Spatially Enabled Society

A joint publication between FIG and GSDI, edited by Daniel Steudler and Abbas Rajabifard

Launched at FIG Working Week 2012 in Rome, Italy, 7 May 2012 and GSDI-13 in Québec, Canada, 14 May 2012

Task Force, its Aim, and Activities

- FIG-Task Force mandated at Working Week 2009
- to explore the issue of Spatially Enabled Societies (SES);
- to identify the role of the profession, how it can provide for a spatially enabled society;
- to make recommendations

- May 2011: paper and presentation at FIG-Working Week 2011 in Marrakech
- Oct. 2011 in Melbourne: meeting of Task Force
- Feb. 2012: joint workshop as a platform to discuss the findings and gain further input
- May 2012: launch of publication at FIG-Working Week 2012 in Rome and at GSDI-13 in Québec
Publication «Spatially Enabled Society»
Steudler and Rajabifard, editors, 72 pages, FIG Publication no. 58

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Challenge – Population growth

- World pop. increasing to 9.2 billion by 2050
- Huge urbanization process
- UN-Habitat (2010): urban population in Africa of 400 million will triple until 2050
- Challenges: development of infrastructures, basic services such as health, education, drinkable water, waste water treatment, public transport, security

![World urban/rural population 1950-2050](esa.un.org)

Challenge – Environmental sustainability

"Tragedy of the commons": Azerbaijan after transition in 1990’s

- Private landownership was introduced initially only for land within the village;
- Land outside the villages remained common property respective state property;
- Village society was not sufficiently organized;
- Sheep secure the income of the rural population;
- Sheep stock became approx. 5 times as big as the actual capacity of the land would have been;
- Serious erosion and degradation problems;
- Basic problem was lack of responsibility and accountability for the resource "land".
Challenge – Disaster management

- Thailand after tsunami: lack of proper landownership information allowed financial investors to take over land, while local fishermen have been ousted from their properties;
- well documented landownership information would have protected minorities with lesser economic power against exploitation;
- Aceh after tsunami: the loss of land registry and cadastral data caused huge problems for reconstruction, planning, and social stability;

Disaster management starts before the disaster; landownership information is crucial.

Challenge – Land Management

Nail house in Chongqing, China (2007): A cadastre with documentation of land ownership is clearly in place, but something else seems to be non-satisfactory.
Land Administration and Management Paradigm

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Land related activities</th>
<th>Tools / Methods</th>
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<tr>
<td>Administration / Documentation</td>
<td>Land administration</td>
<td>• monitoring</td>
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<td>− handling of spatial information, data</td>
<td>and cadastre</td>
<td>• navigation</td>
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<td>− cadastral operations, data modelling,</td>
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<td>• land registration</td>
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<td>data acquisition, data maintenance, data</td>
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<td>distribution</td>
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<td>• surveying</td>
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<td>• geodesy</td>
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Definition of a Spatially Enabled Society

A spatially enabled society – including its government – is one that makes use and benefits from a wide array of spatial data, information, and services as a mean to organize its land related activities. Spatial enablement is a concept that adds location to existing information and thereby unlocks the wealth of existing knowledge about the land, its legal and economical situation, its resources, potential use and hazards. Information on landownership is thereby a basic and crucial component to allow for correct decision-making. Such data and information must be available in a free, efficient, and comprehensive way in order to support the sustainable development of society. It therefore needs to be organized in such a way that it can easily be shared, integrated, and analysed to provide the basis for value-added services.
Six key elements for a SES

- **Legal framework** for basic geoinformation;
- **Common Data integration concept:**
  - legal and institutional independence of information (to allow for independent responsibilities);
  - common geodetic reference framework;
  - standardized data modelling concept;
- **Positioning infrastructure** for the common reference framework;
- **Network infrastructure** to enable integration and sharing of spatial data through the spatial data infrastructure SDI;
- **Landownership information** as one of the basic information topics;
- **Data and information:**
  - official, authentic, complete, comprehensive, updated;
  - accessibility of data i.e. public sector information initiatives;
  - volunteered geographic information (VGI), web 2.0 possibilities.

Legal Framework

- **Jurisdictional framework**
  - constitutional statement about geoinformation
  - national law on geoinformation to be harmonized
  - national law on documentation of land ownership
- **Legal interoperability**
  - use conditions clear and determinable
  - no restrictions on derivative products
  - no restrictions on use and access of other datasets
- **Governance**
  - comprehensiveness, coverage
  - transparency of information
  - inclusion of public-law restrictions (RRR)
## Common Data Integration Concept

<table>
<thead>
<tr>
<th>Legal topic</th>
<th>Institution, data owner</th>
<th>Spatial Data Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water/noise protection</td>
<td>Local government</td>
<td></td>
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<tr>
<td>Environ. protection</td>
<td>Environ. dept.</td>
<td></td>
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<tr>
<td>Land-use planning</td>
<td>Planning dept.</td>
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<tr>
<td>Collective land rights</td>
<td>Corporations, tribes, clan</td>
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<tr>
<td>Land valuation</td>
<td>Government</td>
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<tr>
<td>Public-law restrictions</td>
<td>Government</td>
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<tr>
<td>Land registry, cadastre</td>
<td>National government</td>
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<td></td>
<td>State government</td>
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<tr>
<td></td>
<td>Local government</td>
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</tbody>
</table>

Three key elements for data integration concept:
- legal resp. institutional independence
- common geodetic reference framework
- standardized data modelling concept

## Land Management Paradigm

- Cadastral engines...
  - 1. Multipurpose Cadastre (German style)
  - 2. Title or deeds tenure style Cadastres (Torrens/English style)
  - 3. Taxation driven cadastre (French/Latin/USA style)

- SDI: Mapping services and other data providers

- Land management paradigm:
  - Tenure
  - Value
  - Use
  - Development

- Spatially enabled government:
  - Incorporating Land policy
  - Spatially enabled LAS
  - Services to business and public
  - Country context

- Sustainable development:
  - Economic
  - Environmental
  - Social
  - Governance

(Williamson, Enemark, Wallace, Rajabifard, 2010)
Positioning Infrastructure

- In Australia, a report estimated the benefits for agriculture, construction and mining through precision machine guidance to AUD 73-134 billion over the next 20 years, mainly in fuel efficiency.
- Underpinning the broad spatial enabling of society;
- Ubiquity for hundreds of million mobile phone users to locate themselves; hunger for improved performance;
- Ultimate accuracy requirement of both PI and SDI is likely to be better than 10cm at a very high confidence level;
- Establishing of a PI for surveying and geospatial sector alone can only be justified in densely populated areas; the extension into rural and remote areas can only be justified when the business case is broadened beyond surveying and spatial data → machine guidance for agriculture, construction and mining.

Spatial Data Infrastructure

- Enabling platform
- Social and technical components
- Interoperability
Land Ownership Information

- application of subsidiary principle: political decisions should be taken at lowest administrative and political level, and as close to the citizens as possible;
- interaction between Government, business, and citizens is concerned with land tenure, land tenure security, land and mortgage market;
- it is generally accepted that a land administration system is to be based on land ownership data;
- examples are INSPIRE (where cadastral parcel is a core data set) and the six Dutch official and authentic registries (with one of them "parcel and land registration").

Data and Information

Location revolution, LBS, social media turn location-based

Public Sector response: NSDI, INSPIRE, Open Government Data;
Private Sector response: high resolution satellite imagery; crowd-sourced data; big digital powers create digital civilizations;
Citizen response: dramatic shift to crowd-sourcing, also “passive” crowd sourcing through mobile devices;

The Future of NMCAs: strategies to incorporate crowd-sourced data into production processes: using data from trusted sources, act as moderators of input portals; cautious about change; retreat to diminishing market for authoritative geospatial data?

→ Global technology companies understood the power of location
Spatial Enablement *in action*

A GFC Early Warning System

The real world...

Build a cadastre...

Add a mortgage layer (gray)

Aggregate nationally and respond promptly...

Monitor spatially for clustering

Record foreclosures spatially (red)

...most countries, including the US, do not have this capacity yet
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Where to get it

directly at conferences (FIG-Working Week, GSDI-13)

can be ordered at FIG Office in Copenhagen (www.fig.net)

or online at www.fig.net ➔ Publications
(direct link: www.fig.net/pub/figpub/pub58/figpub58.pdf)
Spatial enablement at work …

Cover picture from Amman, Jordan taken by Robin McLaren, with cadastral map overlay from Switzerland.