Land Governance in an Interconnected World
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MEGATRENDS SHAPING THE FUTURE CADASTRAL SYSTEMS

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Abstract

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Many wide-reaching global level changes such as digitalization and urbanization are taking place in a modern society. In order to maintain a fully functioning cadastral system, these changes and especially their impacts on cadastral systems need to be noticed. This paper discusses the cadastral systems with the assumptions that megatrends are shaping the future of our society. We examine the relevant megatrends and their anticipated impacts identified by an expert panel in the context of the Finnish cadastral system. The most significant megatrends to be further analyzed are digital culture, ubiquitous intelligence, increasing trend in transparency, accessibility and open data, urbanization, business ecosystems, new patterns of mobility, global risk society and knowledge-based economy. After that, we reflect the megatrends to interviews made with international experts and discuss the anticipated impacts on the cadastral systems at a global scale.

Key Words: cadastre, cadastral system, megatrends, future

1 Introduction

As people's relationship with land has varied throughout years, so has the form and function of cadastral systems, from fiscal towards multi-purpose cadastre (e.g. Williamson et al. 2010). Thus the need for redesigning cadastral systems in order remain relevant in a changing environment has been recognized by many authors (Ting & Williamson 2001; Riekkinen et al. 2016).The modern society that we are living in has several functions which are directly related to land -- for instance housing, energy, and food production. At the same time, many wide-reaching global level changes such as digitalization and urbanization are taking place. In order to maintain a fully functioning cadastral system, these changes and especially their impacts on cadastral systems need to be noticed.

A cadastral system is usually described as parcel-based, up-to-date system that records the individual parcels, their boundaries and rights related to them. It can be established for different purposes (e.g. fiscal, to support tenure etc.), yet the main function is to identify parcels and rights related to them, and to support efficient and sustainable land use (see FIG 1995; Williamson et al. 2010). In this paper we will discuss, how to maintain the main functions, but at the same time answer to the changing needs of the future. Krigsholm et al. (2017) have identified eight most important megatrends in the Finnish context within the framework of cadastral system, of which many were also identified as important future themes in the same framework (Riekkinen et al. 2016).

This paper is built upon a hypothesis that the megatrends are shaping and going to shape the way people relate to the spatial objects. First, the paper discusses about the megatrends in the cadastral concept and their anticipated impacts. The most important ones according to Krigsholm et al. (2017) are digital culture, ubiquitous intelligence, increasing trend in transparency, accessibility and open data, urbanization, business ecosystems, new patterns of mobility, global risk society and knowledge-based economy.

Second assumption in this paper, derived from the first one, is that the megatrends have implications on cadastral systems as well. For the reflection and discussion, the paper first presents the anticipated impacts of the chosen megatrends found by Finnish experts. For collecting the data, a Delphi survey was conducted to gather expert opinions on impacts of the megatrends on the future cadastral system. This method was chosen since it is often seen as useful tool in the literature when searching perceptions of complex issues under severe uncertainty and when objective factual data is scarce (Winkler and Moser, 2016), as it is in this case as well. After presenting the Finnish results, they are compared with the answers given by international experts on the importance of presented megatrends to the cadastral system.

Taking these assumptions in the consideration, we can state that megatrends are affecting the cadastral system no matter where the system is located. However, even though megatrends are more or less global, it can be assumed that the anticipated impacts of the megatrends depend on several issues. A megatrend being global does not necessarily mean it has the same impacts all over the world. And secondly, the variety of cadastral systems in the world is wide and not only does the systems differ in terms of the principal design but also in terms of their level of development (Bennett et al. 2012). It is important to notice that due to these variables, the anticipated impacts might be different in different nations. This paper contributes to this field by trying to show the hypothesis of different impacts to be correct and by increasing the knowledge about megatrends in the cadastral context.

The last part of this paper discusses the answers of the panelists in the context of the Finnish cadastral system compared with the answers of international experts. The answers of the international experts and the Finnish experts are much in line, but due to each nation's unique cadastral system, political and legal system, some differences can be seen as well and these differences are discussed.

2 Methods and materials

Megatrends can be studied with the help of PESTE model (Table 1), which divides the megatrends into political, economic, social, technological and environmental categories. Naisbitt (1982) describes megatrends to be significant movements or major global trends that affect every individual and organization around the world. Further, megatrends are suggested by Retief et al. (2016) to refer to such global influencing factors that have high degree of certainty, but over which we have little control. Compared to regular trends, Mittelstaedt et al (2014) describe that megatrends are larger in magnitude, longer in duration and deeper in their impacts. We can with certainty say that the world is changing rapidly in all of these categories, but the anticipated impacts of these megatrends vary from country to country. For example, Finland situating in an area with little risk of environmental hazards and almost non-existing population growth, causes the impacts of environmental and social megatrends to be less remarkable than in countries that suffer from extreme dryness or exponential population growth.

Category	Megatrend
Political	Transformation of political world order; Global risk society; Increasing transparency, accessibility, and open data
Economic	Knowledge-based economy; Business ecosystems; Changes in the work environment; Globalization; New consumption patterns
Social	Demographic change; Individualization; Social and cultural disparities; Reorganization of health care systems; Changes to gender roles; New patterns of mobility
Technological	Digital culture; Learning from nature; Ubiquitous intelligence; Technology convergence
Environmental	Climate change and environmental impacts; Upheaval in energy and resources; Urbanization

Table 1: Megatrends categorized by PESTE model (Krigsholm et al. 2017).

The panelists of the Delphi survey represent national governmental organization (National Land Survey), municipalities, private sector and research institutes. They were asked to provide their expertise and they covered a wide range of land related topics, varying from real estate appraisals to photogrammetry. Providing the panelists the opportunity to revise their answers by giving them feedback based on other's answers, is one of the essential characteristics of a Delphi survey (see eg. Keeney et al., 2006). We provided the panelists quotations of the open-ended questions related to the anticipated impacts of the megatrends on the cadastral system.

Since this paper aims to contribute to global audience, the results of the Finnish panelists are reflected to the international cadastral context with the help of international literature and a small round of interviews, which were conducted during FIG Working Week in Helsinki in May-June 2017. Altogether ten international experts were introduced to the same megatrends as the Finnish panelists and they were asked to provide the most important ones from the cadastral system's point of view, and give reasoning for the selections.

The experts were selected from the participation list, based on the topic of their possible presentation or their previous studies. Altogether 15 individuals received an invitation to participate in an interview, of which 10 replied and agreed to participate. The represented countries in the interviews are Australia, Austria, Denmark, Estonia, Germany, the Netherlands, Norway, Slovenia, and Sweden.

The interviewees were shortly introduced to the Finnish cadastral system. First the experts were asked to briefly describe the main differences between the Finnish system and the cadastral system of their country. Then the interview touched upon topics of the changing world and the effect to the cadastral system. After that, the experts were shown a table of different kinds of megatrends that the interviewers had studied with the Finnish experts and were encouraged to choose those drivers that they think are the most significant in terms of the cadastral system. Finally, they were asked to described the ongoing development projects of the cadastral system. Below are the questions:

1. Could you tell the most important differences between the Finnish cadastral system and the system of your country?

2. In your opinion, what are the most important changes in the world that are affecting the cadastral system? How do these changes challenge you to develop your cadastral system?

3. We have studied the perceived significance of drivers of change for a cadastral system among Finnish experts with drivers listed below (see Table 1). Please, choose maximum 5 of these trends in order according to their significance to the cadastral system. In addition, provide a short explanation to your answers.

4. What kind of ongoing development projects concerning the cadastral system your country has?

The interviews were conducted as semi-constructed. Nine of the interviews were individual and one with a group of three persons. Seven of the interviews were made by two persons, where one acted as interviewer and one as secretary. Three of the interviews were made by one interviewer, who then acted as secretary as well. All the interviews were recorded with the permission of the interviewee. Afterwords, the notes of the secretary were checked and completed with the help of the recordings. The duration of one interview was approximately one hour.

3 Results

Krigsholm et al. (2017) categorized the studied megatrends according to PESTE model. Table 1 presents the studied megatrends by categories. Out of these megatrends, the Finnish experts identified in a 2-round Delphi survey the five most important ones to be digital culture, ubiquitous intelligence and increasing transparency, accessibility and open data, urbanization, and business ecosystems, in this order of importance. The study showed that technological megatrends were anticipated to have the most impact on the Finnish cadastral system by year 2035.

The foreign experts represented countries with more or less multi-purpose cadastral systems (for the evolution of cadastral systems, see e.g. Ting & Williamson 1999).

Bearing in mind the goal of this paper, the results of the third question *("We have studied the perceived significance of drivers of change for a cadastral system among Finnish experts with drivers listed below (see Table 1). Please, choose maximum 5 of these trends in order according to their significance to the cadastral system. In addition, provide a short explanation to your answers."*) are presented and analysed. Based on the frequency of the answers, the five most important megatrends shown in Table 2 are: urbanization, increasing transparency, climate change, demographic change and digital culture. Since we did not ask to put the megatrends in any specific order, the five can be seen as equally important in the context of the future cadastre. The five megatrends represent environmental, social, political and technological categories in the PESTE framework.

International experts		Finnish experts	
Megatrend	Category	Megatrend	Category
Urbanization	Environmental	Digital culture	Technological
Increasing transparency	Political	Ubiquitous intelligence	Technological
Climate change	Environmental	Increasing transparency	Political
Demographic change	Social	Urbanization	Environmental
Digital culture	Technological	Business ecosystems	Economic

Table 2: Five most important megatrends identified by international and Finnish experts.

The five most important megatrends of the Finnish experts represented technological, political, economic and environmental categories in the PESTE model. Looking at the megatrends more closely it can be seen that the Finnish experts see the cadastral system more technology-driven than their foreign colleagues do.

Krisholm et al. (2017) noticed the same connection between technology and the Finnish cadastre. Next, we will provide a closer insight to the five most important megatrends in cadastral context identified by the international experts. The insight is based on content analysis made by reading the notes of the answers carefully.

Urbanization was mentioned by most of the interviewees to be one of the most important megatrends affecting the future cadastral system of their countries. The direct impacts to land administration when people move to cities was recognized, but also other maybe not as obvious possible impacts were mentioned. Smart cities and 3D models seem to be here already. Urbanization also might increase the capitalized value of the land. On the other hand – the meaning of ownership of a real property might step aside and the value of use rights increase, as the value of use becomes more important than the property itself.

A new generation of digital natives has born and they are leading the societies in the future. These people are used to 3D games and smart phones and they have very different expectations when it comes to data and its use. At the same time, the cadastral agencies need to be able to answer these expectations but with accurate and reliable data in network society. As one interviewee said: “People expect that cadastre has no limits in a spatially enabled society”.

Together with digitalization, the tendency towards increasing transparency, accessibility and open data was mentioned several times. Often these two technological megatrends are related to each other and in terms of cadastral system, might cause similar impacts in terms of managing data. As is the case with digitalization, expectations of citizens are high and they want the cadastral data providers to meet with the expectations. Open data enables spatial applications produced by the economy. However, the trend of transparency was not necessarily seen as increasing but rather decreasing. Free and open data might create issues related to cybercrime or personal security.

Climate change, as well as overall natural disasters, is an issue that has already been recognized in many countries also in terms of the cadastre (cf. Brown & Crawford 2006). “It is important not only to minimize the impacts but also be prepared with the infrastructure when it happens”. Due to climate change, some rapid changes in land use and reallotment might take place and a reliable 3D cadastre should be there to support these rapid changes. However, most problems related to cadastre and climate change occur in areas where the parcels are not identified at all.

Demographic change was often mentioned together with urbanization and climate change. Many of the interviewees could not mention the anticipated impact of the demographic change in the cadastral context, but still saw the importance of this megatrend.

4 Discussion and conclusions

Answers of the Finnish and foreign experts obey a certain pattern but differ in some parts as well. It seems to be a widely anticipated impact that digital culture and digitalization do have a strong impact on cadastral systems in the future. Another similarity in the answers was the importance of increasing transparency, accessibility and open data. On the other hand, this was seen as opportunity to create new businesses, especially by the Finnish experts, but on the other hand, the impacts of this megatrends were anticipated to be wider than just new applications, and not always positive. Open and accessible data might create a need for adjust the quality management of cadastral data. As one Finnish expert expected, people are going to maintain and manage data by themselves. How to assure that the cadastral data is reliable and accurate in these kinds of situations? The answers of the Finnish experts were quite technical, the anticipation was that the cadastre would move towards more multipurpose direction including more information than the current one. The reason why many of the foreign experts did not mention the multipurpose aspect might well from the fact that their systems already have more functions than the Finnish system.

Both groups of respondents pointed out urbanization to be one of the most important megatrends impacting the cadastral system in the future. This is an apparent change that has been recognized also in earlier studies (cf. Williamson & Ting 2001). The reasoning behind this thinking seem to be diverse. Both groups saw impacts in terms of 3D cadastre, increasing number of real properties, and management of growingly complex property interests. Urbanization might also bring with it an interesting feature on how people relate to land: the meaning of the ownership of land decreases at the same time as the meaning of the land use increases. In terms of cadastral system this leads to a situation where the management of use rights needs to be more accurate. The well-functioning management of use rights includes the management of all the rights, restrictions and responsibilities (RRR's), not just ownership rights (Bennett et al. 2007). We can say that the basic features of a cadastral system, where the land register gives answers to questions "who" and "how" and the cadastre to "where" and "how much" (see e.g. Henssen 1995), cannot be seen as separate but as coherent functions in the future.

An interesting and different view on the impacts of transparency, accessible and open data was that the transparency is not necessarily increasing but rather decreasing. This was mentioned by several foreign

interviewees, unlike the Finnish experts. Trying to disentangle this difference on views is challenging. On the one hand we could argue that personal preferences overrule the answers here. On the other hand we know that many legal and also cultural restrictions affect on the level of personal data that can be released. This influences how the release of land register and cadastral records is seen in different countries as well. Moreover, we have evidence that some countries have shown tendency towards less-transparent ways of governance, even though transparency has been associated for instance with better economic performance and lower levels of corruption (Bellver and Kaufmann, 2005). This kind of examples reassert that the fact increase in transparency cannot be taken as a self-evident truth.

The northern location of Finland and its sparsely populated area might create explanations on the differences between the views on importance of climate change and demographic change of the Finnish and the international experts in the cadastral context. Extreme natural hazards caused by the climate change or demographic change in terms of population growth are not seen as megatrends that have a great impact on the Finnish cadastral system in the upcoming years. This is definitely not the case in all parts of the world, where one of the main functions of the cadastre is poverty alleviation and food security (Bennett & Alemie 2014).

Foresight studies are sometimes seen as forecasts of the accuracy of the possible futures. However, as Glenn (2009) states, the actual value of these studies lies in opening minds for changing policies and making better decisions. Based on this paper, we cannot know the future. What we can do, is to bear in mind possibilities and anticipated impacts to be prepared for the future. In addition to that, some interesting remarks can be made from the different answers of Finnish and foreign experts. As both of the expert groups called for innovation and service design, the Finnish experts seem to be more trustful towards positive changes. The foreign experts seem to be more critical towards the anticipated impacts, which shows for example in the answers of impacts of increasing openness of data.

The results of this paper give a strong indication that even though megatrends are global, their impacts to the cadastral systems in different countries depend on the system the country is using. However, it should be noted, that the answers from the Finnish experts were collected and analyzed by using a Delphi questionnaire whereas the answers of the foreign experts were collected by personal interviews. The number of interviewees was rather narrow, as were the development stage of the cadastral systems of their countries they represented. A very interesting further study could be completed by broadening the group of interviewees to represent countries with cadastral systems in different phases of development.

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