

An Evaluation on Current Turkish Cadastral Systems in Accordance with FIG Cadastre 2014 Statements

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SUMMARY

When worldwide cadastral systems are taken into consideration, it is apparently seen that legal cadastres are evolved from taxation purposes and multi-purpose cadastres are evolved from legal cadastres due to the latest advances in economic, social, political and technological issues. FIG Cadastre 2014 Vision was accepted as the most important criterion for the purpose of setting up the components of future multi-purpose cadastres in all countries. Since we arrived to the year of 2014, we performed an evaluation on Turkish Cadastral Systems in accordance with the six fundamental statements of FIG Cadastre 2014 Vision Report and implemented comparative analyses on obtained results in order to have the most vital requirement for modeling the future vision of our country's cadastral systems. For this purpose, this paper focuses on a broad investigation on legislation improvements which is done by government and administrative processes of Land Registry and Cadastral Modernization Project with all components (Improvements and Updating Land Registry and Cadastre, Improvements in Services, Improvements in Human Resources, Developing a Real Estate Valuation System and Project Management). On the other hand, new information systems (Land Registry and Cadastre Information System, Spatial Real Estate System, Turkish National Permanent GNSS Network, Map Databank and Turkish National GIS) that Turkey has been developed so far, are introduced briefly. The paper is concluded with determining what Turkey has done so far and what it will have to do in the future for its cadastral systems in order to supply a sustainable land administration system.

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1. A BRIEF HISTORY AND CONTENT

1.1 Cadastre 2014 Vision Report

During the 20th FIG Congress in 1994 which was organized in Melbourne, FIG Commission 7 which concentrates on Cadastre and Land Management decided to develop a vision for the purpose of improving worldwide cadastral systems for following 20 years; thus, this commission set up three working groups that would study on defined purpose for 4 years. The head of the 1st Working Group, Jürg Kaufmann and the secretariat Daniel Steudler, primarily prepared a questionnaire form in order to define the trends related with the topic. The form contained questions related with legal and institutional characteristics of cadastre, planning facilities and control systems, multi-purpose cadastre, responsibilities of public and private sector, future trends and ongoing reforms (Ulger, 2010).

According to responses, most of the participant countries have title and/or deed registration system, a legal theory based on a civil law, compulsory registration of property rights, integrated mapping and land registration, coverage across country, service administration by public sector such as mapping, land valuation, environmental impact evaluation, strategic planning and taxation purposes. On the other hand; limited automation, inadequate linkage between land registration and cadastre, problems in financial, administrative and organizational issues were claimed to be weak features of current cadastral systems in the world.

The evaluations on questionnaire forms forwarded to six main statements on which comprehensive discussions were done in 1995 Delft, 1996 Budapest, 1997 Penang FIG Working Weeks. Finally, an eventual report called “Cadastre 2014” that presented a new vision, was published in 1998. In the report, not only the cadastral vision of the future, but also current situation of cadastral systems, reform projects and surveyors’ role for Cadastre 2014 Vision were well-described.

1.2 Six Statements of Cadastre 2014 Vision

1.2.1 1st Statement of Cadastre 2014 Vision

Depending on the results of the questionnaire, there are currently two fundamental types of land registration systems in the world. The first one contains a cadastre with boundary definitions, measurements and mapping processes, supported by a “land registration” with registration of property rights in title books. The second one, “land recording” where there is

An Evaluation on Current Turkish Cadastral Systems in Accordance with FIG Cadastre 2014 Statements (7586)
Nihat Enver Ulger, Cengiz Yildirim and Can Iban (Turkey)

no obligation to define, to measure and to map boundaries, but notaries/lawyers take a role in contracting and recording property rights. Both systems have a state guarantee of property rights based on laws and states put some restrictions on these property rights because of increased land necessity for public interest. However, when these restrictions are not stated in maps and land records, not only administrative institutions but also individuals would have difficulties in determining legal status of land parcels, therefore it would increase time and finance loss. Hence; the first statement of Cadastre 2014, in parallel with a thorough definition of “land object”, foresees that future cadastres should be more comprehensive and show all legal status of land, including restrictions.

1.2.2 2nd Statement of Cadastre 2014 Vision

In the second statement of Cadastre 2014 Vision, it was reported that the systems that have duality of cadastre and land recording components where the cadastre component is fulfilled by surveyors and land recording component is fulfilled by lawyers / notaries, might be monotonous, inconsistent and might cause cost increase, even though there is a possibility to implement cross control. The statement foresees that the future cadastres will not only be limited to mapping purposes, but also will contain more land-object oriented components; therefore, responsibilities of surveyors that are interested in technical concept (cadastre) and notaries/lawyers that are interested in legal concept (land records) will significantly change. Considering the fact that both disciplines will be run together, the separation between maps and records will be eliminated in Cadastre 2014 Vision.

1.2.3 3rd Statement of Cadastre 2014 Vision

Third statement of Cadastre 2014 Vision states that in the process of classical mapping production; the measurement of land details and creating maps based on these measurements need notably effort, capability and time; correspondingly these maps can be archived in defined scales, even though the new technologies of our era bring important changes in map production and archiving techniques, for example, Remote Sensing and GPS technologies enable to perform a straightforward acquisition of land details, displaying and storing collected digital data in desired size, media and scale and sharing these data with users. Assuming that classical mapping production and storage methods will be removed, these systems will evolve to “Cadastral Modeling”.

1.2.4 4th Statement of Cadastre 2014 Vision

The fourth statement of Cadastre 2014 Vision goes parallel with the third statement and claims that spatial datasets of objects that are obtained with classical cadastral facilities will be digitized in order to be a base for data processing models because of increased technology supply. All works that are done with pencil and paper (manually) will evolve to automated computer systems for implementing more user-friendly, efficient and cost-effective cadastral system.

1.2.5 5th Statement of Cadastre 2014 Vision

The fifth statement of Cadastre 2014 helps us to understand that public sector is the only responsible for the purpose of maintaining the security of land registration system by setting up and sustain a cadastral system, although these systems that are driven by public sector have not elasticity and they are stricter in customer-based facilities than private sector. In a world where privatization attempts and other re-arrangements take a significant role in countries' policies, cadastral organizations should open their doors to private sector; hence private sector will be effective more in control and supervision tasks for the security of land registration; but, private sector will take role densely in setting up and maintaining cadastral systems.

1.2.6 6th Statement of Cadastre 2014 Vision

Obviously, there is a noteworthy need for financial resources to set up and maintain such cadastral systems. The sixth statement of Cadastre 2014 Vision focused on this issue. Land taxes enable public sector to run cadastre and land registration operations; besides, private sector runs its operations with the help of payments of business owners. Therefore, a complex structure in payments and taxation which brings on difficulties in determination of real costs can be seen. On the other hand; this statement emphasizes the need of reclamation of an amount from the people/companies that take benefit/income with the help of cadastral systems.

2. GENERAL VIEW ON CADASTRAL SYSTEM IN TURKEY

First of all, in order to understand the content and the current situation of Turkish cadastral system in Turkey, which consists of two components, one is map production that defines the geometrical status of land; the other is the land registration that defines land property records; it is required to take a brief look into land acquisition and instruments for land recording in two periods: Ottoman Empire Period and Turkish Republic Period.

2.1 Ottoman Empire Period

In Ottoman property system, almost all land was possessed by the empire and land tenure was given to people who were helpful for the wars in order to create financial support for the military organization. These people were called as 'dirlik' and they were allowed to collect taxes from farmers that run agricultural facilities on these lands (Yaşayan et al., 2011). In this context, land records are called as 'tahrir' were organized by government in order to **textually** define the boundaries and areas of lands.

The "Dirlik" system that had been parallel to Turkish-Islamic concept and tradition of property had been used by Ottomans, until this system became inadequate in the 19th century because of financial and legal reasons. Therefore, the government set up a land registration system based on a legislation (titles) and administrative network in a more westernized concept. On 21st of May, 1847, "Defterhane-i Amire Kalemî" which was the foundation of

An Evaluation on Current Turkish Cadastral Systems in Accordance with FIG Cadastre 2014 Statements (7586)
Nihat Enver Ulger, Cengiz Yildirim and Can İban (Turkey)

today's "The General Directorate of Land Registry and Cadastre" and land registration were adopted (Yarçı, 2013).

Since the foundation of Ottoman Empire until Balkan Wars (1912-1913), all registrations were executed textually and supplied governmental guarantee for property rights; even though the lack of maps that show geometrical status of land (position, area and other information) became a huge problem for maintaining this guarantee. Therefore, the first cadastral work was set up in a westernized way with a law that came in force on 5th of February, 1912. With this law, the aim was to survey boundaries, estimate values and incomes of all lands but it was not successful because of WW1.

2.2 Turkish Republic Period

After the renewal of old registers, a new law that set up a governmental guarantee (#658 Cadastre Law) entered into force in 1925, generally focusing on the Turkish-Greek Interchange and including 'value' factor of the land (Yaşayan et al., 2011). Just after, in May 1925, cadastre work started in Ankara, Istanbul, Izmir, Bursa and Konya cities.

In parallel, in year of 1926, Turkish Civil Law (#743) entered into law which presents "private property concept" differently than Ottoman period. Its judgments related with private property significantly changed the understanding of cadastral concept in Turkey. Turkish Civil Law indicates two important issues: The Treasury became responsible for any inconvenient and wrong land registration and the cadastre is the main tool for the boundary definitions.

In 1934, a new law of titling (#2613) enabled government to title lands and real estates in urban areas. This law put a definition of cadastre as "Cadastre shows and determines real estates' legal and geometrical status." On the other hand, another law (#658) enables Income Administration to execute land valuation and General Directorship of Forestry to execute Forest Cadastre.

After WW2, agricultural machinery was started to use in large rural lands of Turkey and the idea of determining legal and geometrical status of lands in rural areas came into mind. Hence, titling law was regenerated (#5602) in 1950 and enabled to execute cadastral work in rural areas. In the beginning, orthogonal measurements were done to create cadastral maps since any geodetic reference system was not used; but, in following years photogrammetric maps were produced for graphical- cadastral maps.

In 1987, a new definition of cadastre was spelled in new Cadastre Law (#3402) as "the aim of this law is to define real estates' legal status based on country's cadastral topographical map with demonstrating their boundaries both on land and on maps and setting up land registration that is foreseen by Turkish Civil Law". By this law, the methodological difference between cadastral works in urban and rural areas was removed and a single method was adopted for all country.

After the foundation of Turkish Republic, with several of methods and laws, the cadastral applications had been completed in 39.319 units out of 52.439 units till 2002. In 2003, The General Directorate of Land Registry and Cadastre decided to put forward “Completion of Cadastre Project” and took a support from private sector. Until 2013, the directorate has completed the cadastre in 12.740 units more (totally it has been reached up to 99.3% of all units) and there were only incomplete 380 units because of refusal for cadastral work or disputed boundaries. In parallel with “Completion of Cadastre Project”, Cadastre Law (#3402) had updated statements in 2005 in order to get rid of technical deficiency of cadastral maps, to complete forestry cadastre in desired standards and for all kinds of utility services.

After completing this project, technical details of produced cadastral maps are given in Table 1, 2 and Figure 1.

Coordinate System (CS)	Number of Maps	Percentage
ITRF	26,942	5.2 %
Local	110,817	21.2 %
ED-50	286,624	55.0 %
Without any CS	97,942	18.6 %
TOTAL	521,537	100.0 %

Table 1: Produced maps based on their coordinate systems

Measurement Method	Number of Maps	Percentage
Numerical	154,008	29.5 %
Orthogonal	127,118	24.4 %
Graphical	91,804	17.6 %
Photogrammetric	81,334	15.6 %
Prismatic	61,271	11.7 %
Photo plan	1,782	0.3 %
Other	4,220	0.8 %
TOTAL	521,537	100.0 %

Table 2: Produced maps based on measurement methods

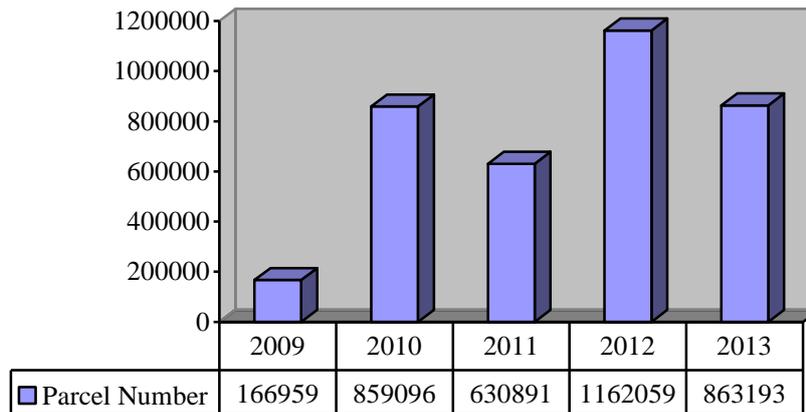


Figure 1: Cadastral Renewal after New Statements in Cadastre Law

3. LAND REGISTRATION AND CADASTRE MODERNIZATION PROJECT

“Land Registration and Cadastre Modernization Project” was implemented on 13th August 2008 with the help of World Bank funds and it contains five fundamental components whose aims are to improve the quality of land registration and cadastral services, to regenerate and update cadastral maps standing by registration information and numerical cadastre, supplying institutional improvement and human resources, developing institutional policies for real estate valuation and project management with capacity improvement.

3.1 1st Component

In the first component, titled as “Regenerating / Updating Cadastre and Land Registration”, of the project, it was aimed to update not only the maps and technical archive datasets in computerized environment with a transformation to international coordinate system (ITRF), but also related land registry information. In this context, as aforementioned, regeneration and updating were carried out for 3,682,195 parcels between 2009 and 2013 with the support of private sector.

3.2 2nd Component

The second component is called as “Refinement of Services”. In this context, all data were transformed into suitable digital format that can be used in a central CAD-based system (Land Registry and Cadastre Information System – TAKBIS in Turkish), then these data were matched with land registry information and eventual information were shared among stakeholder institutions, foundations, municipalities and became accessible by public in international standards through e-Government (this system is called “Spatial Real Estate System” – MEGSİS in Turkish). On the other hand, Turkish National Permanent GNSS Network (TUSAGA AKTİF / CORS-TR in Turkish) with a model office design and Map Databank (Harita Bilgi Bankası in Turkish) have been developed.

3.2.1 Land Registry and Cadastre Information System (TAKBIS)

An Evaluation on Current Turkish Cadastral Systems in Accordance with FIG Cadastre 2014 Statements (7586)
Nihat Enver Ulger, Cengiz Yildirim and Can Iban (Turkey)

The main aim was to transform all graphical and textual data, which had been collected by General Directorate of Land Registry and Cadastre since the foundation of the Republic of Turkey, into a multi-purpose land information system with a Geographical Information System (GIS) context, which enables interior and exterior user to access the data straightforwardly. For this purpose, TAKBIS-1 phase contract was signed in order to start working officially in December 2000. With TAKBIS-2 and TAKBIS-3 phases, sustainable generalization and refinement of the information system were desired.

During TAKBIS-1 phase, different software were developed for both Land Registry Offices and Cadastre Offices, for the purpose of transferring land registry and cadastral information and determination of possible problems in data infrastructure in order to have automatized services.

During TAKBIS -2 phase, no effort had been observed for refining data infrastructure, but the focus was the generalization of the system for all offices across the country, but in TAKBIS-3 phase, problems related with software were to resolved, data backup was prioritized and in parallel with TAKBIS-3, refinement of cadastral data was begun.

It was possible to use land registration information containing textual data among 957 Land Registry Offices in an automatized way after three phases; but it was not possible to have the same success in land registration information containing graphical data, since collecting all cadastral maps that have been produced so far with different coordinate system, into a database with unique coordinate system, was high-cost.

3.2.2 Spatial Real Estate System (MEGSIS)

Spatial Real Estate System (MEGSIS) Project started in the aim of setting up the infrastructure of spatial information system and creating a geographical information system from which public and private sector benefit.

MEGSIS is an open-access application which collects CAD-based data from local computers in Cadastre Offices into a central system, matches them with land registry information and shares these data with other stakeholders through e-Government. E-Government enables public to get informed about collected cadastral data. MEGSIS is the 5th ranked application in Turkish E-Government.

The work that has been done under the project of MEGSIS is separated into 3 main sections:

- 1) Web-based application software
- 2) Map services in international standards
- 3) E-Government map services

Web-based application software contains modules that enable all authorized users to insert and export data, integrate data with land registry, control and monitor the processes. Map services in international standards enable to share collected cadastral data among demanding institutions in open-access standard. E-government map services were set up in Microsoft .NET Framework 4.0 – Silverlight 5.0 environment and coded in C# programming language. It contains a PostgreSQL+ and PostGIS web database and Geoserver geographic server. This system responses to institutional demands with 95% success rate.

Finally, approximately 58 million parcels have been processed in the project between 2011 and 2013. With the help of qualified human resources, it was an important project for Turkey, which desires to develop more open-source technologies.

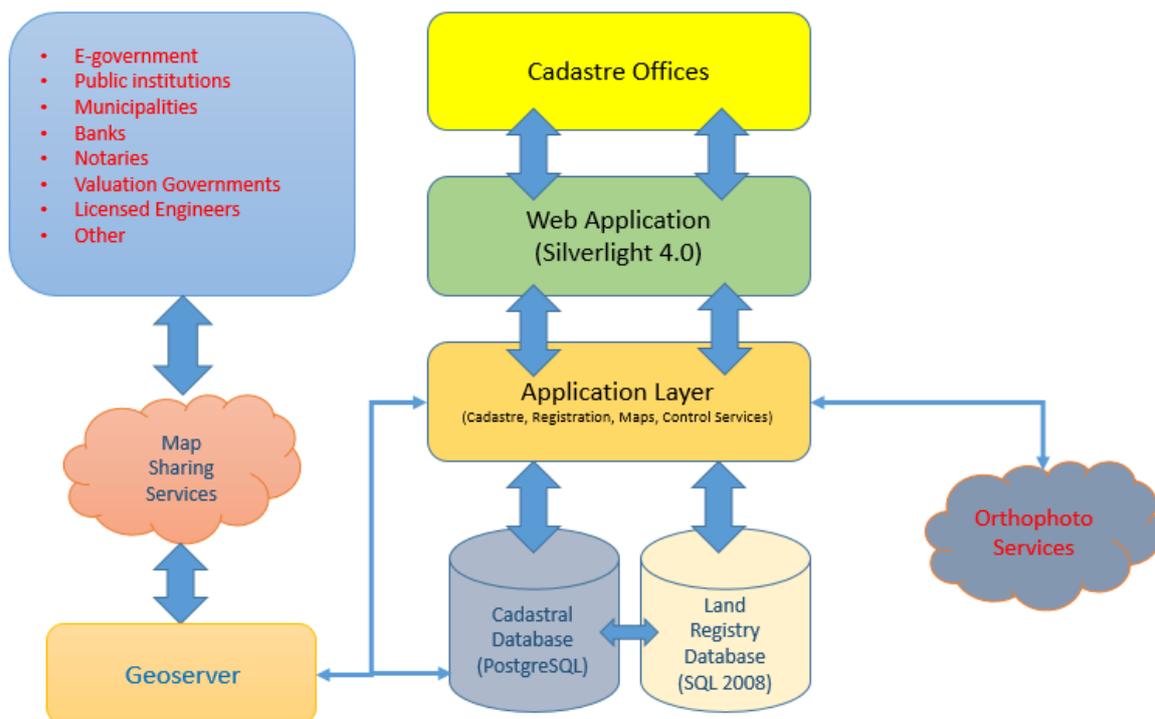


Figure 2: MEGSIS Architecture



Figure 3: Coordinate System Transformation Process

3.2.3 Map Databank (HBB)

In the aim of setting up a high-scale spatial information system, metadata related with all kinds of map documents and information that have been produced by several institutions, has been integrated in a databank through internet; therefore duplications of maps and wasteful expenditure are avoided. ISO 19115 Metadata Standard has been used to design this information system.

Service Type	Responded Demands	Non Responded Demands	Total Demand Number	Success Rate
WMS (Web Map Services)	727,503	14,869	742,372	98.00 %
WFS (Web Feature Services)	3,274,579	192,706	3,467,285	94.44 %
TOTAL	4,002,082	207,575	4,209,657	95.07 %

Table 3: Total service demands via E-government

Map Databank Portal aimed to collect all information related with maps under one umbrella and to integrate in a portal structure to be accessed by all users.

3.2.4 Turkish National Geographic Information System Project (TUCBS)

Turkish National GIS (TUCBS) aims to set up a national GIS depending on nation-wide technological developments and INSPIRE directions. It consists of developing a mutual infrastructure to present all kinds of geographical data for which various institutions are responsible. It is an e-government project that focuses on rendering content standards and geographical data transfer standards in order to respond to users' demands.

An Evaluation on Current Turkish Cadastral Systems in Accordance with FIG Cadastre 2014 Statements (7586)
Nihat Enver Ulger, Cengiz Yildirim and Can Iban (Turkey)

3.2.5 Turkish National Permanent GNSS Network (TUSAGA-AKTIF/CORS-TR Project)

Across Turkey and Turkish Republic of Northern Cyprus (TRNC), in order to determine real-time kinematic (RTK) geographical position and transform current maps into International Terrestrial Reference System (ITRS); Turkish National Permanent GNSS Network (TUSAGA-AKTIF / CORS –TR Project) was completed in June 2013 by the cooperation of “The Directorate of Land Registry and Cadastre” and “General Command of Mapping”. By June 2013, this network has more than 4200 active users. With this project; a quick, accurate, reliable and economic geographical data acquisition is aimed for purpose of map and cadastre facilities. Project decreases the cost for measurements of benchmarks and therefore, a disposition up to 250 million Turkish Lira (circa 100 million US Dollar) occurs annually.

System has following components:

- GNSS
- Permanent stations that transmit and collect signals from GNSS Satellites
- Mono or dual band commercial or military receivers that collect phase / code satellite data from GNSS satellites
- Control stations
- Communication units for data transfer

In context of project, there are 146 permanent station across Turkey and TRNC, and the project is managed by The General Directorate of Land Registry and Cadastre.

Objectives of the project are:

- To set up a geodetic infrastructure (National Vertical and Horizontal Control Networks etc.) in order to produce precise and quick position data for defense, development and scientific work,
- Determination of reliable position data for all kind of navigation, vehicle monitoring and transportation purposes,
- Determination of parameters for transformation between different coordinate systems (ED50-ITRF-WGS84),
- To able to transform current cadastral measurements and maps into up-to-dated coordinate systems and land registry & cadastral information systems,
- As being a seismically active country, to define and monitor very precise tectonic deformations,
- To model ionosphere and troposphere above the country, to do meteorological forecasts.

3.3 3rd Component

In context of 3rd component of the project, The General Directorate of Land Registry and Cadastre has focused on seminars by means of human resources strategies, institutional strategies and development of business plans. In Table 4, details related with seminars are given.

Name of the Seminar	Participant Number
2 nd Project Management Seminar	45
Education and Evaluation Meeting	1250
TOTAL (World Bank Resources)	1295
Seminar with Candidate Officers	268
Adaptation Seminar	35
Legislation Seminar	192
Services Seminar	4648
TOTAL (Institutional Resources)	5143
GENERAL TOTAL	6438

Table 4: Seminars that have been organized so far

3.4 4th Component

There has been an enormous need for scientific, reliable and up-to-dated land valuation methods and archiving land values in order to have social justice in public sector, because of the fact that housing credits, expropriations, development applications, urban regeneration, capital market applications, and determination of current values based on taxation become widespread in Turkey. Therefore, “Land Valuation” became the title of fourth component of the Land Registry and Cadastre Modernization Project.

The sub-components of this theme are:

- Policy design
- Pilot application
- Institutional Capacity Assessment

For policy design, 125 participants from 47 institutions were asked to share their opinions related with policy design and 79 institutions participated to regular meetings. In 2012, the commissions went to technical trips to Helsinki and Tallinn, they organized workshops and symposiums for brainstorming.

In July 2012, across two neighborhoods in Istanbul and Ankara, a pilot application has been performed which consists of 55,300 independent units with an international support. After this application, all factors that can influence on land valuations were estimated, hence, a “Real Estate Valuation Information System” was targeted that can be updated, analyzed, shared across the country and containing matching algorithms itself.

An Evaluation on Current Turkish Cadastral Systems in Accordance with FIG Cadastre 2014 Statements (7586)
Nihat Enver Ulger, Cengiz Yildirim and Can Iban (Turkey)

3.5 5th Component

The fifth component of the modernization project is called as “Project Management” and it aims to organize planning, resource use, accounting, finance and coordination facilities in optimum time, cost and desired quality.

For this purpose, private sector is desired to take a part in cadastral activities since public sector is stricter for customer-based tasks. General Assembly of Turkey put a concept in force which is called “Licensed Surveying and Cadastre Engineering Offices (LIHKAB)” whose responsibilities are cadastral applications, land use changes, parceling, easement establishment, and independent unit determination after cadastral surveying.

In Turkey, all kinds of land registry and cadastre applications are liable for a tax or duty depending on the kind of the application and value of the real estate. When one takes taxation income into consideration between 2002 and 2013, the total income is ten times more than the total expenditure of modernization projects.

4. ANALYSIS ON CURRENT TURKISH CADASTRAL SYSTEMS IN ACCORDANCE WITH FIG 2014 STATEMENTS

4.1 In accordance with 1st Statement

Our national cadastral systems contain processes for determination of real estate boundaries, boundary measurements and producing related maps and respond to “Where?, How Much?” questions. It consists of a land registration system in which defined property rights and changes related with these property rights are recorded in titles, and responds to “Whose?, “How?” questions.

This system has a legal base in Turkish Civil Law (#4721) which states that “Acquisition of ownership of real estate is subject to several legal and contractual limitation. Ownership of real estate can be established by purchase, gift, appropriation, inheritance, expropriation, execution and court decisions. The Land Register is of decisive importance for the ability to prove ownership of real estate, as it – like the possession of a movable – serves to publicize the existing legal circumstances.” Article 705 deals with the prerequisite of registration in Land Register (the so-called Registration Principle), while Articles 706-714 contain the rules for different forms of acquisition. Article 719 deals with the case when a disagreement in boundary and rules that the boundary on cadastral map is always valid than land markers (except landslide zones).

On the other hand, Article 35 of Turkish Constitution rules the conditions when the government can end the property law. These conditions are generally called “commonweal” and various institution can put restrictions (informally “touch”) on property rights for a commonweal purpose through their plans.

An Evaluation on Current Turkish Cadastral Systems in Accordance with FIG Cadastre 2014 Statements (7586)
Nihat Enver Ulger, Cengiz Yildirim and Can Iban (Turkey)

However, the restrictions on private property rights by means of plans and laws that are described above, are not currently “registered” in Land Registration System. Usually these kind of restrictions are not seen in registration archives. The first statement of FIG 2014 Cadastre Vision suggests that not only private property rights but also foreseen public rights and responsibilities should be indicated in land registration, even though our current system should fill this gap with the help of TAKBIS and Turkish National GIS projects. For example; legally all institutions that put restrictions on private property rights should remark these changes through TAKBIS for each parcel ID. Therefore, public would be able to follow these restrictions and their content via e-Governance. It would be possible to guarantee all kinds of rights and restrictions by government.

4.2 In accordance with 2nd Statement

Both legal component (land registry) and mapping component (cadastre) of land registration system are organized by a unique institution (The General Directorate of Land Registry and Cadastre) in Turkey. Cadastre and mapping facilities are performed by Cadastre Offices, while land registry facilities are performed by Land Registry Offices. Therefore, current structure is suitable with the 2nd statement of FIG 2014 Cadastre Vision which states that both disciplines should be run together and the separation between maps and records should be eliminated.

4.3 In accordance with 3rd Statement

Several methods have been used to produce cadastral maps since 1925 in Turkey. While production of maps, archiving and presenting these maps were used to be done manually in the past; especially by the help of TAKBIS and MEBSIS projects, data models take place instead of graphical productions. Even though TAKBIS was not successful so much, since collecting all cadastral maps with different coordinate systems and transforming them into a unique coordinate system caused high cost expenses and a long duration; MEGSIS was successful to collect all kinds of CAD-based numerical-cadastral data from all offices in a unique coordinate system (ITRF96) and in an integrated mutual database.

4.4 In accordance with 4th Statement

Turkish cadastral system has a harmony with the 4th statement, as indicated also in the 3rd statement. Because of IT and technological developments, detailed measurements are accomplished utilizing GPS and electronic tachometers, modelled with data models, archived and shared digitally. As a result, paper and pen usage in cadastral activities was eliminated.

4.5 In accordance with 5th Statement

The latest Cadastre Law (#3402) enforces to supply private sector support besides public institution opportunities during modernization projects. Generally, the General Directorate of Land Registry and Cadastre opens bids for purchasing private sector services. Licensed

An Evaluation on Current Turkish Cadastral Systems in Accordance with FIG Cadastre 2014 Statements (7586)
Nihat Enver Ulger, Cengiz Yildirim and Can Iban (Turkey)

Surveying and Cadastre Engineers are responsible to accomplish several tasks with their own regulations.

However, there has not been any co-operation between public sector and private sector for land registration activities since decision makers have a doubt and fear, considering that the security of registration could be in danger in case of any private sector partnership; even though in many countries there are successful and secured systems without any danger (with the help of notaries and lawyers). Turkish Civil Law has a guaranteeing article and it states that “Government is the only responsible in case of any erroneous registration”.

4.6 In accordance with 6th Statement

As indicated in Section 3.5, duties and taxes are collected for all kinds of land registration and cadastral task. The property right holder should pay this amount depending on his/her land value and area, otherwise any process would not be executed.

A general budget of 750 million Turkish Lira (300 million US Dollar) was expensed in 2013 by the General Directorate of Land Registry and Cadastre for the modernization projects, even though the income from taxation reached up to 6.8 billion Turkish Lira (2.72 billion US dollar).

On the other hand, technical applications that are not to be registered are performed by Licensed Surveying and Cadastre Engineers and they collect duties in the name of “Service Costs”. Service costs are determined by the directorate annually for each type of task.

In Turkey, taxation of land is calculated with ‘Current Registered Price’ of the real estate. These prices can be out-of-dated and wrong, hence, it is not possible to calculate an “up-to-dated and correct” tax amount for individuals. Therefore, there should be some refinements in Real Estate Valuation Law and Tax Procedure Law.

5. CONCLUSIONS

In Turkey, legal and planned restrictions on private property rights are not indicated in cadastral maps, even though all kinds of land acquisition are registered and indicated in the cadastre. The society cannot follow planned or decided restrictions on their own real estates and the security of property right might be in danger in such cases. Turkish National GIS and TAKBIS became active in order to get rid of this problem by integrating all parcel information with unique IDs in a single infrastructure and sharing them with users via e-governance. This will let users know their real estates' status, whether it has a restriction or not on it.

In our country, mapping (cadastral) and legal (land registration) components are under the same umbrella. Cadastre offices are able to respond to questions of “Where? How much?” and Land Registry offices are able to respond to questions of “Whose? How?” Therefore, it can be said that our country has an integrated organizational structure in accordance with FIG Cadastre 2014 Vision statements.

Unfortunately, there are gaps in production of a cadastral infrastructure with a single coordinate system since collecting and integrating all types of geographical data that have been produced with different scales, methods and bases have high costs and they are time consuming. TAKBIS and MEBSIS projects still deal with data modelling in order to get rid of this difficulty.

Computer-aided and automated cadastral works reached to an important level and it can be shown as an example model to other countries' institutions that have difficulties to manage such projects. These kind of reforms have not been performed to land registration activities, despite of availability of legal base and experience from projects in cadastral reform. The general directorate should focus more on this issue.

The expenses for these projects require a supply system via taxation and duties. In our country, incomes are significantly more than expenses. However, the methods for defining the “real estate values” are not logically scientific, therefore they are not equitable, realistic and acceptable by society. In this context, there should be real estate valuation bases with legal and procedural reforms; besides these values should be evaluated by valuation experts.

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