www.Opencadastre.org - Exploring Potential Avenues and Concerns

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SUMMARY

In search of alternative cadastral information systems for local communities, the openstreetmap.org provided an appealing avenue. This article explores if the analogy of opencadastre.org could be a realistic and feasible endavour. Studies on volunteered geographic information (VGI) and open systems have generated potential avenues of applications and a list of critical concerns. Our study hypothesized that in the cadastral domain many of such potential avenues and concerns were also valid when starting up an opencadastre application. We conducted an extensive inventory of professional opinions on the potential of an opencadastre application through various discussion boards on Linkedin. After 4 months, we were summarized and categorized the discussions, and compared the results to the list of potential avenues and concerns from the VGI and open systems community. The results show that the regulatory nature of the cadastral domain complicates open access and participation of a potential opencadastre. The opencadastre concerns coincide with many of the technical concerns of the VGI and open systems. On the socio-organizational and legal side there are fundmenatal differences. The most valuable potential application of an opencadastre relates to the exploratory phases of setting up of land registrations. The visualization aspect and the potential of participation could increase the legitimacy of land adjudication and delimitation of boundaries. Opencadastre could be complementary for land administraiton practices when there are no formal cadastral systems are present. However, security and protection of data remains a potential problematic area. Further research should therefore focus on piloting an opencadastre application in a real-life setting.

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1. INTRODUCTION

The key question of this exploratory paper is whether voluntary contributions of citizens in an ICT environment which is open to all citizens can offer additional and/or complementary opportunities to develop and maintain cadastral or land information systems. This question is opportune and timely, because in many other application domains similar developments are currently occurring. Openstreetmap.org is one among many examples which has empowered citizens to contribute with their own insights and in maps, and attributes of map objects. Openstreetmap has developed into a global patchwork of street maps. Most users do not only consider the quality reliable, but also the result is frequently the only map available. The street maps of Port-au-Prince created after the earthquake disaster in Haiti[1] are a prominent example of relevance of voluntary mapping contributions through the openstreetmap facility. Other examples on a wider scale include wikipedia[2] and wikimapia[3]. All these examples provide any users the opportunity to share their own information and to correct each other's information. Both occur in a internet-based environment which is open to all internet-users, hence to all citizens. What a similar endeavour would entail for the cadastral and land information domain? For this domain the information collection, provision and sharing is usually heavily regulated, and the technology is usually far from 'open' to all citizens. This paper will therefore explore the implications of an 'opencadastre'.

The paper consists of the following sections: first we provide a summary of the research on 'open' and 'voluntary'. Clarifying and founding these terms in current scientific views is important to understand the character of the technological opportunities as well as the changing nature of government-citizen interaction. Next, we provide the methodology to collect and share opinions on the issue of opencadastre, followed by a section summarizing and synthesizing the results of this. We discuss the results in the light of our earlier explanation on 'open' and 'voluntary', aiming to derive critical bottlenecks and challenging opportunities in the context of the cadastral domain. Based on these findings we conclude with a list of recommendations for further research in the field of cadastral and land information sciences and a proposal for action-based pilot projects to test opencadastres .

2. THEORETICAL CONTEXT OF 'OPEN' AND 'VOLUNTARY' INFORMATION

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[1] http://haiti.openstreetmap.nl
[2] http://www.wikipedia.org
[3] http://www.wikimapia.org

As mentioned above, the system of an 'open' cadastre could rely on the experiences and guidelines of similar other systems. For this paper we summarize the pros and cons based on two particular fields: 'open systems' and 'voluntary geographic information'. While many of the publications on either VGI or open systems seem to overlap to a certain extent, in particularly when discussing the examples of 'openstreetmap', we still discuss these separately, because VGI often originates from the geographic scientific domain, whereas research on open systems originates from the research on internet and new media. Each type of research reasons from its own perspective, even though the conclusions and implications for opencadastre may be similar.

Research on 'open' systems originates from earlier publications on organizations. From an organizational science perspective the difference between organization in a closed or open system is that the former only considers influence and control from internal actors and factors, while the latter also assumes environmental influences, i.e. agency from other actors and factors outside the single organization (Scott, 2001). In information infrastructure research this basic concept of 'open systems' has increasingly gained attention. A crucial aspect of 'openness' is the issue of scalability. Craglia et al. (2008) refer to the specifications of the open geospatial consortium (OGC) as a way to increase the number of users and applicaitons. Interoperability of 'open' spatial data infrastructures would improve through open standards and as a result inter-organizational collaboration and data exchange should become more effective. Yet, with additional actors contributing to the development of system also the complexity in managing and controlling the system contributions. Braa et al. (2007) find, for the case of open health information systems, that as a result of increasing scale standards of contributions and information exchange tend to become increasingly flexible. With an increase of 'openness' the agency of external actors and factors in how the system is operating becomes increasingly persuasive. This was further investigated by Niederer and van Dijck (2010) in their research on Wikipedia as open infrastructures. They regarded wikipedia as an open system of collaborative knowledge, which has pros and cons. They highlight the fact that in open infrastructures anonymous amateurs can produce quality information, yet there is a contest to Wikipedia's claim to accuracy and neutrality.

Research on 'voluntary geographic information' (VGI) has emerged rapidly in the past 5 years. Goodchild explored the phenomenon of the voluntary build-up of geographic information through the web. In his 2007 articles on citizens as sensors (Goodchild, 2007a; Goodchild, 2007b) he explores sites such as wikimapia and openstreetmap, and questions what drives people to voluntarily contribute to such sites, how accurate the results are, and how they augment more conventional geo-information sources. In subsequent publications (Goodchild, 2008; Goodchild, 2009a; Goodchild, 2009b; Goodchild and Glennon, 2010) he differentiates areas where VGI has a crucial role and where it has virtually no role. The former concerns disaster and environmental management in particular. The latter specifically include areas which are highly dominated by legal rules. As cadastral mapping has historically been rooted in rules and regulation, this would explain why VGI in the cadastral mapping world has not yet taken off.

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Elwood (2008a) argues that the research field on VGI is still new, given the variety of terms that are available to refer to similar issues and phenomena: *Research on these new geospatial technologies and forms of data is still nascent enough that a central line of discussion remains how to name these phenomena and the activities they enable.* However, there is a difference between the terms which emphasize the new technologies of cartographic representation (such as 'neogeography', 'web mapping') and terms which emphasize the data themselves and the processes through which they are created and used ('collaborative' or 'participatory' information, 'user-generated' content, 'voluntary' information). In addition, Elwood (2008b) argues that for the latter category *problems of data access, quality and content are rooted in grassroots groups' resource constraints, diverse knowledge systems, and socio-political position as less powerful actors in local government and unrecognized stakeholders in local spatial data development. The efforts of these groups to obtain and adapt local government data for their own use, as well as their propositions for bringing their own deep local knowledge into public data resources, can serve as starting points toward imagining solutions to grassroots data challenges.* Elwood (2009) questions furthermore to whose advantage and to whose disadvantage the 'geoweb' is developing. She argues that it is still unknown yet crucial how '*different constituencies, variously more and less powerful, will take up the technology and what they will create with it*'.

Geomatica dedicated two special issues to VGI (volume 64, no. 1 and no. 4). Feick and Roche (2010) provide an overview of the current practices and research efforts in VGI. Amongst others, Budhathoki et al. (2010) address the issue of motivaiton of volunteers through posing why individuals give their time and expertise to develop VGI. Coleman et al. (2010) also reasons from the motivation dilemma when comparing citizen-sourced geographic data to mapping agencies data. Feick and Depardy (2010) evaluate selected visualisation methods used in VGI. Genovese and Roche (2010) provide a SWOT analysis of VGI for developed and developing countries. Grira et al. (2010) discuss the quality issue when relying on VGI.

Haklay (2010) and Ather (2009) found that the quality of openstreetmap (OSM) as compared to maps of the Ordnance Survey (OS) of the UK is fairly good. The positional accuracy of *OSM information is on average within about 6 m of the position recorded by the OS, and with approximately 80% overlap of motorway objects between the two datasets* in comparison to OS MasterMap. *In the space of four years, OSM has captured about 29% of the area of England, of which approximately 24% are digitised lines without a complete set of attributes.*'

Finally, de Leeuw et al. (2011) found that local knowledge through participatory mapping is likely to improve the classification accuracy of many other attributes featured in topographic maps. As a result, VGI provides a reason to consider engaging local expertise in the production and updating of topographic maps, in case other means are not available.

2.1 Summarizing all these articles:

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VGI research reflects in particular the issue of participation in the map production beyond government agencies only. In particular the role of citizens in information quality and information currency is crucial. VGI reasons from the volunteering actor perspective. Crucial is that not only formal agencies produce information, but also individual citizens produce information. VGI provides the complementary means to update local maps, hence has the potential to improve the quality and currency of existing maps. Also, all citizens can provide their own views on spatial entities and spatial phenomena. Concerns in relation to VGI are that VGI does not automatically imply unlimited participation. Resource constraints may limit the sustainance of contributions from communities and grassroots level groups. As a result, it is still unknown how those in power and those without power can benefit equally from the technological opportunities. Research on 'open systems' also deals with participation, however with a different focus. The research mainly reasons from the access perspective. Crucial is that the information systems grow through a collective of system contributors. The role of actors in information production and dissemination is related to issues such as information freedom and information system construction. Collective benefits arise from collective checks and balances. Concerns are that it remains unclear who or what controls the rules and who/what decides in the collective. Table 1 summarizes the main concerns raised in literature on VGI and open systems. These concerns are differentiated in concerns from a socio-organizational and a technical perspective.

Table 1. Concerns on VGI and open systems

	Main concerns from a socio-organizational perspective	**Main concerns from a technical perspective**
Voluntary information	– Participation versus exclusion – Power and (in)equality – Local versus central expertise – Autonomous / independent views vs accountable views	– Complementarity of datasets vs. redundancy – Ad hoc / occasional vs. systematic data collection
Open systems	– Scalability versus local use (socio-organizational) – Unlimited access vs. controlled access – Collective agency vs collective benefits – Rule making vs. rule enforcement	– Large vs small applications (geographic) – Data quality vs data completeness – Flexibility vs regulation in standards

3. METHOD TO EXPLORE THE POTENTIAL OF OPENCADASTRE

As we believed that the concerns derived by the Open systems and VGI discussions did not automatically or implictly apply for the Opencadastre potential, we considered a further exploration of the issue with practitioners necessary. Given the exploratory nature of the

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research we started by compiling views from practitioners and professionals, and by assembling accounts of similar experiences and relevant documentations. We collected opinions of practitioners and professionals through online discussion groups in LinkedIn and in Wikimapia.org, asusming we could tap from the collective knowledge of both scientists and practitioners. In all online discussions we raised the same main question:

Can social media have added value to the formal statutory cadastral systems that exist world wide?

We posed this question in the following discussion groups:

Social media network	Discussion group	Number of members (on 5 April 2011)
LinkedIN	Land information systems (LinkedIn)	298
	Spatial data infrastructure and development (LinkedIn)	65
	NSDI group (LinkedIn)	842
	FIG (LinkedIn)	277
	Openstreetmap	1192
	Mortgage professionals	6235
	UNSDI	101
	Participatory Geographic Information Systems & Technologies	856
	ITC Alumni	896
Wikimapia	Wikimapia.org/forum	7500
Dggroups	Dggroups.org	Unknown

In addition to monitoring and moderating the discussion we set up a subdiscussion group opencadastre.org to exchange ideas and manage the process. We assumed that the high number of members would be an indicator for the total number of possible contributors. Furthermore, by posing the questions in more than one forum we aimed to receive a wide range of opinions, and to rely on different kinds of epistemic communities and networks. The original first post in just a few of the groups generated a number of new issues in the overall discussion, which we hadn't expected beforehand. Examples included the issue of community-based quality control and the question whether landclaims can influence mortgage rates. To accommodate for those issues as well, we decided to braoder our initial focus, and pose the quesitons in other social media based groups as well. The majority of the discussions in the LinkedIn groups took place during November and December 2010, while for all other media there were more fragemented (in time and in content) contributions.

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4. RESULTS

After December 2010 the total number of contributions amounted to approximately 100. Most contributed in one or more of the linkedin groups. Some also contacted one of the authors or moderators personally. It is difficult to count for the number of contributions exactly, because some comments appeared in more than one group simultaneously, as some (if not: most) of the social media are interconnected. In addtion, the personal contacts through telephone email and personal communication also generated some overlap between the contributions. Overall, the contributions of the discussions can be grouped in two types of categories, socio-organizational concerns and technical concerns, which can each be further subdivided in to special concerns:

Socio-organizational concerns:

- Necessity
- Legality / role of government
- Legitimacy control
- Economic effects

Technical concerns:
- Quality control in OpenMapping
- Quality control in OpenCadastreMap
- Technology to contruct

In addition, a number of contributors provided comments at the meta-level of the discussion. These comments included concerns about:
- Redundancy due to overlapping discussions
- References and relevant documents

Some of the contributions within each of these categories are further elaborated hereunder.

4.1 Necessity

Several contributors reffered to a necessity to formulate a new citizen centric paradigm for land administration. This necessity drew upon several arguments, including:

- the need to find land administrative solutions for the 1.1 billion slum dwellers in the world,
- the problems of governments in many countries to solve the land registration issues in the classical way by executing big land registration projects.
- The current speed of land reform (being too slow).
- The need for simpler, more engaging and more inclusive approaches.
- The problems when government takes the lead in land registration (such as bureacracy)

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- The need of data after natural disasters and the need to build secured datasets in high risk zones. This includes community involvement and the use of community data, such as for the reconstruction of cadastral boundaries after a vulcano eruption in Indonesia.

4.2 Legality / role of govenment

A number of contributors posed that it should always be governments that have the lead in land registration processes since they act as a referee in land issues. A current fact is that governments are nót taking the lead in OpenCadastreMap, or commiting fast enough in the open systems endeavours. Coming from a country with a sound land registration system, it is hard to envisage the absence of such systems. Contributors concured with the idea that a common concept of OpenCadastreMap could create important building blocks for a land registration system, but that without government support it will always remain a limited project.

4.3 Quality control in OpenMapping

OpenStreetMap and Wikimapia shared some experiences about quality control. The level of Quality control is closely related to the openness of the system. One contributor called it a sliding scale. Maximum openness is given by a totally open and free platform such as OpenStreetMap. In a totally open system everybody can do everything without being stopped. In principle it is possible to wipe out the whole map. In OpenStreetMap so called edit wars took place between people that disagreed on the spelling of geographical names. In less open systems contributors can only flag certain information as potentially out-of-date. The former USGS Map was an example of such a system. Also in Wikimapia the information that is uploaded is checked by a community of editors. There are some general norms but in practice editors tend to have their own norms.

An additional potential of Opencadastre was the possibility for a higher level of quality control. StackOverflow is a community where software developers share knowledge through an FAQ-type system and gain explicit recognition (trust!) by providing meaningful answers, insightful comments or just ask sensible questions. According to one contributor it could be possible to build such systems in OpenStreetMap by adding a 'social quality' to information: who has been involved in creating this particular unit of shared knowledge and what are their characteristics? Users with a lot of experience, whose contributions are less often superseded by newer versions, or in the case of a body of geographic information expose a lot of knowledge in the same geographical area, may be seen as more trustworthy for that particular (spatial) context. OpenStreetMap now does not have such a system for explicit user recognition.

The concept of openness can also be applied on formal organisations like mapping agencies and cadastres. The possibilities for individual users to update the information or to appeal against government decisions is defining the openness of the information system.

4.4 Quality control in OpenCadastreMap

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The value of an OpenCadastreMap system could be highly improved if a process of quality management is in place. One remark refered the so called Trusted Broker in Ghana, which was established completely outside the government. The Trusted Broker is applying some best practices like rules that the occupied property is not in environmentally sensitive areas, under power lines, in flood areas, in cultural areas etc. etc.. These tools and processes could be put up to the web site for anyone wanting to become a trusted broker.

Another discussion dealt with the difference between Quality control and legitimacy management. The latter is supposed to imply the formal recognizance of claims. Quality is more associated to accuracy (of data) and efficiency (of processes). Legitimacy has to do with the legal acceptance in a particular social context. Legitimacy has more a political or institutional meaning.

In this distinction contruibutors argued that certain means of quality control would be acceptable. It means that the claims that are put forward to the government are according to certain quality standards. Certain contibutors stressed the importance of the involvement of the surveying sector in this process, they have the knowledge to do it in a professional way. Furthermore, they pleaded for greater creativity to engage non tradition actors in delivering trusted services to the poor and collect enough information to allow the inclusion of those persons in a broader administration process. NGO's active in microfinance have broad knowledge of property issues as an example.

Several contributors referred to the availability of the Social Tenure Domain Model as a very important structure in which overlapping claims can be registered or claims that cannot be registered in a statutory system.

4.5 Legitimacy control

The question was further raised whether it is possible to set up a system of legitimacy control that is not run by the government. This brought up the aspect of trust in ownership matters: if everyone believes that someone is the owner of this parcel, that can be assumed to be a fact. This same principle applies to crowdsources like Wikipedia and OpenStreetMap: if everyone agrees to a certain description of reality, this is assumed to be reliable In less established environments these instruments could also be used to build up a registration. In all cases however he thinks it is necessary to have some independent authority that is responsible for:
- assuring that all parties with interests are involved in the process
- setting a kind of 'final status' that affirms that a representation on the map is the best representation of legal reality.

This final status will remain necessary to make those data reliable enough to base important decisions upon.

The edit disputes are interesting from a perspective that two or more potentially valid opinions collide with the concept of one definitive map or representation. While the cadastre is and should be a definitive statement of how a state acknowledges property ownership rights, there might be other views, legitimate or not, which might range from disputing individual properties to

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boundaries of entire administrative areas. If an OpenCadastreMap would be used to register those different opinions alongside each other, this could become a powerful policy instrument and collaboration tool. The process of revisiting and agreeing ownership rights can use this tool but needs to be a transparent and institutionalized process since it results in a legal outcome. The risk of an OpenCadastreMap could not undermine the authority of the definitive one, but would need to be managed carefully.

4.6 Economical effects

A serious concern was whether an OpenCadastreMap could be relevant in economical terms. It is clear that a mortgage can only be registered if there is an official registered title. On the other hand the interest on loans that banks ask is based on a risk assessment. And the strength of a claim on land could be relevant in such a process. This question was posted in the LinkedIn group for mortgage professionals (6000+ members) but no further reaction was triggered.

4.7 Technology

The discussion on technology was not so much on the availability of modern technology to be used in the OpenCadastreMap concept but more on which technology should be used in which social context. Contrasting views were given for the possibilities in Africa. Also a discussion was held whether the need for transparency can be created with technology in which pen and paper is still dominant. Rather than the technology focus - we need to focus on how we can engage non tradition actors in delivering trusted services to the poor and collect enough information to allow the inclusion of those persons in a broader administration process. Educating NGo's microfinance and others that already work with the poor and who collect much of the information needed to indicate rights to property.

4.8 Redundancy due to overlapping discussions

One contributor argued that many of the issues are not new, and warned that one should try to avoid to re-discuss what has been discussed already. The argument was that looking from an SDI perspective, the community would need to start from legal requirements and find solutions (authorised access, biometric approaches, layers with initial data and with authorized data (that's the continuum of land rights from UN Habitat)). To restart a discussion about institutions etc and not about participatory approaches will not work, was the argument. There would be many example cases supporting this statement. Data collected in field can be projected to the community in the evening. There the discussions take place.

4.9 References and relevant documents

Specific papers which contributors brought up during the discussions included (Uitermark et al., 2010) and (McLaren, 2010). Specific websites referred to by contributors included:

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Website
http://indigenousmapping.net/
http://indigenousmapping.net/imnconference/cfp.html
http://www.nativemaps.org/
http://siteresources.worldbank.org/INTARD/Resources/335807-1174581646324/InnovLandRightsRecog.pdf
http://www.fig.net/pub/figpub/pub52/figpub52.htm
http://en.landsystems.com/images/Presentations/esri_emea_ils_opentitle_presentation_25102010.pdf
http://sdh-sageo.teledetection.fr/index.php?option=com_docman&task=doc_download&gid=14&Itemid=35

Most of these website and documents refer to community mapping and alternative forms of setting up and maintaining cadastres.

5. DISCUSSION

Based on the results above, we can construct a comparative table, integrating the concerns from the vGI and open systems discussions with the opencadastres discussions. This results in Table 2.

Table 2. Relation between opencadastre discussion results with VGI and open systems concerns

Concerns		Degree to which these are applicable for 'opencadastre'?
Socio-organizational concerns	Participation versus exclusion	Since opencadastre can affect the land rights of people, participation is a crucial concern for openmapping. The discusison on necessity and the role of the government makes this clear.
	Power and (in)equality	Idem
	Local versus central expertise	The references to community mapping projects

		indicate that Opencadastre is most to originate from local expertise and benefit local communities. This is potentially risky, because relying on only few people.
	Autonomous / independent views vs accountable views	The issue of legitimacy and the role of the government is a central and crucial concern with regards to the quality control of opencadaster.
	Scalability versus local use (socio-organizational)	This concern will equally be applicable to opencadastre. Centralising and possible scaling up remains therefore a concern.
	Unlimited access vs. controlled access	Although contributors argue that the starting point of opencadastre is open access, they also urge for a government role.
	Collective agency vs collective benefits	The contributors did not emphasize collective agency. Apparently, this issue was much less prioritized than in comparable VGI and open systems discussions.
	Rule making vs. rule enforcement	Since opencadastre addresses legal claims on land this concern is of major importance
Technical concerns	Complementarity of datasets vs. redundancy	Opencadastre will most likely create differences with official records. The mechanisms to solve these differences are key to the success. The contributioons on quality frequently mentioned this issue.
	Ad hoc / occasional vs. systematic data collection	Professionals envisage both approaches as practical and feasible options to construct any opencadastre platform or system.
	Large vs small applications (geographic)	Existing iniatives are at small scale. Scaling up to other levels is unlikely for the moment.
	Data quality vs data completeness	Quality is of main concern
	Flexibility vs regulation in standards	STDM is providing a standard that tries to solve this concern

Based on this comparison and integration we identify three lines of further discussion:

1) To which extent do the opencadastre discussion contributions converge with the open/VGI concerns? This leads to common paths and ideas.
2) To which extent do the opencadastre discussion contributions diverge from the open/VGI concerns. This derives a number of paradoxes and challenges.
3) To which extent is there a need for a common practice or theory? This leads to research challenges.

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5.1 Convergence of opencadastre ideas with open/VGI concerns

Primarily the technical concerns coincide. For exmaple the technical map quality concerns and the tools to create, maintain and/or restrict access to the data are similar. On the socio-organizaitonal side the issue of having to rely on local expertise remains problematic. This also related to technical expertise. If such expertise is only available in a few fragmented locations, certain actors may benefit more from the technical oppportunites than others. This concern has also been identified by earlier examples in open systems.

5.2 Divergence of opencadastre ideas from open/VGI concerns

The biggest difference between VGI and opencadastre concerns relates to the type of interests of the participants. The direct self interest of participants to opencadastre may be rather opportunistic rather then idealistic. That's why the contributors to the opencadastre discusisons freqeuntly urged for a role of the govenrments to regulate part of the contributions, part of the access and part of the quality. Whereas in openmapping much of the quality is self-sustained, in opencasdastre the mechanism of self-regulation is questioned. The stakes of associating contrubitons to sensitive issues such as land rights, are simply to high to leave it to anyone in the public. As a result, contributors stress the need for some sort of nt a better government intervention.

Another mjaor difference is the role of standards and standard exchange mechanisms. The cadastral professionals generally prefer the use of a standard model, such as the STDM. Flexible standards, sometimes promoted I nthe VGI and open systems discussions, are less preferred.

Finally, the rule making is of particular concern in the opencadastre discussion. Who sets and who maintains the rules to contributions and to the technical systems? There was no concrete answer to this question, but some of the contributors clearly pointed to this issue as one that needs to be resolved.

5.3 Towards a common practice or theory?

The initial reactions in the discussions ranged from "It is never possible" to "It is already happening". The first reaction in general was based on the assumption that only governments can exercise the authority that is necessary to solve land issues between individuals. It is correct that authority is necessary but the question is whether that should always be national governments and what to do if national governments do not take that responsibility. The statement that "It is already happening" also needs further scrutinizing. How open are the existing iniatives? The extent to which current initiatvies are open is unknown for two reasons:

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- It remains unlcear in the opencadastre what 'open' means. There is no clear reference framework.
- It remains unclear which iniatives have which impact. The social dynamics related to technical initiatives may be crucial, but are still largely undocumented.

Overall, the theory with respect to openmapping is very young and, as explained in the introductory section, there is no common terminology. A common terminology as a starting point for building a new theory can help in this respect. Much is still unknown about the technological feasibility and the potential socio-economic effects. A research framework to study both could help explore current initiatives.

6. CONCLUSIONS AND RECOMMENDATIONS

The concept of opencadastre is from a geographic information perspective an extension of the concept of VGI. There is not much difference between uploading the contours of a road or building and a cadastral boundary. From a social/economic point of view the potential participants to such a system are different because of the big differences in interest that lies at the basis of such participation.

From a technological point of view not much seems to be in the way of a opencadastre concept. One can question the functionality of existing technology but seen the rapid developments it is not difficult to envisage that these problems will be overcome.

Key issue in opencadastre seems to be the authoritativeness of the data. The land administration paradigm places the government in the centre of land registration processes. Individuals, social groups and companies have land rights, the government is the indepenent party that is setting the rules and solving the conflicts. The land administration paradigm does pay attention to a possible role of civil society in these processes. It needs a carefull assesment of existing initiatives of more open cadastral approaches and the development of a common reference frame to be able to investigate the possibilities of such an approach.

We strongly depended on contributions in social media, such as LinkedIn. When we started we assumed that, given the large amount of members within the LinkedIn groups we could easily tap from the collective knowledge within the geoinformation/cadastre community and produce a complete overview of issues relevant for the opencadastre concept. This happened to be too optimistic. The initial group of people that was involved in the discussion did produce a wide number of issues that are relevant but only a small number of people got involved later on. Especially the fact that from the LinkedIn group of mortgage professionals nobody reacted on the question about economic relevance, was striking. A better insight is needed in the circumstances under which such an approach can work. Literature on social presence of technology might be helpful to explore.

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REFERENCES

Ather A. (2009) A quality analysis of OpenStreetMap data.

Braa J., Hanseth O., Heywood A., Mohammed W., Shaw V. (2007) Developing health information systems in developing countries: The flexible standards strategy. MIS Quarterly 31:381-402.

Budhathoki N.R., Nedović-Budić Z., Bruce B. (2010) An Interdisciplinary Frame for Understanding Volunteered Geographic Information. Geomatica 64:11-26.

Coleman D.J., Sabone B., Nkhwanana N.J. (2010) Volunteering Geographic Information to Authoritative Databases: Linking Contributor Motivations to Program Characteristics. Geomatica 64:27-40.

Craglia M., Goodchild M.F., Annoni A., Camera G., Gould M., Kuhn W., Mark D., Masser I., Maguire D., Liang S., Parsons E. (2008) Next-Generation Digital Earth: A position paper from the Vespucci Initiative for the Advancement of Geographic Information Science. International Journal of Spatial Data Infrastructures Research (IJSDIR) 3:146-167.

de Leeuw J., Said M., Ortegah L., Nagda S., Georgiadou P.Y. (2011) Assessment of the accuracy of volunteered road map production in Western Kenya. Remote sensing : an international journal of the science and technology of remote sensing and the applications 3.

Elwood S. (2008a) Volunteered geographic information: key questions, concepts and methods to guide emerging research and practice. GeoJournal 72:133-135. DOI: 10.1007/s10708-008-9187-z.

Elwood S. (2008b) Grassroots groups as stakeholders in spatial data infrastructures: challenges and opportunities for local data development and sharing. International journal of geographic information science 22:71-90.

Elwood S. (2009) Geographic information science: emerging research on the societal implications of the geospatial web. Progress in Human Geography 2009:1-9.

Feick R., Depardy V. (2010) Evaluating se;lected visualisation methods for exploring VGI. Geomatica 64:427-438.

Feick R.D., Roche S. (2010) Introduction (special issue VGI). Geomatica 64:7-8.

Genovese E., Roche S. (2010) Potential of VGI as a resource for SDIs in the North/South context. Geomatica 64:439-450.

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Goodchild M.F. (2007a) Citizens as voluntary sensors: spatial data infrastructure in the world of Web 2.0. International journal of spatial data infrastructures research 2:24-32.

Goodchild M.F. (2007b) Citizens as sensors: the world of volunteered geography. GeoJournal 69:211-221.

Goodchild M.F. (2008) Commentary: whither VGI? GeoJournal 72:239-244. DOI: 10.1007/s10708-008-9190-4.

Goodchild M.F. (2009a) Neogeography and the nature of geographic expertise. Journal of location based services 3:82-96.

Goodchild M.F. (2009b) Virtual geographic environments as collective constructions, in: H. LIN and M. BATTY (Eds.), Virtual Geographic Environments, Beijing. pp. 15-24.

Goodchild M.F., Glennon J.A. (2010) Crowdsourcing geographic information for disaster response: a research frontier. International Journal of Digital Earth:11.

Grira J., Bédard Y., Roche S. (2010) Spatial Data Uncertainty in the VGI World: Going from Consumer to Producer. Geomatica 64:61-72.

Haklay M. (2010) How good is volunteered geographical information? A comparative study of OpenStreetMap and Ordnance Survey datasets. Environment and planning B: Planning and design 37:682-703.

McLaren R. (2010) Can the Innovative Use of Mobile Phones Support More Effective Land Administration Services?, FIG Congress 2010. Facing the Challenges – Building the Capacity, Sydney, Australia, 11-16 April 2010.

Scott W.R. (2001) Institutions and organizations. 2nd - thoroughly revised and expanded - (original edition from 1995) ed. Thousend Oaks: Sage.

Uitermark H., Oosterom P.V., Zevenbergen J., Lemmen C. (2010) From LADM/STDM to a Spatially Enabled Society: a Vision for 2025, The World Bank Annual Bank Conference On Land Policy And Administration, Washington D.C., USA, 26-27 April 2010. pp. 13.

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