An Assessment Towards to Innovative Cadastre Integrated with Cadastre 2034 Vision

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Key words: Cadastre 2034, Innovative Cadastre, Innovative Land Administration and Management, Data Model

SUMMARY

Looking back the few last years, it has shown a growing interest in through science, technology, through the best management of land related application, practices and approaches. And so it is intended to build and improve cadastral systems integrated with innovative domains mainly socio-economic needs of society in global world today. This is an opportunity especially for ensuring deep understanding towards sustainable land administration system (LAS) and land policy design. To successfully advance in improving to long-term strategies in fulfilling the needs of these opportunities, it should be encouraged by making considerable progress towards to innovative cadastre within the land administration functions and management paradigms. Further, these domains should be coordinated with both spatial enabled and knowledge-based society. Underline the fact that as the innovation-allowed cadastre is becoming a major component of the soci-economic dynamics and societal drivers, it helps to increase best meets on food security, livelihood security, tenure security, social security and poverty alleviation with ongoing implementation and assessment for land management and policy reforms in global world. Moving from this, the key focus is making it possible to build sustainable land administration system in response to enable securing land tenure and property rights as well. The second focus of how it could be developed to identify of new and creative most effective strategies/visions for cadastral development issues beyond Cadastre 2014. Due to scope of our works is aimed to special emphasis on building major infrastructure to innovative cadastral systems. Also it would be focused on how to move forward to new spatial framework through the development of integrated conceptual data model with designing of innovative outstanding domains mentioned above. This is the only one way to drive the evolution of the needs for the societies within growing realization to sound and meet the requirements through building innovative cadastral systems since the beginning to future.

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1. INTRODUCTION

Today continued population growth, urbanization and rising incomes are likely to continue to put pressure (Herbel et al., 2012) on land resources demand. This demand is expected to increase by 60 percent in the next years as the world's population is estimated to reach 9.2 billion by 2050. This has to be attained under existing and foreseeable constraints such as the stagnation of expansion of lands (Sylvester, 2013). Land is a scarce resource. Its management is required to contribute to solving of the severe problems the world population faces today. The total land mass is estimated at approximately 13,295 million ha, of which 1,559 (12%) is cultivated land. The needed intensification of existing land use: the cultivation of another 120 million ha and the irrigation of an extra 32 million ha, require widespread adoption of sustainable land management practices. Land administrators can contribute to solutions within the policy documents push for innovations: new land administration and land management instruments and processes are needed. Firstly the needs are summarized as (i) technical (trends and tools) such as data acquisition technology, database technology, data modeling, process design and data distribution technology, in an overall system design approach, taking into account infrastructural (SDI's), organizational and financial aspects (costs), (ii) Institutional changes as the performance of land information system should meet its purpose, namely to support the implementation of land management policies and (iii) security of land tenure" (Vander Molen, 2013). "There is an urgent need to build cost-effective and sustainable systems that identify the way land is occupied and used and accordingly provide for secure land rights. When assessing technology and investment choices, the focus should be on a "fit-for-purpose approach" that will meet the needs of society today and that can be incrementally improved over time. A country's legal and institutional framework must be revised to apply the elements of the fit-for-purpose approach. This means that the fit-for-purpose approach must be enshrined in law and that the information be made accessible to all users. The systems allow for incremental updating and upgrading. This approach will facilitate economic growth, social equity and environmental sustainability to be better supported, pursued and achieved. A fit-for-purpose approach will ensure that appropriate land administration systems are built within a relatively short time frame and affordable costs" (FIG-World Bank, 2014).

In many parts of the world "to maintain and promote the usefulness of the profession for the public advantage, securing the optimal use of land and its associated resources to meet social and economic needs" and "measuring and delineating the physical features of the earth" are the key concepts toward to enable land administration and management system (Strong et al., 2013; Aronsohn and Elder, 2013). Land administration and management is based on land policies combined with related laws for cadastre driven registration and planning. Furthermore the laws describe the institutional and public principles and procedures for the land property registration, land use planning and land development. These institutional and public principles and procedures are curial for being as a support tool to build spatial data infrastructure basis of comprehensive spatial planning related to the cadastral and topographic maps system at local, regional, national and global level for also managing agricultural and environmental development (Enemark, 2007). With a view of inspiring future land development associated with topics mentioned above, there is a need to a conceptual data model framework to enable link to land management practices. To do so geo-spatial data and spatially related information of land use is a crucial requirement for many environmental models at multi-scale as well. It is strongly involvement of a common crucial point in data modelling at regional scale is to account for management strategy with accurate spatial resolution (Gärtner et al., 2013). So within a forward-looking perspective for land and property related spatial data are key factors in helping to build land administration and management system for land use (Bell, 2009). Consequently, research through the ensuring the land use information can support users and policy makers' decisions (Chopin and Blazy, 2013).

2. LAND ADMINISTRATION AND MANAGEMENT FRAMEWORK REFERENCED WITH CADASTRE

Globally, surveying, land administration and management mainly covers people, politics and places. The people coverages are human rights (rights, restrictions and responsibilities), engagement and dignity; the politics covarages are land policies and good government and the last places covarages are shelter, land and natural resources (Deininger and Enemark, 2010; Deininger, et al., 2010). Recall that Land Administration Systems (LAS) are the basis for combining the rights, restrictions and responsibilities associated with people, policies and places. Having said this, the social, ethical commitment and attitude to environmental sustainability are addressed under the responsibilities (Deininger and Enemark, 2010; Deininger, et al., 2010), "property rights are normally concerned with ownership and tenure whereas restrictions usually control use and activities on land. Land management is about the policies, processes and institutions by which land, property and natural resources are managed. This includes decisions on access to land, land rights, land use, and land development. The operational component of the land management concept is the range of land administration functions that include the areas of land tenure (securing and transferring rights in land and natural resources); land value (valuation and taxation of land and properties); land use (planning and control of the use of land and natural resources); and land development (implementing utilities, infrastructure, construction planning, and schemes for renewal and change of existing land use)" (Figure 1) (Enemark, 2009;2010; Enemark et al., 2014).

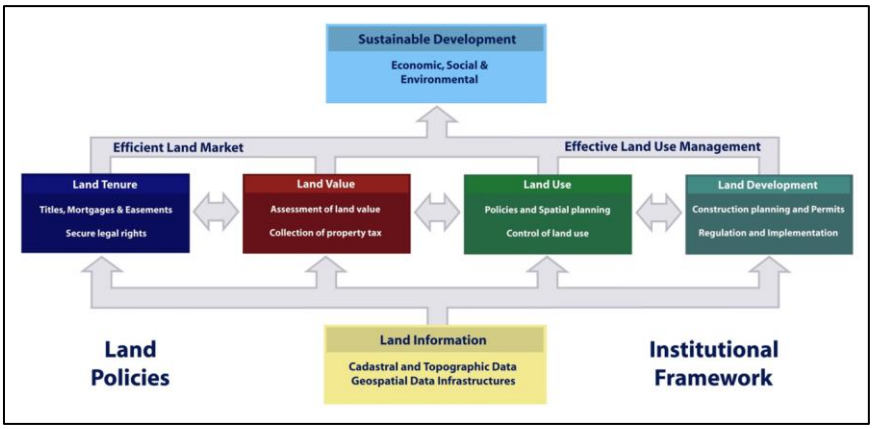

Figure 1. Land Management Framework within the Basic Needs (Enemark, 2013; Enemark et al., 2014)

For all governments, land administration and management enable access to information and service delivery. And also as well as the broader areas of National Spatial Data Infrastructure (NSDI) it presents many challenges for policy and institution accounting for future demands of land administration and managements systems (WB/FIG, 2014). "Land administration should be designed to meet the needs of people and their relationship to land, to support security of tenure for all and to sustainably manage land use and natural resources. Land administration systems provide a country with an infrastructure for implementing of land policies and land management strategies in support of sustainable development. Such land administration systems need a spatial framework to operate" (Enemark et al., 2014). Spatial frameworks cover the spatial units such as land parcels, as a basis for association with land administration functions. "This framework provides the basis for dealing with the land administration functions such as recordation and management of legal and social tenure; assessment of land and property value and taxation; identification and management of current land use; planning for future land use and land development; delivery of utility services; and administration and protection of natural resources. Spatial framework should be in response to current societal needs and available economic resources or societal, institutional and technological developments" (Enemark, 2013).

2.1 Cadastral System

As shown in Figure 2, generally, cadastral systems are organized in different ways throughout the world related to the land registration components (Enemark, 2012).

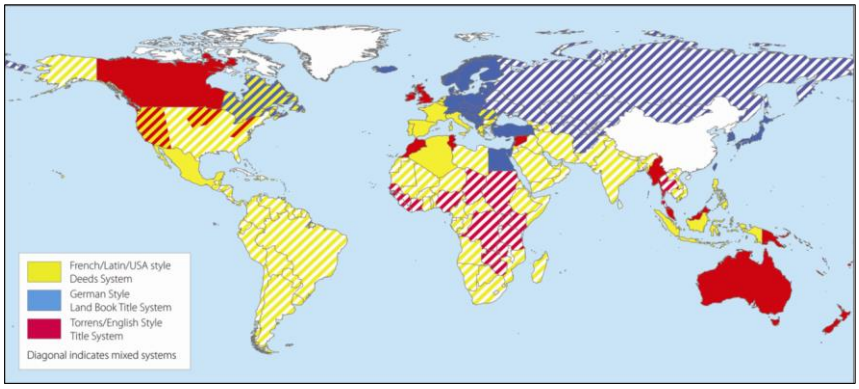

Figure 2. Land Registration System Approaches through the World (Enemark, 2010a; 2012)

"International experience suggests three basic approaches to cadastral systems. These approaches are based on countries grouped according to their similar background and legal contexts (German style, Torrens/English approach, and French/Latin style). Just as there are three different styles of land registration systems, these translate to three different roles that the cadastre plays in each system. However, given the difficulty of finding a definition that suits every version it makes sense to talk about cadastral systems rather than just cadastres" (Figure 3) (Enemark, 2012).

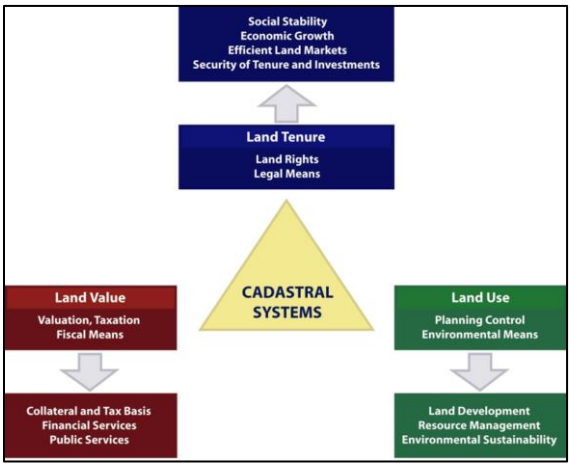

Figure 3. Cadastral System Integrated with the Land Administration Components (Enemark, 2012)

"These systems incorporate both the identification of land parcels and the registration of land rights. They support the valuation and taxation of land and property, as well as the administration of present and possible future uses of land. Multipurpose cadastral systems support the four functions of land tenure, value, use, and development to deliver sustainable development" (Enemark, 2010a; 2012). And also the work flow for cadastral system highlights the usefulness of the cadastral maps as a support tool as the representation of the land use and how people are connected to their land. And also it representations built environment and the deep understanding of land use patterns in agriculture, businesses, homes and the other application fields within the core information and data set for enabling to development an overall administrative framework to build a sustainable development in

global world (Enemark, 2009; 2010). Clearly land administration is generally based on cadastral activities. This case brings some opportunities to modern LAS to build a spatial data infrastructure and enable integration of the processes related to land administration functions (Enemark, 2013). And also the cadastral activities have an important role in helping to establish and improve the innovative techniques and best practices of LAS at any national system focused on land management (Enemark, 2009; 2010).

2.2 Spatial Technologies with Spatially Driven Innovation for Land Administration and Management

LASs are the basic information and data source for all spatially based innovation and technologies. But it is considered that how the global trends and technologies of innovation could help to managamenet of these data and information in providing inclusive, transparent and sustainable land administration services. In response this there has been a broad range of ongoing works to development of data management standards around the world. The most popular one is ISO standard on Land Administration Domain Model (LADM, ISO 19152) and European Union (EU) INSPIRE directive. They provide a growing solution of a way forward for countries as an initiaitive support tool to data management standards in adopting geo-enabling solutions to link and share data in land administration (Törhönen et al., 2013). "Spatial technologies supporting and sustaining land administration and management are increasing more modular, using standardized data models. Spatial technologies and practices that are applied explained and innovation and advancement explored, all aiming to achieve the desired results that will fit the purpose for the future. With the support of key partners and stakeholders aimed to explore appropriate and affordable spatial technologies, spatial innovations and good practices that will definitively contribute towards integrating land governance into the future development agenda" (WB/FIG, 2014).
In moving towards the year 2020 it is described a number of developments along with the innovation and technologies mentioned above are as follows; "Mature Information Infrastructure, Dynamic Process Models, 3D and 4D Space-Time Administration, Parcel Design Applications, More Than Traditional Rights, Restrictions and Responsibilities, Faster and More Direct Updating, International Seamless Registration, Semantic Web-Based Content, Mobile Applications, Monitoring Applications, Community Driven Cadastral Mapping, Open Cadastre Map" (Lemmen et al., 2011). On the other hand, many countries must aim to development data models integrated with technical standards across the country to create new opportunities and trends on land administration and management strategies (Wallace et al, 2010). Highlight the fact that "Designing Scalable and Interoperable Land Information Infrastructures such as Data Model Standards, Open Interoperability Standards, Service-Oriented Architecture and Web Services, Combining Open-Source Solutions with Open Geospatial Consortium Standards, Open-Source Strategy and GIS Solutions, Social Tenure Domain Model are some of recent innovative trends and applications. Another initiative in setting data model standards is the Social Tenure Domain Model under the wider Land Administration Domain Model developed by UN-HABITAT and FIG, which provides a standard model for social/customary tenure that ISO is ratifying and adopting" (Mclaren and Stanley, 2011; World Bank, 2011). At the end, these developments mentioned above, it provides "an overview of how science, technology and innovation can address key challenges for the future development agenda. And also it provides a forward-looking insight into the

next set of developmental challenges and policy implications surrounding science, technology and innovation applications" (United Nations, 2014).

3. RESULT and DISCUSSION

Multipurpose cadastres, Cadastre 2014, and sustainable land administration have radically altered understanding of cadastres and their potential over the last thirty years. Many of these concepts continue to be relevant. However, the world is not in stasis, so cadastral science must anticipate and facilitate emerging change. It is presented some design elements (Figure 4) relating to the role and nature of future cadastres as a starting point for further dialogue. Globalised society will affect the design of future cadastres. Firstly, will be a need for survey-accurate cadastral data; secondly, a shift in focus from land parcels to property objects. Third will be a need for height and time information, and fourth for real-time updating and accessing cadastral databases. Then there are complex commodities in the land market traded worldwide that induce the need for regional and global cadastral networks, and a requirement to model the organic natural environment. These factors will be elaborated here, including progress status and what needs to be done (Bennett et al., 2010b).

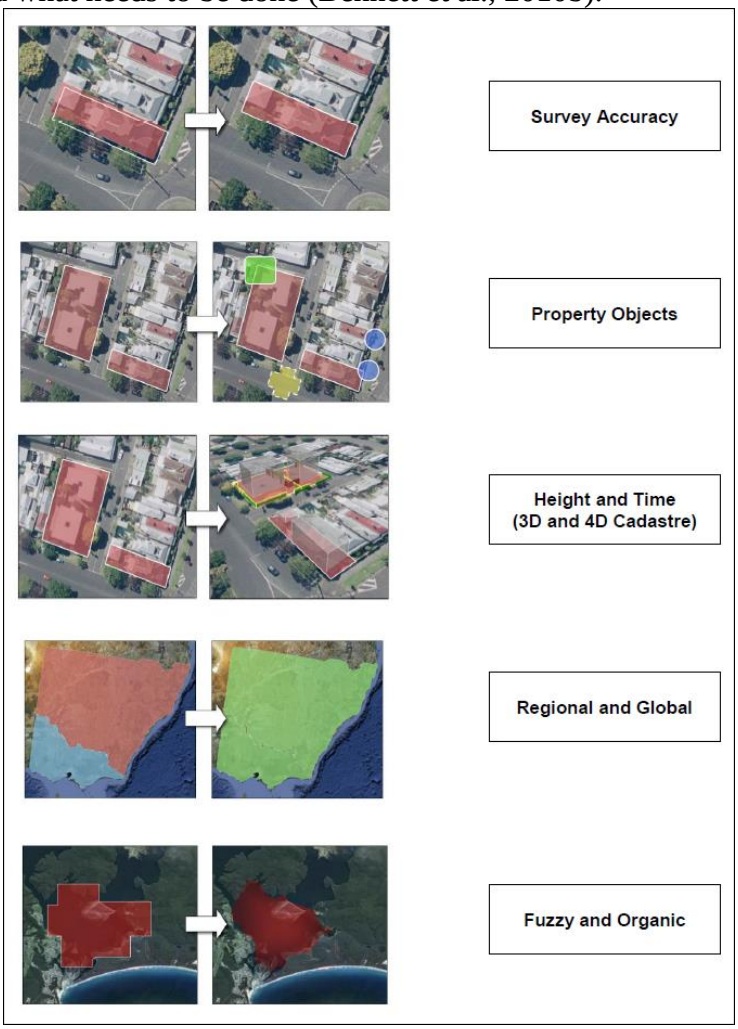

Figure 4. Design elements relating to the role and nature of future cadastres (Bennett et al., 2010; 2010b; 2011; GIM, 2011).

It is aimed to provide developing a vision on the future of cadastres. The Cadastre 2014 vision covers six topics, calling them not ‘design elements' but ‘statements'. Thus, the six design elements include; (i) move from approximate boundary representation towards survey-accurate boundary representation, (ii) focus shift from purely parcel-based systems towards systems of layered property objects, (iii) expansion from 2D approaches to include the third (height) and fourth (time) dimensions, (iv) updating and accessing of cadastral information in real time, (v) making national and state-based cadastres interoperable at regional and global levels, (vi) inclusion in property interests, now designed around strict bearings and distances or Cartesian coordinates, of modelled organic natural environment by enabling fuzzy and dynamic boundary definitions. Additionally, those involved in land administration also need to signal societal and technological dynamics that may affect the practice of land administration worldwide over the coming twenty years (Lemmens, 2010; 2010a).

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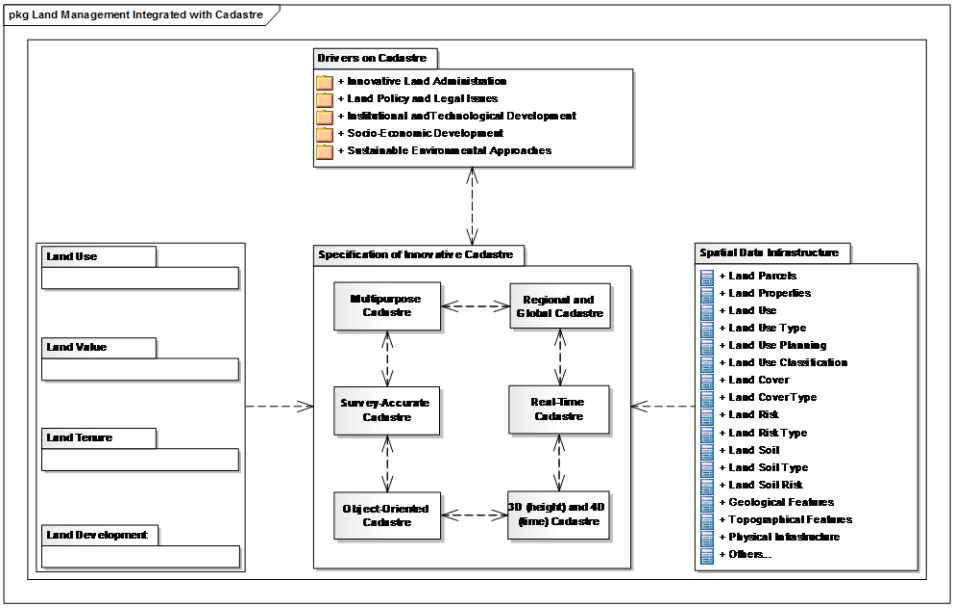

Figure 5. Cadastre as Spatial Data Framework for Land Administration (Adapted from: Ozcelik, 2013; Enemark, 2012; Bennett et al., 2010; GIM, 2011)

Moving from this, the key focus is making it possible to build sustainable land administration system in response to enable securing land tenure and property rights as well. The second focus of how it could be developed to identify of new and creative most effective strategies/visions for cadastral development issues beyond Cadastre 2014. Due to scope of our works is aimed to special emphasis on building major infrastructure to innovative cadastral systems. Also it would be focused on how to move forward to new spatial framework through the development of integrated conceptual data model with designing of innovative outstanding domains mentioned above. This is the only one way to drive the evolution of the needs for the societies within growing realization to sound and meet the requirements through building innovative cadastral systems since the beginning to future.
In Turkey, initiatives projects are developed for providing integration to vision on the future of cadastres. These are namely, Turkey National GIS (TUCBS or TRGIS) and as an information system the Land Registry and Cadastre Information System (TAKBIS). TUCBS is a project started to define national geo-data standards, to analyse geo-portal development, and to determine institutional and policy all needs and requirements (Aydinoglu et al., 2014). Thus, towards to vision of future cadastre, TUCBS (or TRGIS) provide a broad sense of development infrastructure through Cadastre 2034 design elements beyond Cadastre 2014 statements.

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