Plan4all: European Network of Best Practices for Interoperability of Spatial Planning Information

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Abstract — **Methodologies usually adopted in urban and regional planning do not assume an approach based on Spatial Data Infrastructures principles, which could ensure a better use of geospatial data and support interoperability of planning choices providing an active participation of stakeholders involved in planning processes. An innovative approach of e-government based on a better organization and management of geospatial data, could contribute, through a deeper territorial knowledge and a more appropriate use of decision support tools, to more effectively pursue planning goals. Spatial planning and related information have a strategic importance not only at local and national level but also at international scale where a "continuum" of settlements characterizes the crossing of various countries. Planning activity is also strictly related to aspects such as management of natural resources, prevention of natural disasters, transports which in many cases have international cross-border interests. Consequently, today there is an absolute need of harmonized planning data a strong demand of planning core data sets in order to provide an easy and wide understandability of this information. The objective of the Plan4all project is to build a network of local, regional and national stakeholders, companies in the ICT sector, organizations involved in planning and economic development, universities and international agencies in order to find a consensus concerning the harmonization of spatial planning data based on existing best practices in Europe and according to the European Directive INSPIRE. The project takes into account lessons learned from previous experiences, such as Armonia, Humboldt, eSDINet+, Euradin, whose partners are also present in the Plan4all consortium. The project will involve also the experience of OGC working group members concerning the definition of standards technologies. Plan4all aims to contribute to the harmonization of planning data. Based on best practices analysis, the project is producing a series of technical documents for metadata profiles design and implementation, data models and harmonization procedures. Particular attention will be paid to issues related to the protection of intellectual property rights, as well as security aspects.**

Keywords: Spatial Planning, INSPIRE, Spatial Data Infrastructures, E-government, Urban planning, Regional Planning, Environmental Planning.

I. INTRODUCTION

Sustainable development and spatial planning mainly concern the place where people live and work, the location of social and economic activity and the way to exploit resources, possessed in limited supply, in order to achieve socio-economic objectives [9] [10] [14].

National, regional and local authorities face important challenges in the development of territorial framework and concepts that balance-up and respect the needs of different stakeholders, guarantee economical development, environment protection, but also risk protection [11] [12].

Approaches to spatial planning based on the need of strong involvement of all institutional levels, local authorities, stakeholders and all citizens interested in process of defining the main choices on their own territory become common in the last decades. This demand of participation has not been matched with effective information sharing through web technologies, which could support the interoperability of planning choices with active stakeholders participation.

In order to improve quality and effectiveness of planning documents an evaluation phase of objectives is often included within the planning process: an innovative approach in e-government could contribute to pursue, more effectively, all planning objectives facilitating the evaluation phase included in the process [13].

Spatial planning and related information are important not only for national, regional and local development, but have also a cross-boundary dimension, specially in Europe where the "continuum" of settlements characterises the transition between countries. Moreover, spatial planning is also strongly related to natural disasters prevention, which has in many cases cross border or international character.

Very complex issues such as environmental preservation and protection from natural hazards increase considerably their complexity level in cross-border regions where it is not easy to understand how planning indications on a border side may impact on the other side. In cross-border areas it is very difficult, if not impossible, to produce Environmental Impact

Assessment and Strategic Environmental Assessment with a good quality, using currently available spatial data.

While thirty years ago the effort was concentrated on the realization of spatial information systems (and nowadays most organizations and local authorities have implemented these systems) the new challenge is to create a dialogue among these spatial databases and systems [8].

Therefore there is a strong need for harmonized spatial data used for planning and for interoperable Spatial Data Infrastructures to guarantee information sharing and understandability all across Europe. This is important for all regions, and mainly for under developed regions, which need international investment together with the protection of natural resources which generally characterize these regions.

The main objective of INSPIRE is to establish a European Spatial Data Infrastructure (SDI), defined in the Directive as the "*... metadata, spatial data sets, spatial data services; network services and technologies; agreements on sharing, access and use; coordination and monitoring mechanisms, process and procedures, established, operated or made available in accordance with this Directive ...*"

INSPIRE does not establish new infrastructures, instead it is based on infrastructures created by Member States that are made interoperable by common Implementing Rules [4] (IRs) and measures established at Community level, to guarantee compatibility and usability in the Community and in transboundary context. The INSPIRE Directive represents a common framework, addressed to the Member States, whose purpose is to align national legislation and achieve a joint result. All Member States have to transpose the Directive into national laws, and have freedom in the form and method to adopt and to realise the Community objective, based on internal legal order.

Although the Directive is aimed specifically to support the European environmental policy, INSPIRE is having a great impact on the European GI community. The correct implementation of the INSPIRE Directive [1] [2] [3], approved in May 2007, could represent a big step towards an effective information sharing to support problem solving.

INSPIRE represents a solid and robust background on which to build interoperability of spatial planning in Europe, since it takes into consideration current standards and practices in the field of SDIs, and summarises the point of view of most stakeholders.

Implementing Rules focus on the five specific areas (*Metadata, Data Specifications, Network Services, Data and Service Sharing, Monitoring and Reporting*), and address 34 spatial data themes needed for environmental applications. Spatial data themes are organized into three annexes.

The development of the Implementing Rules is addresses by several groups of experts coordinated by the European Commission and profits of EU funded projects. Plan4all is among these projects, and can significantly contribute to the process. The project takes into account lessons learned from previous experiences, such as Armonia, Humboldt [7], eSDINet+ [5], Euradin [6], whose partners are also present in the Plan4all consortium. The project will involve also the experience of OGC working group members concerning the definition of standards technologies.

II. PLAN4ALL PROJECT

In the last few years, due to the massive use of digital data for producing "plans" in different scales, public authorities, mainly at national and sub-national (local) level, demonstrated interest and put in place efforts to harmonise data used in spatial planning in order to compare different policies and planning maps.

The way how to perform this harmonisation and interoperability varies from country to country and from region to region of the same country spanning from using a common legend and a unique base cartography to using common data models, neutral exchange formats. It is wise to note that most of initiatives of mentioned harmonisation of spatial planning data took place in the framework of *e-government* applications.

The project Plan4all focuses on the harmonization of spatial planning data based on the existing best practices in EU regions and municipalities and the results of current research projects. The project involves detailed description and summarising of the current situation and standards, proposal, testing and implementation of spatial planning metadata profiles, common data models and harmonization procedures. The important part of the project is networking standards for spatial planning data, based on previously collected and analysed experiences, and then defining common procedures and methodologies for spatial data sharing and utilisation of new pan-European standards for spatial planning data within the EU.

Although almost all the themes listed in the INSPIRE annexes, for their general character, are valuable for spatial planning purposes, Plan4all is focusing on seven of them:

1. **Land cover:** Physical and biological cover of the earth's surface including artificial surfaces, agricultural areas, forests, (semi-) natural areas, wetlands, water bodies;
2. **Land use:** Territory characterised according to its current and future planned functional dimension or socio–economic purpose;
3. **Utility and Government services:** Includes utility facilities such as sewage, waste management, energy supply and water supply, administrative and social governmental services such as public administrations, civil protection sites, schools and hospitals;
4. **Production and industrial facilities:** Industrial production sites, including installations covered by Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control, water abstraction facilities, mining, storage sites;
5. **Agricultural and aquaculture facilities:** Farming equipment and production facilities (including irrigation systems, greenhouses and stables);
6. **Area management/restriction/regulation zones and reporting units:** Areas managed, regulated or used for reporting at international, European, national, regional and local levels.

Includes dumping sites, restricted areas around drinking water sources, nitrate-vulnerable zones, regulated fairways at sea or large inland waters, areas for the dumping of waste, noise restriction zones, and prospecting;

7. **Natural risk zones:** Vulnerable areas characterised according to natural hazards (all atmospheric, hydrologic, seismic, volcanic and wildfire phenomena that, because of their location, severity, and frequency, have the potential to seriously affect society), e.g. floods, landslides and subsidence, avalanches, forest fires, earthquakes, volcanic eruptions;

Plan4all will produce:

- data models (application schemas) and metadata profiles for each of the seven themes, according to the INSPIRE requirements. These are called target or Plan4all models;
- tools for describing current data models and metadata profiles (source models);
- tools for transforming source data and metadata into Plan4all models;
- Plan4all geoportal.

The work-plan of Plan4all has been structured into nine Work Packages (Fig. 2):

- **WP1 Project Management and Coordination**: deals with the proper organisation, implementation and orchestration of the project activities, in order to monitor and evaluate its progress;
- **WP2 State of the art analysis**: aims to analyse the current state of the art in spatial planning, used technologies, INSPIRE requirements and also identify the user requirements on planning systems t;
- **WP3 Design of Plan4all metadata profiles**: will define metadata profiles for selected INSPIRE themes and a common metadata profile for European Spatial Planning, covering requirements given by national legislations and INSPIRE directive;
- **WP4 Plan4all data models definition**: will be focused on national models and their combination and translation into common models covered by selected INSPIRE Themes;
- **WP5 Networking architecture**: will extend the INSPIRE networking principles for the purpose of European Spatial Planning;
- **WP6 Large scale testbed**: aims at using existing technologies and services that are already successfully implemented and operating in some regions by the project's technical partners, in order to appropriately deploy them for the needs of the project;
- **WP7 Content deployment**: will publish data and metadata using the platform deployed in WP6 based on standards defined in WP3, 4, and 5;
- **WP8 Validation**: will provide the quality framework for the evaluation of the outputs of the project through pilot evaluation and validation activities to be performed within the targeted user organisations;
- **WP9 Dissemination, clustering consensus building and sustainability planning**: will include all activities planned to promote the project results. A major aim is to achieve wide dissemination at multiple levels, including publicity/dissemination activities. It will also involve all activities related to creating liaisons with SDI technology standards, as well as formulating networks for future sustainability of the **Plan4all** network and the promotion of its results.

The objective of Plan4all is to build a network of local, regional and national public bodies, stakeholders, ICT industry, organisations dealing with planning issues and regional development, universities and international organisations to find consensus about harmonization of Spatial Data Infrastructure (SDI) for spatial planning according to the INSPIRE Directive and also to contribute to standardisation of related Spatial Data Themes from the INSPIRE Annexes.

III. PRELIMINARY RESULTS

The project started in May 2009 and it is not yet possible to analyze the results in a very detailed way.

In this first phase, an inventory of spatial data infrastructures, more or less related with spatial planning, in all EU countries has been made. A very complex work has been developed trying to synthesize all planning systems existing across Europe. Approximately forty experiences at European level, previously classified as good practice, has been analyzed selecting positive aspects considered relevant for the project.

For what concern the analysis of INSPIRE requirements, all documentation produced in thirty European projects, completed or in progress, having a direct or indirect relationship with the INSPIRE directive, has been analyzed, as well as most of the technical documentation developed within the INSPIRE process.

These requirements can be summarized in three main aspects:

- Recommendations for Metadata;
- Recommendations for Data Models;
- Recommendations for Networking Services.

As far as metadata are concerned, Plan4all will work on two levels (figure 1):

- on one hand INSPIRE requirements claim for the definition of metadata elements on dataset level, for each spatial data theme, in addition to the mandatory metadata elements set of the INSPIRE Metadata Regulation;
- on the other hand a main objective of the project is the definition of an overall spatial planning metadata profile derived from the metadata profiles on dataset level.
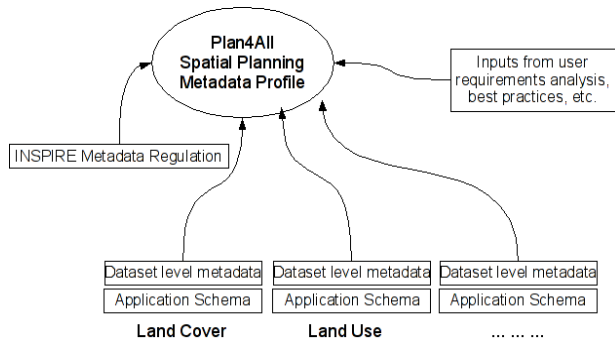
Figure 1.   Plan4all and Metadata.

The results of the state of the art analysis are now being used by work packages 3 and 4 for their respective activities. Work package 3 is now analysing national requirements in terms of metadata for spatial planning purposes. The goal is to compare national requirements and define common sets of items, which will be used for common metadata sharing. At the same time work package 4 is analysing and comparing application schemas used in single countries. The result will be used as a base for developing common data models. It is worth noting that the Plan4all will not issue complete data specifications for the cited spatial data themes: instead, it will focus on application schemas from the spatial planning point of view. The INSPIRE Generic Conceptual Model lists 74 requirements and 29 recommendations. In the analysis of INSPIRE requirements phase recommendations and requirements considered relevant for planning activities have been selected from these lists and should be considered in work package 4 of the project; Commission regulation on INSPIRE Network Services (EC No 976/2009) was published on 19 October 2009. In order to ensure that public authorities and the third parties are given the technical possibility to link their spatial data sets and services to the Network Services, the regulation defines the appropriate requirements for those services. INSPIRE Network Services Architecture is based on the description provided in the INSPIRE document "D3.5 INSPIRE Network Services Architecture". At the core of the architecture are the INSPIRE Service Types: Discovery, View, Download, Transform and Invoke (Figure 2). INSPIRE Services have to be accessed via the rights management layer and may be accessed by applications and geoportals via the INSPIRE services bus.
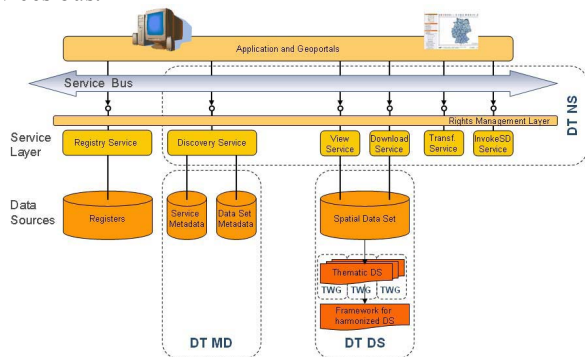

Figure 2.   INSPIRE Services Architecture (from INSPIRE D3.5).

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