Cadastral Dimensions – Crossing Boundaries

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The World Cadastre Summit

20-24 April 2015, Istanbul, Turkey

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- Evolution in Switzerland and experiences
- Crossing the boundaries: latest developments and future trends
**Trends – Social**

- huge urbanization process
- environmental sustainability
- disaster management
- land management issues

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**Trends – Technical**

- digital data → information age
- cadastral data (land ownership) as part and basis for GDI
- synergies with topographic data
- cadastral systems are documentation systems → increasing content
Land Administration and Management Paradigm

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Land related activities</th>
<th>Tools / Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategy</td>
<td>Land policy</td>
<td>• political activities</td>
</tr>
<tr>
<td>– visions and objectives</td>
<td></td>
<td></td>
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<tr>
<td>Management</td>
<td>Land management</td>
<td>• land-use planning</td>
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<tr>
<td>– measures and projects for the</td>
<td></td>
<td>• land consolidation</td>
</tr>
<tr>
<td>implementation of the policy</td>
<td></td>
<td>• land reallocation</td>
</tr>
<tr>
<td>Administration / Documentation</td>
<td>Land administration and</td>
<td>• melioration</td>
</tr>
<tr>
<td>– handling of spatial information,</td>
<td>cadastre</td>
<td>• landscape development</td>
</tr>
<tr>
<td>data analysis, data visualization</td>
<td></td>
<td>• land recycling</td>
</tr>
<tr>
<td>– cadastral operations, data</td>
<td></td>
<td></td>
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<tr>
<td>modelling, data acquisition, data</td>
<td></td>
<td></td>
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<tr>
<td>distribution</td>
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</tbody>
</table>

Land Management Paradigm

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

Cadastral engines...

SDI Mapping, geospatial and other data providers

Land management paradigm

Spatially enabled government

Incorporating: Land policy

Tenure

Value

Use

Development

Country context

Sustainable development

- Economic
- Environmental
- Social
- Governance

Better decision making

(Williamson, Enemark, Wallace, Rajabifard)
CH: Reform of cadastral surveying (1980's)

Principles of Reform Project RAV:
- Minimum of regulations on the Federal level
- Avoidance of double data acquisition
- Increase of data actuality
- Freedom of data acquisition method
- Data as basis for LIS as well (not only registry)

Legal basis for AV93:
- Ordnance for Official Surveying (VAV, 1.1.1993)
- Technical Ordnance for Official Surveying (TVAV, 1.7.1994)

Two very relevant achievements:
- Extension of purpose (not only for land registry, also for land information in general)
- Need of flexible data exchange mechanism

Data Modelling

Standardized data modelling and cadastral data definition (introduced in Switzerland in 1993)

8 Information Layers (Possibility to realise the layers separately)

8 Information Layers
- Control points
- Land cover
- Single objects
- Heights
- Local names
- Ownership
- Pipelines >5 bar
- Administrative subdivisions

Data Model (UML) (Entity-Relationship-Diagram)

Data Description Language
- INTERLIS

with this standardized way of data modelling, the use and exchange of digital cadastral data is independent from the GIS or software system.
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 principles**
  - official, authentic, complete, comprehensive, updated;
  - accessibility of data i.e. public sector information initiatives;
  - volunteered geographic information (VGI), web 2.0 possibilities.
Land Ownership Information


- Legal recognition and allocation of tenure rights and duties
- Transfers and other changes to tenure rights and duties
- Administration of tenure
- Responses to climate change and emergencies
- Promotion, implementation, monitoring and evaluation

Examples on a European level are INSPIRE (where cadastral parcel is a core data set); the six Dutch official and authentic registries (one of them "parcel and land registration"); or the Danish basic data program (person, business, real property, address, geographic, and incomes data).

Common Data Integration Concept

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

Four basic principles for a common data integration concept:

1) to respect the legal / institutional independence of stakeholders
2) to use a standardized data modelling concept
3) to use a common geodetic reference framework
4) no logic relations to objects in different topic except through geographic location
**Independent information layers**

**Advantages:**
- stakeholders can look after their own data sets, they only have to respect the defined basic principles
- the fear of stakeholders – losing control over their data – can be overcome
- responsibility, work flow and data flow can clearly be defined and managed by each stakeholder independent from the others

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**17 Public-Law Restriction in Swiss Cadastre**

<table>
<thead>
<tr>
<th>PL-Restriction</th>
<th>Institution, stakeholder</th>
<th>Textual information</th>
<th>Spatial data, geoinformation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cantonal and municipal use planning, Land-use planning Dept.</td>
<td>National government</td>
<td></td>
<td>National government</td>
</tr>
<tr>
<td>Protection zones</td>
<td>National government</td>
<td></td>
<td>State government</td>
</tr>
<tr>
<td>Construction lines</td>
<td>Canton dep.</td>
<td></td>
<td>Local government</td>
</tr>
<tr>
<td>Project zones</td>
<td>Airport auth.</td>
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<td>National government</td>
</tr>
<tr>
<td>Construction lines</td>
<td>Environment</td>
<td></td>
<td>Canton Dep.</td>
</tr>
<tr>
<td>Hazardous waste</td>
<td>Water Management</td>
<td></td>
<td>Canton Dep.</td>
</tr>
<tr>
<td>Ground water protection zones</td>
<td>Environment</td>
<td></td>
<td>Canton Dep.</td>
</tr>
<tr>
<td>Ground water protection perimeters</td>
<td>Water Management</td>
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<td>Canton Dep.</td>
</tr>
<tr>
<td>Noise lines</td>
<td>Environment</td>
<td></td>
<td>Canton Dep.</td>
</tr>
<tr>
<td>Forest distance lines</td>
<td>Canton dep.</td>
<td></td>
<td>Canton Dep.</td>
</tr>
</tbody>
</table>

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Considerations

• seemingly these are technicalities
  → but with strong conceptual implications
  → we as professionals need to be able to handle those
technicalities in order to be able to provide the appropriate
services and expertise

• all partnering stakeholders would have to respect those basic
principles and maintain and update their data sets accordingly

• setting-up of an SDI is less of a technical problem, it is much
more about inter-governmental communication (to overcome
stakeholder’s silo-type of thinking and the fear of loosing control
over its own data and information)

Background

• Think Tank active since 2012;
• aim is to identify the current trends in the
geoinformation field and to develop a
strategy for the cadastre;
• Swiss cadastral system is well
advanced: digital, well conceptualized,
close to full coverage, legally
comprehensive;
• issues in Switzerland are mainly
organizational (federalist environment)
and structural;
• a first result of the Think Tank is a
Discussion Paper published in May 2014
→ identify trends and developments
→ open eyes and minds of professionals
Changing World

- from drawing board and pencil to computer technology
- from terrestrial measurements to photogrammetry and GNSS
- from analogue to digital
- from paper maps to databases to knowledge bases
- technology push vs. citizen pull
- trend from written word to imagery
- social media

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Objects of the Cadastre

- traditionally, the cadastre provides legal security of landownership and represents objects such as parcels, buildings, and structures;
- new categories come into being, e.g. polluted sites, land-use zoning, zones exposed to noise, etc.
- the Internet brings along social change, increasing involvement of the public (open data, apps, open source software, social networks);
- rise of radical new approaches, namely a society driven more by legitimate than legal impetus.

**Internet of Things and Linked Data**

Diagram showing the connection between devices, data, and services. Images from http://www.linkeddata.org and http://eecatalog.com

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**Big Data and Data Mining**

Image of a modern house and a countryside view. Text: "Data mining is going to speed up the mass exploitation of "big data"."

Images from C. Moullet
Ubiquitous Mobility

Making the invisible visible…

From: Cadastre 2034 – A 10-20 Year Strategy for developing the cadastral system

Crowd-sourcing, Augmented Citizen

Citizens as the nation’s number one geomaticians!

© http://www.geoawesomeness.com

The new "Common Property"

- public sector information was so far the standard for knowledge on land and its legal status;
- private initiatives are producing new data collections, such as e.g. footpaths, OpenStreetMap, GoogleStreetView, eBird.org, virtual visits to tourist destinations, etc. → all eventually becoming a knowledge base used by society at large;
- the combination of both – public and private – information sets will yield additional value to the knowledge base of the land and territory.

→ the new "Common Property" of shared knowledge, i.e. public and open know-how
Conclusions

• there are trends and developments, which cannot be ignored;
• increasingly dynamic world;
• drivers are the technology-push, as well as the pull by citizen involvement (crowd-sourcing, augmented citizen);
• the public sector – responsible for a public good, called the cadastre – needs to consider, how to deal with citizen-driven input (which, in some cases, is more efficient);
• the public sector needs to re-focus its role.

İlginiz için teşekkür ederiz!