

Cadastre from the Perspective of National Development

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ABSTRACT

Also known as cadastral survey, a cadaster refers to a map containing technical and legal data on immovable property. By determining these parameters and registering them in single-sheet cadastral deeds as well as an online database, a great step can be taken to mitigate the rate of violations and crimes related to property registration, and subsequently reduce the lawsuits. Nowadays, it is critical to implement a land and real estate registration system in any country, since it can facilitate the sustainable development of the central government, provide security of tenure and property ownership rights, facilitate investment in the real estate market and the transactions, guarantee a transparent, efficient property evaluation and ultimately set the groundwork for planning and utilizing lands and achieving sustainable development. It is crucial to emphasize the fact that the Iranian economic and industrial development has posed numerous new obstacles against authorities in charge of the cadaster survey and registration of land ownership, since they have to take caution about the potential demand and dynamism of the cadaster expansion in the future. As a result, the cadaster expansion should be constantly monitored to ensure its compliance and support for adopting appropriate decisions, optimally managing the lands, minimizing the detrimental consequences of environmental changes and their consistency with the current and upcoming requirements. The continuous development of cadaster systems and their capability to cooperate with other national databases is vital for ensuring all needs are met in various economic sectors and providing reliable data update on real estate.

KEYWORDS

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Introduction

Accurate, real-time statistical data on spatial reference is critical for any macro-scale plan and decision adopted in economic, cultural, social and political areas. The spatial reference system (SRF) has for long been considered an essential infrastructure in developing countries. Nowadays, the land administration systems involve cadaster survey, land registration, land valuation, cadastral

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land uses serving the purposes of sustainable development. The utilization of land capacity refers to exploitation of resources appropriately while preserving the earth. In other words, the objective is not merely to exploit lands at the cost of destroying its resources, but it rather implies that sufficient data available on the location of urban, rural, national properties, lands, waters, rivers, seas, mines, etc. can document the truthful owners while gaining a good understanding of research projects on the location and area of each property, thereby to devise various plans for appropriate real estate management. For instance, sufficient data available on groundwater aquifers and agricultural lands across a specific region can prevent any excessive exploitation and rather promote appropriate practices, while taking into account the owners of deep and semi-deep wells and whether they have been legally licensed.

One requirement of the Iranian Deeds and Property Registration Organization is to generate and synchronize digital maps, collect and update data registries, automate the database submissions, promote the land use culture, hold educational courses and ultimately obtain consulting, supervising and executive services aimed at optimization of the cadaster project. In that light, the cadaster survey can provide the foundation for a comprehensive, multipurpose cadaster system underlying the national database infrastructure.

1. Definition of cadaster

Also known as cadastral survey, a cadaster refers to a map containing technical and legal data on immovable property. Cadastral survey has both technical and legal implications. The former involves the geographic and descriptive land information including location (GPS), dimensions and geometric shape on a large-scale map whether digital or print¹. The large-scale version of geographic and landscape data can ensure the accuracy and speed of cadaster maps, while facilitating the legal (real estate taxation), economic and political exploitation.

The descriptive data on immovable assets include property, property details, property information, area, title deeds transfer and relevant data.

Given the prevalence of digital data in cadastral maps, several items are inserted into the software program such as geometric, geographic and spatial features of the property, descriptive data online and in real-time. Hence, the distinguishing characteristic of digital maps versus similar but traditional maps is the digital data and large-scale representation, which enhances the reliability of geometric and descriptive data as well as the information transfer rate².

In a broader sense, cadaster map is multipurpose, covering all immovable assets in a country. In fact, every spot across a land is assigned a modern, digital title deed. It progressively develops a comprehensive land data system, which can improve spatial capabilities and land administration measures by delivering physical, spatial, registration and legal data. In that light, land administration can rely on basic data to facilitate administrative, economic and developmental decisions, ultimately leading to efficient spatial planning.

In a broad sense of cadaster, all lands, real estate, forests, meadows, roads, industrial zones, etc. are coded and their technical and legal data are

¹ Henssen, J.L.G "the development of a conceptual framework for the study of cadaster ", FIG congress, 1986, Toronto, p. 23.

² Simpson, S.R., " land law and registration", Cambridge University press, 1971, pp. 66-61

synchronized and updated through an electronic system and spatial database³. More specifically, cadaster serves to assign a national ID to each immovable asset, thereby to facilitate spatial management at macro level while preventing any profiteering, economic rent, etc.⁴

2. Cadaster and development

According to the International Federation of Surveyors (FIG), only 3% of lands have been registered in most developing countries⁵. For this reason, there are informal, unplanned settlements in the wake of urban development, eventually leading to poverty urbanization and slum formation. On the other hand, lands and natural resources are exposed to maltreatment due to ambiguity in land rights. Nevertheless, lands can be developed optimally through a digital cadaster system through which accurate information tools are designed in conjunction to the real estate industry⁶.

Unfortunately, many environmental problems such as climate law, data concerning the endangered/protected areas as well as numerous urban and social loopholes are rooted in insecurity due to inadequate land rights⁷.

The FIG's stressed the establishment of a pro-poor land administration system (LAS), the functions of which through cadaster focuses on the following:

- Forests and resources management
- Customary land tenure underlain by collective rights
- Identifying and recognizing unofficial properties in order to prepare them for promotion
- Identifying large-scale land rights and claims after natural disasters as a pre-cadastral stage, covering multiple families living in one residential building
- Developing databases related to post-conflict environmental claims, including those concerning property conflicts.

Evidently, there is a direct and immediate relationship between cadaster and sustainable development, where digital cadaster is undoubtedly one of the essential elements of land rights.

One of the obstacles against sustainable and optimal land development is the absence of sovereignty over the real estate and macro-scale, valuable assets such as mines, forests, meadows and so on. With regard to the absence of transparent real estate laws, the perceivable solution is to expand the land rights infrastructure and set the foundation for a digital cadaster survey. The current bottlenecks in land rights have led to poor transparency in the real estate market and ultimately *land corruption*.

There are several land-related corruptions gripping the Iranian government, including land/housing market rent and land hunger. In conflict with the developmental approach to lands, non-transparency has led to ambiguity in land rights, severely undermining land administration and investments made in the real estate market. Perhaps, one of the barriers to implementation of cadaster survey is the political pressure from some landowners and influential figures.

³An inclusive definition was proposed for cadaster in a regional meeting held by the UN cadaster experts (12-18 March, 1996) in Bogor, south of Jakarta, Indonesia, which later became well-known as Bogor Declaration. In another definition by the UN Interregional Meeting of Experts, cadaster refers to a systematic set of data concerning real estate.

⁴See Larson, G. "the evolution of the existing cadasters towards the multipurpose cadasters " FIG congress, Stockholm, 1977, p. 13.

⁵Gonzales, A. " modern technology n cadastral operations in developing countries", Canadian Survivors, 34(1). 1980

⁶Meek, op. cit. p211

⁷Shayegan, Farideh "Development Rights", University of Tehran Press, 2009, P. 123



After all, one of the major advantages of digital cadaster survey is to build maximum transparency in lands and housing.

Digital cadaster provides a desirable land administration and equitable allocation. It can ultimately help curtail poverty in the real estate and housing sector⁸. A well-established foundation can be found for appropriate distribution of national immovable assets and the right to housing by reviewing the IRI Constitution, particularly Articles 43 to 55 concerning *Economic Rights and Finance*. For instance, Article 43 points out the economic duty of the government to eradicate poverty and deprivation.

The right to housing (Paragraph 1 of Article 43) is well recognized as one of the *fundamental rights*. Moreover, Article 41 deals with non-discrimination in exploitation of natural resources and allocation of reasonable financial resources nationwide. In this regard, Articles 49 and 50 prescribe the governmental coercive and defensive approaches, where it is prohibited to *maltreat uncultivated lands* or *destroy/contaminate the environment*. Although the Iranian legislator has stipulated the equitable allocation of resources and prohibited any transgression to public properties, it is crucial to design and deploy a digital cadaster survey project in order to preserve the public rights to land/housing.

3. Significant role of cadaster in development

3.1 Significant role of cadaster in land administration

Land is a unique resource, the availability of which is limited, because availability does not expand, but consistently shrinks. Nowadays, there are increasing concerns about the shortage of land. This tension can be associated with several factors. Economic growth both in the agricultural and construction sectors can lead to greater demand for land. The population on Earth is growing, thus intensifying the demand for food products and living space. Therefore, the desired information about land use, ownership rights and distribution will be highly critical⁹.

In the scientific literature, and in describing the land as a resource, there are four major roles attributed to land administration: land tenure, land value, land exploitation and land development. The modern system of land registration encourages the essential infrastructure to integrate processes related to land tenure (security and transfer of land rights), land value (evaluation and tax levy), land exploitation (land use planning and monitoring) and land development (infrastructural facilities, construction and planning). As an important tool to fulfill the four major roles above, cadaster can support all aspects of land administration, while providing the essential infrastructure for the implementation of land policies and management strategies in a country.

In a situation where there is a huge deal of demand for land resources, one of the key tasks of land administration involves tenure. Without an efficient, accessible, non-discriminatory and transparent land registration system, it is impractical to guarantee absolute security in land tenure and preservation of ownership rights. Consequently, land tenure plays a major role in effective utilization of land. Nonetheless, it should be stressed that tenure indicates a crystal-clear standpoint concerning the ownership conflicts. Historically,

⁸ West, H,W, " the role of land registration in developing countries", chartered Surveyors, November, 1969, p.11

⁹ Boruks A, zemes izmantosana un kadastrs latvija, LLU and SLS, riga, 2001

European countries developed several different types of real estate registration systems dealing with land tenure data. Cadaster 2014 emphasizes two types of land ownership: 1) land registration and 2) cadaster. Normally, cadaster provides information about the object and answers the following questions:

How? - For what purpose is the cadastral system used?

Where? - Where is the cadastral system located?

How much? - Data regarding the area and its allocation mechanism, buildings located on the ground, and the like.

What? - Evaluation of property and its annexes;

What? - Debts and liabilities restricting the property use.

Land ownership registration primarily concentrates on the links between property and its respective owner. Land registration and cadaster are complementary, interactive and interdependent systems. In fact, there are land registration systems in many European countries, including Latvia. However, there are countries such as Lithuania, where data on real estate and owners are registered and stored in a single database.

The real estate cadaster and property registration system in Lithuania include digital, descriptive (textual) and graphical data within a single system operated by the Central Bureau of Deeds and Properties Registration in Vilnius as well as several offices in other cities. There are also sub-offices and secondary departments in local divisions in central and suburban regions. Cadaster covers the country's entire real estate and land registration system providing extensive data on properties, lands, construction operations, apartments and landscaping. The system involves data concerning legal ownership, debts and liabilities, farmhouse rights, legal facts and mortgage information fulfilling the citizen rights. The real estate cadaster and land registration data are collected in the central database, which contains information on more than 6 million property and respective rights. The central database content is made available to domestic and international customers. The entire territory of Lithuania has been divided into 1,403 cadastral regions and 9,949 blocks. The rural cadastral region spans approximately 4,300 hectares. The territory of each city has been assigned to one cadastral region. The cadastral boundaries cannot cross the municipality boundaries¹⁰.

The information stored in the real estate database are realistic and reliable. The data are ensured and protected by the data transfer network providing an online connection between the central database and local offices.

Land is an incredibly valuable asset, typically constituting the national wealth in developing countries¹¹. The income from land is obtained in different ways, to the extent that land can be stated to be a multipurpose resource. As can be seen in Figure (1), land uses can be divided into four major categories.

- Land exploitation for environmental protection;
- Land exploitation for production.
- Land exploitation for social applications;
- Land exploitation for housing or urban utilities.

The abovementioned land uses are closely linked and interdependent. The exploitation of agricultural and agri-environmental lands may change according to regional policies and numerous other apolitical factors such as climate

¹⁰ Daugaliene V. (2004). Report based on Exchange Programme documents. Budapest: Celk Center, pp. 165-204

¹¹ Kunte A., et al (1998). Estimating National Wealth: methodology and Result, Prepared Environmental Department, World Bank.



change, demographic shift and globalization. The environmental consequences of change in agricultural land exploitation is complicated, because such changes can affect other uses of agricultural lands, crop composition, permanent crop cultivation and pastures and ownership rights concerning land and water¹². These land uses can be enforced by providing the relevant data. It has been demonstrated that 80% of all official decisions on spatial data are adopted according to cadaster information.

If cadaster was initially established to serve financial purposes, its modern version should handle many functions. Hence, cadaster is referred to as a *multipurpose* system. The mission of a multipurpose cadaster is to provide information that can meet the needs of all land exploitation possibilities. Cadaster is primarily responsible for sustainable development of land as one of the most fundamental natural resources. Land exploitation is greatly diverse and multipurpose. Moreover, cadaster is supposed to provide the necessary information for decisions based on balanced utilization and sustainable development in case of construction land uses.

One of the functions of land exploitation is food production or agriculture, which is in principle a space-specific activity through which rural development takes place. Hence, the information on real estate structure and division in rural areas is crucial, cadaster includes information about the property and its composition, type of land use, land exploitation purposes and so on. As the land resources shrink, humans need to make systematic use of lands. Furthermore, land consumption and urban expansion are inevitable, but can be regulated. The law includes the land exploitation regulations and restrictions. The land exploitation planning can stipulate legal provisions that restrict land ownership. The land development plan is a document, where the opportunities, instructions and limitations of development and exploitation are outlined by the municipality as well as the vision of local land use. One of the items stipulated by this development document involves any kind of construction operation such as railway and infrastructural facilities¹³. These plans are relatively extensive, reflecting the authorized projects for construction of infrastructural facilities within a given geographical territory and restrictions imposed on exploitation of those territories under the long-term vision (12 years) for each lot. One cannot escape the fact that many of the planning procedures are time-consuming. In fact, 75% of the initial resources are spent on collection data collection, acquisition and preparation. Only 4% of the financial resources are dedicated to effective planning. The new cadastral survey system can be adopted to reverse that ratio to 25-75%¹⁴. The sustainable land exploitation planning should employ cadaster as an essential prerequisite.

The agrarian policy should be adopted based on reliable spatial data and updated information about real estate, land exploitation and vision. The agrarian policy has been enforced in Latvia by implementing a land administration law project, where an in-depth focus has been shifted on rational use and protection of land resources. This law intends to generate a land report, based on which the key aspects of the agrarian policy can be evaluated. In that respect, land is deemed a valuable item in legal context. The land report will

¹² UN Economic Commission for Europe(2010).Policy Framework for Sustainable Real Estate Markets. UNECE, Geneva.

¹³ Organisation for Economic Co- operation and development(2009).Farmland conversation: the Spatial dimension of agriculture and Land-use policies, OECD

¹⁴ Kaufmann. J. (2008).The Boundary Concept: Land Management Opportunities for Sustainable Development Provided by the Cadaster 2014, Approach, FHG Working week 2008, Stockholm, Sweden.

provide realistic, transparent data to define the priorities of the agrarian policy, improvement of land policies and efficiency evaluation of development and executive policies. The land report will be employed by the government institutions and municipalities in charge of realizing the agrarian policy. A summary of the land report will be prepared based on cadaster data as well as information retrieved from other general databases.

3.2 Cadastral systems in sustainable development

The relationship between ownership rights, sustainable development and environmental management has been declared clearly in the World Development Report 1992 titled *Environment and Development*, (World Bank, 1992). The report first explains the relationship between environmental management and development. "Environmental protection is an essential part of development. Development will be undermined without adequate environmental protection. Without development, resources required for investment will be insufficient and environmental protection will fail."¹⁵

The report states that "there are extensive measures to be taken for expanding income, reducing poverty and improving the environment especially in developing countries. These *win-win* policies include... identification of administration and ownership rights to lands, forests, and fisheries¹⁶." The report goes on arguing that there are numerous policies capable of realizing better environmental management, but two policies are particularly important: 1) eliminating the complexities leading to excessive consumption of resources and 2) clarifying the ownership rights."¹⁷

The report elaborates on the emphasis regarding ownership rights as follows: "When the ownership rights to natural resources are not in place or left unenforced, when access is granted limitlessly, no one can be held fully responsible for environmental degradation, and there will not be any mechanism to regulate the exploitation of resources. This will ultimately lead to misuse of resources..."¹⁸

The report specifically protects the rights of private land, "When the lands belonged to and were managed by the private sector, there were no such environmental problems. If the owner is a specific legal individual, the land is less likely to be subject to excessive land exploitation. When individual ownership is guaranteed, people are more likely to put the land under cultivation, but they will administer the farm through a brighter foresight."¹⁹ The report continues, "stipulation of ownership and exploitation rights will improve the environmental consequences, particularly when everyone investing in environmental protection will gain greater benefits."²⁰

The report provides examples to associate ownership rights to appropriate land farming, "When people have free access to forests, pastures, etc., they tend to overuse them. Granting land ownership to farmers in Thailand has helped reduce damage to forests. The transfer of ownership to the slums in Bandung, Indonesia, tripled the domestic investment in health facilities. Securing the

¹⁵ WB Report, Page 2

¹⁶ WB Report, Page 2

¹⁷ WB Report, Page 10

¹⁸ WB Report, Page 70

¹⁹ WB Report, Page 137

²⁰ WB Report, Pages 68-69



ownership rights of farmers in Kenya reduced soil erosion across hills. Recognition of land rights in Burkina Faso greatly improved land administration."²¹

In an article jointly written by the Land Tenure Center at the University of Wisconsin, Madison and the World Bank, Wachter (1992) explored the link between land degradation and land conservation, while evaluating the land ownership document from an economic perspective. Nonetheless, his focus was primarily on agricultural lands in Africa. In order to investigate the desirable solutions, he argued it is essential to concentrate beyond private freehold land ownership, rather covering the joint ownership and governmental ownership scenarios. He argued that land title deeds are useless when official land laws are gone. He demonstrated that land title deeds and legal registration are required when there is uncertainty concerning the application and effectiveness of local systems and effectiveness of the land use and real estate transactions system.

However, Wachter believed the proposition of *organization and legislation* was critical for the protection of any land-tenure-based system, because it specifies to a certain extent the costs and benefits of land ownership and tenure for the clients. At the end, he argued that land title deeds should not be deemed isolated in land preservation, but should rather be consolidated into a sustainable development strategy, where land ownership is only one component.

Agenda 21

Agenda 21 was a key outcome of the United Nations Conference on Environment and Development (UNCED) at Earth Summit held in Brazil in 1992. The agenda elaborates on a number of key topics interesting to land managers. The topics included access to information, development of suitable databases, information exchange, land use and transport planning, legal frameworks and particularly land tenure. Bayern stated that Agenda 21 requires us to build efficient land markets. It also requires us to implement a desirable tenure procedure in line with protecting all land users, especially the indigenous people."²²

Bayern enumerated several key activities or principles enunciated in Agenda 21, outlining the significance of a cadastral system in sustainable development and environmental management. These principles include explanation of acquisition, habitat, land information systems, land administration, land registration, land tenure, land ownership, legal framework and secure tenure.

In reviewing the outcomes of Agenda 21, the United Nations Center for Human Settlements (UN-Habitat 1993) promoted the sustainable development of habitats, putting an emphasis on appropriate land administration practices adopted in urban areas.

The above declarations by the World Bank and the United Nations confirmed that recognition of private ownership is are crucial as an integral part of an effective cadastral system for sustainable economic development and environmental management across rural and urban areas.

4. Diverse roles and implications of a cadastral system

4.1 Cadaster underlies economic justice

²¹ WB Report, Page 12

²² Berzina M, Rudzite S, Parsova V., et al. (2013). Kadastrs no viduslaiku nodevu saraksta hdz modernai informacijas sistamai daudzfunkcionalam kadastram, State Land Service. Riga.

In addition to realizing one of the manifestations of economic justice (the right to housing), the digital cadastral survey can facilitate the fulfillment of social justice (rights of access to land) and legal/judicial justice (land security and establishment of an equitable taxation system).

Needless to say, the realization of social justice can be facilitated by providing security in the investment and housing markets, improving the land identification and addressing systems, and ultimately social and economic sustainable development.

Cadaster is also an essential factor contributing to expansion of E-government and modernization of land rights and environmental management, leading to the fair allocation of land resources. By compiling a comprehensive digital multipurpose cadastral map, the government can appropriately distribute and redistribute lands and real estate, thereby to build an equitable system backed by efficient legal groundworks.

Another implication of social justice in supporting the deployment of cadaster is the creation of new job opportunities and subsequently reduction of inflation and expansion of active workforce. This is also a key factor contributing to mitigation of poverty and promotion of living standards²³. For instance, if an advanced land law is ratified and enforced, ambiguity will shrink in the real state data, which in turn facilitates investment and budget allocation. The outcome of such macro policymaking will prevent land hunger while benefiting the social strata by abundant, renewable land resources.

4.2 Macro functions of cadaster

The macro functions of cadaster revolve around land administration and spatial management. The cadastral survey contains a series of geometric and descriptive information on land (i.e. area, dimensions, buildings, villas, gardens, forests, urban and rural housing, etc.). Hence, the mainstream reference is known as *land information system* or Territorial Database as noted under Article 3 of Executive Bylaw, Article 156 of Property and Deeds Registration Law. The land information system contains geographic, natural and legal data either formerly or subsequently. In that light, the land information system provides data on lands, thereby to build territorial capability for information availability and exchange. Strictly speaking, spatial data are one of the most sensitive factors contributing to everyday life decisions. For that reason, many organizational requirements, goals and activities are fulfilled when access to spatial data is facilitated within an integrated system. This is particularly critical for devising future plans. Relying on spatial data, a better land administration can be achieved in various economic, social and environmental realms²⁴.

An efficient land administration can improve the living standards, accelerate the progress towards sustainable development and promotion of financial, legal, economic and social structures. In most countries nowadays, including the International Federation of Surveyors (FIG), there is a research center for spatial data infrastructure and land administration. Every year, several conference are held on real estate market administration. In one of such conferences held in Australia during November 9-11, 2005, the subject was titled

²³ Demsetz, H, "toward a theory of property rights", American economic review, No 57, 1967, p. 98.

²⁴ Blachut, T. J. and Villasana, J.A, " Cadastre, various functions, characteristics, techniques and planning of a modern land record system", National Research council Canada, Ottawa, 1994, p.39-45.



Sustainable Development in ICT-enabled Land Administration". This conference sought to devise a national perspective for land administration in Australia based on modern information and communication technology, putting an emphasis on 3D or 4D digital cadastral surveys. In fact, it was argued that adoption of a digital cadaster would bring about optimization of land administration owing to involvement of modern technologies.

Land administration can provide a desirable space for planning and devising policies in civil development, political, legal and other realms. For instance, a good understanding of land geometry across different regions can facilitate the planning in desert, road and industrial tourism sectors, while employing the land information system as a fundamental resource in completion of construction projects. At later stages, this can be adopted in the country's policies on provincial geographical area, etc. The land administration serves registration and judicial purposes while providing reliable data to resolve public disputes and conflicts. Hence, the adoption of cadaster and its macro function can create plans to navigate governmental guidelines. In other words, the cadastral survey will prevail the mechanism of national energy and manpower allocation based on spatial data.

The most important outcome from the macro function of a digital cadastral system is discipline in land structure and fulfillment of an inclusive sustainable development. Another instance of this function can be found in the urban economy, agricultural economy and market economy. An example of urban economy is the procedure of land division, architectural practices in residential buildings owing to robust data, land geographical value and urban management and planning practices²⁵.

One instance of agricultural economy is the presentation of data regarding land potentials, soil type, age and quality, climate, etc. One instance of market economy is the dependence on population density, where market centralization or decentralization is raised. It will ultimately contribute to national income generation and urban wealth and facilities distribution.

Furthermore, environmental preservation arises from the land information system. Accurate data and appropriate policies will determine which kinds of animals, waters, forests, minerals, etc. should be conserved and to what extent they should be exploited. Hence, the macro function of cadaster either directly or indirectly overshadows the entire natural and land resources, leading to deeper insight concerning short-term and long-term planning.

4.3 Diversion

Registration offenses refer to any criminal act or omission committed during or after the registration procedure, violating the property and deeds registration laws and regulations. Such offenses are significant both in terms of frequency and implications. The registration offenses are deemed a recently emerged variant of financial malfeasance at national and international arenas. In fact, they can hinder the development and prosperity of human societies as well as the socio-judicial relations. Similar to other scenarios, registration offences preventive measures tend to be more effective and less costly than repressive, retributory measures. In line with minimizing or eradicating these factors, it is crucial to take actions including the deployment of a comprehensive cadastral

²⁵ Sullivan, translated by Jafar Ghaderi, Discussion on Urban Economy, 1st volume, Nour-e Elm Publications, 3rd edition, 2009, P. 237 and 284 onwards.

survey. In principle, cadaster refers to a system serving to outline the ownership scope together with legal information concerning each property.

Implementation of the comprehensive cadastral survey is directly correlated with mitigation of registration offenses. It can build transparency in formal real estate transactions and registration inquiries, establish the scope and details of acquisitions and issue cadastral title deeds under the cadaster project, which ultimately prevent any forgery and consequent lawsuits.

The deployment of the comprehensive cadastral survey can particularly eliminate the opportunities to commit certain registration crimes, while remaining ineffective regarding other cases. This project can be most effective when the property and deeds registration law is adapted to the cadastral survey. In addition to the comprehensive cadastral survey, there are other preventative measures against registration offenses, one of which is electronic fingerprint devices recently set up at notary's offices.

The cadastral survey can greatly eliminate the opportunities to commit registration crimes, thus minimizing the subsequent litigation. There are several types of registration offenses restricted through implementation of cadastral survey, including incapacity claims to evade debts to other parties, conflicting obligations and transactions, trading a property with conflicting title deeds. Furthermore, the real estate registration offenses (deemed forgery) include counterfeiting/falsification in official documents (addressing the servicemen at property and deeds registration offices) and false confirmations, which can be mitigated by enforcement of the cadastral survey project.

Another instance of registration offense is betrayal of trust, including collusion between a real estate agency and clients registering endowed, confiscated or eleemosynary property, regarding which any registration offenses can be minimized through the cadastral survey.

Fraud makes up a large fraction of registration offenses, covering the following: application to register the property owned by others and impersonation, application by trustees to register the property owned by others, collusion or betrayal by the trustee and a few accomplices to register a property under the name of an untruthful owner, claiming ownership regarding the property of others and applying to register untruthfully, refrainment from transferring the right to the true owners and disproving their right to refund in transactions and refusal from reflecting the rights of natural/legal entities to part or all of the property or deeds destroyed due to war and unexpected disasters in the application form submitted by the client. These registration offenses can be minimized through implementation of the cadastral survey.

4.4 Urban planning and management

The geo-spatial data create the favorable groundwork from the social and urban points of view. The social outcomes of cadaster are urban planning, improved services, improved addressing, land use planning and environmental conservation. These outcomes will all promote the living standards, eradicate poverty and deliver valid statistics.

Cadastral systems are widely capable in utilization of spatial designing and planning²⁶. All agencies somehow engaged in spatial activities (e.g. municipalities) need to adopt the cadaster information system in order to

²⁶ Dale, P.F. and McLaughlin J.D. " Land information management ", Clarendon press, Oxford, 1988, p. 198.

accelerate their tasks at hand. The municipality projects are highly dependent on cadaster at the feasibility and location stages. An inclusive cadastral survey can outline all properties, whose prices are recorded in the multipurpose cadastral system, can estimate the costs of each project in terms of land acquisition.

Given the key role of cadaster in urban projects, it is asserted that 60% to 85% of Iranian urban projects suffered losses due to lack of a cadastral system. These projects were occasionally proven unfeasible with huge margins between the detailed plan and the executive plan. Furthermore, the roads data on cadaster maps can greatly minimize the urban project expenditure on road design and construction.

Another application of cadastral survey involves the permits granted to construction projects. On the macro scale, such system will provide the only solution to optimal urban management in the realm of construction. One beneficial implication of cadaster can be a reduction in unauthorized construction activities and transactions across urban areas.

Naturally, such measures to control the permits granted to construction projects can benefit the environment, since the perfect information layers in a cadastral system will facilitate the urban development plans.

As the metropolitan regions expand violently in the developing countries, the governments are assigned the critical task of efficient urban management, in which the adoption of real-time, accurate maps is inevitable. Moreover, it is critical to employ the digital cadaster data (3D and 4D) to monitor the construction activities.

4.5 Improvement of organizational services

The service organizations involved in telecommunications, electricity, gas, sewage and so on, can also benefit greatly from cadastral systems. In fact, the organizations can adopt the cadastral system to identify subscribers, estimate the building areas, land uses and utilities. Moreover, the cadastral maps help detect how the water, sewage, telephone and gas grids cross the lands.

Cadaster can improve the addressing system and semiotics in the municipality. Since cadaster deals with registered plates, it is considered the most efficient strategy for improving the addressing system. Secure addressing is effective not only in urban traffic and shipping, but also in economic, political and sanitary affairs. For instance, cadaster can serve as a vital element in correct, systematic addressing where the complicated practices confuse the judicial services (e.g. court notifications) and health care/emergency services and as well as fire and transport services. Adopting cadastral surveys, advanced countries have simplified addresses through an accurate addressing system.

4.6 Economic implications

The economic implications of a cadastral survey can be divided into two categories: 1) preventive (defensive) and 2) positive. Instances of preventive implications are prevention from land hunger, mitigation of corruption in government institutions, prevention from information rent and so on²⁷. The positive implications concern the creation of new job opportunities, improvement of the financial system, expansion of investments made by natural entities in the

²⁷ Bernstein, op, cit, p .156.

economy, strengthening the national income²⁸ and maintaining a balance in the real estate market. The following will explore a few other positive implications of cadastral surveys.

4.6.1 Improving economic efficiency

The appropriate real estate data management can be facilitated by controlling the inflation rate and expanding real investment in the economy. Hence, the economic efficiency at macro scale can be improved through deployment of a cadastral system.

Owing to a large volume of data on immovable property, cadaster can provide the desirable groundworks for real estate transactions and market performance. Subsequently, the market adopts the cadastral information so as to guarantee the security of transactions while accelerating the ROIs. Such trend in the real estate market leads to massive development and financial relations within the economy, thus facilitating the employment rate and GDP²⁹.

4.6.2 Improving of tax revenues

Improvement of tax revenues is one of the aspects of greater economic efficiency. Since this implication is crucial, this section elaborates on the scope of tax revenues. Tax levy on property is one of the primary applications of cadastral systems and a major cause behind why they have been developed³⁰. As the cadastral purposes and applications expand, tax revenues become more important, since it is facilitated by accurate data on regions, areas, land uses, owners, etc. which are all constituent elements of a typical cadastral system.

An overview of the revenues from property taxes in Iran would reveal that the tax revenues amounted to 136.4 billion IRR over 1991-1997, during which the average property tax in Iran was 0.0003% of the general revenues and 0.016% of total tax revenues. The same figures were 3% and 10.8% in the USA, 3.2% and 9.3% in the UK and 3.3% and 3.9% in Canada³¹.

Accordingly, any corrective and restorative actions taken to raise the tax revenues will prevent evasion and establish an equitable economic system, which can easily lead to attainment of a non-oil economy (single-product economy). Furthermore, the cadastral system can provide the essential spatial data on insurance, government charges and various investments.

Conclusions

Cadaster serves diverse functions in line with sustainable development and optimal utilization of territorial capacities, including environmental conservation, meteorology, vegetation evaluation, optimal land capacity management in the agricultural sector, water resources management, environment and tourism, wetlands management, development of schools, representation of ethnic cleansing, urban and rural management, traffic management, spatial location of fire stations, addressing, real estate market

²⁸ Bennett, Rohan, "organizing land information for sustainable land administration", Journal of land use policy, 2007, p. 28.

²⁹ *ibid*

³⁰ Feder, G, "the economic implications of land ownership security in rural Thailand", paper presented for the world bank seminar on land information management", Annapolis, MD, 1986 & "land registration and titling from an economic perspective", Survey review, 29, 1987

³¹ Berenjkari, Hamid, *IBID*, P. 37



development, fair and efficient property tax levy, supporting complicated markets and permit/license management

Activities related to land administration can be defined in terms of three components: agrarian policy, land information infrastructure and territorial administrative practices in support of sustainable development.

Agrarian policy encompasses different land uses in promoting the national policies, goals, economic development, social equity and political stability. Agrarian policies can be accompanied by ownership security, land markets (especially real estate transactions and access to credit), real estate taxation, stable management and land/natural resources/environment use control, procurement of land for the poor, ethnic minorities and women; and measures to prevent land hunger and territorial conflict resolution.

Despite the fact that cadastral systems around the world clearly differ in terms of structure, process and actors, they are designed increasingly through globalization and technological progress towards multipurpose cadastral surveys. The traditional cartography, mapping and land registration have transitioned from developer-based into user-based. The success of a cadastral system depends on how it digests the changes to achieve large-scale social, economic and environmental goals.

The integrated land use management should be exercised based on policies underlying the general regulations of agrarian policies such as the Land/Cadaster Registration Act and Construction/Planning Act, which are recognized as formal guidelines prevailing the property and deeds registration practices, land use planning and development. There are more prominent policies adopted by different administrative sectors, covering several areas including agriculture, forestry, housing, natural resources, environmental protection, water, artefacts, etc.

The comprehensive planning control is based on a modern land use system such as cadaster, land books, real estate valuation registration and so on. The property and deeds registration system resembles an integrated network connected to cadastral database and topographic maps, employed as a spatial data infrastructure in built environments.

In the land use system, the various user interests' management plays a moderating role against the overall development goals of a region. Consequently, lands will be used through planning permits, construction permits and exploitation permits according to the relevant laws and regulations.

Desirable land administration will help promote economic and social development in urban and rural areas. Throughout their developmental transitions, countries need to modify agrarian policies. The current obstacles mainly concern the capacities essential for educational, professionals land uses and organizational standards.

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