

## **Results of the INSPIRE State of Play 2010:**

### **First lessons learnt from the application of INPIRE directive in EUROPE**

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Acronyms mostly used:

**EU** European Union - **EC** European Commission - **ESDI** European Spatial Data Infrastructure - **EUROGI** EUROpean umbrella organisation for Geographic Information - **GI** Geographic Information - **GIS** Geographic Information System(s) - **INSPIRE** Infrastructure for Spatial Information in Europe - **ISO** International Organization for Standardization - **MR** Monitoring and reporting - **MS** Member State- **NSDI** National Spatial Data Infrastructure - **NSOP** New State Of Play - **OGC** Open Geospatial Consortium - **SOP** State Of Play - **SADL** Spatial Applications Division of the Katholieke Universiteit of Leuven - **SDI** Spatial Data Infrastructure .

The opinions and the ideas expressed in the paper are of the authors even if they are based on official documents.

#### **Abstract**

Within the context of recent cartographic conferences and the preparatory meetings of the GGIM forum the European directive INSPIRE has been already briefly presented attracting the attention of delegates. At the start of the INSPIRE initiative, the European Commission decided it should build upon existing and emerging SDI initiatives in the different countries of Europe. Therefore it initiated a study, the INSPIRE State of Play, to assess the status of SDI development and INSPIRE implementation. This position paper aims to present the approach of this study, as well as the results of the assessment for 2010. The paper also presents some thoughts on how similar assessments elsewhere in the world could help to trigger SDI developments and ultimately facilitate the use of Geographic Information in a wide range of applications for governments, private sector and citizens.

#### **1. Introduction**

The EU interacts with Member States through Directives which, after being approved by the EU Parliament and Council, must be transposed and implemented into national legislation. Being in default of implementing EU directives may open infringement procedures on the part of the EU itself against the defaulting Member States. The European Commission (EC) is the executive branch of the European Union. It is responsible for proposing and preparing legislation, implementing decisions, upholding the Union's treaties and the general day-to-day running of the Union.

The most relevant and recent Directive regarding Geographic Information has been passed by the EU Parliament and came into force on 15 May 2007: the INfrastructure

for SPatial InfoRmation in Europe (INSPIRE)<sup>1</sup>. The Directive sets a general framework for a Spatial Data Infrastructure (SDI) for environmental policies and for policies and activities which may have an impact on the environment. INSPIRE aims to improve the interoperability and the access to spatial information across the EU at local, regional, national and international level, to facilitate the sharing of Geographic Information between public authorities and the improvement of public access to spatial information. INSPIRE is also complementary to related policy initiatives, such as Directive 2003/98/EC on the re-use of Public Sector Information, also called PSI-Directive (European Commission, 2003a) and the Directive 2003/4/EC on public access to environmental information, also called the Access Directive (European Commission, 2003b). INSPIRE is based on the premise that the European spatial data infrastructure shall be built upon the national infrastructures that have been established and operated by the Member States. Five key principles have been highlighted. They represent the pillars of the initiative which started more than ten years ago and is nowadays consolidated in the Directive.

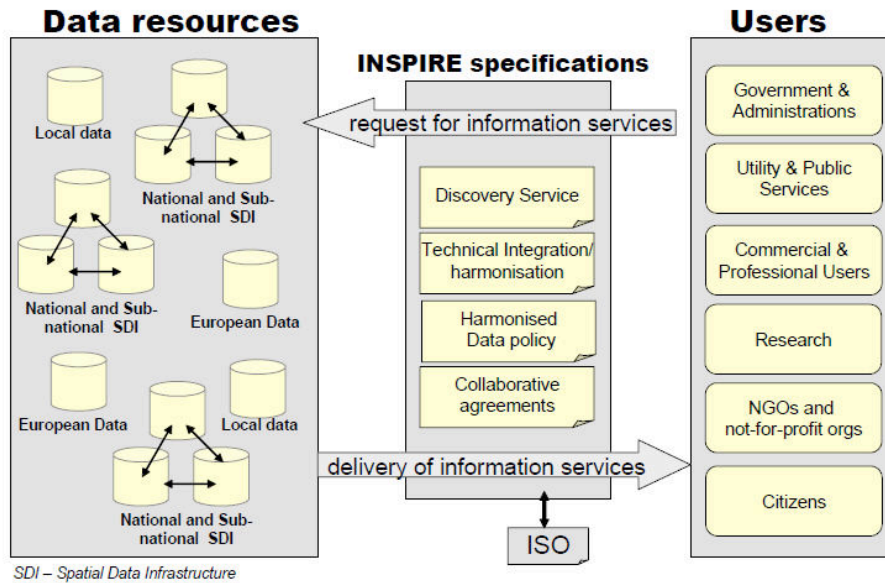
1. Spatial data should be collected once and be stored, made available and maintained at the most appropriate level.
2. It should be possible to combine spatial data from different sources across the community in a consistent way and share them among several users and applications.
3. It should be possible for spatial data collected at one level of public authority to be shared with other levels of public authorities.
4. Spatial data should be made available under conditions which do not unduly restrict their extensive use.
5. It should be easy to discover available spatial data, to evaluate their suitability for a given purpose and to know the conditions which apply to their use.

These principles clearly address the ambition of INSPIRE which intends to trigger the creation of a European spatial information infrastructure that delivers to the users integrated spatial information through services. These services should allow the users to identify and access spatial data from a wide range of sources, from the local level to the global level, in an inter-operable way and for a variety of uses. The target users of INSPIRE include policy-makers, planners and managers at European, national and local level and the citizens and their organizations. INSPIRE itself will focus on services to discover, view, download, transform and on invoking spatial data services. Some examples of possible services are the visualization of information layers overlaying of information from different sources, download of (parts of) spatial data sets, transformation of coordinate systems in cross-border applications, spatial and temporal analysis, etc.

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<sup>1</sup><http://eur-lex.europa.eu/JOHtml.do?uri=OJ:L:2007:108:SOM:EN:HTML> translation in all EU languages may be found at this reference.

# INSPIRE Information Flow



**Figure 1: Schematic view of the INSPIRE vision**

The Directive consists of five main chapters describing the requirements regarding metadata, interoperability & harmonization of spatial data sets and services, network services, data & service sharing, coordinating measures and monitoring & reporting. It is complemented with three annexes<sup>2</sup> which cover the data themes which the Directive is addressing. Specific aspects are elaborated in daughter legislation which takes the form of so called Implementing Rules (IR). At the moment these IR cover five major areas: Metadata, Data specifications, Network services, Data and service sharing, Monitoring and reporting. They become legally binding as EU regulations or decisions through a comitology procedure set up at EU level as part of the INSPIRE process.

<sup>2</sup>ANNEX I - SPATIAL DATA THEMES REFERRED TO IN ARTICLES 6(A), 8(1) AND 9(A) : 1. Coordinate reference systems ; 2. Geographical grid systems ; 3. Geographical names ; 4. Administrative units ; 5. Addresses ; 6. Cadastral parcels ;7. Transport networks ; 8. Hydrography ; 9. Protected sites.

ANNEX II - SPATIAL DATA THEMES REFERRED TO IN ARTICLES 6(A), 8(1) AND 9(B) : 1. Elevation ; 2. Land cover ; 3. Orthoimagery ; 4. Geology

ANNEX III - SPATIAL DATA THEMES REFERRED TO IN ARTICLES 6(B) AND 9(B) : 1. Statistical units ; 2. Buildings ; 3. Soil ;4. Land use ;5. Human health and safety ; 6. Utility and governmental services ; 7. Environmental monitoring facilities ; 8. Production and industrial facilities ; 9. Agricultural and aquaculture facilities ; 10. Population distribution — demography ; 11. Area management/restriction/regulation zones and reporting units ;12. Natural risk zones ;13. Atmospheric conditions ; 14. Meteorological geographical features ; 15. Oceanographic geographical features ;16. Sea regions ;17. Bio-geographical regions 18. Habitats and biotopes ;19. Species distribution ; 20. Energy resources ;21. Mineral resources.

The transposition period of the Directive expired in May 2009 but it has to be said that, in spite of the wide consensus and strong support that has been received since the initial phase from the majority of the scientific and technical communities and the public administrations, after two years from the date of entry into force only a minority of the Member States concluded the transposition phase on time. Nevertheless the adoption phase of the IR, which runs in parallel to the transposition process, will last until 2012 with phased compliance between 2010 and 2012, and beyond that date. In spite of the delay in transposing the Directive into the national legislations, the Directive itself has influenced and is continuously influencing the sub national level of public authorities. This gives a multiplier factor to spatial information in many final user oriented services provided by central and local public authorities.

## **2. The current status of INSPIRE implementation**

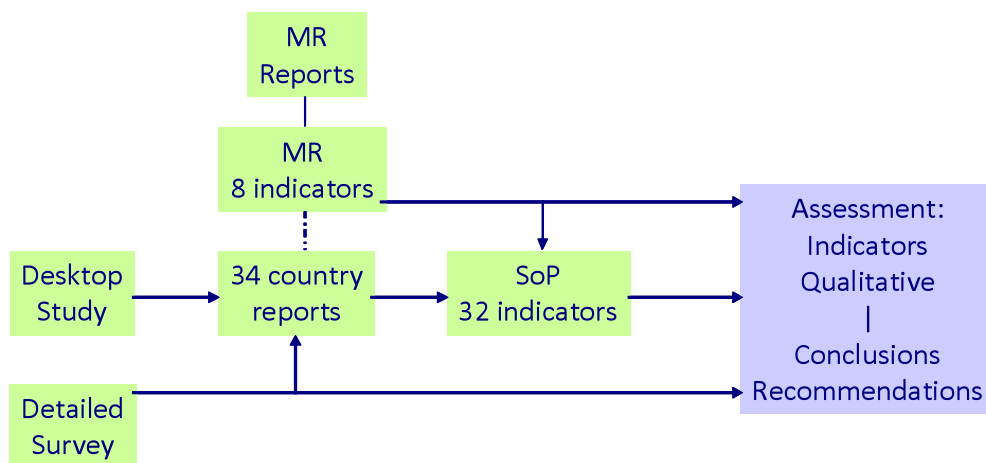
In order to monitor and assess the status of NSDI development, the European Commission decided in 2002 to initiate a study, the so called INSPIRE State of Play. In a first period (2002-2005) the aim was to analyse the SDI in Europe with regard to their distance-to-target with the target defined as a typical and complete SDI consisting of several technological and non-technological components as described in the GSDI Cookbook (Nebert, 2000; 2004). In a second phase, once the INSPIRE Directive took final shape, the aim was also to assess the SDIs in view of their development towards the principles and the requirements of the INSPIRE Directive and its implementing rules (Vandenbroucke et al., 2008). The INSPIRE State of Play took place annually from 2003 onwards, with a break of two years between 2008 and 2009. In 2010 the assessment was carried out for the sixth time. This latest round is taking place at the moment that Member States of the EU have or are in the process of transposing the INSPIRE Directive into national legislation. With the implementing rules which are becoming available step-by-step, countries started implementing (parts of) the required INSPIRE components, mostly as part of the countries' overall NSDI development.

### **2.1 A pragmatic approach to assess the status of national SDI**

The objective of the INSPIRE State of Play study is to describe, analyze and assess the status of INSPIRE and National SDI (NSDI) implementation in 32 countries in Europe: 27 Member States, 4 EFTA countries and 1 Candidate Country (Turkey). In 2009 it was decided to add also FYROM (Republic of Macedonia) and Croatia both EU Candidate Countries. The aim is to better understand the status of the NSDI and INSPIRE implementation and their development over time. The European Commission also wanted to know if one can speak about different types of SDI in the European context. Based on these objectives, an approach and methodology was elaborated in 2002 and fine-tuned in 2006 and 2009. It was decided to collect and structure information on the major SDI components as described by the GSDI Cookbook and take this as the 'ideal SDI' together with the requirements described in the INSPIRE position papers as a kind of baseline (Nebert et al., 2000; 2004; European Commission, 2002). The components studied are: the organizational approach, legal issues & funding, data, metadata, access services and standards. A

specific environmental component was added to assess the link of the SDI to the environmental domain.

The methodology itself is largely based on a desktop study. Information is collected through websites and geoportals, by analysing documents describing the SDI initiatives in the respective countries, and by receiving input from experts from the different countries. It is complemented by a series of dedicated interviews during selected visits to several countries (until now 15 countries have been visited). This analysis results in a series of 34 SDI country reports, which are updated annually (except in 2008-2009). To grasp certain INSPIRE developments in more depth, an annual survey is conducted to collect qualitative information on a particular aspect. A first detailed survey was organised between November 2009 and April 2010 regarding the coordinating, funding and sharing measures taken by the countries. In addition to this, information was provided by the Member States to the European Commission (so only part of the analyzed countries) regarding the availability of the data, their metadata and the network services for the INSPIRE initiative, as well as their conformity with the implementing rules. This happens in the form of 8 indicators of which the definition and calculation method were published as part of the implementing rules for monitoring and reporting (European Commission, 2009). The results from those 8 indicators are assessed separately and they are used to underpin the findings of the State of Play study. The information is also integrated in the State of Play country reports to complete them. The overall approach is illustrated by figure 2 below.



**Figure 2: schematic overview of the approach for the INSPIRE State of Play**

Based on the country reports, a methodology was developed to assess the status of the NSDI and to compare them. The presented items in the reports relate to a number of organizational issues and to the five generic components of an SDI as described above. They can be considered as the building blocks of the SDI under study. The items or building blocks are expressed as statements or indicators. Some examples are given in table 1. The assessment of the studied SDI-initiative has been made in terms of whether it is (1) in full agreement with the statement, (2) in partial agreement, (3)

not in agreement or (4) no sufficient information is available for assessing the level of agreement. Table 1 gives some examples of the applied indicators. From the 32 indicators, 7 describe the organisational aspects, 9 describe the legal framework and funding, 6 relate to reference and thematic data, 3 to metadata, 5 to access or network services and 1 to standards and environmental issues respectively. The assessment was then carried out by interpreting the resulting matrices and describing the major conclusions in a summary report (for an example see Vandenbroucke et al, 2010).

**Table 1: Examples of indicators of the INSPIRE State of Play**

Component	Indicator
Coordination	The officially recognised or de facto coordinating body of the SDI is a National Data Producer, i.e. a National Mapping Agency or a comparable organisation (Cadastral or Land Survey Agency, i.e. a major producer of GI)
Participants	Producers and users of spatial data are participating in the SDI
Legal framework	There is a legal instrument or framework determining the SDI-strategy or -development
Funding	The long-term financial security of the SDI-initiative is secured
Data availability	Geodatasets exist which provide a basis for contributing to the coverage of pan-Europe for the INSPIRE-selected data themes and components
Interoperability	Concern for interoperability goes beyond conversion between different data formats
Metadata availability	Metadata are produced for a significant fraction of geodatasets of the themes of the INSPIRE annexes
View services	There are one or more view services available for to visualise data from the themes of the INSPIRE annexes

The results of the study for 2010 were discussed during a two-day workshop in Krakow, Poland, prior to the INSPIRE conference. The workshop was attended by 13 international SDI experts and 33 representatives from 21 countries. The findings of the discussions were integrated in the final reports which are all available for the broader public (<http://inspire.jrc.ec.europa.eu/>).

## 2.2 Major observations on the status in 2010

From the detailed survey we can learn that the majority of the EU member states have transposed the INSPIRE Directive or are on their way to do so. It appeared that, besides other activities necessary for the transposition, the establishment of coordination structures and arrangements have caused many problems. There is high diversity in coordination/cooperation structures and arrangements across Europe. Mapping agencies, ministries and environment agencies are the most active organizations for implementing INSPIRE. There does not appear to be much happening at local level (yet). Many countries have no funding policy established, and have no long-term funding secured. In the long-term, this could cause problems regarding maintenance of the created infrastructure. The minority of countries have an explicit strategic or implementation plan. It seems that countries are implementing the Directive and the rules as they become available. From the answers, it appears that

there is a high diversity in INSPIRE implementation strategies. This confirms no single best solution or recipe exists since the context of each country is unique on its own. For coordination and implementing INSPIRE, the national level is crucial. Other levels may not necessarily be equal partners in the exercise. With respect to data and service sharing, there is both unrestricted access and selective access in many countries. Numerous reasons exist across Europe for limiting public data access (in particular confidentiality of personal data – privacy - is often used as a reason). In order to promote access to spatial data, many countries set up standard agreements/licenses for all groups of stakeholders. National Geo-portals as one of the possible building blocks for INSPIRE implementation still needs to be established in many countries. The uncertainties for the future of INSPIRE implementation are diverse. Financial resources, technological INSPIRE-issues, human resources, time planning, etc., are all considered to be uncertainties. The implementation of INSPIRE has mainly achieved so far the increase of the awareness of spatial data use, improved data sharing conditions, and capacity building.

From the desktop study, as well as the INSPIRE monitoring and reporting results, it becomes clear that most countries are very active in developing the different components of their NSDI. Although many countries have metadata for a considerable part of their data sets, it seems that in the past, it was overestimated for some of them. According to the INSPIRE monitoring and reporting 11 countries have less than 50% metadata for the reported data sets. View services are very well developed and download services really start to emerge now. Also discovery services start to become available for most of the countries – 21 out of the 34 have them - although there are less of them, (which is normal). Transformation and invoking services are rather the exception. The level to which metadata – and thus their related data sets or services – can be discovered is very variable, but in general terms still very low. Only 7 countries score 50% or more. And data sets that can be both viewed and downloaded is even lower: only 3 countries reach the 50% mark. This might not be surprising since 5 countries even do not have an operational catalog. In general terms, there is more and more focus on interoperability issues, and geo-standardization to reach this interoperability. This is often underpinned by specific standardization bodies and/or particular projects to develop country profiles for metadata and data specifications. Countries that are active in the geo-standardization process (OGC, ISO, CEN) are also advanced in the application of existing standards/IR/guidelines. Finally it should be noted that in several countries the NSDI is broader than INSPIRE, while other countries put more or less everything under the INSPIRE umbrella. From the analysis of the current state of play, we can also see the shift in the way countries are working: more and more the users – typically the major Ministries – are involved in coordination, while GI associations are now more in a supporting role and National Mapping Agencies or similar organizations are playing the role of executive office (taking the technical lead). These developments caused some shifts in the typology assigned to a country, as it is partially based on these characteristics. In general, the NSDI are becoming more mature and more operational. Almost everywhere in Europe, we can detect ‘Good Practices’ which can be showcases for other countries. Those ‘Good Practices’ do not only relate to the development of NSDI components like geoportals, access services, standardization, but also to the link with eGovernment, the development of cross-border initiatives,

environmental applications and technological innovation.

From what was learnt from the European assessment, some recommendations for the further INSPIRE and NSDI implementation were formulated. With regard to the approach, it seems that the combination of information collected through a desktop study, a detailed survey and the official results from the INSPIRE MR provides interesting insights in the status of INSPIRE & NSDI development. There are no major contradictions, although the status of e.g. metadata development is probably worse than originally estimated. Based on the experience it is advisable to continue integrating the different sources of information to perform assessments at the European level. Additional efforts to analyze the detailed results from the INSPIRE monitoring and reporting and to cross-tabulate the different resources of information could provide new insights. The analysis of the INSPIRE monitoring and reporting led us also to some possible improvements for the INSPIRE monitoring and reporting guidelines, e.g. with regard to the templates used.

As said before, the local level is still far from being integrated in the INSPIRE implementation process. This will need particular attention in the coming years. It is therefore worthwhile to use and support initiatives that are focusing on this sub-national level. There is also an overall need to work more on capacity building, to create better awareness, and to train more experts to support the often complex tasks of INSPIRE and NSDI implementation. The organization of a good INSPIRE e-learning offer at the European level by relevant European stakeholders and the exchange of experts among NSDI, should be envisaged. A good strategic and/or implementation plan can make a big difference. It is advised to build a central repository of existing plans to help countries that do not (yet) have such plans. Sustainable funding seems to be an important issue as well. While it is probably not feasible to have an overall funding program for INSPIRE at the European level, the more systematic usage of existing budget lines or the creation of specific activity lines in existing programs would be a good solution (combined with mobilization of own funds and business models in the respective countries). On the technological side, countries and individual technological stakeholders should be stimulated to become active members of (some of) the standardization organizations like OGC and the ISO & CEN committees. It will help them to implement INSPIRE faster and smoother. The usage of registries for supporting (and as part of) the infrastructure is promising, while the metadata for services are still in the initial stage of development and deserves particular attention. And although there are more and more network services available throughout Europe, it is not always clear how they perform and whether they are conformant. This might be further investigated since this will become a critical factor as well. Over the last few years, and confirmed by the country reports, many efforts have been done on the issue of harmonization and interoperability of spatial data. Several European projects have been carried out or are still continuing. Those experiences should be more systematically documented in view of selecting good practices and problems that were overcome.



### 3. Lessons learnt for other developments worldwide

Based on the experience of the NSDI & INSPIRE development in Europe over the last 8 years some interesting lessons can be learned which might be useful for similar initiatives and developments elsewhere in the world:

- Spatial Data Infrastructures are not to be treated as ‘information systems’, but as ‘complex configurations’ consisting of distributed components in a networked environment to which many stakeholders can/should contribute.
- INSPIRE developments over the last years have shown that it is possible to develop successful SDIs in larger regions where many administrative/political entities have to cooperate across borders. But this is only possible if all the relevant stakeholders are mobilized and actively involved.
- It is imperative that a good coordination mechanism is set-up to organize and streamline this involvement. This mechanism should be flexible enough to motivate the stakeholders from different levels of authority, including the sub-national levels.
- Legislation (or any form of agreement) and a more explicit strategic and implementation plan that describes the objectives of the SDI at the different levels of authority facilitates the implementation of an SDI. It should be overarching whenever possible, avoiding a multitude of individual agreements and complex legislation.
- The creation of technological and organizational “laboratories” gives the opportunity to define pilot projects, to develop in a controlled manner components of a regional, national or sub-national infrastructure. These “laboratories” could take the form of testbeds to find out the best (technological) solution before going operational and to learn from it.
- There is a clear need to make the stakeholders aware about the need to go from an operational infrastructure to an active uptake of components in working processes. The ultimate goal is to serve the needs of different user communities and their applications.

Regarding the approach and methodology of the INSPIRE State of Play it can be noticed that it might be applied to assess SDI elsewhere in the world:

- The INSPIRE State of Play approach allows to assess the status of SDIs in terms of where it stands at a certain point in time. Secondly it allows to assess its development over time. Thirdly, interesting lessons can be learnt, the practices that work well and problems that were successfully overcome.
- The INSPIRE State of Play follows a qualitative approach combining the analysis of desktop information, surveys and expert knowledge. This allows a certain flexibility, but it also guarantees comparability. The approach is complementary to other assessment methodologies.
- The approach can be ‘easily’ applied on each SDI. This has already been done extensively in Latin America and the Caribbean, as well as e.g. in Abu Dhabi. Even if only certain components of the SDI are emerging, the approach is applicable and can reveal interesting results.

#### 4. Conclusions

Worldwide, many countries are developing or are planning to develop a Spatial Data Infrastructure to support decision making by government, private businesses or the activities of citizens. Not one SDI is identical since it has to take into account the particularities of the region, the country and/or the local environment. But even so, it is important to understand which components are available, their characteristics, and the degree to which they match certain standards (or in case of INSPIRE specifications as defined in implementing rules). Therefore, a systematic assessment of the status of SDI development and its progress towards such specifications are of utmost importance. The INSPIRE State of Play study carried out since 2002 illustrates that governments and SDI stakeholders in general can learn a lot from the assessment of SDIs according to a well defined approach, and that such assessments help to improve the infrastructures and ultimately the decisions they take.

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