

*REFLECTIONS, VISIONS AND EXPECTATIONS FOR A DYNAMIC FUTURE CADASTRE*

# Beyond Dimensional Limits

New information and communication technologies, along with economic, financial and political globalisation, the increasing mobility of people and cultural and social exchange, have all helped to shape the way in which we perceive geographic information systems, including cadastres, today. The Swiss think tank called 'Dimension Cadastre' has identified trends that are felt both within society and within the professional community which will potentially affect the future development of cadastral systems.





In 2014, the Swiss think tank called 'Dimension Cadastre' published a report entitled 'Beyond Limits' examining reflections, visions and expectations for a dynamic future cadastre. The intention of 'Beyond Limits' is not to predict the future, but rather to identify and discuss trends that are felt both within society and within the professional community. A number of these trends are explored below.

### CHANGING WORLD

Examining the evolution of the cadastre, of surveying and of its various aspects means, above all, tracing the development of methods and technologies from the drawing board to the computer, from 2D to 3D, from terrestrial measurement to global navigation satellite systems, from terrestrial surveying to photogrammetry, from databases to knowledge bases and from analogue to digital technology. Boundaries between the private and the public sphere are disappearing. Today's mobile phones are smart devices and thus computers in their own right, equipped with diverse sensors and countless apps; they even can show us the way thanks to the built-in global navigation satellite systems. This allows for a contextual presence, in situ. These devices also can take photos and create video footage instantly since digital images can be modified, transmitted and stored 'on the spot'. This will be a key factor in the coming decade. Our societies are moving away from the written word towards imagery, forming new semantics, new languages and a new framework of understanding.

### SOCIAL NETWORKS

Massive datasets are being generated with help of such devices. Data mining can use – or misuse – those datasets. The issue of open data is gaining ground, especially within public administrations, based on the openness of the internet and software. The rapid rise of social networks is bringing about the biggest change in social behaviour in decades. People are able to 'socialise' freely with others at low cost, with varying degrees of commitment and for an indefinite duration in a new kind of 'common interest club'. This represents a complete restructuring of social relationships. Decisions are made by each individual citizen, and this empowerment is the very essence of the ongoing social revolution.

### SURVEYING AND POSITIONING

Official cadastral surveying provides authentic and certified data with a guarantee of the required geometrical and attributive accuracy. This official guarantee needs to be retained since the data is essential for a country's economic development; numerous political and social decisions depend directly on it. What may change, however, is the method of data collection. Positioning technology might soon be just as accurate and more or less obtainable in real time using the above-mentioned smart devices. Global navigation satellite systems in combination with smart devices may provide data, collected by citizens, through visual recognition. It is by pointing the smart device at a building, a land parcel, or even a landscape that recognition in its entirety will work. The territory will 'signal' our position to us with absolute accuracy. In a manner of speaking, the land will become the map encompassing all maps. Hence, the contributions from traditional surveyors will decrease, which could also spell the end of the surveying profession as we know it.

## ***SOCIETY WILL BE DRIVEN MORE BY A 'LEGITIMATE' IMPETUS THAN A 'LEGAL' ONE***

The theoretical and practical consequences will certainly concern the legal recognition of such methods. Whereas we currently set out to define databases of objects, cadastral layers, etc., in the future we will also be storing and archiving algorithms. These will require official certification because they will form the basis of the reconstitution of datasets and data. Hence, there are indications that future surveyors will have a role to play in the transition process, i.e. as professionals in charge of changing and adapting representations of properties and the management of land and augmented reality.

### LEGITIMATE VERSUS LEGAL

Technological and political pressures led to the rapid development of the traditional cadastres, which are based on surveying and land registration, over the last two decades. The legal mandate has been an essential factor, but in the wake of digital technology



and the political call for professional land management, new categories of legal land objects are increasingly evolving and thus giving rise to new levels of representation. We have to anticipate that social changes – increased involvement of the public and social networks – will result in radical new approaches, namely a society driven more by a 'legitimate' impetus than a 'legal' one. Whereas the legal basis has previously been regarded as a constitutional element in democracies, especially in the West, the situation seems to be becoming somewhat different today; in fact, it now appears that an action deemed 'legitimate' can prevail over a national legal system. An example can be seen in Switzerland in connection with the blacklisting of countries regarded by the OECD as 'tax havens'. Although Switzerland's position was based on a sovereign and legal foundation, the 'legitimate' pressure exerted by some of the major OECD member states sufficed to cause Switzerland to quickly bend one of its most essential principles, namely the rule of law.

Nowadays, the differentiation between a position based on a legal foundation and one based on 'legitimate' actions is a constituting element of societies, and especially of global governance. As more and more people become involved in social networks, they will continue to exert pressure in this sense. Based on the development of public opinion, transparency and political correctness in ▶





society in the course of the last few decades, there can no longer be much doubt about this process of societal change.

#### **CADASTRAL DIMENSIONS**

When representation was merely planar, we lived in a world in which objects were described in two dimensions; maps and plans were sufficient. The representation of pipes and conduits beneath the ground, and of the height of buildings, slope of roofs, etc., led to the creation of what we now call '3D' within geographic information systems. On old plans and maps, details of historical development and modifications over time were often preserved at best in the form of barely legible notes. Today, with the aid of digital storage of data, it is – and will remain – easier to obtain a history of modifications within the cadastral system and thus of the recorded objects. In areas such as tourism and land-use planning, as well as regional economic development, there are also calls for data to be attached or linked historically to buildings and land. Temporal (4D) data of this type is not currently regarded as an integral part of the cadastral system, but it should be incorporated in the future, including at the legislative level.

#### **THE INTERNET OF THINGS**

The Internet of Things (IoT) entails smart devices equipped with functions for geolocalisation, visualisation, simulation and anticipation acting as intelligent systems and interacting with one another based on algorithms. The result is huge databases that are fed and accessed via cloud-based services on the internet, anytime and anywhere. What is lacking so far is an understanding of the implications for the cadastral system. In 20 years' time, we can assume that, in addition to surface, line and point objects, there will also be virtual and algorithmic objects. Together these will form the basis of a new cadastral system. Each of these objects will belong to a new nomenclature recordable in uniform resource identifier (URI) format so that it can be

directly accessed via the internet. This will resemble a huge 'virtual library' in which each object will have an identifier just as each book has its own form of identification (ISBN). Initially, all cadastral objects will be provided with a URI in order to be addressed; later they will be given physical (IP) addresses to make it possible to connect smart systems associated with the objects. As far as the objects forming the present-day cadastre are concerned, it seems safe to predict that they will mainly be linked with each other

### ***FOR PROFESSIONALS, THE CONCEPT OF 'COMMON PROPERTY' CERTAINLY RAISES QUESTIONS***

via the internet, which will be very useful for urban development, construction of new roads, etc. It will be possible to provisionally deposit measurement instruments in order to simulate situations such as rainfall, landslides or exposure to sunlight.

#### **AUGMENTED CITIZEN**

Thanks primarily to the internet and so-called 'smart cities' and 'smart devices', people now find themselves able to directly intervene in information and production systems. Blogs, feedback, applications like Mash-up, etc., enable them to contribute to databases, including geographic information systems, to such an extent that these have come to rely heavily on their input. Examples include feedback on restaurants, hotels, travel, visits to museums, reviews of music and books, and comments on numerous other products in the consumer sector. The value of information about such items is significantly modified because it has acquired a subjective, somewhat 'emotional' dimension. While 'emotional' contributions may be less well suited to objective products such as

maps and cadastres, we are nevertheless moving in the direction of integrated information systems: the objective and the subjective, the legal and legitimate, the real and the virtual. This integration will enable us to describe the core of our vision including the dimensions, the objects involved and the stakeholders.

One of the major challenges to be faced in the future concerns the integration of the general public as stakeholders in the cadastral system. The solution will neither be obvious, nor easy. Initially the answer will be to prompt people to submit comments regarding, for example, footpaths by asking them to intervene to report identified problems and hazards, and then to issue warnings so that their contribution can be clearly beneficial to others.

#### **'COMMON PROPERTY' AND STAKEHOLDERS**

A new notion is emerging of a concept positioned between 'private' and 'public' property, namely one that could be referred to as 'common property' or a 'common asset'. To a certain extent this takes the form of shared knowledge or a combination of public and open know-how. One example can be found in various newspaper publishers initiating a web-based platform permitting people to report information by describing an aspect of a specific location in e.g. 100 characters. Other examples include knowledge about footpaths, Google Street View, City Wikis, dedicated websites such as Craigslist (USA), eBird.org for birds, virtual visits to tourist destinations, as well as knowledge of the past or present development of a particular city, district or street. At the same time, these private and open knowledge collections can be linked or combined with public and authoritative data of different levels defined by geomatics, cadastre, geography or geology. For surveying, cadastre and land register professionals, the concept of 'common property' as neither private nor public but somewhere in between certainly raises questions. This may mean that the

professional communities will have to rethink their approach to these issues.

#### CONCLUDING REMARKS

The growing importance of 'legitimate' versus 'legal' can be interpreted as a confrontation between a priori and a posteriori legislation. Furthermore, there are the questions about the relevance of introducing new objects into cadastral systems and about the general public as stakeholders, consumers, players and co-creators of future information systems. Finally there is the central question of ownership, the private/public aspect and the new concept of the 'common asset'. For the professionals involved, another matter appears to be just as urgent, namely the redistribution of tasks: who will be responsible for what in the future? Based on the potential of the nearly ubiquitous smart devices and their possibilities, the conclusion can perhaps be summed up by reversing Alfred Korzybski's aphorism; not "The map is not the territory", but rather "The territory is the map". ◀

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Xavier Comtesse gained a degree in mathematics and a PhD in computer science from the University of Geneva, Switzerland. He has been passionate about communication and computers since the seventies. In addition to being the creator of three start-ups in Geneva, a pioneering digital work in publishing (Zoe editions), communication (one of the first Swiss local radio stations: Tonic), telecommunications (an internet start-up: Concept Modern), he is also an innovator in diplomacy (Swissnex Network, a kind of science & technology consulate). In 2002 he was appointed as the first director of the French-speaking think tank Avenir Suisse. In 2012 he launched, in co-creation on behalf of the Chamber of Commerce of Neuchâtel and Industry, the 'Swiss Creative Center' dedicated to the new industrial revolution (FabLab, Design Thinking and Think Tank).

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