COS AND LAND USE PLANNING: OPEN DATA TOWARDS PLANNING EFFICIENCY

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Abstract

The objective of the research and development projects Landyn and eENVplus is to streamline the integration, access and analysis of information that characterizes the evolution of a spatial reality. The developed tools are intended to support the problems associated with the integration in webservices, of geo-referenced data associated with the analysis of the evolution of an area, crossing the space-time dimensions and demand. These developments are useful in open source applications.
The General Directorate for Territorial Development (DGT) is responsible for building a prototype in the context of land use planning, risk assessment and civil protection. This innovation of this pilot project is related with , the integration of the space-time information, as a differentiating specific factor: by integrating the time series of different datasets to build land use scenarios an web GIS is developed as a model-specific data that addresses this temporal component, explaining to the users the quality of the results of each scenario. These projects contribute to better understand the relevance of a multi datasets approach to build evolutionary scenarios and explains the importance of including information quality and reliability to help users dealing with uncertainty.

Key-words: SDI, Inspire, Land Use and Land Cover, eENVplus, LANDYN.

1. Introduction

The EU Cohesion can be better achieved within collaborative, web based, knowledge sharing platforms. They are, nowadays, a relevant form to integrate responsible and wide public participation in many different governance areas like planning investment to promote economic grow, understand environmental impacts in water, air quality, biodiversity, study alternatives and mitigation measures, integrate this option in land use plans integrating several development options, within areas and regions.

The Inspire Directive (Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007) aims to create a European Union Spatial Data Infrastructure (SDI) in order to enable sharing spatial information among organizations and promote public access to spatial information across Europe.

A European Spatial Data Infrastructure will assist in policy-making across boundaries. Therefore the spatial information considered under this directive is extensive and includes a great variety of topics and technical themes.

Inspire Directive is based on the following common principles:

- Data should be collected only once and kept where it can be maintained most effectively.
- It should be possible to combine seamless spatial information from different sources across Europe and share it with many users and applications.
- It should be possible for information collected at one level/scale to be shared with all levels/scales; detailed for thorough investigations, general for strategic purposes.
- Geographic information needed for good governance at all levels should be readily and transparently available.

Synthesizing, it should be easy to find what geographic information is available, how it can be integrated in a Information management system, if it meets a particular need, and under which conditions it can be acquired and used.

In this context DGT is participating in two projects. The Project "*LANDYN - Land use and cover change in Continental Portugal: characterization, driving forces and future scenarios*" aims to identify and interpret the main changes of land use and land cover, to set future scenarios and to determinate measures which may contribute to the reduction of greenhouse gas emissions (Barbeiro *et al*., 2013; DGT, 2013; Reis, 2013).

The other project, eENVplus - Environmental services for advanced applications within INSPIRE, aims to unlock huge amounts of environmental data which is managed by the involved national/regional environment agencies and other public and private environmental stakeholders through the integration and harmonization of existing services. Within the eENVplus project DGT is responsible for developing a Portuguese pilot whose objective is to develop a prototype integrating the implementation of web services related with building environmental quality indicators namely indicators that help understanding the relation between water and air quality evolution and growing urban and recreation land use near a water catchment. The indicators are extracted through a set of GIS web services built to help the user understand water and air quality evolution and its relation with human activities and urban growth. The aim of the pilot is evaluate fitness for purpose of different available official datasets to deal with urban landscape evolution and how these different datasets evaluate the impact in water quality. The data sets cover similar time periods and include soil use legal classification, cartographic based housing evolution datasets and thematic land use maps reporting urban land use.

2. Methodology

2.1. eENVplus

The pilot covers four municipalities of Portugal (Loures, Loulé, Abrantes and Tomar), facing different development problems.

The main benefits of the pilot are to better understand environment and socio-economic realities in these areas, evaluate existing spatial datasets,

considering their data quality, in order to assist the planning process and legal framework accomplishment.

DGT intends to develop a prototype integrating web services and related collaborative information management tools as a new approach to the planning processes monitoring and evaluation.

The prototype integrates data related to territory, socioeconomic and environmental quality Indicators, build upon different data aggregation. The main effort considers mainly indicators that help understanding the relation between territorial assessment, environment and socioeconomic evolution and urban grow.

It will help users understand territorial evolution in different perspectives and their impact during a time period to evaluate in witch extent the legal framework was relevant to achieve effective development.

The indicators are extracted through a set of GIS web services built to help the user to design different approaches to understand territorial evolution and its relation with human activities and urban growth.

Besides this goal the aim of the pilot is also to evaluate fitness for purpose of different available official datasets to deal with urban landscape evolution and how these different datasets contribute to evaluate sustainability of urban grow and their socio-economic and environmental pressures.

The selected data sets cover similar time periods and include soil use legal classification, environmental related framework (namely water framework directive and Impact assessment Directive) cartographic based building evolution datasets, and thematic land use maps reporting urban land use plans and effective land use findings.

The spatial data used in the pilot, correspond to several INSPIRE data themes, and is organized by administrative units for the study areas. It covers land use, land cover, orthoimagery and statistical units, environmental and socioeconomic data, and will be harmonized according to the INSPIRE implementing rules.

The metadata will follow the Portuguese National Profile for Metadata for the type of data considered. This Profile consists of a subset of the ISO 19115 metadata and ISO 19119 (extension services) whose selection criteria is related to the INSPIRE requirements, mandatory elements of ISO standards, functionality of systems and frequent use by the technicians.

2.2. LANDYN

The evaluation of the evolution in the last decades of land use and land cover in the LANDYN Project was based on 1279 sampling units with 4Km^2, randomly distributed through continental Portugal. These sampling units were obtained by photo-interpretation and vectorization of geo-referenced aerial images for various decades, with the help of the maps of land use/cover (COS1990 and COS2007). The data was subject to the evaluation of thematic accuracy based on a test of hypothesis (DGT, 2013). The land use and land cover was divided into 7 classes (agricultural, agro-forestry, artificialized, water bodies, forests, uncultivated soils and wetlands), subdividing these into 32 more detailed classes. From the samples the results were extrapolated to the land use and land cover of continental Portugal as a whole first, and later for the five NUT2 regions, allowing the evaluation of changes between the different time-periods. All results are published on the website http://landyn.isegi.unl.pt/, which is developing a WebGIS platform and a Wiki.

3. Results and discussion

eENVplus will show the relevance that GI web based infrastructures have for decision making and their contribution to understand in a holistic approach problems raised within socioeconomic grow and sustainable resources management and the relevance of working with several datasets integrating time and space in order to better understand and solve complex problems.

The results of the Landyn project were obtained from the extrapolation of the results obtained by 1279 samples for the continental area, for the assessment of the variation of land use and land cover between the different decades, in

the seven types of occupation and land use considered. There were classes whose area increased or reduced gradually, while for others there was an increase until the 1995 and subsequently a reduction (e.g. Uncultivated Soils, Wetlands). The more significative trends in the period 1980-2010 are the high growth of forest and artificialized areas and, with lesser expression, uncultivated soils and wetlands. However, the agricultural areas decreased drastically, revealing the decline of this activity in the last decades.

4. Final considerations

The developed projects contribute to recognize the relevance of understanding information quality and its reliability for urban delimitation, urban growing, in a more knowledge shared based approach.

Having a good information basis to evaluate and build good planning approaches is essential. Collecting, organizing and maintaining the necessary datasets, and making them available to users is vital.

This paper shows how information can be organized in an spatial data infrastructure build in a collaborative way, integrating contributions of users and producers in order to assure that information collected is according with users needs and fits appropriate quality criteria.

It also illustrates the difficulty of dealing and integrating different data sources and formats, and documenting quality within a webgis based data analysis that supports decision-making.

Finally, the whole work shows that dealing with complex problems can have several approaches and that data fitness can be discussed along with the fitness of the legal water and land management related framework making easier to understand different problems that different European economies have to face in order to induce economic growth for Europe in a more and more efficient way.

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