The GEOCID and Senses@watch experience: lessons learned for VGI-SDI integration

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The emergence of geospatial information crowdsourcing and VGI invites to a new reflection on the role of a bottom-up model in the SDI context.

- Enhance the degree of accessibility and applicability of the information within the SDI;
- Enlarge SDI audience with the participation of groups of citizens acting independently and addressing the needs of local communities;
- Contribute to help to fill gaps in official data or improve SDI possibility of receiving near-real-time data.

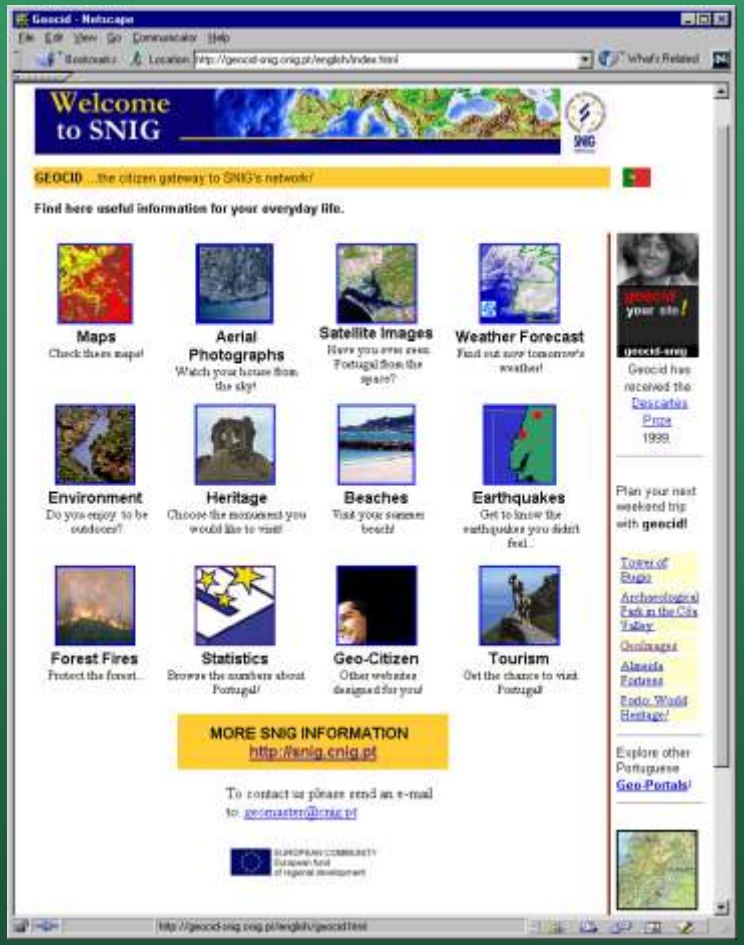
Identify issues to be considered in the cross VGI-SDI domain

Learn from the past:

- GEOCID: The citizen gateway to SNIG
- Senses@watch: a research project on the use of citizens as sensors of environmental variables.

Identify the issues, crossing the actual concerns and challenges and the lessons learned from the two projects.

GEOCID was a pioneer effort to involve citizens in SDI, although following a top-down approach



Information architecture targeting non-professional users

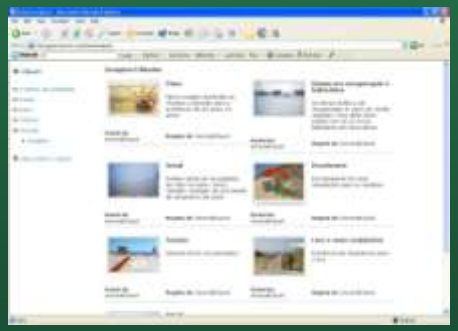
Appealing information on easy-to-use formats

Geocid (1999 - ...)

Senses@Watch intended to create and evaluate strategies to promote the use of environmental data collected through citizens' senses

Collect data based on human senses and other qualitative data

Register the data



Interpret the data

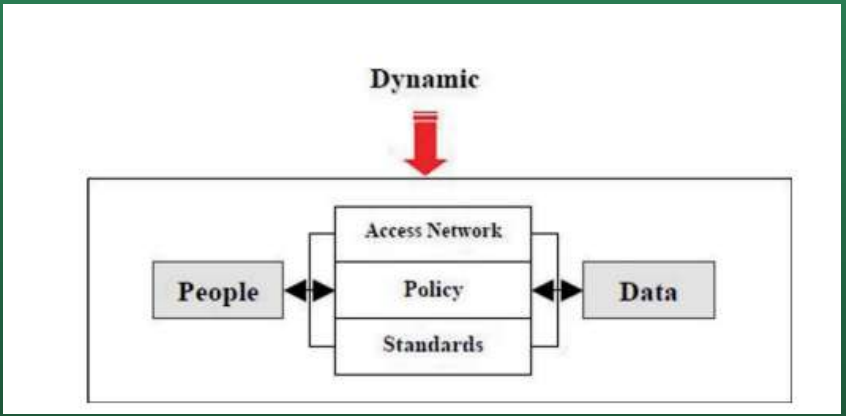
Create visually appealing messages

Senses@watch (2002 – 2006)

What could we learn from these projects that can be meaningful for the topic of VGI and SDI?

Components	GEOCID	Senses@watch
Policy	NSDI should be "available for all" considering the challenges brought by the Information Society (IS) (1997 Portuguese Green Book for the IS). Citizens are considered a priority among the GI. New priorities for NSDI implementation emerge accommodating citizens needs (e.g. data, interface, tools) that go beyond the simple access to geographic data in formats only available to professionals.	Citizens are seen as potential information providers. Citizens can act as communities of users. SDI can support the development of Environmental Collaborative Monitoring Networks. Reflection on new institutional and organizational models for SDI. Relevance given to non-traditional types of environmental data in monitoring systems.
People	Users: The citizen, seen neither as a GI specialist nor as an Information Technology (IT) expert. Data providers: National GI producers, from official organizations, that had to change their mindset to provide the required data.	Users: Environmental monitoring organizations/institutions. Data providers: Environmentally concerned citizens that were involved in the different case studies, acting individually or as communities of users. Motivation in a participatory context was a major research issue.
Data	Types of data: consideration of SDI contents organised according to different themes and in accessible formats. National GI producers had to face the challenge of providing their contents in formats accessible for all web users which have different needs in terms of data detail and accuracy when compared with the GI professionals.	Types of data: collection of non-traditional types of monitoring data related to the case study themes. The integration of the different types of data was a major issue. Data credibility and data quality evaluation were major concerns that emerged during the project. Data representativeness was also an issue as spatial, temporal and thematic coverage was not assured.
Access	Interface: Interface design principles based on the use of images and text (clear, direct and appealing sentences avoiding the use of technical jargon). Users both easily recognise the content of the link and are readily able to identify the information space. Data infrastructure: SNIG, the NSDI, as the basis for GEOCID content provision using a consistent information structure. Technology: Web-based applications, from webmapping to web access to databases; image compressing techniques or the emergence of vector file standards on the WWW, allowed the visualization, navigation and access to the data. Different metaphors for data browsing, as "fly over" the territory and stop in points of interest to visualize and access the data were used (Fernandes *et al*, 1997). The site usability from low bandwidth connections was a main concern.	Interface: Consistency in the information structure was guaranteed in the development of the Senses@watch back-end information infrastructure for the ECMN, supported by the project website. Data infrastructure: the back-end information infrastructure for the ECMN available to support citizen's activities. Technology: Webmapping was crucial to the development of the collaborative website. Mobile technologies supported the collection of multimedia and sensory data, but with limitations. Tools to facilitate data integration and management were a specific need (e.g. geo-reference, annotate data and create metadata, thematic, temporal and spatial searches based on web mapping tools). A case-based library, based on the clipart metaphor, addressed the need to educate users.
Standards	SNIG metadata supporting the organization and access to the data.	Forms for data collection and submission. Metadata availability. Guidelines supporting data collection linked also to the case-based library.

An analysis of the key issues around both projects was performed in relation to an adaptation of the SDI components used by **Castelein et al, 2010** as a common framework for the study of SDI-VGI relation.



(1) Which were the major issues in the development of the projects that conditioned their success?

- (GEOCID) provision of easy to explore information, a challenge for data providers that had to adapt the existent contents to user profiles from specific thematic areas
- (GEOCID) the integration of NSDI standards and services was constrained by the technology available at that time
- (Senses@watch) the need of tools to facilitate the integration and management of non-traditional types of environmental data
- (Senses@watch) the need to build tools to help citizens to translate qualitative data into environmental quality indicators. This data translation is always a major issue concerning citizen collected data.
- (GEOCID and Senses@watch) metadata was a need although the creation of predefined rules for such a dynamic and diversified data was a difficult task.

(2) How the situation evolved?

- (GEOCID) image technology used in “Portugal from the sky” application - better performances are now achievable, new tools and standards emerged that facilitate the on-line access and handling of big raster data through standard-compliant interfaces.

- (Senses@watch) The emergence of high resolution aerial photography covering the whole Earth's surface and the explosion in GPS ownership via smartphones is enabling citizens to become better sensors of the world.

- (GEOCID and Senses@watch) Virtual globes such as Google Earth enable users to create and contribute with geo content, becoming a tool for grassroots mobilization, environmental protection and disaster response.

- (Senses@watch) Mobile sensors, included or coupled with mobile devices have also increased - most smartphones include GPS, cameras and sensors for monitoring variables such as temperature, noise, orientation and acceleration – allow citizens to perform surveying and use these data for tracing features and visualisation of temporal changes to an environment.

(2) How the situation evolved?

- (Senses@watch) it is possible to couple sensors to the smartphones for measuring a diversity of variables from air quality to radioactivity. Some of the most interesting initiatives in this area come from the growing community of makers that take advantage of open source hardware platforms, such as the Arduino.

- (GEOCID and Senses@watch) the emergence of the internet of things will increase the availability of sensors as well as tools to share and process the big data that results from it. (e.g. initiatives such as IFTTT)

- (Senses@watch) mobile technologies, became attractive devices to support citizenship activities (e.g. increase of processor speeds and memory)

- (Senses@watch) developments in robotics create a new dimension in the use of mobile devices, which can now be autonomously or remotely controlled by users.

(2) How the situation evolved?

- (GEOCID and Senses@watch) Organisational and institutional models to support the logistics involved in VGI projects from recruiting new members to maintain the motivation of the existing ones are now much better achieved through Web 2.0 developments namely social networks.

- (GEOCID and Senses@watch) Maps became easy to create with a simple drag and drop interface, allowing anyone to add placemarks, text, photos and videos to simple mash-ups, which could be saved, embedded and forwarded as a KML files. (e.g. OpenStreetMap).

- (GEOCID and Senses@watch) users can nowadays “map” their own location by “checking in” at geosocial networks such as Facebook, Twitter or Foursquare.

- (GEOCID and Senses@watch) In the domain of SDI, geographic data and services harmonization, gained force with initiatives such as INSPIRE in Europe or GEO/GEOSS worldwide, creating conditions that facilitate the provision of data that is usable for different purposes.

The analysis of the two projects based on the SDI-VGI framework provided insights at different levels:

User Interface and data formats and types

- Design principles targeting citizens as users and producers of information;
- Accommodate VGI data types in the SDI that are diversified and dynamic, sometimes produced in real-time;
- Incorporate in SDI easy to access formats and not only the formats usually available to GI professionals;

Local Soundscapes

Collection of geography-specific audio recordings recordings created from the activities and processes of local businesses and revealing practices of everyday life and moments from the creation of various products.

Maps in real time

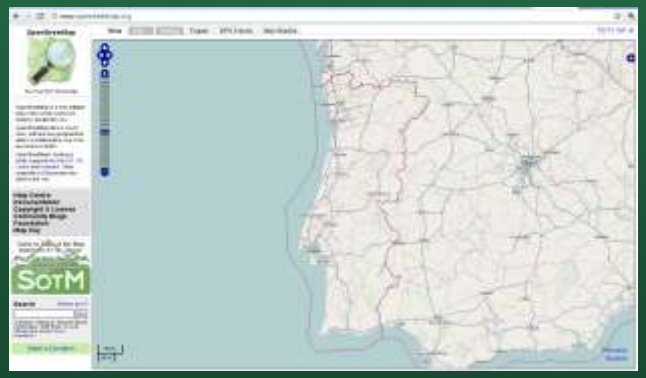
Citizens equiped with lightning detectors contribute through the Internet to the lightning map of Europe

The analysis of the two projects based on the SDI-VGI framework provided insights at different levels:

SDI Tools & Architecture

- Development of webservices towards interoperability and able to integrate non traditional types. Adoption of standards (e.g. for metadata and data) that may help to deal with data quality and interoperability issues;

- Tools to support citizen's efforts to collect and manage data (e.g. geo-referencing, data annotation, metadata creation) as well as data handling tools to search, visualize and explore the data; Explore mobile computing and communication as well as novel sensing devices;



http://www.openstreetmap.org/

The analysis of the two projects based on the SDI-VGI framework provided insights at different levels:

SDI Tools & Architecture

- Data producer's provision of tools enabling the evaluation of the data quality for different purposes, i.e. evaluate "fitness for purposel";
- Tools provided by the data producers to support the training of individuals and groups of citizens and to promote community building around specific SDI needs (e.g. filling gaps in official cartography; collection of new types of data with new sensors that may augment the impact of the SDI);

Smart Citizen

Low cost sensors

Projecto RIOS

The analysis of the two projects based on the SDI-VGI framework provided insights at different levels:

SDI political and organizational aspects

- New organizational models for data collection and validation should be considered to support the logistics involved in volunteered initiatives, for recruiting new members and maintaining the motivation of the existing ones (e.g. use Web 2.0 developments namely social networks).

- Mechanisms to register and manage the collaboration of volunteers should exist, allowing the identification of profiles. The adoption of these types of procedures may contribute to increase data credibility.

- Privacy and ethics in data collection have to be considered as well as new business models.

Geo-Wiki Project

A game to improve global Cropland through crowsourcing.

The integration of VGI datasets into SDI requires further research

(a) VGI in the validation/production of official cartography.

(b) VGI in SDI case studies.

VGI in the validation/production of official cartography (*)

The idea is to have a VGI managing model to gather, compile and use this new source of information in Land Use/Land Cover (LULC) mapping activities which includes issues such as:

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(1) Identification of data requirements relevant for LULC

(2) The collection and compilation of geographic information provided by web users

(3) The understanding of who are the VGI providers, identifying communities with different participation profiles differentiating the best participation profile for LULC

(4) Evaluate data quality

(5) Develop case studies aiming to illustrate and test the use of VGI in the validation/production of official cartography

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(*) A project proposal coordinated by ISEGI was submitted to the Portuguese NSF (FCT)

VGI in SDI case studies

- Identify and analyze the integration of VGI in the context of SDI within the environmental domain.
- The environment merges the need for updated and scientific valid data together with the activity of grassroots movements making it a good fit for VGI and accordingly a good research topic.
- Volunteer citizen initiatives in environmental planning and monitoring will be analyzed particularly in topics such as resource efficiency, climate change mitigation and water resources quality as these are topics that SDI still have to better address and where it may benefit from citizen participation.

Workshop Citizens Observatories Infrastructures for Citizen Science and Crowdsourcing – Concepts, methodologies, apps and sensors with INSPIRE in mind

29 May 2015

11:00 – 17:00

Hall: Pavillion 3B

See you there ☺

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