Geospatial Data Based Environment for Educational and Gaming Purposes: The Pilot INSPIRE4Youth

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Abstract. The SDI4Apps Open INSPIRE4Youth supports creativity, technical capabilities, skills, knowledge and also relations, through the sharing of spatial based content and educational materials around environment. Using new methods of digital cartography enables to go beyond linguistic barriers. Using principles of Linked Open Data INSPIRE4Youth offer new possibilities of analyzing relation among different types of objects. The pilot is focused on building of Environmental and Geographical Web based atlas and educational quizzes based on utilization of Geospatial data, Linked Open data and other environmental data (maps) for educational and gaming purposes. The main components of the environment introduced are – water, air, soil, forests, nature protection, climate information, landscape, waste management, forest management etc. Each component has its actual condition measured for the region. All this will be made available in an entertaining manner – no school textbooks. Pilot also re uses database of Smart Point of Interest from Smart Tourist Data pilot. The main user group for this Atlas are students – higher grades of elementary schools, high schools and universities. However it should be appealing also for any adult person interested in topic.

Keywords: INSPIRE, Education, Linked Open Data, Environmental Atlas

1 Introduction

The European SDI (INSPIRE) is based on existing data of Member States. The INSPIRE Directive does not intend to change the way how data are collected, processed and stored. INSPIRE focuses on harmonisation and interoperable exchange of spatial data and services. The main target of SDI4Apps is to bridge the 1) top-down managed world of INSPIRE, Copernicus and GEOSS built by SDI experts and 2) the bottom-up mobile world of voluntary initiatives and thousands of micro SMEs and individuals developing applications (apps). SDI4Apps will secure that users profit

from INSPIRE and INSPIRE profits from different voluntary initiatives. SDI4Apps will build a WIN-WIN strategy for building a successful business for hundreds of European SMEs on the basis of INSPIRE, Copernicus and GEOSS. [4].

The ideas of solution and also some tools are based on results of previous projects in this are namely Naturnet Redime [5], [2], Metaschool [6] and SDI-EDU [1].

2 Environmental Spatial Data current trends

Current society requires **easy, reliable and quick access to environmental information** published by various organisations and initiatives. The environment questions cover many activities that produce various sorts of data. In Europe collection and management of this data

INSPIRE, GEOSS and Copernicus are politically driven top-down initiatives supported by experts from countries and organisations.. [6] presented during the Joint Research Centre Cost Benefit Workshop in 2012 the relation between costs and benefits for various governmental levels, depicted in Figure 2.

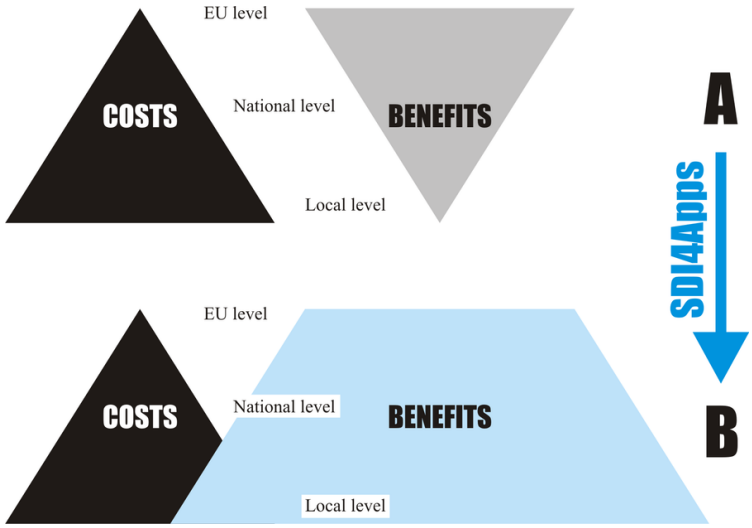

Fig. 1. Current costs and benefits of the European SDI (A) and the targeted situation (B)

On other side, there exist number of **voluntary or bottom-up initiatives** supporting SDI building. Currently, data collection by citizens is higher than collection of data by public bodies, as depicted in Figure 2.

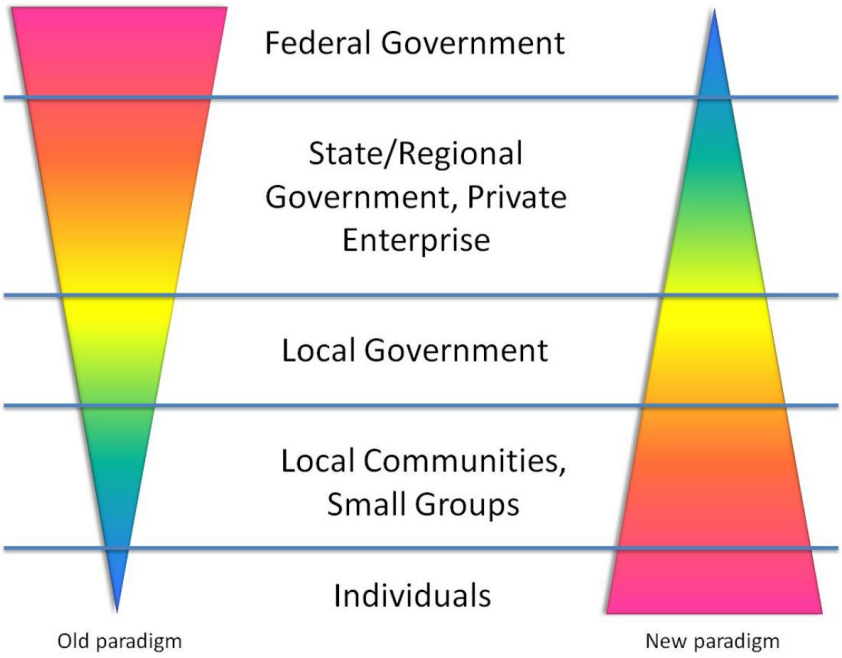

Fig. 2. New paradigm in data collection.

Volunteered geographic information (VGI) [7] is the harnessing of tools to create, assemble, and disseminate geographic data provided voluntarily by individuals [10]. These methodologies bring serious challenges to SDIs and traditional forms of data. Raw GI data published by public administration or private sector are not easy to be interpreted or (re)used by third parties without deep knowledge of data structure, data specifics and underlying technologies. There are several EU initiatives aiming to improve this situation mainly through establishment of Spatial Data Infrastructures (SDIs). The main goal of SDI is to provide access to geospatial data in a country, across a given area or a domain. Data are provided from various sources through a distributed environment. [4].

3 SDI4Apps pilots

The concept of SDI4Apps is demonstrate on six different pilots projects:

1. PILOT 1: Easy data access aims to support easy access to existing services using the SDI4Apps platform API solution, which supports easy collection of information using smart phones and integrates this information into current SDIs, by implementing the European Tourism Indicators System (ETIS) and Ground Truthing services
2. PILOT 2: Open Smart Tourist Data focus is on collecting, integrating and presenting tourist related data. This can be then further reused for various applications.

3. PILOT 3: Open Sensor Network -aiming to allow farmers to integrate low cost sensors into local and regional web sensor networks. Meteorological data and in-situ meteorological sensing networks will be used to support the crop production systems.
4. PILOT 4: Open Land Use Map Through VGI involves management and modification of natural environment into built environment such as fields, pastures, and settlements. The intention is to support voluntary initiative for open land use mapping, extending the initiative outside of Europe.
5. PILOT 5: Open INSPIRE4Youth supports creativity, technical capabilities, skills, knowledge, and relations, focusing on methods where young people are able to contribute to environmental and social issues.
6. PILOT 6: Ecosystem services evaluation is focused on identification of spatial representation of the outcomes of ESS Evaluation, focusing on sustainable support of tourism. The pilot web application will utilise the outcomes of Open API adopted by the project.[9]

4 INSPIRE4Youth

Open INSPIRE4Youth supports creativity, technical capabilities, skills, knowledge and also relations, through the sharing of spatial based content and educational materials around environment. Using new methods of digital cartography enables to go beyond linguistic barriers. Using principles of Linked Open Data **INSPIRE4Youth** offer new possibilities of analysing relation among different types of objects. The pilot is focused on building of Environmental and Geographical Web based atlas and educational quizzes based on utilization of Geospatial data, Linked Open data and other environmental data (maps) for educational and gaming purposes. The main components of the environment introduced are – water, air, soil, forests, nature protection, climate information, landscape, waste management, forest management etc. Each component has its actual condition measured for the region. All this will be made available in an entertaining manner – no school textbooks. Pilot also re uses database of Smart Point of Interest from Smart Tourist Data pilot. The main user group for this Atlas are students – higher grades of elementary schools, high schools and universities. However it should be appealing also for any adult person interested in topic.

The pilot currently cover two pilot solution with tree different applications:

1. Thematic Environmental Map Atlas based on Map Composer
2. Mobile Thematic Map Viewer
3. Geographical quiz based on database of Linked Open Data

4.1 Thematic Environmental Map Atlas – Map composer

The application is providing the necessary functionality for displaying geographic data on a map and then creating a map composition (a thematic map) that can contain

several data layers. After the map composition is created, i.e. detailed definition and metadata of each layer of the composition along with the composition itself, it can be saved as a JSON-styled text document. Then, this document can be read and visualized by an HSLayers NG-based web application. So, the main purpose of the application is to share visualized geographic data between users.

Map Composer is currently it is able to display map layers that come from the following services/sources: WMS, WFS, WCS, KML, GeoRSS, GML, GeoJSON and SOS. A user can then combine the layers he wishes into a composition that will be saved as an .hsl file (JSON styled text document that contains all necessary definitions and metadata of each layer and composition itself). It is further intended that the user will publish the composition he has created and share it with other users. It can be done in several ways: if user sets composition to "public" it can be viewed by other users of the platform in the Thematic Atlas web-application or the user can use Embed Map utility (feature of Thematic Atlas) to generate link to insert the map window with composition into any web-page (as data object, iframe etc.).

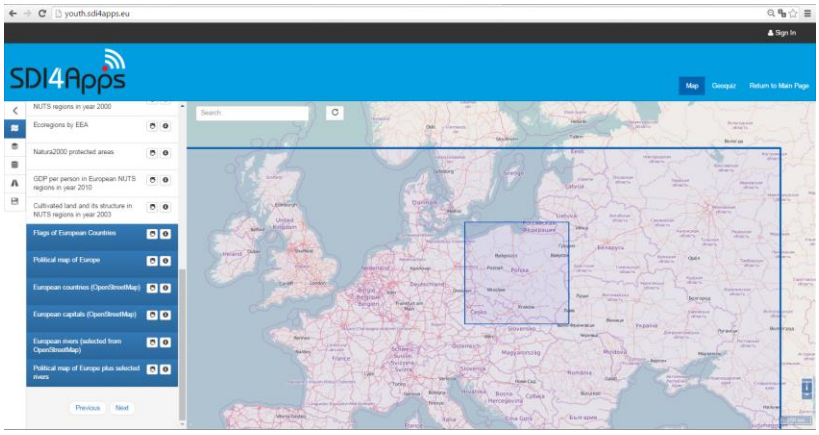

Fig. 3. Youth: Map composer

In the context of the project the Map Composer is playing very important role as it is allowing thematic map creation. With the help of this application users can overlay data from different sources and visually explore patterns in data and relationships between different data layers. The application is intuitive enough even for users that don't have strong background in GIS.

4.2 Mobile Thematic Viewer

It is mobile version of Thematic Viewer. The mobile application being developed as a part of the SDI4Apps project is a result of the HS-Layers framework and mobile specific code integration. Geolocation component also needed to be rewritten to use native geolocation API via the Cordova Geolocation plug-in. This allows for usage of

high precision GPS service. A GPS logging functionality was also introduced as a part of the mobile geolocation component. It employs a WebSQL database to store location information (available values are longitude, latitude, altitude, horizontal accuracy, current velocity and heading). Another storage options are also available, including local file storage or other database types. This logging functionality can be extended to display various statistics about created GPS tracks or the tracks themselves as features on the map. Displaying velocity and altitude as well as centring on the user's current position functions as intended.

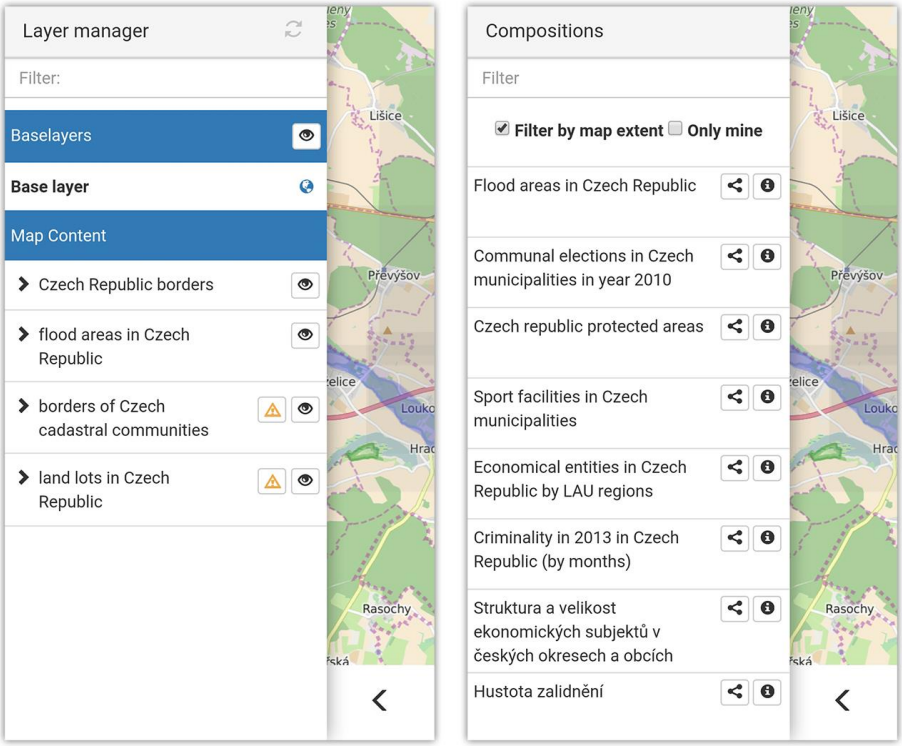

Fig. 4. INSPIRE4Youth: Mobile view

4.3. Quiz

One of the interesting tasks of the pilot is creating ontologies for those mentioned geographic objects. After creating those ontologies and then storing the data in RDF format and uploading it to Virtuoso, it is possible to query the data based on created ontologies, taking into account different interesting relationships between the classes. This can be very useful as in some cases it is impossible precisely to define some of the relationships by geometrical/topological means or even by visual means.

The semantic to such games brings a lot. It allows to add pictures and description of the places automatically if needed – for example from DB:Pedia. Also as was mentioned below it allows explore various interesting relationships between the objects: rivers and towns, mountains and provinces, lakes and habitats of water bird species, countries and forests, and in questions all these relationships can be combined for example we have following classes: cities, provinces, countries and rivers then we can ask such question 'find the city with more then 100 000 inhabitants, that lies in x province, on the bank of x river, that flows through x,y,z countries?'. It can well be filled with the picture of the most famous monument from that city from DB:Pedia. The Apps provides spatial analysis and build semantic linkage among different types of data. Like for example: river A is crossing countries A, B, C. Protected area X is in countries Y. Z. The results of analysis are stored as RDF files, so it allows different types of queries and educational scenarios. [8], [11].

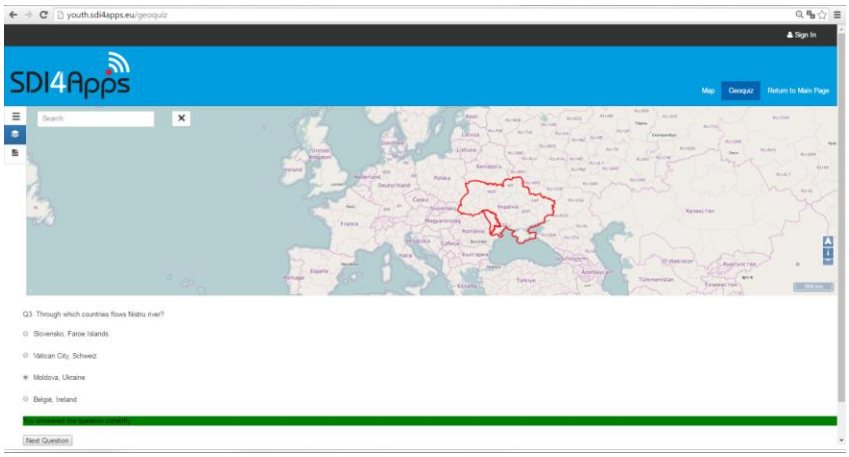

Fig. 5 INSPIRE4Youth: Quiz interface

5 Conclusion

The basic components of platform are now deployed and authors are preparing large scale testing in pilot countries. The pilot results will support modern form of education using remote and individualized access as well as information and communication technologies. The developed application and services are based on working with digital maps and support gaining knowledge and derivation of information through visual form. There is also very important a view on global world, which is able to present connections and consequences not perceptible from books or video materials. Also raising awareness of the Earth as interconnected planet (not a set of isolated countries and nations) through the maps is very important for young people, now. Last but not least it is necessary to emphasize an opportunity of influence the educational materials through creating of new compositions or development (or updating) new local data and information.

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Disclaimer

The responsibility for the content of this paper lies with the consortium and not with the European Commission or its agencies.

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