

FIG COMISSION 7 ANNUAL MEETING

GEOCONFERENCE ON CADASTRE 4.0
TRANSPARENCY, PARTICIPATION, COLLABORATION

24-28 OCTOBER 2016 | COIMBRA, PORTUGAL



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Geoconference on Cadastre 4.0
Fig Commission 7 Annual Meeting 2016
24-28 October 2016 | Coimbra, Portugal

Cadastre 4.0 as a paradigm towards a Fin-Tech enabled Real estate management

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Structure of Presentation

- Introduction
- Cadastre 1.0
- Real estate Cadastre
- Cadastre 2.0 - Participatory Information Sharing, Interoperability, Collaboration
- Cadastre 3.0 - Creative Economy and Public private partnership
- Case study : Denmark
- Cadastre 4.0 - Fintech, Blockchain
- Case study : Ghana, Georgia
- Conclusions and further research
- References



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Introduction

- To provide a basis for a more informed assessment of land administration initiatives.
- "Comparative Study of Land Administration Systems", the World Bank (2003)
Reviewed land titling and registration options
Characteristics
Accessibility
Costs, and
Sustainability
based on information compiled in a number of case study countries.



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UN-HABITAT:2008 -

“The continuum of tenure types is a range of possible forms of tenure which can be considered as a continuum. Each continuum provides different sets of rights and degrees of security and responsibility. Each enables different degrees of enforcement. Across a continuum, different tenure systems may operate, and plots or dwellings within a settlement may change in status, for instance if informal settlers are granted titles or leases.

Informal and customary tenure systems may retain a sense of legitimacy after being replaced officially by statutory systems, particularly where new systems and laws prove slow to respond to increased or changing needs.

Under these circumstances, and where official mechanisms deny the poor legal access to land, people tend to opt for informal and/or customary arrangements to access land in areas that would otherwise be unaffordable or not available”



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Cadastre

Cadastre is a methodically arranged public inventory of data concerning properties within a certain country or district, based on a survey of their boundaries. Such properties are systematically identified by means of some separate designation. The outlines or boundaries of the property and the parcel identifier are normally shown on large scale maps which, together with registers, may show for each separate property the nature, size, value and legal rights associated with the parcel. It gives an answer to the questions “where” and “how much”. (Henssen and Williamson 1990, p. 20.



- *Web 1.0 : a set of static websites that were not yet providing interactive content. refers to the first stage in the World Wide Web, entirely made up of Web pages connected by hyperlinks*



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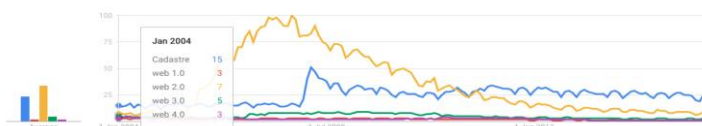
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Cadastre vs Web



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Cadastre 1.0 & Real estate

“The real estate cadastre can be called as a dynamic system with information expanded to needs of the market. A land real estate property is identified in the real estate cadastre by the numeric description of its boundaries using x,y coordinates. the horizontal boundaries delimit the real estate property as an area to which specific rights are assigned in a planar x, y system”

- The problems of the cadastre 1.0 w.r.t real estate - a planar two dimensional land vs need to visualise the 3D cadastre and address the space depiction problems in the cadastre.

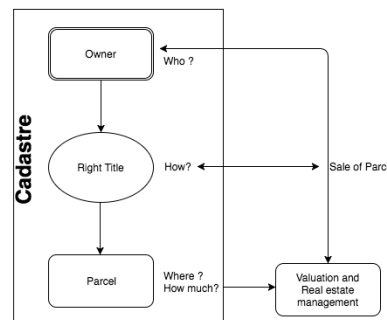


Figure 1 : Cadastre and Real estate management - core entities connected.



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Cadastre 2.0

- Cadastre 2.0 - an analogy drawn from the Web 2.0 beginning of open map culture using mobile technologies through collaboration and citizen engagement

“Web 2.0 is the business revolution in the computer industry caused by the move to the internet as platform, and an attempt to understand the rules for success on that new platform. Chief among those rules is this: Build applications that harness network effects to get better the more people use them.” Tim O’Reilly (O’Reilly Media Web 2.0 Conference, 2004)

*Participatory information sharing, Interoperability, Collaboration
better modelling, continuum of rights, citizen of engagement.*



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Cadastre 2.0 - Cadastral template

- Critical step of collection of the generic information about cadastral and land administration systems
- Template : 2 main parts
 - Part I: defines five broad areas - Country Context , Institutional framework, Cadastral system, Cadastral mapping and Reform issues.
 - Part II : Reflects the core principles of the Cadastre 2.0 - basic cadastre.
- The statistics focused on -
 - Population
 - Number of parcels
 - Professionals working in the system.



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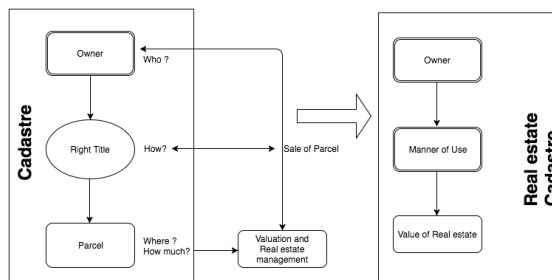
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Cadastre 2.0 - Real estate management

One of the key steps to bring in efficient real estate management : three core elements of the Real estate cadastre.

Challenge :

- it doesn't represent a new version of cadastre
- cadastre that is still more futuristic with features like - authentic data sources, more trust and transparent systems, content having guaranteed interoperability



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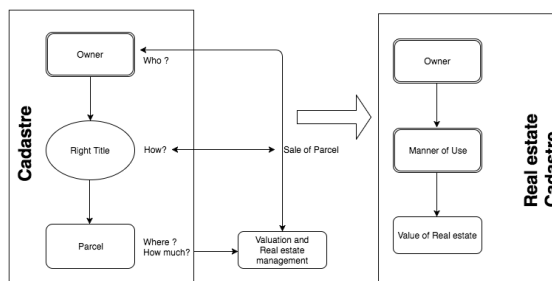
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Cadastre 3.0 vs Web 3.0

Web 3.0, a phrase coined by John Markoff of the New York Times in 2006, refers to a supposed

Third generation of Internet-based services that collectively comprise what might be called 'the intelligent Web' — such as those using semantic web, microformats, natural language search, data-mining, machine learning, recommendation agents, and artificial intelligence technologies — which emphasize machine-facilitated understanding of information in order to provide a more productive and intuitive user experience



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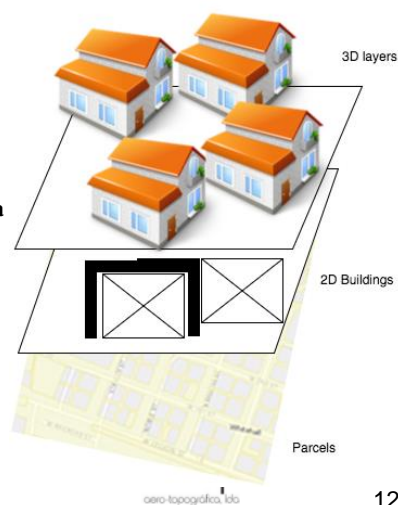
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Cadastre 3.0

- potential to increase awareness amongst user groups for legal responsibility of data, addition of more dimensions, sustainable business model
- full contents to be made public with Government offering its data for commercial use to boost (PPP)

“Opened Cadastral Information is A Password to Economic Growth.”(Korea)

*“creative economy”
Openness, Sharing, Collaboration*



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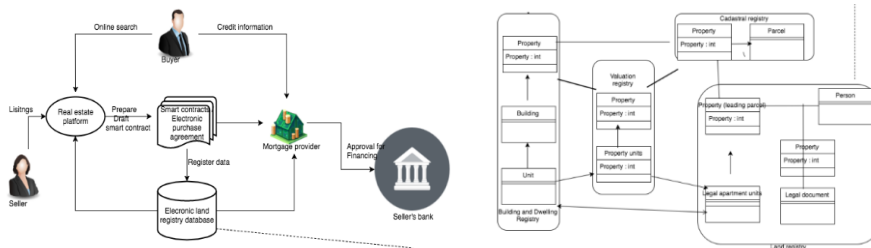
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Cadastre 3.0 - Danish House purchase process



coupled with the changing demands of consumers and the democratization of big data,
led to a fin-tech rebirth in managing real estate



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Cadastre 4.0 - Web 4.0

Cadastre 4.0 establishes links between the virtual and real world securing interests of landowners, society, governments and economy. It sets the scene for permanent communication between people, procedures and products. The Internet of Things is amended by a social aspect.

Cadastre 4.0 is a cadastre for people made by people. Cadastre 4.0 leverages on Web 4.0 -

the read-write-execution-concurrency web



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Cadastre 4.0

Cadastre 4.0 as a paradigm ::

- will close the circle between new technologies and automatism of processes, products and services and stakeholders, including citizen and landowners as essential partners at equal level;
- support partnership model building coalitions /symbiosis between professionals in private and public service, between citizen and users and public authorities and between technology and society;
- sets the scene for permanent communication between people, procedures and products by amending internet of things by a social aspect;
- encourage citizen engagement and greater transparency and accountability to generate more trust and support for the cadastral system;
- truly 5D and above, defined as the spatio-temporal unit against which (one or more) unique and homogeneous rights (e.g. ownership right or land use right), responsibilities or restrictions are associated to the whole entity, as included in a Land Administration system.



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Cadastre 4.0

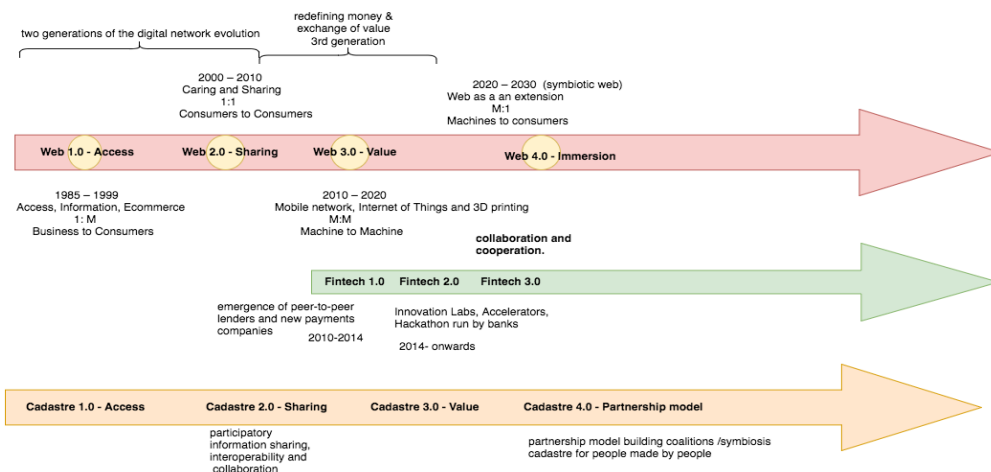


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Fintech 4.0

1866-1967

1968-2008

2009-now

2018-future

Identity
Bigdata
IoT
AI
Decentralised
Distributed Ledger

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Cadastre 4.0 - Fintech

- The first phase actually overlaps with Cadastre 3.0 stage
- First wave directly has only started creating the stage for a disruption even in real estate management practices
- “Second Wave”: incumbent players created leverage on business models through their existing expertise, innovation centers to remain competitive amongst startups while leveraging their established brands and infrastructure and by fostering on the cultural mentality of fin-tech startups .
- Third wave Fin-tech 3.0 will aggressively use blockchain to distribute digital data globally,

So the Cadastre 4.0 will leverage on such distributed ledger systems. It also uses Internet of things to enable a value chain defined by effective use of data.

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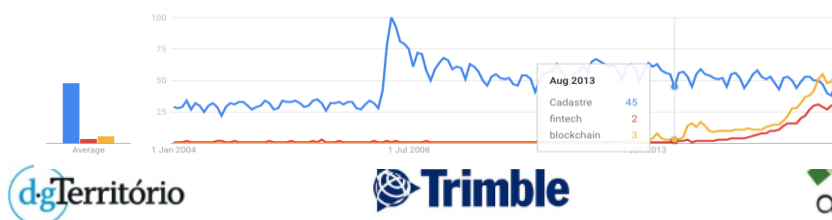
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Cadastre 4.0 - Blockchain

- Cadastre 4.0 is expected to use principles of - Web 4.0 is also known as symbiotic web.
- Symbiotic web is interaction between humans and machines in symbiosis, mind controlled interfaces using web 4.0
- syndicating trust in a peer-to-peer way for the communication of assets
- pre-distribute the wealth than redistributing the wealth by full participation
- power of the government can be used to torment the title



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Case study - Ghana

- Almost 90% of rural land in Ghana is not recorded in an official database, and many city dwellers have not yet official address.
- The real estate management seen in Ghana is similar to many developing countries. Bitland NGOs are working to save the title to the blockchain and resolve land conflicts.
- A symbiotic approach to building a cadastral register and property register for the people and made by the people.
 - reducing human corruption in land disputes
 - transparency
 - wealth distribution to entire communities and property rights

futuristic paradigm of Cadastre 4.0



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Case study - Georgia

In April 2016, the National Agency of Public Registry and the company specializes in BitFury bitcoin
 - directly and officially by the government.

Goal : enable citizens to register their property on blockchain.

Objective : global transparency of the titles
 rights of the property cannot be misrepresented.



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Conclusions and further research

- Efficient real estate management currently depends on the degree of the modernity of the cadastre
- Challenges grew even after proposals of Cadastre 2.0 and 3.0 - So Cadastre 4.0 through its nature of cadastre for the people made by the people perhaps might quicken investments.
- The use of this futuristic ideology of creating these essential elements of block chain is one of the tenets of Cadastre 4.0 that can lead to efficient real estate markets

Challenge : transferring online functionality to physical world

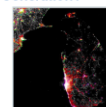
Industry standards are also a concern

Security standards of the technology may be que

Privacy - *act of user providing personal data to cadastral*

What Could be the Fourth Generation?

- Completion of land titling/Cadastre using new technologies and adopting fit for purpose to compress time of completion from 10-20 years to 3-5 years
- Directly collect data in digital format



- PPP (Private Public Partnership) not only in cadastre construction/issuance of titles, but, in management of registry offices
- Integration of land data with other important data (zoning, taxation, financial sector, market research, utilities and development of smart cities, as part of E-Government programs.



Property Markets | 3

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References

- Daniel Steudler, Ian P. Williamson, Abbas Rajabifard and Stig Enemark 2004, “ The cadastral template project”
http://www.cadastraltemplate.org/documents/ts01_2_stuedler_et_al.pdf
- Lavadenz, I., Sanjak, J., Barnes, G. and Adlington, G. (2002). Concept Paper and Annexes – Comparative Study of Land Administration Systems. Unpublished report, prepared by the World Bank, January (cited in World Bank, 2003).
- Myers, chris (2016), “Fintech's 'Third Wave' Is Coming, And It Will Change Everything”
<http://www.forbes.com/sites/chrismyers/2016/10/03/fintechs-third-wave-is-coming-and-it-will-change-everything/#5ac0f04f1fff>
- Schennach, Gerda (2012), “ Vision for a future cadastre” , FIG commission 7 International Symposium San Luis/Argentina
- Shennenach, Gerda 2011, “Cadastre 2.0 - Proceedings International FIG Symposium & Commission 7 Annual Meeting Innsbruck/Austria September 2011” https://geo.tuwien.ac.at/fileadmin/editors/VGI/sonderheft2011_34_final_OCR.pdf



5 : Growth by crowdfunding



solution 2015

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