProcurement infrastructure.

Implementing eProcurement processes has proven to be very challenging for a range of technical, resource, and change-management reasons. Moreover, monitoring of the EU eProcurement marketplace shows that uncoordinated deployments are proliferating. However, local eProcurement actions are often neither interconnected nor interoperable. This leads to reinvention of the wheel, duplication of efforts, delaying take-up and the creation of barriers to cross-border procurement. This ISA action generates a coherent set of information products to support EU-wide cross-border accessibility and interoperability of eProcurement operations. The action also seeks to identify bottlenecks to eProcurement take-up, common barriers to interoperability and promotes participation in cross-border eProcurement and best practices.

Action 2.16 – The European Single Procurement Document Service

Action 2.16 aims to simplify the process of public procurement. The concept of 'the European Single Procurement Document (ESPD)' was introduced in the new Public Procurement Directive 2014/24/EC to support this. The 'European Single Procurement Document (ESPD)' is a self-declaration document intended for preliminary evidence in a public procurement procedure. In order to make full use of the ESPD concept, the European Commission will establish an ESPD service, i.e. a web-based system provided to end users (buyers and suppliers) to create, edit and reuse existing ESPD documents. The service aims to reduce the administrative burden and simplify the participation in public procurement procedures by removing the need to produce a substantial number of certificates and documentation related to exclusion and selection criteria.

Action 2.17 - e-Certis - Greater clarity of evidence requirements in the EU public procurement

The e-Certis action aims to develop a generic and re-usable system supporting the definition of criteria in any given business domain with a mechanism for compliance definition and checking based on eDocuments. In cross-border procedures, it is often difficult to know which evidence can or must be used to demonstrate compliance with certain criteria, which makes cross-border procurement processes more difficult to implement. e-Certis allows the mapping of evidence of compliance to criteria in a given business domain. It is developed in a generic way so that it can be used in any electronic business process in different policy areas. The e-Certis service will also be embedded into the European Single Procurement Document (ESPD) service.

In section 5, the eProcurement initiatives within the context of the ISA programme are discussed in more detail in view of possible linkage to procurement of geospatial technologies.

3. ANALYSIS OF PROCUREMENT PRACTICES

To demonstrate the need for alignment and guidelines on the procurement of geospatial technologies, an analysis is made of existing procurement practices in Europe in the domain of geospatial technologies. In this section we briefly discuss the method for collecting information for this analysis and present the results and conclusions of the analysis.

3.1   Method for collecting information

In order to assess the way procurement documents refer to INSPIRE and Geographic Information (GI) standards and technologies, it was decided to perform a comparative analysis based on a series of cases. The cases were selected from Calls for Tender that were published between 2008 and 2015, at European, as well as national and sub-national levels. The cases cover several policy domains: environment, energy, mapping, health and transport. Table 2 provides an overview of the parameters collected to describe the cases.

Table 2: Parameters to describe the procurement documents

Generic parameters	Comment	Location information parameters	Comment
Short name	Common name used for referring to the procurement	**General reference to INSPIRE**	Examples of how the Directive is cited
Full name	Official title of the procurement	**Reference to specific standards/specs**	Examples of how specific INSPIRE requirements and standards are referenced
ID	Reference to the procurement number	**Collection, design and harmonisation of data**	Split in several parameters regarding the spatial data (1/0)
Year	Year the procurement was launched	**Design, development and implementation of services**	Split in several parameters corresponding to different types of network services (1/0)
Level	European / country	**Metadata**	Work related to metadata (1/0)
Organisation	Department initiating the procurement documents	**Implementation of geo-portals / applications**	Work related to the development of applications (1/0)
Objective(s)	Abstract describing the aim of the procurement	**Reference to standards**	ISO 19100 series and OGC standards (1/0)

The first series of parameters describe the cases in a general way in order to understand the objectives and scope of the procurement, and to provide more general background information. The second series of parameters describe: 1) how the procurement document refers to the INSPIRE Directive in more general terms, 2) examples of how reference is made to specific INSPIRE or standards requirements, and 3) which components are covered in the procurement (indicated with 1 if the component is covered, and 0 when it is not covered), e.g. spatial data, network services (technical interfaces), metadata, applications such as geo-portals or international standards. A

total of 20 cases are included in the analysis. For these guidelines we focus on the qualitative analysis of some cases by means of examples.

3.2   Results of the use case analysis

The analysis of the cases was carried out in terms of their general reference to INSPIRE, and their specific requirements and references to international standards. Moreover, particular attention was paid to how the procurement documents were referring to compliancy / conformity with the INSPIRE Directive and its implementing rules. Most of the cases in the analysis were dealing with the creation, modelling and/or harmonisation of spatial data. Some projects also dealt with the development and implementation of network services and/or the creation of metadata.

In one particular project, i.e. the European Coal Resources (EUCORES) project, existing data sources had to be collected and an evaluation of different classification schemas in relation to coal deposits in the EU had to be carried out. The project clearly deals with the collection and modelling of (spatial) data, but no reference is made to the INSPIRE data modelling approach described in key INSPIRE documents which is based on the ISO 19100 series of standards[13]. This is a missed opportunity since the INSPIRE Directive refers explicitly to the energy theme in Annex III (theme 20) and the INSPIRE data specifications (regulation n°1089/2010) describe the spatial objects and attributes for this theme. The INSPIRE method for defining data (product) specifications might also be applied to spatial data sets that are developed and that are not within the scope of the INSPIRE themes (even if there seems to be a clear link here). The Invitation to Tender (ITT) documents refer in very general terms to the requirement of the *formulation of a common classification and terminology for coal topology and Coal Bed Methane (CBM) reservoirs taking into consideration existing methodologies and classifications (main national systems in the EU as well as classifications used by international organisations)"*. On the other hand, the Invitation to Tender document makes clear reference to INSPIRE metadata requirements: *"The geographic data should be documented, preferably in line with the INSPIRE Implementing Rules on metadata (*full reference is given*) and the metadata implementing rules: technical guidelines based on EN ISO 19115 and EN ISO 19119 (…) and are preferably made available in XML"*. Finally the ITT document refers also to the application of the ETRS89 Coordinate Reference System standard.

One of the other cases, i.e. VectorNet, a European project for sharing data on the geographic distribution of arthropod vectors and the pathogens they transmit to humans and animals, does not refer to INSPIRE at all. Nevertheless, the procurement document does refer to the application of standards and practices from the specific sector: *"The web-questionnaire tool should be modified to implement the harmonised vector distribution database model provided by EFSA/ECDC[14], respecting terminology and business rules specified by EFSA and ECDC. The data model will be based on the existing*

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[13]   D2.5 – INSPIRE Generic Conceptual Model; D2.6 - Methodology for the development of data specifications; D2.7 – INSPIRE Guidelines for the encoding of spatial data

[14]   European Food Safety Authority and European Centre for Disease Prevention and Control

data models in use by EFSA and ECDC". At the same time the procurement requires the generation of on-line maps in JPEG instead of WMS as used in the context of INSPIRE[15].

Other procurement documents refer in one or another way to the INSPIRE Directive and its Implementing Rules, and/or international standards for geographic information.

Table 3: *Examples of procurement documents referring to compliancy requirements of the INSPIRE Directive*

Case	Reference to INSPIRE and INSPIRE Conformity	Comments
ATMOSYS	*"(…) make available real-time air quality data via WMS/WFS and SOS technology, (...) conform with the specifications of the European INSPIRE Directive"*	Not clear whether conformity refers to the data or services
Air Quality ETL	*"Following functionalities (for the tool to perform ETL) are crucial (...) Must be usable to make the data available in conformity with INSPIRE (as far as possible according the current status of affairs)"*	The tool as such does not guarantee conformity, the methodology applied using the tools does
Environmental Mapping	*"The methodology (for preparing the maps) (...) must be in accordance with the technical and procedural annexes to the Implementing Rules of the INSPIRE Directive (...) in order to make the data interoperable"*	The preparation of the maps can hardly be in accordance with INSPIRE, the data and services can be in accordance with INSPIRE though
Mapping Eco-systems	*"Elements which should be covered in the reporting, (…) are: (…) Quality of the deliverables, compliant to INSPIRE provisions; (…) results should be produced according to INSPIRE regulations and guidance documents"*	There are 12 legal acts and over 400 technical guidance documents
DOV data Specs	*"Paying attention to the impact of the INSPIRE Directive is crucial in this assignment. In particular, we should take into account the requirements from the Directive."*	Specific mentioning of the relevant Implementing Rules and Guidelines would help
Strategic Plan and basic e-services and web hosting for the Implementation of Directive 2007/2/EC (INSPIRE) in the Republic of Cyprus	*"The purpose of this Contract is to prepare a «Strategic Plan» for the overall implementation of Directive 2007/2/EC (INSPIRE) in the Republic of Cyprus, (…) and also to deliver the «basic GIS e-services» (INTERNET based cloud services) required by the Directive,*	The INSPIRE Directive does not requires the delivery of "basic GIS e-services", nor of "Internet based cloud services". The procurement document defines a broader concept as compared to the SOA based network services.
EC INSPIRE Directive Consultancy Services Malta	*"The consultancy will cover both the technical, legislative and operational aspects of the EC INSPIRE Directive, such as: datasets and metadata, implementing regulations, network services, data and services sharing and monitoring and reporting aspects."*	Specific mentioning of the relevant Implementing Rules and Guidelines would help. Not clear why reference is made 'implementing regulations' between other INSPIRE components.

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[15] Of course, not all activities and ITTs should apply INSPIRE specifications. However, the methods can be applied in many cases in order to reach improved interoperability and in many cases it makes sense to develop the data and systems based on the same international standard interfaces.

Table 3 gives some examples of how reference is made to the INSPIRE Directive and to the conformity that must be respected. Most references are relatively vague, referring to INSPIRE in general and stating that deliverables should be INSPIRE compliant. However, INSPIRE is a framework Directive and 10 Implementing Rules detail the specifications for different components such as metadata, data, network services, data and service sharing and monitoring and reporting. In addition several guidelines exist which also refer to the standards the specifications rely on. Moreover, in most cases it is not clear what the compliancy is referring to (which component).

Table 4 provides examples of detailed references to international standards on Geographic Information from ISO/TC 211 and the Open geospatial Consortium (OGC).

Table 4: Examples of procurement documents referring to ISO, OGC and other international standards

Case	Reference to ISO, OGC and other international standards	Comments
ATMOSYS	*"The objective is to make the WMS/WFS compatible with the INSPIRE data specification on Atmospheric Conditions as far as possible according to the current state of affairs of the INSPIRE process"*	It is not clear how the WMS/WFS can make the data compliant with the data specs
Air Quality ETL	*"The extracted data should be presented as INSPIRE compliant GML (XML), retrieved as WFS that can be validated against IPR schema (...) or data will be transformed to the required formats with the aid of xml-schema (.xsd) (...) or additional services are developed (WFS, WPS, WCS, SOS) to become part of the existing SOS implementation"*	This reference is relatively detailed and precise
Cape Verde SDI	*"Completing the Metadata Catalogue and a Metadata Profile, as well as creating an electronic template for filling metadata, enabling the standardisation of the existing and future cartographic documentation, complying with the Inspire directive and ISO 19115/TS19139"*	The reference to the standards for metadata is precise, but incomplete[16]
DOV data Specs	*"He/she masters the norms and standards to which this Directive and related documents refer (...) UML, XML Schema, GML and eventually also GeoSciML (...)"*	Knowledge about the ISO 19100 series of standards is not mentioned, but key

From the cases described in table 4 we can learn that some are referring relatively precisely to the key standards to perform the work described in the procurement document, however in most other cases references are not precise or incomplete. It would be preferable to add a section in procurement documents stating the mandatory standards to be applied (e.g. comparable to the list of applicable legislation).

3.3 Conclusions

An analysis was made of some typical examples of ITT documents in which location information and location based services are procured. Based on these examples we can conclude that although many ITT documents refer to INSPIRE, their Implementing Rules

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[16] ISO 19115 includes different parts, and also ISO/TS 19139 has two parts. It is recommended to explicitly refer to the relevant part(s). For INSPIRE metadata also references to ISO 19119 (services) and the Dublin Core (ISO 15836) are essential

(and sometimes guidelines), and the International Standards they are built upon, most references are very general and incomplete.

4. GUIDELINES FOR PROCUREMENT

To help those actors responsible for the procurement of location information and location enabled e-Government services, this section provides guidance in the form of a series of recommendations and examples of placeholders. First, a general introduction is given of the main types of references that should be integrated in procurement documents. The second part of this section discusses some of the typical requirements related to location information and services. In the following sections guidance is provided on how to refer to the INSPIRE Directive, to conformity/compliancy requirements and to international standards. Finally, also the importance of taking into account general recommendations on the procurement of ICT is discussed.

4.1 Procurement of location information and services

In general terms, the analysis of the cases (section 3) in which procurement of location information or location services was important, confirms the need for guidance for those involved in the elaboration of procurement documents. Many of the procurement documents leave too much room for interpretation. Procurement documents should give clear answers on questions such as: *"which specification and guidelines should be applied"*, *"what are the relevant standards to take into consideration"*, *"what conformity checks need to be performed – against which specifications"*, etc.

Therefore this section provides practical guidance in the form of a series of recommendations and examples of placeholders – i.e. pieces of text that illustrate how references can be integrated in procurement documents. Three types of references are developed:

1. General references to the INSPIRE Directive, including all the Implementing Rules and Technical Guidelines that are applicable;

2. A correct reference to conformity/compliancy requirements including which results/outputs of the procurement should be conformant/compliant with which specification or standard[17];

3. Very precise references to relevant international standards, referring to the repository of standards of the relevant CEN and ISO committees, of the OGC and of other – thematic - communities.

Before discussing the recommendations for each of these three types of recommendations, we first provide an introductory discussion of the typical requirements related to location information and services.

4.2 Typical requirements related to location information and services

Three main categories of location information products and services can be distinguished: products/services related to the creation and/or harmonisation of data, products/services related to the implementation of network services, and products/services related to the development and implementation of applications and systems for the use and integration of network services in e-Government processes. The provision of expertise in each of these domains can be considered as a fourth separate

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[17] Preferably tools should be provided or referred to that can be used to test this conformity / compliance. Of course the latter might be part of the procurement itself if these do not exist.

category. Table 5 provides an overview of the typical procurement requirements in the domain of location information and services, how these requirements are related to INSPIRE and what are typical pitfalls in dealing with these requirements.

Table 5: *Typical procurement requirements and how they are related to INSPIRE*

Topic	Typical procurement activity	How it might relate to INSPIRE	Typical/potential pitfalls
Data	Development of a spatial data model	INSPIRE Data Specification Approach based on D2.5 – INSPIRE Generic Conceptual Model; D2.6 - Methodology for the development of data specifications; D2.7 – INSPIRE Guidelines for the encoding of spatial data and related documents. Metadata for discovery, evaluation and use: INSPIRE metadata regulation and guidelines	Not taking into account existing data models of INSPIRE and those resulting from international initiatives Not following a standardised approach for modelling (e.g. based on the INSPIRE methodology and/or the ISO 19100 series of standards) Not creating a conceptual model and/or not using a conceptual modelling language but starting immediately with a logical / physical model
	Creation of new spatial data	INSPIRE Data Specification Approach based on D2.5 – INSPIRE Generic Conceptual Model; D2.6 - Methodology for the development of data specifications; D2.7 – INSPIRE Guidelines for the encoding of spatial data and related documents. Metadata for discovery, evaluation and use: INSPIRE metadata regulation and guidelines Data quality and conformity (if applicable) with INSPIRE Implementing Rules and Guidelines Defining applicable rules for public access and sharing (with the European Institutions, other public bodies and external parties) Defining conditions of use Defining licensing approach	Not taking into account existing data (sets) Not requiring the development of a formal conceptual data model using a conceptual data modelling language Unclear description of IPR issues regarding the newly created data (ownership, licensing)

Topic	Typical procurement activity	How it might relate to INSPIRE	Typical/potential pitfalls
	Acquisition of existing location data to support applications	Existing metadata conformant with INSPIRE Implementing Rules and/or ISO 19115 Conformity of the spatial data with the INSPIRE Implementing Rules and Guidelines Data quality aspects IPR issues regarding sharing and conditions of (re-)use	Data cannot be shared or re-used because of license conditions. Data model does not allow data to be easily used as reference data for other applications Data transformation issues because data were created for a specific user community and/or application Lifecycle of the data, including foreseen updates and progressive harmonisation with other data.
	Making existing location data interoperable	INSPIRE Data Specification Approach based on D2.5 – INSPIRE Generic Conceptual Model; D2.6 - Methodology for the development of data specifications; D2.7 – INSPIRE Guidelines for the encoding of spatial data and related documents. INSPIRE Application Schema Transformation services and offline transformation tools	Not taking into account the lifecycle of the data: new versions of the data might need to be transformed again Data transformation issues because data were created for a specific user community and/or application No IPR consideration and/or unclear licence regarding the transformed data
Services	Making location data accessible through services	Network services for discovery, download, transformation, and view Linking the services to the national INSPIRE infrastructure; providing mechanisms for feeding the national portal in case of discovery services Metadata for network services according to the INSPIRE metadata regulation and guidelines License conditions	Minimum requirements for service quality not tested. No requirements defined for metadata for services Sustainability of the solution in the overall IT context: missing maintenance contracts are absent, services or URLs break after some time. Not taking into account variants of certain interfaces (e.g. WFS-T, WCS for raster, …)
Applications	Turn-key solutions for using location services in e-government processes	INSPIRE Architecture INSPIRE specifications for different types of network services	Unilateral focus on the establishment of portals forgetting the link to the processes to support and the data flows required

Topic	Typical procurement activity	How it might relate to INSPIRE	Typical/potential pitfalls
		INSPIRE registry and registers INSPIRE Guidelines and Guidance documents on spatial data services	No requirement defined to describe processes the application(s) should support Pre-defining existing solutions and requiring technologies already in use No requirement defined to offer solutions that support open standards
	Development of a geoportal	INSPIRE specifications for different types of network services	Reference to INSPIRE requirements for geoportals, while there are no INSPIRE technical specifications for a geoportal per se
Expertise	Time-means contractual support	Relevant INSPIRE areas to be covered by the experts (data, services, metadata, portals and applications, …) Knowledge of methods and tools used in the context of INSPIRE	Defining knowledge and required skills only in very generic way Requiring experts to have all the expertise and skills covering all INSPIRE aspects (from data to services to applications)
	Development and provision of a training programme on certain INSPIRE areas	Relevant INSPIRE areas to be covered by the experts (data, services, metadata, portals and applications, …) Knowledge of INSPIRE implementation in different countries and areas	Defining knowledge and required skills only in very generic way Requiring individual experts to have all the expertise and skills covering all INSPIRE aspects

4.3   Referring to INSPIRE

The following recommendations can be given to improve referencing to INSPIRE in procurement documents:

1. *Refer to the INSPIRE Directive, its Implementing Rules and Guidelines in a precise way.*

   Call for tenders might focus on the implementation of specific components of the INSPIRE Directive. The tender might ask for:

   - The development of (new) spatial data products according to the INSPIRE specifications including the creation of the data model, the collection of the data, the development of the database, the creation of metadata, etc.

   - The transformation of (existing) spatial data to the INSPIRE specifications of the relevant theme using transformation tools;

   - The set-up of a catalogue for metadata for spatial data sets and services and a discovery (catalogue) service for exploring the metadata through a geoportal;

- The development of view and download services according to INSPIRE specifications to use the spatial data sets;

- The development of a (spatial) data policy to enhance sharing and exchange of spatial data and services including the elaboration of licences;

- …

It is important that the scope of the tender and the expected activities are clearly defined, referring to the INSPIRE Directive and the applicable Implementing Rules and Guidelines in general. Also reference can/should be made to other (thematic) Directives where relevant. It is recommended to be complete and provide the exact title (referencing to the INSPIRE website allows 'choosing' the rules and guidelines)

> Example placeholder
>
> This Invitation to Tender deals with the implementation of components of a Spatial Data Infrastructure as part of the efforts of <country/region/organisation/…> to implement DIRECTIVE 2007/2/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community, further called the INSPIRE Directive. More particularly it concerns the implementation of <data/services/metadata/…> according to the requirements of the INSPIRE Directive, its Implementing Rules and Guidelines. The following Implementing Rules and Guidelines are relevant and must be used in the context of this Invitation to Tender: <list of published Implementing Rules>; <list of published guidelines>

2. *Even if certain activities covered by a Call for Tender do not, strictly speaking, relate to INSPIRE, it might be worthwhile to refer to INSPIRE as a method for data specification development or to apply some of its technical specifications.*

Call for Tenders might relate to the development of data and systems that are not part of the 34 themes or focus rather on the related information (e.g. collection of travel information); or Tenders might implement different types of services that are not required under INSPIRE (e.g. Sensor Web Enablement). It is recommended that even in such cases reference is made to the INSPIRE Directive, its Implementing Rules and Guidelines. In fact it is necessary in many cases to take into account existing specifications to allow smooth integration in a later stage (e.g. connecting travel data with the INSPIRE road network), or to apply the INSPIRE methodologies to another field which is the topic of the Call for Tender. The tender might ask for:

- The creation of a new data model that covers thematic areas not covered by INSPIRE or that extends one of the 34 INSPIRE thematic areas;

- The collection of data and the development of a database according to existing specifications from a thematic community (not covered by INSPIRE);

- The set-up of web services to provide access and/or to process the data and information;

- ….

For instance, in case a new data model will be created as part of the activities under a call for tender, it can be asked to apply the methodology described in the guidelines D2.5 – INSPIRE Generic Conceptual Model; D2.6 - Methodology for the

development of data specifications; and D2.7 – INSPIRE Guidelines for the encoding of spatial data and related documents.

Example placeholder (creation of new data model)

Although this Invitation to Tender is not directly related to the implementation of the INSPIRE Directive, the activities within this ITT are deemed to be closely linked to this Directive. Therefore bidders are required to take into account the DIRECTIVE 2007/2/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community, further called the INSPIRE Directive. It is advisable that the tenderer uses the Directive and the following Implementing Rules and Guidelines as reference: COMMISSION REGULATION (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services and COMMISSION REGULATION (EU) No 102/2011 of 4 February 2011 amending Regulation (EU) No 1089/2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services. It is recommended that the new data model to be created as part of the activities under this call for tender applies the methodology as described in its guidelines: D2.5 – INSPIRE Generic Conceptual Model; D2.6 - Methodology for the development of data specifications; D2.7 – INSPIRE Guidelines for the encoding of spatial data and related documents.

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3. *Do not refer to INSPIRE requirements for the development of geoportals*

In fact, the geoportal itself is an application to provide access for a user to metadata catalogues containing the metadata descriptions of the data and services. There are no INSPIRE technical specifications for a geoportal as such although the INSPIRE requirements for search functionalities should be embedded in the portal. Therefore, avoid sentences such as "The geoportal should be compliant with the INSPIRE Directive". It is recommended that a concrete reference is made to the functional INSPIRE requirements as described in the INSPIRE Directive in Article 11(2) together with other functional and non-functional requirements that are not INSPIRE requirements (e.g. the integration of a web map viewer to explore the data and services).

Example placeholder

The geoportal <should/must> take into account the functionalities regarding the search criteria for spatial data and services as described in the INSPIRE Directive, Article 11(2). Other functionalities that should be implemented are […]. The geoportal should provide access to the metadata of the data and services through a geo-catalogue and catalogue service implemented according to the following Implementing Rules and Guidelines: COMMISSION REGULATION (EC) No 976/2009 of 19 October 2009 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards the Network Services and the Technical Guidance for the implementation of INSPIRE Discovery Services.

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4. *Clarify the terminology used in the procurement documents and how these relate to the terminology used in INSPIRE*

    INSPIRE uses specific terms for particular components of the infrastructure. For example, INSPIRE refers to network services and defines 5 types of network services to provide access to the spatial data sets: discovery services, view services, download services, transformation services and invoking services. Furthermore, a difference is made between these network services and spatial data services. It is recommended to use precisely the terms and definitions as specified in the Directive and the Implementing Rules and Guidelines, and to avoid the use of similar or different terms when referring to the components of INSPIRE. However, since in the context of the application of International Standards other terms are used it is advisable to foresee a clarification of terms in the procurement document. A short definition can be given, as well as references to relevant documentation providing more insight and background information.

    Example placeholder

    In the context of this Invitation to Tender, the following terms are used. Network services: discovery, view and download services (Directive 2007/2). These types of services can be used to search for spatial data sets and services, to view spatial data sets, and to download data sets or parts thereof. In practical terms, these services correspond to standard interfaces (mostly from the Open Geospatial Consortium): CSW (discovery), WMS/WMTS (view), WFS or Atom Feed (download) as defined in the Technical Guidance for the implementation of INSPIRE Discovery Services, the Technical Guidance for the implementation of INSPIRE View Services and the Technical Guidance for the implementation of INSPIRE Download Services.

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5. *Refer whenever possible to an existing architecture document (European, national) describing the National/sub-National SDI, INSPIRE or e-Government architecture in which the requested components fit.*

    SDIs and INSPIRE are built on a common architecture based on three tiers: a data tier, a service tier and an application tier. In order to make clear which part(s) of the architecture the call for tender is related to it is a good practice to refer to the architecture document of INSPIRE and other relevant descriptions (e.g. describing relevant national SDI or e-Government architectures).

    Example placeholder

    The components developed under this Invitation to Tender are part of the <SDI/INSPIRE> infrastructure of <country/region/organisation/…>. Therefore they should fit in the overall architecture of the <SDI/INSPIRE>. This architecture is described for the European level in the "INSPIRE Technical Architecture – Overview" document and for <country/region/organisation/…> in the following document <reference to document>. Also CEN/TR 15449 – Part 1 – Reference Model (<full reference>) provides an overview of the components of an SDI and the applicable standards.

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6. *Allow room for flexibility by not only referring to standards and specifications that are already adopted, but also to ongoing work (e.g. draft versions of standards or specifications).*

Since procurement in itself is a process that takes time, and since the development of standards, including the INSPIRE specifications and guidelines, is a dynamic and ongoing process, it is necessary to provide some general clauses in the tender documents that requires tenderers to take these developments into account whenever possible. Also more specific references can be made to draft documents. Special attention should be paid to (last) versions of standards, specifications and guidelines (unless there is a specific requirement for an 'older' version of a standard).

> Example placeholder
>
> The tenderer should take into account continuous developments of the standards, specifications and guidelines which are relevant for this Invitation to Tender. New versions of the standards, specifications and guidelines, even when they are not published/adopted yet, that see light during the lifetime of this procurement should be considered by the tenderer as far as possible. At least the tenderer should investigate new documents and advise the client on their relevance and applicability in the context of this tender.

4.4 Including conformity requirements

The following recommendations can be given to improve statements on conformity with INSPIRE in procurement documents:

1. *Be clear about which outputs/products of the procurement should/must be conformant/compliant with which specification/standard.*

Avoid ambiguous statements on conformity: e.g. "developing a geoportal compliant with INSPIRE" or "developing INSPIRE metadata". It is recommended that procurement documents make very clear statements on conformity. This is important since it might be an element of acceptance of the resulting output or product. Conformity relates to the INSPIRE Directive and Implementing Rules. However, there exists also a broader concept of compliancy with specifications and guidelines, or even with a particular standard[18]. Conformity and compliancy are applicable for several aspects of INSPIRE and SDIs at large:

- Conformity of a particular spatial data set with (INSPIRE) data specifications as described in the implementing rules;

- Conformity of a particular network service (discovery, view, download, …) with the specifications of these respective network services as described in the implementing rules;

- Conformity of metadata records with the implementing rules on metadata.

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[18] Usually procurement documents mix the terms conformity and compliancy. In the context of INSPIRE the term compliancy generally denotes the broader concept, whereas conformity is often used in the narrower sense and is linked to specific rules. Note that the technical standards which are defined or referred to in detail in the INSPIRE guidelines have no legal 'obligations'.

> Example placeholder
>
> The <new/transformed> spatial data set must be conformant with the Implementing Rules <reference to the relevant implementing rule> and comply with the relevant guidelines <reference to the relevant guidelines>. It is <recommended/mandatory> that the spatial data set is tested using the Abstract Test Suite <reference to the abstract test suite> developed by the European Commission.

Example placeholder

The <discovery/view/download> service must be conformant with the Implementing Rules <reference to the relevant implementing rule> and comply with the relevant guidelines <reference to the relevant guidelines>. It is <recommended/mandatory> that the conformity of network services is tested using the Abstract Test Suite <reference to the abstract test suite> developed by the European Commission.

Example placeholder

The metadata <for spatial data sets and/or services> must be conformant with the Implementing Rules <reference to the relevant implementing rule> and comply with the relevant guidelines <reference to the relevant guidelines>. It is <recommended/mandatory> that the conformity of the metadata is tested using the INSPIRE Geoportal Metadata Validator<reference to the INSPIRE Geoportal Metadata Validator> developed by the European Commission.

2. *Require testing of the outputs/products on conformity/compliancy as part of the procurement.*

   The testing might be part of the procurement itself (to be performed by the contractor), but it is also an activity of the authority that launched the call for tender in order to test and accept (or not) the outputs/results of the procurement process. In this context the procurement documents might allow the use of testing tools which are in the market or developed by the tenderers themselves, or the procurement might suggest or impose the use of certain test suites. In each case, the description of the testing should be part of the deliverables of the procurement.

> Example placeholder
>
> The resulting <spatial data set/service/…> must be tested on its conformity with the Implementing Rules for <reference to the relevant implementing rules>. The tenderer must describe what was tested, the way the test was done and the tools used.

4.5 Referring to international standards

The following recommendations can be given to improve reference to international standards in procurement documents. These international standards not only include GI standards but also relevant thematic and general ICT standards, which should also be taken into account:

1. *Be as complete and precise as possible when referring to international standards.*

Reference should be made to all relevant standards, taking into consideration the precise name (number), the right version (might even be an 'old' version) and when relevant the different parts and revisions. An option might be to include a list of all applicable/mandatory standards at the beginning [19] of the call for tender (CfT) document.

Example placeholder (example of metadata)

The spatial data sets created must be documented in conformance with the INSPIRE Implementing Rules on metadata <full reference>, and use the technical guidelines on metadata <full reference>. Also the CEN/ISO standards on metadata should be considered as reference material: EN ISO 19115-1:2014, EN ISO 19115-2:2009 and EN ISO 19139:2007. More recent versions of these standards might be considered as well when they would become available during the lifetime of the project.

Example placeholder (at the beginning of the CfT document)

The following standards are considered to be applicable/mandatory in the context of this Invitation to Tender, and should be taken into account by the tenderer:

  □   [add list of applicable standards]

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2. In some cases it is better to refer to a series of standards that go together, rather than to individual standards.

It can become very cumbersome to refer to all the relevant standards individually. In that case, the references to the standards can be grouped, e.g. referring to the ISO19100 series for developing data specifications or to refer to documents that provide an overview of these standards and what they are used for, e.g. the CEN/TR 15449[20].

Example placeholder

For developing new <data specifications/data model> the approach as developed by INSPIRE which is based on the ISO 19100 series of standards must be applied (see D2.5 – INSPIRE Generic Conceptual Model; D2.6 - Methodology for the development of data specifications; D2.7 – INSPIRE Guidelines for the encoding of spatial data and related documents). Also CEN/TR 15449-Part 2 regarding the data view on SDIs and their relevant standards should be consulted as supporting information.

4.6   General recommendations on the public procurement of ICT

Public administrations are significant consumers of ICT, and their procurement can have a significant influence on innovation and competitiveness in the ICT market. A lack of

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[19] Usually this is the administrative part of the procurement document.

[20] This Technical Report provides an overview of standards for SDI. Part 1 provides an insight in an SDI architecture and the related standards, Part 3 provides an overview of relevant standards for spatial data and metadata, while Part 4 describes the relevant standards for a Service Oriented Architecture.

interoperability among European public administrations will be a barrier with regard to the functioning of the internal market. It is therefore not surprising that procuring ICT based on standards is a key component of the Digital Agenda for Europe (Action 23). The action should ensure that public administrations reduce the risk of becoming excessively dependent on a single vendor for the provision of ICT products or services beyond the timeframe of the initial procurement contracts, a situation known as the 'lock-in' problem. The use of standards should also make the ICT infrastructures of public authorities more interoperable and therefore reduce costs and increase the quality of e-Government services.

Standards-based public procurement for ICT should be seen as a process with many activities and steps before information and/or an operational information system for use by administrations, businesses and citizens are available. Many people and their organisations are involved. The following key steps are defined in the *"Guide for the procurement of standards-based ICT — Elements of Good Practice"* (European Commission, 2013):

1. Assessing available standards
2. Developing an ICT Strategy
3. Defining user requirements
4. Assess costs/benefits (business appraisal)
5. Long term budgetary planning
6. Assessing the market
7. Decide on the optimal procurement process
8. Write procurement documents
9. Evaluate the procurement process

The different steps are illustrated in figure 3.

Figure 3: Activities involved in procuring ICT systems based on standards and other technical specifications (Source: European Commission, 2013)
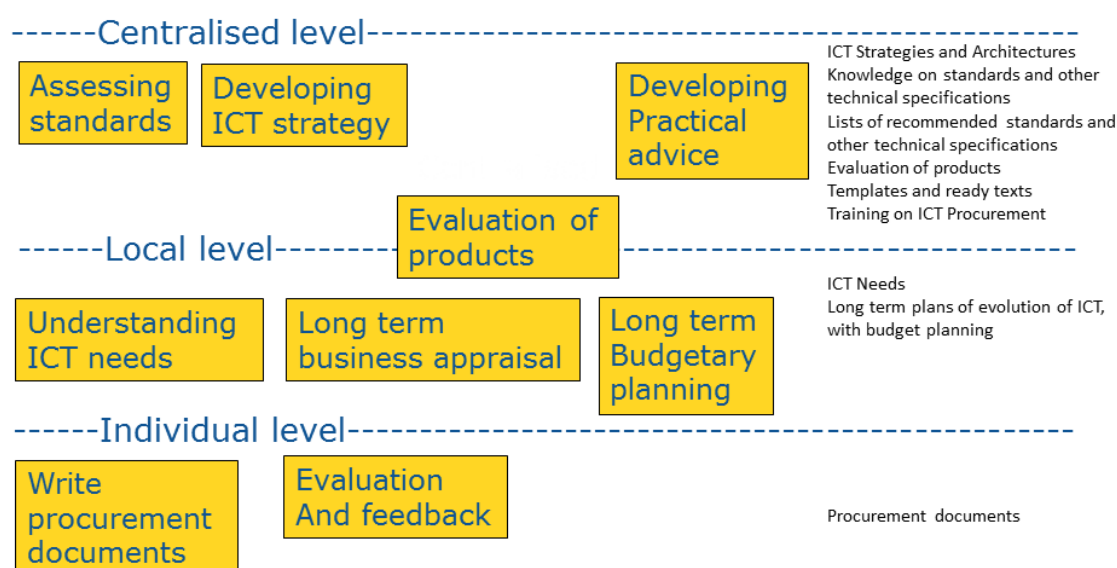
Throughout the procurement process, several rules (do's and don'ts) should be taken into account. Many of these are of particular importance for procurement of location information and location enabled e-Government services. The Guide for the procurement

of standards-based ICT provides many recommendations and "what-to-do's" (European Commission, 2013).

Table 6: *Recommendations from the Guide for the procurement of standards-based ICT and their relevant to the procurement of geospatial technologies*

Recommendations from the Guide for the procurement of standards-based ICT	Relevance of these recommendations to the procurement of geospatial technologies.
Assessing standards Develop and maintain expertise on standards and other technical specifications relevant to each area of ICT	During the assessment of standards, ICT experts, thematic experts and/or geospatial experts should be involved. In the context of procuring location information and location enabled e-Government services that are linked and make use of the existing components of SDIs and INSPIRE, several technical and non-technical experts should be involved: ICT experts, thematic experts, geospatial experts, etc. Also staff from the coordinating body of the SDIs / INSPIRE should at least know about procurement plans and whether they fit with existing solutions.
Assessing the market Work with the market to develop suitable solutions	Communicating the long-term ICT procurement plans to the market may be useful to give suppliers time to react and develop solutions to organisations' needs. This is particularly important for solutions that require levels of interoperability that are currently unavailable. With that regard the efforts of the OGC to provide testing suites for services and software regarding compliancy with the geospatial standards is an important source of information and references to these efforts might be integrated in procurement documents.
Developing practical advice Develop lists of recommended standards and other technical specifications as part of an ICT strategy	In the context of INSPIRE, a list/catalogue of relevant standards, applicable in the context of location information and location enabled e-Government services would be of great added value, especially if it would be integrated with the efforts and solutions offered by the European Commission (ISA programme)[21].

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[21] The Digital Single Market Strategy proposes to develop a European catalogue of standards and specifications. The objective is to support and encourage public procurers to mention ICT standards and specifications in their calls for proposals.

5. E-PROCUREMENT PLATFORM

Several initiatives could be taken to support the preparation of procurement documents, and the procurement process in general. One of these initiatives is the development of a digital platform to support the procurement process. In this section we first briefly discuss how this is part of the eProcurement Actions of the ISA Programme that were launched to support the eProcurement process. We also explain how the integration of catalogues of standards and best practices of implementing these standards into this digital platform could facilitate the preparation of procurement documents.

5.1   eProcurement in the ISA Programme

The eProcurement Actions of the ISA programme are an integral part of the Digital Agenda for Europe - the first of seven flagship initiatives under Europe 2020, the EU's strategy to deliver smart sustainable and inclusive growth. The European Commission "Strategy for e-procurement" was adopted in April 2012, and included plans to implement actions for e-procurement, such as (Ciciriello, 2014):

- Support of the deployment of an e-procurement infrastructure, ensuring support for the sustainability of the PEPPOL components from mid-2012;

- EC financial contribution to the development of an e-procurement infrastructure through the Connecting Europe Facility (CEF);

- Creation of an effective legal framework.

Figure 4: *The PEPPOL vision and architecture (Source: Ciciriello, 2014)*
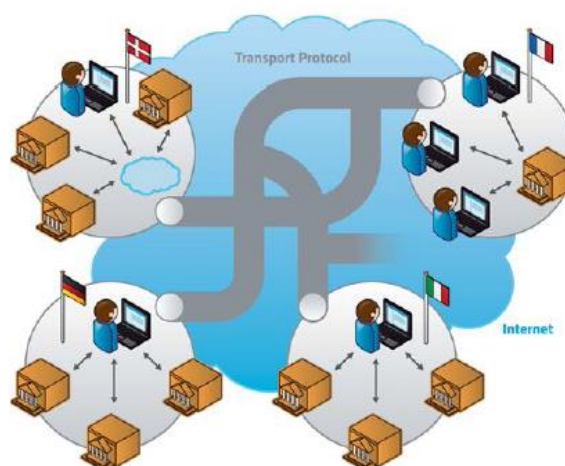
This led in 2014 to a series of new EC Public Procurement Directives (see Section 2). In order to develop this legislation several supporting actions were taken (Ciciriello, 2014):

- Development of a Roadmap for electronic invoicing in public procurement. The main problem to be addressed was the use of multiple standards imposed by Member States. The policy approach that was considered as the most effective was to create a Legislative Act providing the possibility of making e-invoicing mandatory in public procurement, and mandating the use of specific standards to ensure interoperability.

- Single Market Act II – Key Action 10: "Make electronic invoicing the standard invoicing mode for public procurement." The introduction of legislative measures making e-invoicing a standard practice in public procurement making the public sector a 'lead market' for e-invoicing and spearhead its wider use in the economy.

- EC Directive on e-invoicing in public procurement (April 2014): Development of an e-invoicing standard building on the work of CEN WS/BII, PEPPOL, taking into account other initiatives.

The PEPPOL project (2008-2012) was launched to address the key eProcurement challenges in Europe. It was jointly funded by the EC and a consortium of 18 government agencies from 11 Member States and Associated Countries (Ciciriello, 2014). PEPPOL is based on following principles:

- Open and secure network, as the backbone of the e-Procurement Infrastructure in Europe, connecting communities through Access Points;

- Standards-based specifications for e-Procurement documents to be exchanged over the PEPPOL network;

- Focus on the complete process and the critical phases, covering pre and post award processes.

The latter aspect is illustrated in Figure 5.

Figure 5: *The procurement process and supporting PEPPOL components (Source: Ciciriello, 2014)*
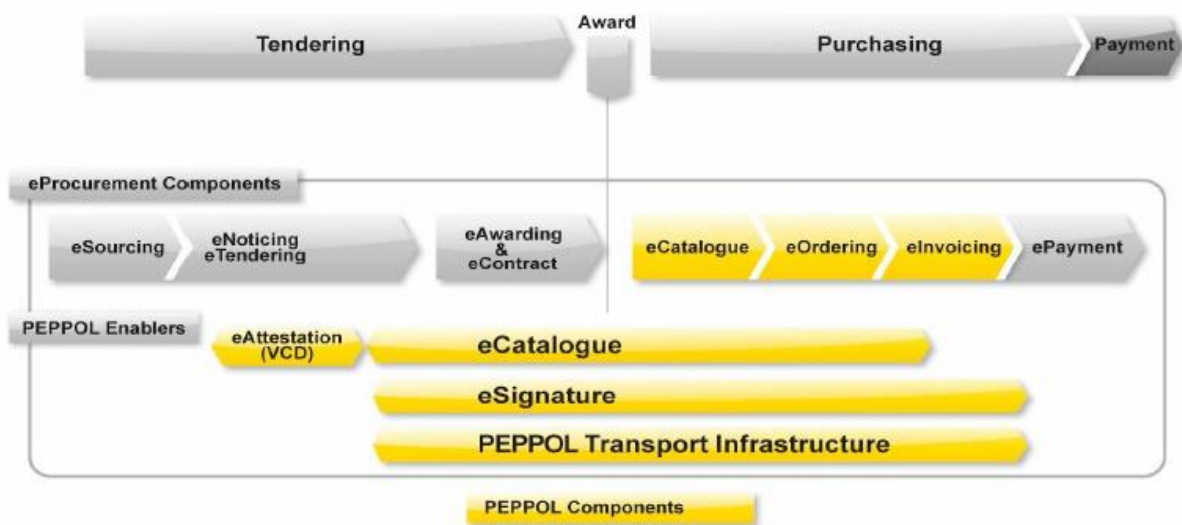

Some of the recommendations, such as the use of lists/catalogues of standards will become part of such an eProcurement platform.

5.2 Procurement and the standardisation process

This brings us to the other mechanism that could facilitate the preparation of procurement documents. This is the set-up of a digital platform to support the preparation of the procurement documents, the selection and award process, as well as the archiving of the results of the projects, whether they are European or national. The platform could contain, among others, the components of PEPPOL (see section 5.1) as

well as other components such as a repository of European (and national) legislation, the repository of standards that is under development[22] and a repository of Best Practices and project deliverables[23]. The guidelines from Section 4 could also be part of this platform by making the placeholders available. Figure 6 illustrates how different processes could feed and make use of the different repositories.

Figure 6: *The procurement and standardisation process*
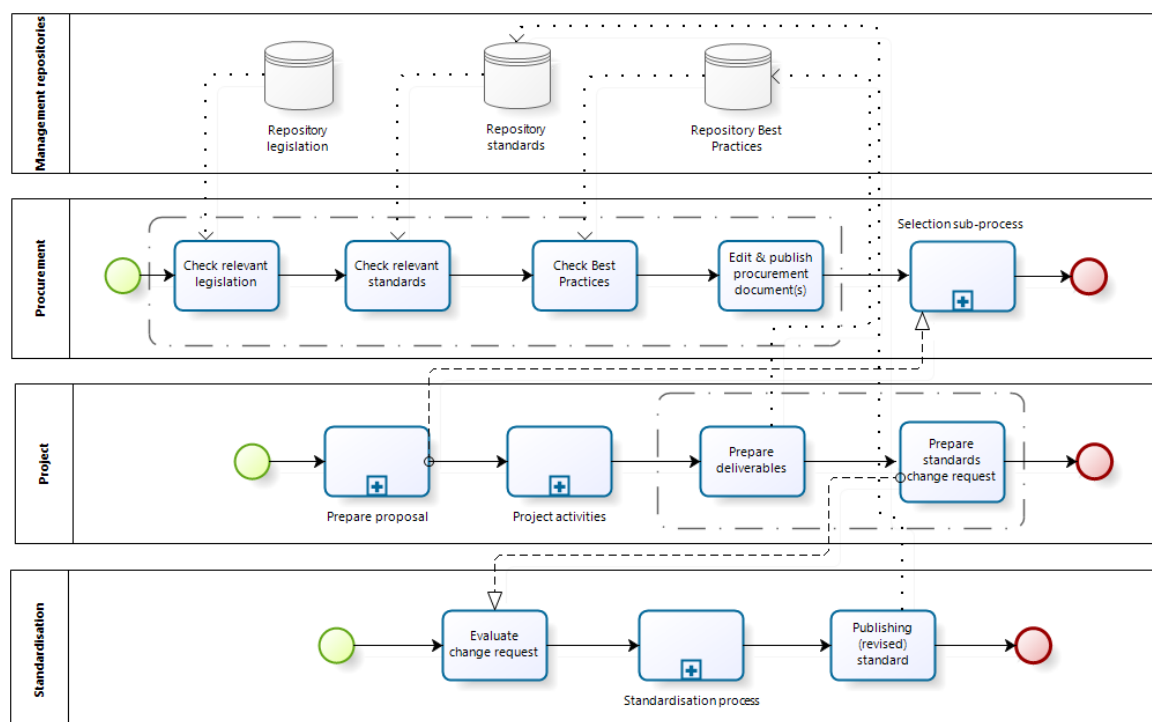
The Best Practice repository could include deliverables from European and national projects describing experience in carrying out certain tasks, especially where it concerns the implementation of International Standards[24]. Such a platform could support the whole procurement process which should not necessarily be limited to Calls for Tender and Invitations to Tender, but also Calls for Proposal (e.g. Horizon 2020), etc.

When preparing procurement documents, public authorities could access e.g. the legislation repository and the standards repository to make references complete and precise. Procurement and technical officers could also check the repository of Best Practices to cross-check previous work and existing deliverables in order to avoid duplication of what has already been done, or to understand the results of other projects

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[22] The Digital Single Market Strategy proposes to develop a European catalogue of standards and specifications. The objective is to support and encourage public procurers to mention ICT standards and specifications in their calls for proposals.

[23] In the past activities of CEN/TC 287, a first version of a repository was set-up to document the use of geospatial standards in European and national projects, and to provide links with project deliverables.

[24] The prototype of such a repository has been set-up in the context of the activities of the CEN/TC 287, but is currently not maintained.

better in order to further build on it. Ultimately, also bidders could eventually be given access to those repositories to better prepare their offer.

With this best practices repository, projects and initiatives are offered a mechanism to consult and contribute to the state of the art in interoperability of Spatial Data Infrastructures and location-based information and services. This also enables the outcomes of projects to be retained and used in future activities. Vice versa, new projects or procurement documents could refer to the repository in order to provide examples of similar implementations or to clarify what is expected to be developed in the context of a new project (whether the project is a proposal under one of the EU or national programmes, or procurement in the strict sense of the word, doesn't really matter). Moreover, information provided through this repository can also be used to provide input for the update and creation of different standards (e.g. Change Requests).

In the next stage a more sustainable mechanism should improve and make the process really operational. The following steps would be necessary:

- The EC should create incentives to connect to the platform to use the catalogues of standards and best practices of implementation of standards whenever a proposal (call for proposals) or bid (call for tender or invitation to tender) is prepared. This could be done by making consultation of and referencing to the standards catalogue and best practice repository mandatory in procurement documents, or in guidelines for proposals in (European) programmes.

- Procurement officers should then make use of the catalogues of standards to refer to them correctly in the procurement documents and to best practices where relevant.

- Each organisation preparing a proposal or a bid will then have the obligation to make use of the catalogue of standards and look into the best practices in order to take into account previous experiences and all the relevant standards. When executing the project, the winning organisation will implement one or more standards-based solutions and draw lessons (in the form of reports, guidelines …). These can in turn be uploaded in the repository and (eventually) lead to suggestions for changes in the standards (change requests) and/or new standards.

- The EC could analyse the experience(s) of the procurement/projects and work with the relevant standardisation bodies (e.g. ISO/TC 211 and OGC) to formulate the Change Request or a New Working Item[25].

In the long term this process, which is needed for the geospatial community, could become part of the broader eProcurement platform aimed for by the ISA Programme.

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[25] Alternatively that can be done directly by a project consortium, e.g. in case of an OGC standard when one of their partners is member of OGC.

6. CONCLUSION

A specific area of the alignment challenge in the public sector is the procurement of location information and services. While the procurement process can be an instrument to improve alignment, also the procurement process itself suffers from many alignment problems. An analysis of different procurement practices demonstrated how several procurement documents refer to INSPIRE regulation, the technical guidance and the relevant standards in a vague and often incomplete manner.

To support public authorities in the procurement of location information and services, this document provides an introductory overview of the general rules on standards-based ICT procurement. In addition, this document provides more practical guidance for those involved in the elaboration of procurement documents dealing with the procurement of location information and services, in particular in the form of a series of recommendations and examples of placeholders. Recommendations and placeholders are provided on how procurement documents should refer to the INSPIRE Directive, to conformity/compliancy requirements and to relevant international standards. The document also proposes an approach for establishing a link between the standardisation and procurement process. The recommendations and approach introduced in this document should contribute to a better procurement practices by EU and Member States' institutions.

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ANNEX I – CHECKLIST FOR PUBLIC PROCUREMENT OF GEOSPATIAL TECHNOLOGIES

1. ## When referring to INSPIRE

   □ *Refer to the INSPIRE Directive, its Implementing Rules and Guidelines in a very precise way*

   □ *Refer to INSPIRE as a method for data specification development or apply some of the technical specifications of INSPIRE, even if certain activities covered by the Call for Tender do not – strictly speaking – relate to INSPIRE.*

   □ *Do not refer to INSPIRE requirements for the development of geoportals*

   □ *Clarify the terminology used in the procurement documents and how these relate to the terminology used in INSPIRE*

   □ *Refer whenever possible to existing architecture documents describing the National/sub-National SDI, INSPIRE or e-Government architecture in which the requested components fit.*

   □ *Allow room for flexibility by not only referring to standards and specifications that are already adopted, but also to ongoing work.*

2. ## When including conformity requirements

   □ *Be clear about which outputs/products of the procurement should/must be conformant/compliant with which specification/standard.*

   □ *Require testing of the outputs/products on conformity/compliancy as part of the procurement.*

3. ## When referring to international standards

   □ *Be as complete and precise as possible when referring to International standards.*

   □ *If necessary, refer to a series of standards that go together, rather than to individual standards.*

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