Societal Drivers in the Geospatial Arena

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SUMMARY

In recent years we have witnessed enormous changes in society. These range from changes in technology, user interaction, web-based working processes, eGovernment, open data, SDI's and – above all – changes is in the way of working and attitudes of our customers and society at large. These changes have a large impact on our agency and business, which ranges from being a key player in our national (and European) SDI up to modern land administration.
In this contribution we will discuss the elements we see as driving forces. We experience a shift from spatial and legal security as a cornerstone to a broader spectrum including the concept of trust. Furthermore users (including businesses and public sector bodies) work increasingly based on communities taking initiatives for the issues at hand. The user is increasingly in the lead. From a more technical point of view interoperability has become a central issue. The changes in the spatial arena are irreversable.

These changes have a large impact on the geospatial arena we work in. At a somewhat slower pace we see similar patterns emerge in land administration. We discuss the impact on our operation by illustrating how we interact with user communities based on open data, advanced technology, and shared spatial information nodes. These issues not only affect our products and services, but also our relations with partners in business and users. Being agile also requires that our organisation has to find a sound balance between agility and society's demand for trustworthy information.
The perspective we have to take is thinking and operating from the user's view and demands.

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1. INTRODUCTION

In the last 15 years we have seen the traditional institutional arrangements slowly changing or or even evaporating. Cadastres and mapping agencies are of old well established institutions with well defined public roles. With the advent of ubiquitous available positioning (GPS), satellite imagery, internet-access, and internet maps (Google, Bing) and the so-called internet of things the geospatial arena has dramatically changed from a functional point of view. At the same time these technologies have acted as an enabler in even a larger change: the empowerment of individuals and professionals in the working processes in the geospatial arena. These changes have been further accelerated by the seamingly endless availability of data. Moreover public data is increasingly available as open data. At the same time we see new communities open up new information bottom-up and large corporations (Apple, Google, Facebook) creating global information infrastructures. These developments have and will have a large impact on the role of mapping and cadastral agencies and the way society will function in the geospatial and land administration domains.
In this contribution we investigate how these developments affect our operation in the geospatial and land adminsitration arenas.

1. DEVELOPMENTS IN SOCIETY

We are witnessing a number of important changes in society. Most notably we see in our realm the following developments:

1. Increasingly people live and act in a virtual world. Many of our actions take place in the virtual world. The wealth of available spatial data makes that e.g. planning can be done from your (mobile) device.
2. The technology and information enables us to act ourselves. We can do many things and we also want to do things ourselves or within our (professional or private) communities. We choose our partners depending on the situation at hand. Initiative and trust in network partners become the cornerstones in this environment. We see this behaviour both with professionals, consumers, interest groups and the public at large.
3. We move towards sharing and opening up of data and knowledge; from charging to reciprocity. We see a transition from ‘knowledge is power’ to ‘sharing knowledge gives strength’.

All these developments result in a new playing field for all actors in the geospatial domain, both for the existing institutions and the new entities. At the same time we see a number of related and enabling developments, e.g. the relation between so-called formal (or authoritative) data and informal data; the structures, processes and meaning in the information society (being networks, dialogue and knowledge respectively) and the issue of privacy.

2. DEVELOPMENTS IN INFORMATION TECHNOLOGY

It goes without saying that technology has been a driving force in the development of what we now call the information society. Starting from computer science and technology developments now take place in the information domain. We have moved from web 1.0 to web 2.0, and are in the process of embracing web 3.0 and already see web 4.0 on the horizon (see Figure 1).

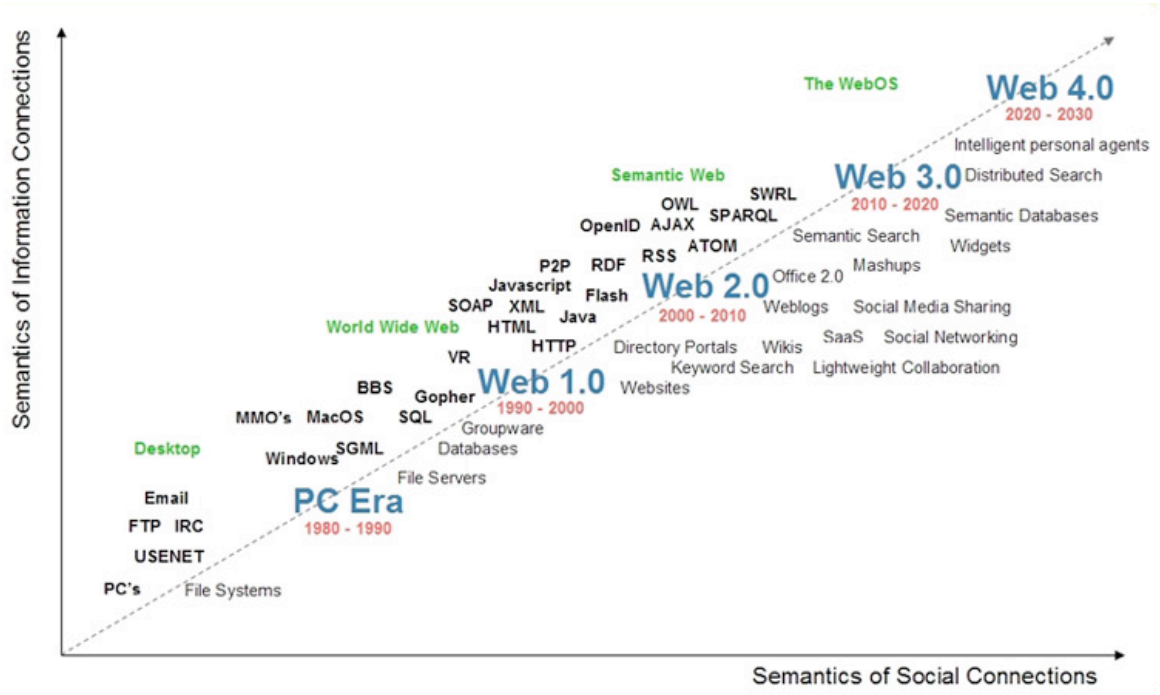

Figure 1: the development of the web from the viewpoint of information connections en social connections. (source: http://joelmeijer.nl/internetweb4-0)

Web 1.0 is characterized by producer generated content (publishing); web 2.0 by user generated content and interaction (sharing and communication) and web 3.0 by system generated content (based on semantics). Web 3.0 is based on knowledge and (linked) entities. Web 4.0 will be based on intelligence modelling.

The connectivity has dramatically increased and also the number of devices that is connected is large (cf. Figure 2). What is striking and will have a large, lasting impact is that most devices will be spatially enabled, but that more and more imagery and real-time (location based) sensor data will be available. The issue in the future will rather be the overload of data than the availability of data. Big data and proper data analytics (and the models and intelligence underlying these analytics) will be part of spatial analysis in the broad sense.

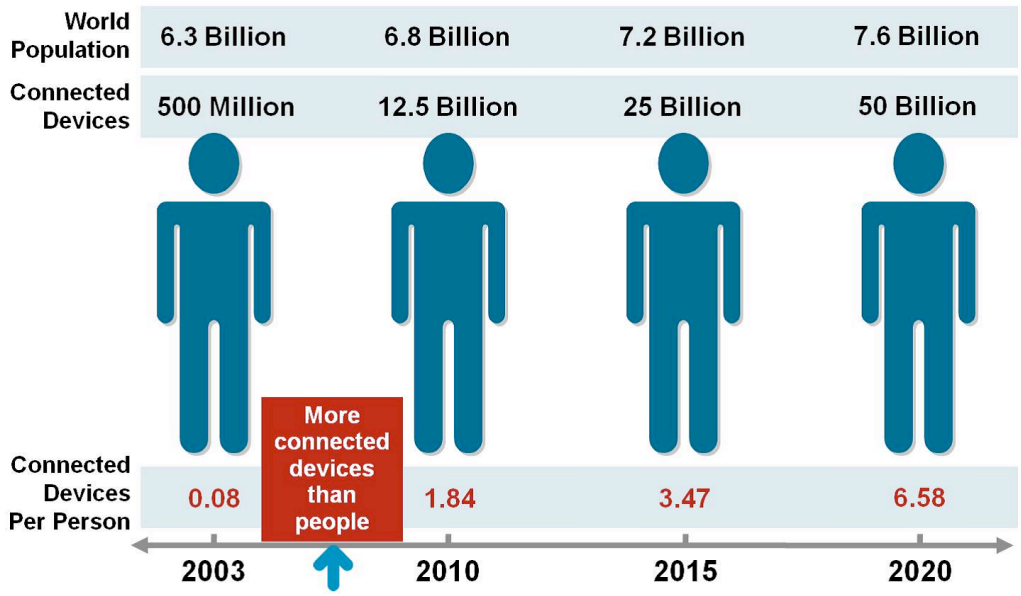

Figure 2: The number of connected devices (*source: Cisco IBSG: April 2011*)

Consequences of these developments are the following:

- The connectivity of data and information becomes crucial. This requires knowledge of the data and information itself, but also of the domains where this information is used. This will lead to a symbiosis between data providers and users. In many cases proper modeling is key to solving societal problems.
- Connectivity requires standardization at the technical level (which to a large extent is already achieved) at the level of semantics and modelling.
- Location is a universal solution to connect information.
- In the geospatial domain we will see a shift from maps to the visualisation of physical or social phenomena. For mapping agencies this means that most of the time their end product will be a component or basic information in the product or service of the end-users.
- In the land administration domain (where relationships between subjects, objects and rights, responsibilities and restrictions are the basis) the concept of linked data is very promising.

3. NETWORKED SOCIETIES

3.1 Centralization and Decentralization

Cadastral and mapping agencies originate from hierarchical organization structures. These have served us well for many decades. Characteristics of these hierarchical structures were the well defined relationships, explicitly defined order, and predictability.
We are now moving into networked societies where relationships are loosely defined, order is implicitly defined and predictability is less.

Centralization and decentralization seem to be in contrast, but in reality networks have elements of both (see Figure 3).

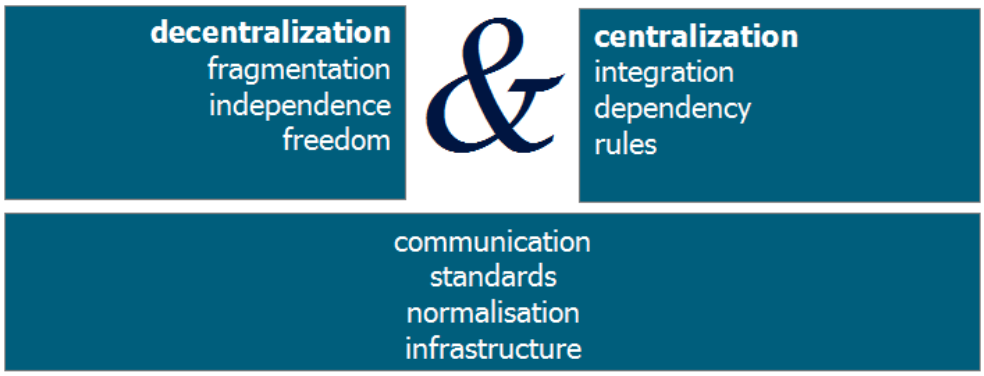

Figure 3: seeming contrasts between centralization and decentralization (after Bert Mulder; The Hague University of applied science).

In practice we see elements of both. Bottom-up we see numerous examples of decentralized initiatives. At the same time we see the emergence of national or global centralized initiatives. Many countries are building (centralized) spatial data infrastructures. We also see the emergence of private global players in the spatial domain. Looking closer we experience that local initiatives benefit from global standards (e.g. W3C and OGC). On the other hand we see that large centralized initiatives are implemented locally.
An example is the INSPIRE initiative in Europe. By nature it follows a centralized approach (being based on a European directive) with standardized services and harmonisation of datasets. Its implementation is done decentralized by the member states. The implementation has common elements, but varies between member states. Finding the balance between centralization and decentralization is a challenge. Open street map (OSM) is an example where a user community has strict standards in maintaining and updating their datasets, while at the same time giving room to their contributors to collect the data.

What has to be discovered in every network is the balance between central, standardized facilities and the autonomy needed by the various stakeholders in the network. Too much harmonization will be felt as a squeezing embrace; too little standardization will result in anarchy. In a networked society it is not about decentralization *or* centralization, but about cleverly combining elements of decentralization *and* centralization (following the ideas of Bert Mulder of the eSociety Institute of The Hague University of Applied Sciences, The Netherlands).
Given their multi-faceted form networks are more complex, or rather organic, structures. This also means that the checks and balances in the system have to be reconsidered.

3.2 Authority, Trust and Dialogue

In a network a single authority does not exist. In hierarchical systems the authority was often vested in law. We expect that in the networked society those parties who contribute to the effectiveness of the network will be considered as the authorities in the network. These parties are not only the existing agencies, but also users' groups, private enterprises and academia. Trust is an important binding element in networks. In many cases parties will operate on the basis of their contribution to the network and less and less on the basis of their formal position. Also end users will put their confidence in those parties who serve their needs best. This will not mean that institutional authority will disappear altogether. In mission-critical environments or land administration some form of authority vested in law or regulations will remain.
Networks require permanent dialogue. Because processes and information are increasingly linked, this dialogue does not only take place within the network, but also with the users of the network and the workers of the various network partners. This is the concept of so-called peer to peer networks.

Consequences of these developments are:

- The spatial arena will become a networked arena. It will not be a single arena, but will consist of partly overlapping networks of the various application domains.
- In a networked society there is a need for a common and agreed upon basis, while leaving, at the same time, enough freedom to the stakeholders in the network. Mapping agencies can play an important role in this respect. Spatial data infrastructures can be an important building block of the required basis. Both mapping and cadastral agencies are an important linking pin to the eGovernment facilities.
- Given their broad scope cadastral and mapping agencies can have an authoritative role in the network. They provide continuity and are able to maintain standards. At the same time this requires that they are responsive to the needs of and in permanent dialogue with the stakeholders in the network.

4. FORMAL VS INFORMAL DATA

4.1 Crowdsourcing

Crowdsourcing has become part of our daily lives. Well-known geospatial examples are Open Street Map (OSM) and Google mapmaker. In many countries the use of so-called volunteered geographic (VGI) has been recognized (see, e.g. National Resources Canada (2012)). Also in the domain of Land Administration the value of crowd sourcing is seen (McLaren, 2011). At the Kadaster we have piloted the concept of VGI for inspecting national boundary markers (see Figure 4).

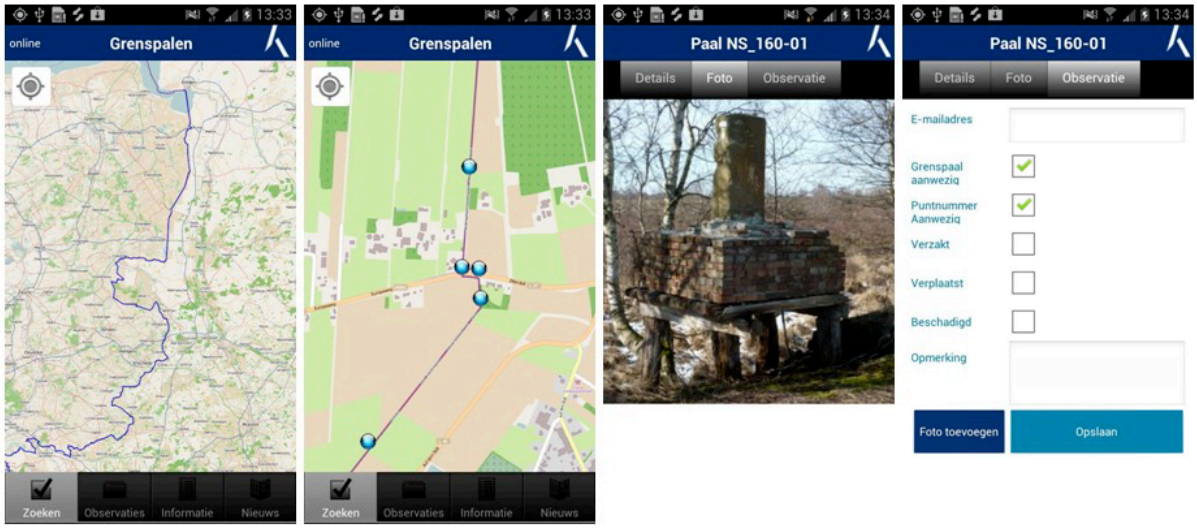

Figure 4: The inspection-app of boundary markers in the Netherlands.

Considering the willingness and ability of users we think that input of the crowd will become a standard element in our working processes, and for many instances it will be the major input. VGI is not limited to private citizens. We think that (semi-)professional users and users' communities will be more and more embedded in our working processes. At the same time our information will be input for numerous crowdsourcing related activities. Thereby the crowd will be an element in the network structure discussed in the previous paragraph.

4.2 Formal (authoritative) Data and Informal Data

Cadastres and mapping agencies are generally the (public) source of authoritative data. The use of these data is often laid down in laws (as in land administrations), rules or regulations, and in eGovernment infrastructures. Furthermore these data serve society in a independent way.

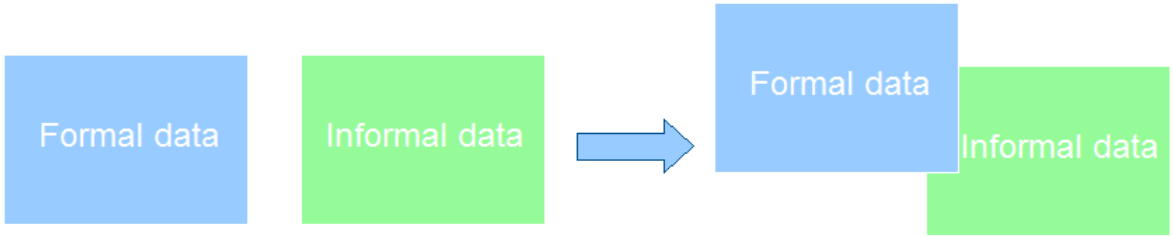

Figure 5: formal and informal data will be used more and more in combination.

At the same time we witness that the public at large increasingly uses data in which they put trust. These are often authoritative data (especially in government related processes), but also data distributed by private firms (Google, BING, Apple) or crowdsourced data. Many decisions are based on so-called informal data. Informal data are sometimes more up to date, and geared to the user's needs, sometimes their content is questionable. In the future formal and informal data will co-exist and will be used in combination (see Figure 5). We have to find arrangements in which we can accommodate this combined use. The decisive factors will

quality (fit for purpose) and trust in that the defined quality meets the user's needs. In the context of land administration useful insights are given by the strategy document on the cadastral system in New Zealand (LINZ, 2014). In this strategy document a clear distinction is made between fundamental data (which are and remain authoritative and are based on certified working processes) and other data which gives a complete overview of all rights, restrictions, and responsibilities.

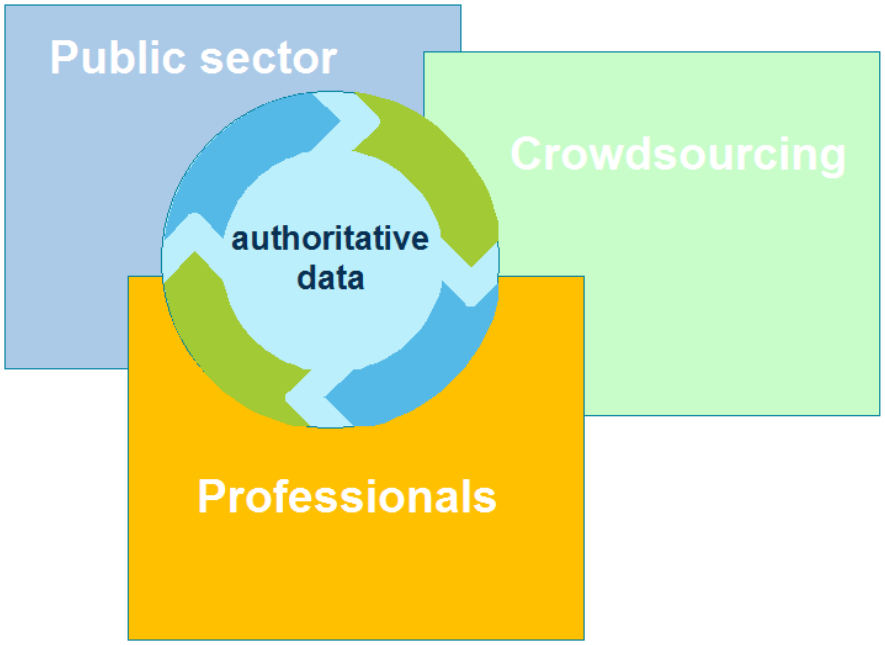

Figure 6: a possible role of authoritative data as linking pin.

Authoritative data should be the linking pin between spatial and land administration datasets collected by the public sector, the crowd and professional communities (see Figure 6). This will not happen automatically, but requires a proper debate (again the dialogue touched upon in the previous section) with the stakeholders in the network. Furthermore the role of the large, global information providers should not be underestimated, as in some domains they are considered as the basic source of information.

Consequences of these developments are:

- Formal (authoritative) and informal data will co-exist and used simultaneously.
- Which data are primarily used depends on the problem at hand and the trust parties place in the quality of the data.
- Input and active involvement of users' and professional communities are here to stay.
- Cadastre and mapping agencies can provide authoritative data a foundation data for many processes and should remain active in the domains deemed critical by society as land administration and safety. In doing this they will cooperate more and more.

5. PRIVACY: LOCALIZATION AND IDENTIFICATION

As stated earlier the so-called 'internet of things' has created a world where localization of devices is standard. Moreover location is the ideal mechanism to couple information. Spatial information has become very close to personal information and thereby spatial has become a topic in the discussion of privacy (see Figure 7). In the domain of land administration personal data have always been a point of consideration.
Many end-users have become accustomed to the fact that their position is known and can be linked to their activities. The number of location based services is steadily growing and is widely used. It is only recently that concerns have been raised concerning privacy. Seldom is a single spatial dataset privacy related, but it is the combination of spatial data and the tracking of one's whereabouts that have resulted in some uneasiness. An example is the heated debate in Germany on data protection rules concerning Google Street View. Recently a number of publications have deeper investigated these issues, e.g. Hilty et al, (2012) and WRR (2011).

Figure 7: the issue of privacy in relation to spatial information

At the political level privacy has become an issue as well (European Commission, 2014). According to the European Commission "personal data is any information relating to an individual, whether it relates to his or her private, professional or public life. It can be anything from a name, a photo, an email address, bank details, posts on social networking websites, medical information, or a computer's IP address." In the discussions it has become apparent that also spatial data (possibly) relates information to an individual. This could lead to the situation where spatial information at large is considered as privacy sensitive information and its use might be restricted. For the time being the European Council has postponed implementation, but localization and identification are certainly on the European political agenda.
Concerning the privacy discussion basically three parties are involved: the data holder, the service provider and the user. In the past the data holder has been made responsible for the

use of his data, but in the networked world it seems more appropriate that the service provider should be the responsible party. At the moment most users do not seem to be too concerned with privacy issues, but an opt-out facility at the user's side should be seriously considered.

Consequences of the developments are:

- Spatial information may relate directly to individuals. This means that our industry has to involve itself in the discussion on personal data protection. At the same time we should advocate the power of spatial data for numerous professional and personal applications.
- We have to find proper checks and balances in processes dealing with personal data.
- Cadastres and mapping agencies are in a position and should take active part in and scope the discussion concerning the personal data protection issue. Cadastres are experienced in this issue.

6. OPEN DATA

In the information society many users take open data for granted. Open is meant in the sense as available, easily accessible and free of cost at the end user. What is mostly forgotten is that the collection, maintenance, quality control and (to a lesser extent) distribution cost money. In the information society the costs and benefits hereof often do not occur at the same point. Moreover in some domains where personal data protection or security prevails data is by definition not open or access might be limited. What is needed is a proper debate how data can best be made available and accessible in the long run. Especially the costs of maintaining datasets, the issues of quality, continuity and personal data protection are often underestimated. This debate should be based on sound business rules fitting to an information society. Public agencies struggle with this issue as they are expected to maintain authoritative datasets, provide continuity and at the same time are often 'locked' in the business models set by their governments.

Consequenses of these developments are:

- Open data are an element of the information society, but expectations on their availability have to made clear.
- Society, and in particular the public sector, has to consider how it will provide and guarantee the information it needs in the long run.
- Cadastres and mapping agencies have to be able to base their operation on sound and sustainable business models.

7. CONCLUSIONS: ROLE AND CONTRIBUTION OF GEOSPATIAL AGENCIES

We have considered a number of societal changes in society. These have a large impact on the spatial arena. In particular we have considered:

- The growth of the internet of things resulting in an infinitive number of spatial sensors.
- The evolution of the producer driven supply of spatial data, via interaction with users

towards an interconnected world of information. In the future this will include (model-)based intelligence.
- The emergence of a networked society where centralization and decentralization happen simultaneously. In networks trust is an important driver and sometimes more compelling than (formal) authority.
- The combined use of authoritative data and other data, collected by various communities and individuals.
- The issue of localization and identification: spatial information helps to work at the local level and at the same time keeps us traceable in our individual transactions
- Open data are here to stay, but expections and conditions under which they are available should be clarified.

This leads to a society that is spatially enabled. This society will know numerous active participants ranging from government agencies, large private information providers, user communities and individuals. Depending on the issue and political setting at hand there will various uses, collection and distribution of spatial information.

For cadastres and mapping challenges this results in a new playing field, where they are judged by their tangible contribution to societal issues in the spatial domain and land administration. In particular we see that the societal changes have the following impact on these agencies:

- Cadastre and mapping agencies can provide authoritative data as foundation data for many processes and should remain active in the domains deemed critical by society as land administration and safety. They however, cooperate more and more with partners in the network.
- Given their broad scope mapping agencies can have an authoritative role in the network. They provide continuity and are able to maintain standards. Asset is that these agencies operate from an idependent position. At the same time this requires that they are responsive to the needs of and in permanent dialogue with the stakeholders in the network
- Cadastres and mapping agencies are in a position and should take active part in and scope the discussion concerning the personal data protection issue.

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BIOGRAPHICAL NOTES

Martin Salzmann is director of strategy and policy with the Cadastre, Land Registry and Mapping Agency (Kadaster) of the Netherlands. In the past Martin has worked extensively in the fields of quality assurance of cadastral surveying and mapping, information strategies and marketing before moving into the realm of strategic planning and eGovernment.

Dorine Burmanje is – since 2004 – chair of the executive board of the Cadastre, Land Registry and Mapping Agency (Kadaster) of the Netherlands. Her portfolio includes strategy and policy, marketing, finances, legal matters and communication. Over the past years Dorine has been leading in the centralization of the organisation, the acquisition and implementation of new tasks and services (such as the registration of cables and pipelines), positioning of Kadaster as an independent non-departmental public body, profiling Kadaster as a player in the GEO sector at both national and international levels, innovation and anticipating in IT-developments. Dorine is the representative of Kadaster in the political arena in both the Netherlands and Europe. She was president of Eurogeographics (European Association for National Mapping Agencies, Land Registers and Cadastres), 2009-2011.

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