

THE ROLE OF CADASTRE IN SUSTAINABLE DEVELOPMENT


Ian P. Williamson

Professor (emer.)
University of Melbourne, Australia

ABSTRACT



Within the political debates about land policies, land governance, land markets, poverty reduction, land administration and sustainable development, the importance of the central role of the cadastre is often overlooked, or worse is taken for granted. While the cadastral concept is simple it cannot be trivialized since implementation of the concept is complex and difficult and requires the full support of both government and society in general. This presentation will review the cadastral concept from the perspective of sustainable development and will re-visit the reasons why all countries wish to implement some form of cadastre, whether it is a high technology computerized system or a low cost fit-for-purpose system. It will consider the importance of cadastre from an EU perspective. The marine cadastre concept will be introduced. In discussing the cadastral journey the presentation will explore the components of cadastre and their role in land administration processes. It will highlight the cadastre as the engine of land administration systems. The presentation will conclude with a discussion of the challenges and opportunities facing cadastres.

***Biography** – He is a surveyor and engineer, and an Emeritus Professor in the Centre for Spatial Data Infrastructures and Land Administration at the University of Melbourne, Australia. His interests include cadastral, land and GIS; land administration and spatial data infrastructures, in both developed and developing countries. He has published widely on these topics. He has undertaken research or consultancies worldwide, including for various country development assistance agencies, FIG, the United Nations, the Asian Development Bank and the World Bank, most governments in Australia. For almost four decades he has taught, consulted, researched, published and provided leadership on cadastral and related matters globally.*



The role of cadastres in sustainable development

Ian Williamson
 Centre for SDIs and Land Administration
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 The University of Melbourne
 Australia



An exciting time for cadastral reform

- In the developed world, cadastres are complete and support spatial enablement and sustainable development
- New initiatives in 3D cadastres for smart cities, marine cadastres and digital revolution (on demand/any place, smart phones, positioning technologies, sensors, virtual world)
- Focus in less developed countries on land governance, fitness for purpose and low cost cadastral solutions






My key messages are:

- All cadastres evolve as society evolves and as such must be continually re-engineered, fine tuned and improved
- Do not forget the basic principles and justification of cadastre
- The biggest threat to modern cadastres is complacency (content with current situation and unconcerned about challenges, self satisfaction, pleased with "business as usual")

Sustainable development

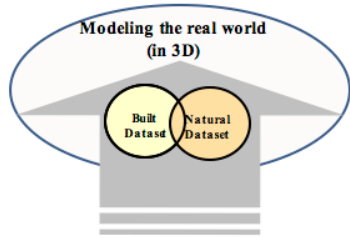
- The "Triple bottom line"
 - **Economic** dimension
 - **Environmental** dimension
 - **Social** dimension
- and increasingly the fourth dimension of **governance**

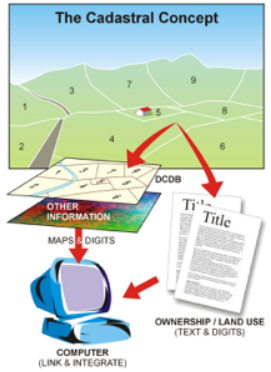
The challenge is the integration of Built (cadastral) and Natural (topographic) Environmental Datasets

Sustainable Development

Modeling the real world (in 3D)



The Cadastral Concept



FIG, 1995

Cadastrals produce AAA land information

- **Accurate** - based on ground truth
- **Authoritative** - created within a regulatory legal environment
- **Assured** - government guaranteed

Importantly the cadastre provides an *authoritative audit trail* for other land information and services in support of spatial enablement

Williamson, 2011

Spatial Data Continuum – fitness for purpose

The basics of a cadastral system

- Digital representation of land parcels
- Information delivery and access systems
- A legal framework
- Survey marks and other physical evidence of property boundaries
- Registered or trained surveyors or technicians
- Records of surveys such as plans (in hardcopy or digital or Cloud)
- Standards for definition and surveying of land

Significance of the Cadastre

Why cadastres? Three examples

- Australia (*similar to most developed countries*)
- The European Union
- Thailand

Australia – CADASTRE 2034

- Cadastral reform and innovation for Australia – a national strategy for 8 separate jurisdictions
- THE VISION – “A cadastral system that enables people to readily and confidently identify the location and extent of all rights, restrictions and responsibilities related to land and real property”
- The cadastral systems of Australia underpin stable and reliable registration of land based property rights. They serve as the foundation for effective land tenure transactions and in securing the legal status of property boundaries.

Enduring principles of CADASTRE 2034

- Certainty in the spatial extent of ownership
- Uniquely defined land (and/or property) that is common to all registers – ownership, value and land use
- Integrity and security of the parcel boundary system
- Strong relationship between regulators and industry
- Appropriate regulatory standards

Australian cadastral system supports (2014)

- \$1.4 trillion in housing loans secured against land titles (mortgages)
- \$5.2 trillion in total value of real property held in title (size of the Australian economy as at November 2014 is \$1.6 trillion per annum)
- Best use of this national information asset benefits the national economy by \$4.7 billion annually above normal growth
- The value of the cadastral system and land registration system is obvious

Cadastre and the European Union

- The Acquis Communautaire (Acquis) – the rules of the EU
- Privatisation of lands and the establishment of efficient land markets
- This required
 - Institution building
 - Effective free market
 - Protection of human rights
 - Environmental sustainability
 - Common agricultural policy

This in turn requires EU countries to have

- A land administration infrastructure
- A free land market
- Protection of property rights
- Documented public and private rights

Further this requires EU countries

...to have an effective land administration system based on an effective cadastre!



The importance of this to EU countries cannot be over emphasised

Importance of cadastre to EU countries

Bogaerts and others 2003



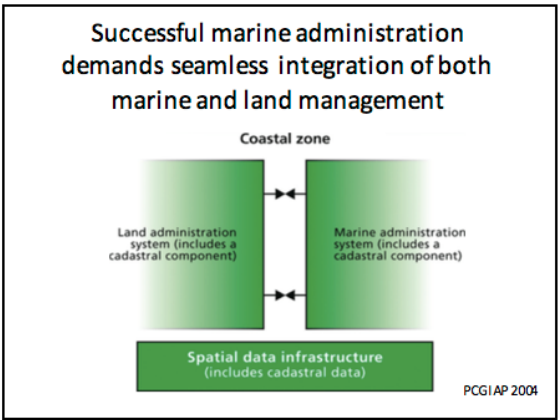
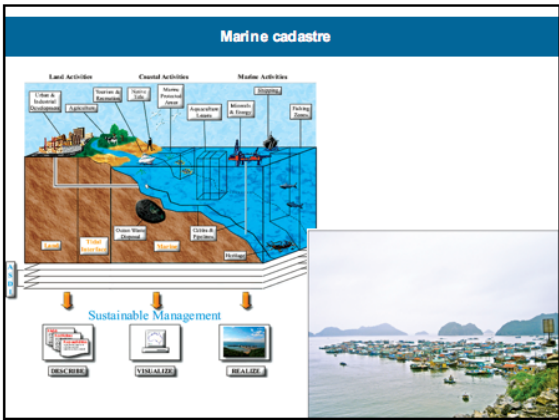
Thailand Land Titling Project

- Policy objectives
 - Security of tenure and land market in urban areas
 - Access to bank financing and on-farm investment leading to increased agricultural production
 - Social justice and reduction of boundary disputes
 - Poverty reduction
 - Land market in urban areas
- Targeted provinces adjoined Cambodia, Laos and Myanmar – why? Importance of giving the rural population a sense of national pride and something to live for.



Marine cadastres

- The cadastre includes both land and the sea
- Managing the rights, restrictions and responsibilities in the marine environment
- Importantly allows a land-sea interface at the sensitive coastal zone



Challenges for cadastral system

- When the system works why spend \$ on it?
- If the system is not broken why change it?
- Building capacity is the key whether in developed systems, developing systems or in cadastral projects
- Education, training and research is central to building capacity
- The risks of privatisation of the cadastre

Again my key messages are:

- All cadastres evolve and as such must be continually re-engineered, fine tuned and improved
- Do not forget the basic principles and justification of cadastre
- The biggest threat to modern cadastres is complacency – simply governments often forget how important they are!

Acknowledgement

I gratefully acknowledge this presentation includes material from:

- *Colleagues and students in the Centre for SDIs and Land Administration, University of Melbourne*
- *CADASTRE 2034 - Cadastral Reform and Innovation for Australia – A National Strategy, ICSM, 2014*
- *“Land Administration for Sustainable Development” Williamson, Enemark, Wallace and Rajabifard, ESRI Press Academic, USA 2010.*



GEOSPATIAL INFORMATION TECHNOLOGIES AND THE CHALLENGES OF URBANIZATION: PERSPECTIVES FROM THE WORLD BANK

Jorge A. Muñoz

MA, PhD,
The WORLD BANK, USA

ABSTRACT

The World Bank Group's support for developing countries grew sharply over the past year as the organization focused on delivering results more quickly, increasing its relevance for its clients and partners, and bringing global solutions to local challenges.

***Biography** – He is Practice Manager of the Global Land and Geospatial Unit overseeing the World Bank's land administration portfolio (\$1.2 billion in commitments). Mr. Muñoz joined the Bank in 1998, where he has worked on land policy reforms and land administration projects in over 20 countries across the globe, mostly in Africa and Latin America. For two years he was Head of the Bank's regional office in Recife, Brazil. He also serves as the Bank's focal point in several global partnerships related to these issues. Mr. Muñoz holds a B.S. in Engineering from Swarthmore College and an M.A. and Ph.D. in Economics from Stanford University.*

THE NEED FOR FAST, CHEAP AND GOOD LAND ADMINISTRATION

Kees de Zeeuw

KADASTER INTERNATIONAL, The Netherlands

ABSTRACT

Estimations show that about 70% of the people-land relationships are not documented. This while population grows and the pressure on land and natural resources increases. Appropriate administration of land is the start for conflict resolution, sustainable development and land use planning anywhere in the world. Appropriate land administration is defined by four aspects. First of all, the requirements of users (or citizens) should be the starting point; Not the professional or technological standards. Then three other important aspects follow: The quality of the data and systems (good), the acceptable timeframe to collect and register the data (fast) and the price of development and maintenance (cheap). The introduction of the Fit for Purpose Land Administration can be considered a new way of thinking in achieving faster, cheaper and more appropriate land administration systems for the world. Also, a good professional starting point has been developed with standards and knowledge models like the Land Administration Domain Model (LADM) and the Social Tenure Domain Model (STDM). But there is still much more to be done. Mobilising leadership, international cooperation, innovation of methods and the adaptation of modern technologies are essential parts of the cadastral actions needed.

***Biography** – He is Director of Kadaster International at the Cadastre, Land Registry and Mapping Agency (Kadaster), The Netherlands. He holds an MSc. degree in land and water management (1989). After long term contracts in Rwanda and Bolivia he has been working more than 10 years in environmental and geo-information sciences at Wageningen University and ResearchCentre. After being responsible at Kadaster for product and process innovation (2007 – 2010), he now is responsible for the coordination of Kadaster’s international activities and international cooperation projects. Kadaster International provides world wide advisory services in the domain of land administration, e-governance, geo-information services and SDI.*



The need for
Fast, Cheap & Good
Land Administration

Kees de Zeeuw MSc
Director Kadaster International
The Netherlands

We offer three kinds of service:
GOOD - CHEAP - FAST
You can pick any two

GOOD service CHEAP won't be FAST
GOOD service FAST won't be CHEAP
FAST service CHEAP won't be GOOD



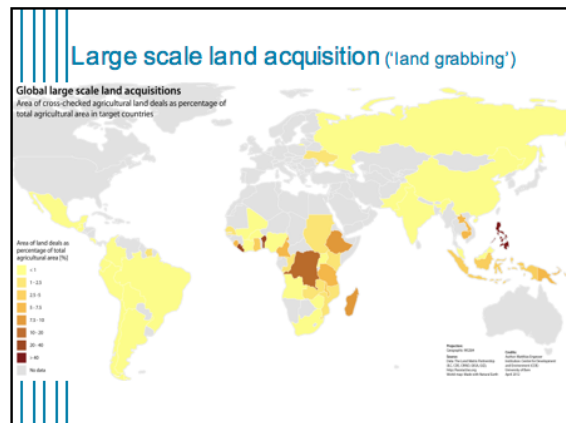
People – Land – Registrations



70% of the world: Non-existent

Need for land administration

- Poverty, slow economic growth
- Compuion and inequity
- No sustainable development



Land Administration

70%

30%

Different land rights in the world

- Formal – informal
- Property – use
- Private – state property

Source: UN-Habitat

Cadastral registration is difficult

Waiting transactions

Where corruption starts

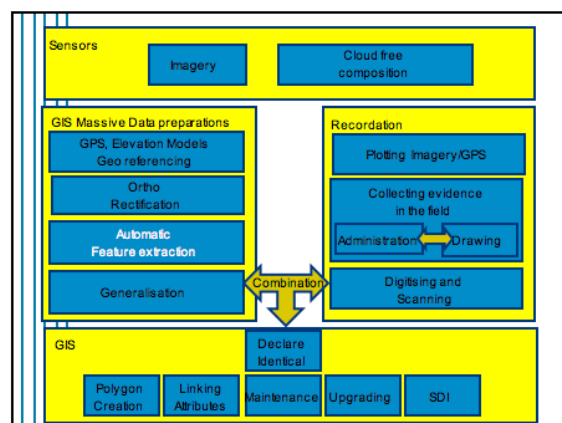
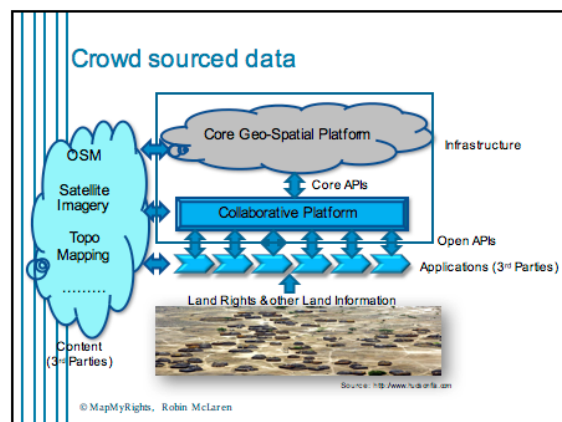
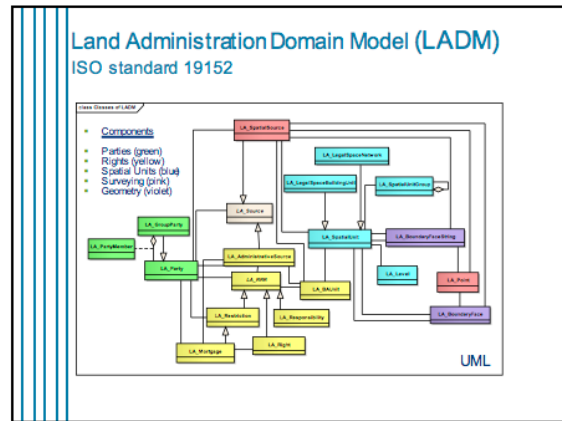
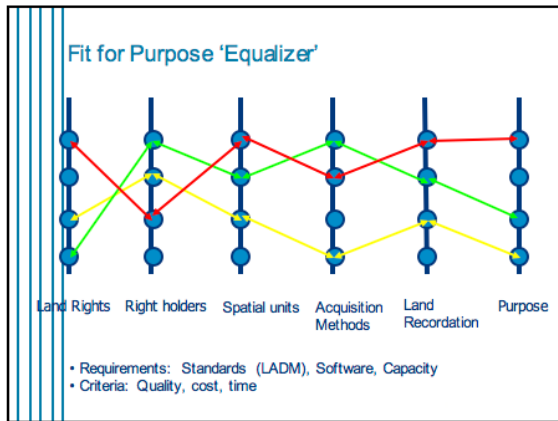
What's the problem?

- 600 – 1200 years of work?
- 5 – 2000 US\$ per parcel?
- > 100 Billion US\$ budget?
- New thinking
- New technology
- New leadership

New thinking: Fit for Purpose

Key principles:

- Visible boundaries rather than fixed boundaries
- Satellite images/orthophotos rather than field surveys
- Accuracy relates the purpose rather than technical standards
- Opportunities for updating, upgrading and improvement



Leadership

Public Private Partnership

- Shared ambition: Cadastre the world within one generation!
- The private sector is developing user-centric approaches, while governments focus on citizens, being citizen centric

Conclusions

- New **thinking** is needed
 - Fit for Purpose, integration of worlds
- New **technology** is needed
 - Automatic feature extraction, cloud & crowd, sensors, Remote Sensing, ...
- New **leadership** is needed
 - This summit
 - Public Private Partnerships
- You** are needed

New paradigm

Let us cadaster our world
and let's do it **Fast, Cheap and Good.**

www.kadaster.nl

SUSTAINABLE SPATIAL TECHNOLOGY FOR CADASTRAL SYSTEMS

Brent A. Jones

ESRI, Washington D.C, USA

ABSTRACT

There are new and exciting spatial technologies for cadastral and land tenure systems. One of the challenges is how to build systems that are both sustainable from a technology perspective, and a human resource perspective. In the past, complex, custom developed software systems were developed, but after several years, they became very difficult and expensive to maintain. Now there are dramatic advances that enable new ways to think about developing and sustaining systems. We are beginning to think of technology differently with mobile devices that are accessible to more people, the cost of high-resolution satellite imagery is coming down, and there is a renewed awareness of the importance of secure land tenure in all levels of government. Technology is addressing many past challenges of system cost, intermittent internet connectivity, and distributed service centres. This presentation will discuss spatial platform and app technologies for collecting information from crowd-sourced models to fully deployed cadastral systems, and how to design, build and maintain sustainable land systems.

***Biography** – PE, PLS. He is the Cadastre/Land Record Global Manager of ESRI. Based in Washington D.C., Brent Jones oversees ESRI's worldwide strategic planning, business development, and marketing activities for cadastral, surveying, and land administration. Jones specializes in modernizing existing land administration systems and designing new GIS-based cadastral management platforms for small and large governments across the globe. Established in 1969, ESRI creates systems that drive all components of land and cadastral administration, including addressing, registration, taxation/valuation, planning, and development.*

Sustainable Spatial Technologies for Cadastral Systems

Brent Jones, PE, PLS
bjones@esri.com

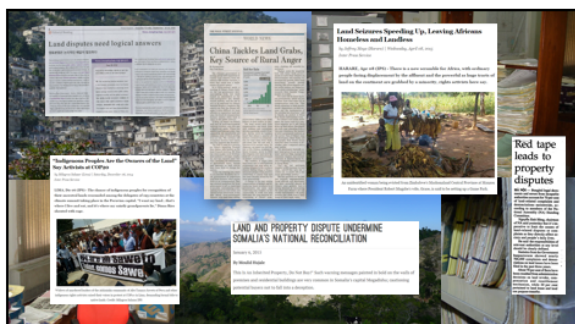


Land Administration for Sustainable Development

<http://www.esri.com/landadmin>




bjones@esri.com



Land Administration Challenges

Efficiency
 Improving Customer Satisfaction
 Changing citizen expectations
 Ad hoc mapping
 IT Resources
 accountability
 Growth
 Security
 Keeping Data Current
 Cost Containment
 new devices
 CAPACITY
 Access to data
 transparency
 standards
 Public Access
 Worldview Management

Current Situation

Kees de Zeeuw "We are in the new era of land administration"

Robin McLaren 350,000 professionals worldwide – capacity needed

Clarissa Augustinus "Let's solve this problem in our generation!"

Land Administration Sustainability Challenges

Efficiency
 Improving Customer Satisfaction
 Changing citizen expectations
 Ad hoc mapping
 IT Resources
 accountability
 Growth
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 Keeping Data Current
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 new devices
 CAPACITY
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 Worldview Management

Required for a sustainable system

- CAPACITY**
- Security
- IT Resources
- new devices**
- Standards
- transparency**
- Access to data

A Few Geospatial Megatrends



Capacity
Everyone is becoming empowered...

7 Billion people

6.8 billion cell phones.....

Increasing demand for IT Resources
Complicated custom systems are maturing – very costly to maintain and expand...

We can't afford programmers or a large IT staff.

New Devices
Tablet Users to Surpass 1 Billion Worldwide in 2015 - eMarketer

The Death of the PC Has Not Been Exaggerated

- Mark Rogowsky, Forbes

Standards
Land Administration Domain Model – ISO 19152:2012.....

We aren't as different as we would like to think.

Transparency
Sunlight is the Best Disinfectant - Justice Louis Brandeis

Open data opens new economies.

Access to Data
Satellites, drones, geodetic networks, the crowd.....

Data Availability

Why are we building from scratch?

Why are we starting over each time?



Web Services
Modern Data Sharing, Collecting and Publishing.....

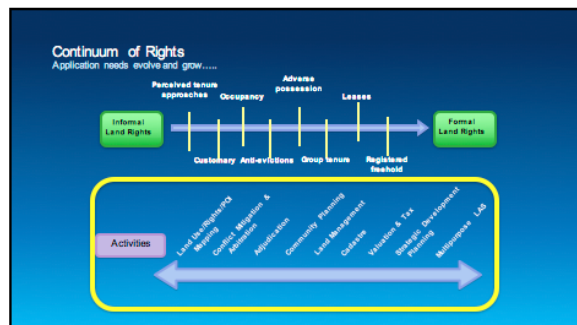
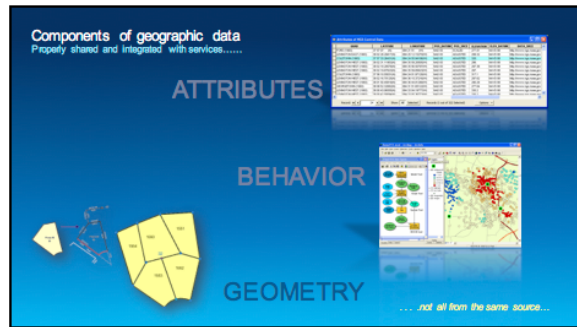
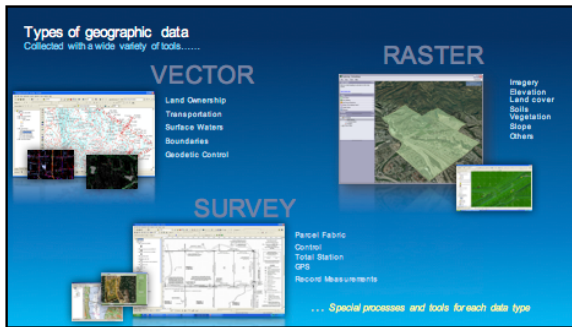
Map Services

Feature Services

Geoprocessing Services (tasks)

Both Internally and securely on the Web....





The first rule of any technology used in a business is that automation applied to an efficient operation will magnify the efficiency.

The second is that automation applied to an inefficient operation will magnify the inefficiency.

- Bill Gates

Leverage Megatrends

Leverage and grow existing capabilities....

- Capacity
- Security
- IT Resources
- New Devices
- Standards
- Transparency
- Data

6.8 Billion cell phones

Leverage Managed Technology

Cadastral Systems are Banking Systems for Land....

- Capacity
- Security
- IT Resources
- New Devices
- Standards
- Transparency
- Data








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Implement Scalable, Durable Systems

The Cloud is Part of Any Modern Solution....

- Capacity
- Security
- IT Resources
- New Devices
- Standards
- Transparency
- Data








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Plan for the Unknown

Plan for a rapidly changing environment....

- Capacity
- Security
- IT Resources
- New Devices
- Standards
- Transparency
- Data



Standardization Creates Opportunities

Many companies supporting and innovating....

- Capacity
- Security
- IT Resources
- New Devices
- Standards
- Transparency
- Data



ISO 19152:2012[®]
Geographic Information -- Land Administration Domain Model (LADM)

Citizens Understand the Value of Data

Available and usable authoritative data prevents duplication....

- Capacity
- Security
- IT Resources
- New Devices
- Standards
- Transparency
- Data



Explore 23,079 Open Datasets from 1,753 Organizations Worldwide

Usable, Accessible Data Will Grow

Current technologies are required to meet growing new data...

- Capacity
- Security
- IT Resources
- New Devices
- Standards
- Transparency
- Data



Global Basemap

Use What is Built

Use others' innovation...

6.8 Billion cell phones

- Capacity
- Security
- IT Resources
- New Devices
- Standards
- Transparency
- Data




Ethiopia Online

Global Basemap


Greece

Enhancing Cadastral Surveys by Facilitating Owners Participation



Enhancing Cadastral Surveys by Facilitating Owners Participation
George SOUKAFTIS, Konstantinos APOTILOPOULOS, Christy POFINOU and
Charalambos IOANNIDIS, Greece

Key words: Cadastraling, VLI, Cadastre, Land Administration, Mobile devices.



Desktops & Devices

People & Devices

Secure Cloud Mapping and Data

Web GIS

The sustainable platform for land administration.....



Desktop Web Device

Web GIS

Server Online Content and Services



Understanding our world.

THE CADASTRAL CHALLENGE OF THE 21ST CENTURY

Gerda Schennach

Chair of FIG Commission 7 on Cadastre & Land Management, Austria

Biography – *She is a Senior Advisor in Headquarters of the Austrian Federal Office of Surveying and Metrology (BEV). Graduated as a DI (MSc) of Geodesy from Vienna University of Technology. In BEV, where she held the position as head of a regional cadastral office for 15 years. Since 1998 she has represented BEV in several European and international organisations and associations as well in projects on Geoinformation and on public administration issues. Member of Executive Committee of EUROGI, Vice-President of Austrian Umbrella Organization for GI (AGEO), Member of Executive Board of the Austrian Society for Surveying and GI (OVG), former Vice-Chair and Member of the WG on Gender issues in the Austrian Federal Ministry of Science, Research and Economy.*

The Cadastral Challenge of the 21st Century

The Cadastral Challenge of the 21st Century

Gerda Schennach, Austria
Chair FIG Commission 7

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The Cadastral Challenge of the 21st Century

A human right

UN DECLARATION OF HUMAN RIGHTS
Article 17 par (1) Everyone has the right to own property alone as well as in association with others.

75% of global population has no access to formal land registration

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The Cadastral Challenge of the 21st Century

Land and registration

- land tenure/property is
 - of fundamental interest of citizens
 - essential for keeping economy alive
 - a part of society
- no security of interests without "registration"
- registration needs
 - political willingness
 - a legal framework
 - communication to raise awareness of value
 - acceptance of property models by society
 - technology

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The Cadastral Challenge of the 21st Century

Cadastre in society

- cadastre provides a feeling of security to land owners
- cadastre is a „local“ service
- strong personal relationship between land owners / beneficiaries and professionals
- stakeholders are considered powerful
- high responsibility for providing confidence
- cadastrial information is an asset for creating business
- more and more awareness about sensitive data and privacy
- a valuable tool for preventing from land abuse and corruption

but
sometimes too slow, too costly, not on political agenda

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The Cadastral Challenge of the 21st Century

Cadastral systems

- different requirements (taxation, geometry e.a.) but always reflecting land or housing rights
- diversity of systems linked to culture and to history
- in many countries private and public stakeholders with different PPP models
- cadastre is often still considered as a privilege to selected groups of professionals
- public authorities and professionals in private practice keep most of the information

There → Accepted → Expertise → Technology

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The Cadastral Challenge of the 21st Century

Cadastre in a changing world

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The Cadastral Challenge of the 21st Century

For society - by society

- > land owners active information providers
- > citizen as passive data providers ▶ communities
- > new age user society growing
- > user profiles changing
- > community creates their own "regulations"
- > communities get part of the (formal) processes
- > citizen are owner of information
- > quality assurance system secure fit-for-purpose -quality

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Citizen as part of the process

professionals | land owners | communities

data | data | big data

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The Cadastral Challenge of the 21st Century

Challenges for the future

Transparency | Security | Business models | Trust

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Trust

- > land owner/citizen as main partner
- > into technology/systems/ web/clouds
- > society trust systems rather than stakeholders
- > sustainability of systems
- > availability of data
- > accessibility for citizen, new silos
- > give long-term evidence on land and changes in land tenure
- > historical evidence on who and when and what (WWW)
- > transparency of conditions for access
- > transparency of processes to stakeholders
- > keep selective at data collection

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The Cadastral Challenge of the 21st Century

Transparency

- > procedures need to be understandable and transparent to public
- > training of citizen by publicity
- > transparency of business models
- > make origin of data available
- > categorize authenticity / legal status
- > community self-monitoring procedures
- > publicity of data under privacy aspects to increase quality
- > access to silos, awareness of clouds
- > transparency of conditions for access
- > track routes of information – what is where
- > clear definition of responsibilities

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The Cadastral Challenge of the 21st Century

Security


- > long-term existence of infrastructures / archives / cloud
- > key moderators / facilitators / responsibility
- > protection of data against manipulation of data
- > data grabbing
- > fraud
- > attacks by interest groups
- > alternative models of land tenure
- > leasehold, community land, shareholder models, generation property, affordable land, non-permanent land tenure
- > securing land rights and systems in post- and pre-disaster and post- and pre-conflict areas
- > archives


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Business models

- > communities produce similar products / substitutes
- > society is user **and** producer
- > public authorities take role as facilitator and moderator
- > open source technologies vers. proprietary solutions
- > power moves to land owners / society / communities
- > ownership of data (citizen, third party, community data...) and structures (hosts, clouds.....)
- > infrastructures and potential of systems for big data mgt.
- > financing / self-financing / cost-benefit models
- > open government data vers. open data
- > distributed responsibility models


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The Cadastral Challenge of the 21st Century

Civil society as stakeholder

- > requirements from society, economy, global environment....
- > role of NGOs, interest groups ...
- > role of global networks
- > role of international professional associations (FIG, ISPRS,
- > global community
- > strong partnerships, 4P Cadastre (Public, Private, People, Professionals)
- > overcome slow, costly, intransparent systems
- > raise awareness for need
- > establish sustainable systems (financing, conflict resistance, adaptable to new technologies, stable in changing environments)

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The Cadastral Challenge of the 21st Century


**FIG Commission 7 on
Cadastre & Land Management**

Chair *G. Schennach (A)*

WG 7.1 Fit-For-Purpose LA <i>Ch. Lemmen (NL)</i>	WG 7.2 LM in CC and PP Disaster areas <i>D. Pérez (CO)</i>	WG 7.3 Crowdsourcing of Land Rights <i>R. McLaren (UK)</i>	WG 7.4 Citizen Cadastre <i>G. Nán (HUN)</i>
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Joint WG C3/C7 3D Cadastre
Cadastral Template 2.0 *D. Staudler (CH)*

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The Cadastral Challenge of the 21st Century

Let us cadastre our world.....



Internat. Workshop on Crowdsourcing
 19-25 Oct 2015, Malta
FIG Com7 Annual Meeting and
Internat. Workshop C2/C7 on Professional
Qualification
 23-28 Nov 2015, Nepal

 The World Cadastre Summit 20-24 April 2015, Istanbul/Turkey

 Plenary Session 2, 21 April 2015
G. Schennach, Chair FIG Commission 7