FIG-Task Force on Spatially Enabled Societies

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Key words: Spatially enabled society, Land Management, Land Administration, Cadastre

SUMMARY

This paper presents the task and work of the «FIG-Task Force on Spatially Enabled Societies». Its aim – in cooperation with other global organisations – is threefold, namely to focus on the term of "Spatially Enabled Societies" and the issues linked with it; to come up with a definition of SES; and to make the surveying profession aware in order to provide the appropriate services.

National societies are increasingly facing challenges of global scale. Economic development, social conflicts, urban growth, rural development, climate change, global warming, or carbon credit management are just a few issues that need careful assessment and sustainable action. Concrete examples on the urban sprawl, disaster management, and land grabbing illustrate the urgent need in developing countries for sound land information. Due to the population density and intensive land-use, there are important needs for good and reliable land information in developed countries as well.

The spatial location is in most cases crucial for responding to those needs; and while ownership information is not the sole information, it is more often than not at the core of the solution. Land administration and land management systems can provide the information and infrastructure to address the issues. This paper presents a land administration and land management concept along with a structural proposal on a conceptual level.

Based on the potential provisions of land administration and land management systems, the paper then suggests six key elements that spatially enable a society. The six key elements include a legal framework, positioning infrastructure, data integration concept, network infrastructure, land ownership information and general data and information principles.

The paper concludes with a work plan for the Task Force that foresees a program and a final report by the end of 2012.

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1. INTRODUCTION

Land administration systems provide the infrastructure for implementing land policies and land management strategies with the aim to support sustainable development objectives. They have proven, especially in developed countries to provide secure and transparent processes to achieve the objectives. The services can continuously be improved and adapted mainly due to new possibilities offered by digital technology. Information can efficiently be shared and interoperability of data be achieved through the multiple and transparent use of digital data.

At the same time, national societies along with the global community are being challenged by issues of global scale. Economic development, social conflicts, urban growth, rural development, climate change, global warming, carbon credit management, or disaster management are just a few issues that need careful assessment and sustainable action. In one way or another, all those issues are linked to location, as «everything happens somewhere», i.e. there is need for effective and efficient geoinformation. Societies and their governments need to become spatially enabled in order to have the right tools and information at hand to take the right decisions.

Different initiatives to improve the availability and access to geodata, such as national data infrastructures (NSDI) or INSPIRE (European SDI) are currently under construction. It is important that these activities are successful. The path to success starts with the spatial enablement of those societies.

The aim of the «FIG-Task Force on Spatially Enabled Societies» – in cooperation with other global organisations – is to focus on the term "Spatially Enabled Societies" and the issues linked with it; to come up with a definition of SES; and to support the surveying profession to become aware of those issues in order to provide the appropriate services.

2. SPATIAL NEEDS OF OUR SOCIETIES

When looking at media reports from the last 6-12 months, there are many examples of where sound land information and good land administration and management systems are needed.

In many large cities, the phenomenon of urban sprawl is creating huge problems, as can be seen in the example of Jakarta described by Philip (2010). The Indonesian capital with a population of 9.6 million is facing huge problems such as pollution, overpopulation, traffic

congestions, inefficient transport systems, and urban sprawl without proper planning. In the face of these challenges, the Indonesian authorities are even considering options to move the capital to somewhere else in order to overcome them. The opposition and NGOs, however, are suggesting "to improve the existing city rather than moving into the jungle, and to create incentives to draw the middle classes back into the city centre. Just as elsewhere, high rents have driven many away – and the proliferation of lavish shopping malls has fuelled property speculation. We have to rethink the way we use land, encourage people to move back and stop building tower blocks. Land is crucial and we need the relevant information in order to manage it well." The call for better land information is a strong one, as it is the basis for the analysis and solution to the multiple problems and the well-being of huge populations.

In disaster management, there is also a strong need for sound land information. Mitchell (2010) describes three main threats to landholders in disaster situations. "First, there are material threats caused by displacement, including the risk of land grabbing and coercion to sell, the need for temporary shelter and resettlement, and the impact of resettlement on those with insecure tenure. A second category of threats is the material threats caused by destruction. These include damage to property, degradation, loss of official records, a reduced capacity of authorities to carry out their duties, and damage to boundary marks. The third type of threat is administrative, post-disaster. These include limited public sector capacity, planning rule changes and inadequate compensation."

A concrete example of these threats is the natural disaster management after the flooding in Brazil in January 2011 and again in March 2011. There were calls that the situation could have been prevented by the establishment and proper use of hazardous zone definitions, of preventing building houses in those areas, and of flood prediction models. Another example was the 2004 tsunami, which destroyed much of the infrastructure in several countries. Already weak land registration and cadastral systems have become defunct after the disaster, and for financial speculators, it was no effort to manipulate land registration documents and to evict previous landowners. In Aceh, about 80% of the land documents have been destroyed, which posed huge problems for the reconstruction (Abidin et al., 2006). The post-disaster situation in Haiti after the 2010 earthquake revealed similar needs. Commentators were suggesting three building blocks for the reestablishment of a functioning society: nation building, the establishment and enforcement of law and order including land ownership, and the education of people in order to enable them to self-help (Kappeler, 2010).

A concrete example of land grabbing has been described by Bunting (2011). In Mali, an international development company has built a 40km long water irrigation canal mandated by the government. The canal, however, displaced many local people living on the ground for generations. The development company claimed that planning of the canal has been based on maps that show the actual landownership situation. However, the map didn't reflect the actual situation on the ground as Mali has almost no private land titles and land is owned ultimately by the state. This has been interpreted with respect for customary land use, though it is not clear how the rights of those living on the land will be protected. Already, more than 150 families have been forced off the land to make way for the canal. Campaigners worry that this

is only the start: "Even if the land does belong to the government, the people living on it still have rights, and we will do everything to fight against this injustice."

Those examples from developing countries show urgent needs for efficient land administration and management systems based on sound spatial land information. In developed countries at the same time, there are important needs to have reliable spatial information as well. Due to the density of the population and the land-use, existing cadastral system in such countries are to be extended to also accommodate information that reflects these situations. One example is the discussion of 3D Cadastres i.e. the extension of cadastral systems with the 3rd dimension in order to document the definition of ownership rights in condominiums.

In this same context, the paradigm of landownership rights extending up in the sky and down to the centre of the earth might not apply anymore and needs discussion. In urban areas, street or railway tunnels might be built 10-20m below existing properties and buildings. What is the legal situation when those landowners would like to drill their 100m bore hole for geothermic heating? Such facts as well as public-law restrictions that potentially impact on the use of the land need to be documented in order to keep the land market transparent. Traditional cadastres documenting private-law rights can be extended in order to accommodate such land related issues.

There are many challenges and needs of our national societies. They are increasingly also of global scale and impact on all our lives. The spatial location and land information is in most cases crucial for responding to those needs; and while ownership information is not the sole information, it is more often than not at the core of the solution.

3. POTENTIAL PROVISIONS OF LAND ADMINISTRATION AND LAND MANAGEMENT SYSTEMS

Over the last 15-20 years, the topic of cadastre and land registration has been discussed extensively. The FIG-statement on the cadastre (FIG, 1994) established that the "cadastre assists in the management of land and land use, and enables sustainable development and environmental protection." In the 1990s the UN-ECE (1996) coined the term "land administration" in order to express the broader need and use of land information for managing the land as an asset. The Bathurst Declaration concluded in 1999 that sustainable development is the key driver influencing the Humankind to Land relationship and that it needs sound land administration (UN-FIG, 1999).

3.1 Land administration and land management in context

Land administration and management are serving the particular needs of societies as discussed in chapter 2. A spatially enabled society certainly needs well organized and efficient land administration and land management systems. The context of administration and management and their respective tools and methods are illustrated in Figure 1.

Tasks	Land related activities	Tools / Methods
Strategy • visions and objectives	**Land policy**	• political activities
Management • measures and projects for the implementation of the policy	**Land management** 	• land-use planning • land consolidation • land reallocation • melioration • landscape develop-ment • land recycling
Administration / Documentation • handling of spatial information, data analysis, data visualization • cadastral operations, data modelling, data acquisition, data maintenance, data distribution	**Land administration and cadastre** 	• monitoring • navigation • geoinformation • land registration • cartography • surveying • geodesy

Figure 1: The broader context of land documentation, land administration and land management (adapted from Kaufmann, 2008).

3.2 Elements of a land administration system

A land administration system has originally been defined by the UN-ECE as the "processes of determining, recording and disseminating information about the tenure, value and use of land when implementing land management policies." The land administration system is a basic foundation for the spatial enablement of a society and is considered to include land registration, cadastral surveying and mapping, fiscal, legal and multi-purpose cadastres and land information systems (UN-ECE, 1996).

Horisberger (2010) proposes a set of basic elements that a land administration system consists of. Those basic elements are (compare Figure 2):

- **cadastre** with the basic entity "cadastral object", i.e. land parcels, built objects, topographic objects, or administrative areas;
- **land registry** with basic entities: ownership rights, rights holders
- **land valuation** with basic entities of land market value, regulations, based on land parcels
- **public-law issues** with basic entities of restrictions (with spatial extend) and legal and political provisions.

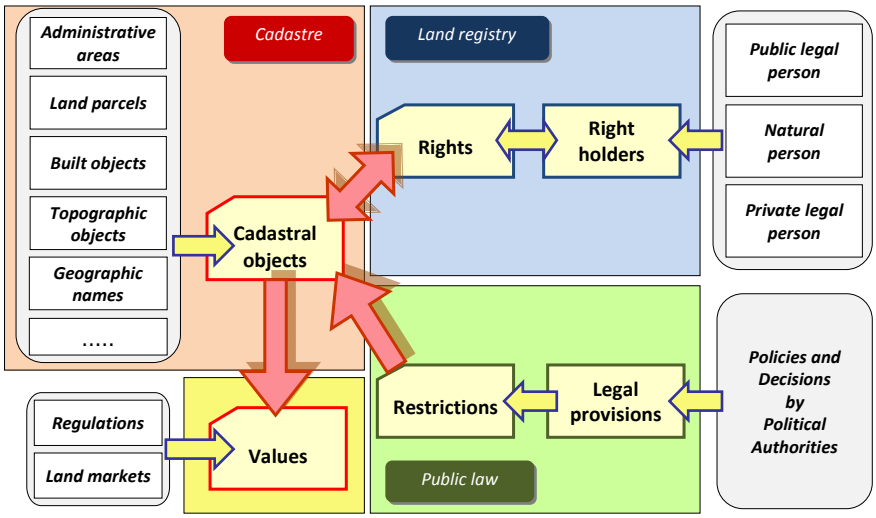

Figure 2: Elements of a land administration system (from Horisberger, 2010).

It is of course possible that a land administration system has more elements than those four basic ones mentioned above. A society through its adopted land policy would have to define these other elements depending on the need. What is important is that all these elements have a link to the geographic location as they are documenting issues happening at a specific geographic location.

3.3 Legal and institutional independence of topics

The different elements of a land administration system are often managed by different institutions. Those institutions have to take care of their own data and information, and often are not prepared to share it with other institutions. From a holistic society point of view, data sharing is however very much needed in order to be able to make best use of it. This integration and linkage of spatial information is exactly what can be called the spatial enablement of a society.

The integration and sharing of geoinformation can be imagined as a specific infrastructure being set-up, which is named "spatial data infrastructure" (SDI). The organization of land administration data then needs to follow some basic principles:

– the principle of legal independence (Kaufmann and Steudler, 1998);
– the use of the same geodetic reference framework;
– the use of the same standardized data modelling concept.

The principle of legal independence allows independent data management and independent data responsibilities avoiding institutional take-overs. Data owners only have to provide copies of their spatial data into the spatial data infrastructure, where it can be accessed and used by many (compare Figure 3). The proposed structure of such a framework has not a purely technical background; it is rather a conceptual way of organizing spatial data to allow

the different institutions to remain independent and thus help to overcome the fear of being merged with others.

The spatial data infrastructure is of course a whole research area in itself. But there are two technical preconditions that this infrastructure has to satisfy in order that data and information can be used for the benefit of the whole society. These two preconditions are that spatial data are to be held in a common geodetic reference framework and that they are all defined in a common data modelling concept (compare Figure 3).

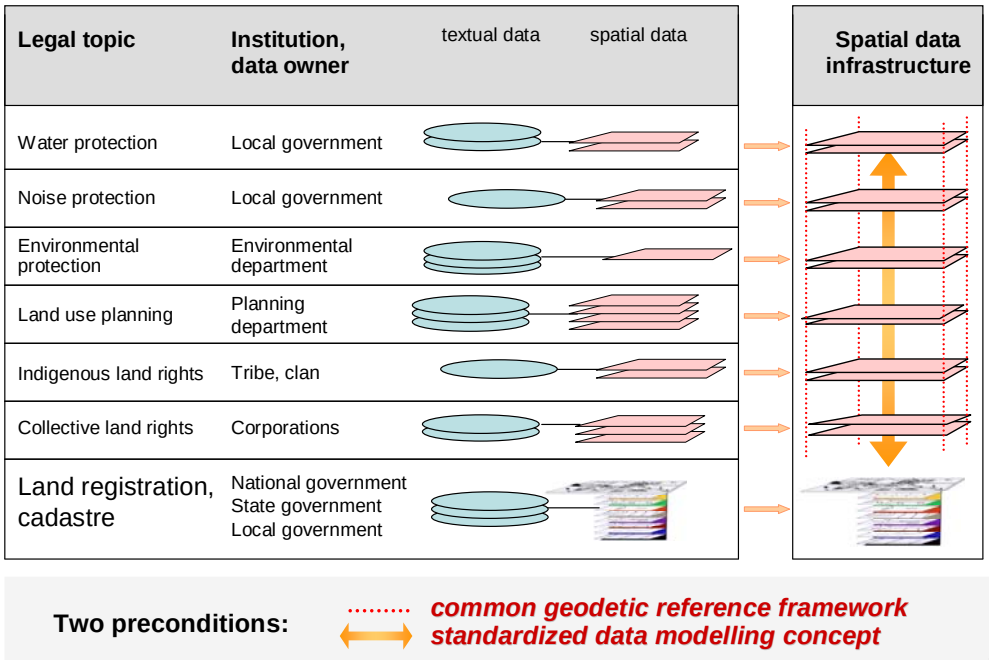

Figure 3: Legal independence of topics and sharing of spatial information through the concept of spatial data infrastructure.

4. DEFINITION OF SES

The previous chapter shows how a land administration and management system is at the basis for the spatial enablement of a society. Spatial enablement, however, is not just about developing and using geographic information systems (GIS) technologies. It is a concept that permeates the whole of government and society and draws heavily on the spatial data infrastructure available in the jurisdiction (Williamson et al. 2010). There are different players in an SES such as governments, data suppliers and societies as a whole.

In a first draft, the Task Force suggests six key elements that make a society spatially enabled:

- **legal framework** for basic geoinformation;
- **positioning infrastructure** for the common reference framework;

- **common data integration concept:**
  - standardized data modelling;
  - independent information administration (to allow independent responsibilities, principle of legal independency);
- **network infrastructure** to enable sharing and integrating spatial data through the spatial data infrastructure SDI;
- **landownership information** as one of the basic information topics;
- **data and information:**
  - official, complete, comprehensive, updated;
  - accessibility of data i.e. public sector information initiatives;
  - virtual geographic information (VGI), web 2.0 possibilities.

In terms of spatially enabling a society, there are further issues that need to be considered, namely the **educational framework**, the **technical and institutional development of spatial data management**, the **development of awareness on all levels of society** (citizens, institutions, and decision-makers, the **development and applicability of land management tools** in order to make best use of spatial data.

5. WAY FORWARD FOR TASK FORCE

The work plan for the Task Force foresees a program until the end of 2012. Along with this paper, a questionnaire is being presented during the FIG-Working Week 2011, which's result should provide input regarding the issues that have been raised in this article. The Task Force will also ask regional representatives for their input during the remaining months of 2011. In early 2012, a joint workshop is being planned, serving as a platform to discuss the findings and gain further input. The results will be presented at the FIG-Working Week 2012 before a final report is being compiled by the end of 2012.

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BIOGRAPHICAL NOTES

Dr. Daniel Steudler graduated from the Swiss Federal Institute of Technology (ETH) in Zurich in 1983, earned the Swiss license for licensed land surveyor in 1985, and did a M.Sc.Eng. degree at the University of New Brunswick, Canada from 1989-91. In 2004, he completed a PhD degree at the University of Melbourne, Australia. Since 1991 he is working for the Swiss Federal Directorate of Cadastral Surveying and since 1994 he is involved in the activities of FIG-Commission 7.

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