EFFECTS OF A WELL ORGANIZED CADASTRAL INFORMATION SYSTEM TO E-GOVERNMENT PERFORMANCE

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ABSTRACT

E-Government services are increasing remarkably due to the infrastructural progress achieved in information technologies. The increase of e-Government services creates another requirement regarding the machine communication between e-Government services without human interruption. This work represents the benefits gained by the usage of Turkish Cadastral Information System (TAKBIS) and Geospatial Property System (MEGSIS) services in internal systems of General Directorates of Highways and General Directorate of State Hydraulic Works for property management and expropriation operations. Furthermore, the security issues coming with sharing the property information through e-Government services are discussed in detail. Finally, usage of an online cadastral information system in daily operations is compared to the traditional ways of property information acquisition from an implementer's point of view.

Key words: GIS, web services, e-government, cadastre, property management, expropriation.

ÖZET

Bilgi teknolojilerindeki altyapısal gelişmeler, e-devlet servislerinin de fark edilir şekilde artmasına sebep olmuştur. Diğer yandan bu artış, e-devlet uygulamalarında sistemler arası etkileşimlerin insan müdahalesi olmadan gerçekleştirilebilmesi yönünde ihtiyaçlar doğurmaktadır. Bu çalışma Tapu Kadastro Bilgi Sistemi (TAKBİS) ve Mekânsal Gayrimenkul Sistemi'nin (MEGSIS) Devlet Su İşleri Genel Müdürlüğü ve Karayolları Genel Müdürlüğü'nün iç sistemlerindeki kullanımından elde edilen faydaları incelemeyi amaçlamaktadır. Ayrıca, e-devlet uygulamaları arasında mülkiyet bilgisinin paylaşımıyla gelen güvenlik sorunları da detaylı bir şekilde incelenmiştir. Son olarak, çevrimiçi bir kadastro bilgi sisteminin kullanımıyla gerçekleştirilen işlemlerin, geleneksel yöntemler ile karşılaştırıldığında sağladığı faydalar, pratik uygulama deneyimleriyle irdelenmektedir.

INTRODUCTION

E-Government services are increasing remarkably due to the infrastructural progress achieved in information technologies. The increase of e-Government services creates another

requirement regarding the machine communication between e-Government services without human interruption.

This work represents the benefits gained by the usage of Turkish Cadastral Information System (TAKBIS) and Geospatial Property System (MEGSIS) services in internal systems of General Directorates of Highways and General Directorate of State Hydraulic Works for property management and expropriation operations.

Furthermore, the security issues coming with sharing the property information through e-Government services are discussed in detail. Finally, usage of an online cadastral information system in daily operations is compared to the traditional ways of property information acquisition from an implementer's point of view.

CONVENTIONAL METHODS TO OBTAIN CADASTRAL INFORMATION

Cadastral information is one the basic informational entity for many governmental activities such tax collection, investment planning, expropriations etc. Besides it needs to be kept confidentially and can only be shared in case of legal necessities.

The one requiring cadastral information of a third party, is obligated to prove the necessity and expected to keep that obtained information as confidential. In general, public authorities who execute development projects or large scale constructions need the cadastral information of application territory in order to refine the zoning ordinances or expropriate for constructions.

Conventionally, required cadastral information can only be obtained from regional cadastral offices as a result of formal application referring to a proven legal necessity. After the application phase, asked cadastral information can be received in approximate time of two weeks depending on the workload of the applied regional cadastral office.

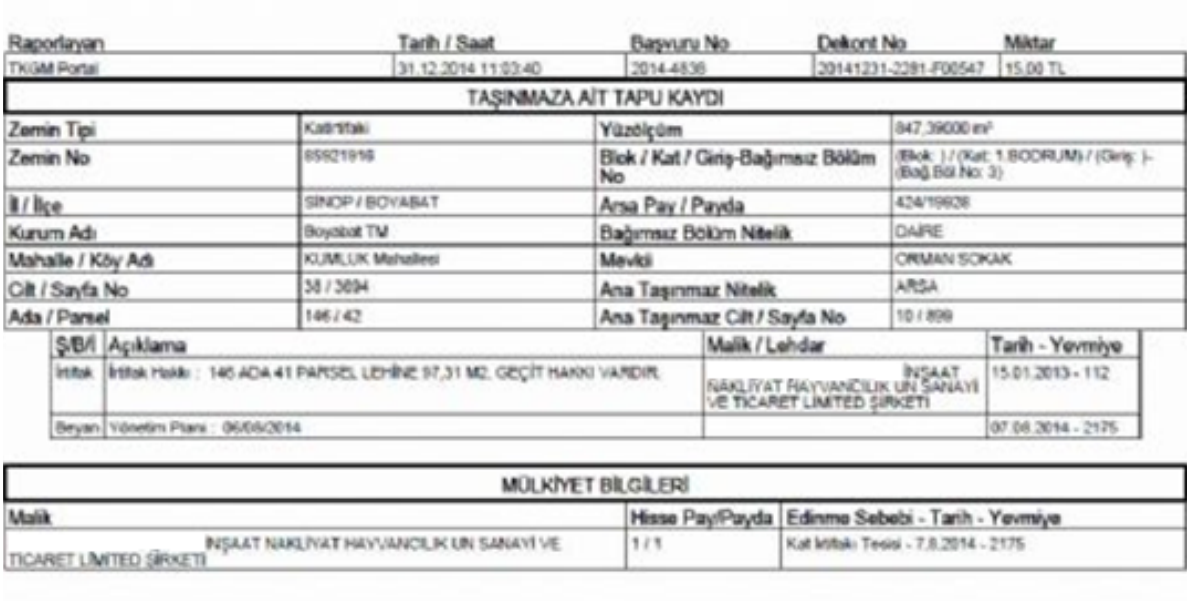
On the other hand, the received information is generally in analog format which cannot be easily used at modern information management systems. An extra human work is required to prepare the received information and convert it to digital format to be used in CAD systems etc. A typical cadastral information at analog format can be seen in figure 1.

E-GOVERNMENT SERVICES TO OBTAIN CADASTRAL INFORMATION

As a result of progress in e-government investments, General Directorate of Land Registry and Cadastre (TKGM) initiated the digitalization of cadaster and started to publish the digital data through e-services named TAKBIS and MEGSIS. While TAKBIS is the service network publishing the tabular cadastral data, MEGSIS is focused on publishing the vector data including city, county, district and parcel borders through OGC web services.

The application process to receive the digital cadastral data is quite similar to conventional ones except, all applications should be made to general directorate and is strictly investigated if the requirement is legally proven or not.

Consequently, a shared application key is provided to the declared static IP address of applicant which will be used for web requests. All requests except coming from the specified IP address are rejected regarding the security of the process.



Raporlayan	Tarih / Saat	Başvuru No	Dekont No	Miktar
TKGM Portal	31.12.2014 11:03:40	2014-4836	20141231-2291-F00547	15.00 TL

TAŞINMAZA AİT TAPU KAYDI

Zemin Tipi	Kat/Irtaki	Yüzölçüm	847.39000 m²
Zemin No	855021916	Blok / Kat / Giriş-Bağımsız Bölüm No	(Blok:) / (Kat: 1.BODRUM) / (Giriş:) - (Bağ.Böl.No: 3)
İl / İlçe	SİNOP / BOYABAT	Arsa Pay / Payda	424/19828
Kurum Adı	Boyabat TM	Bağımsız Bölüm Nitelik	DAİRE
Mahalle / Köy Adı	KUMLUK Mahallesi	Mevkii	ORMAN SOKAK
Cilt / Sayfa No	38 / 3094	Ana Taşınmaz Nitelik	ARSA
Ada / Parsel	146 / 42	Ana Taşınmaz Cilt / Sayfa No	10 / 899

Şİ/İ	Açıklama	Malik / Lehdar	Tarih - Yevmiye
İrtifak	İrtifak Hakkı : 146 ADA 41 PARSEL LEHİNE 97,31 M2. GEÇİT HAKKI VARDIR.	İNŞAAT NAKLİYAT HAYVANCILIK UN SANAYİ VE TİCARET LİMİTED ŞİRKETİ	15.01.2013 - 112
Beyan	Yönetim Planı : 06/06/2014		07.06.2014 - 2175

MÜLKİYET BİLGİLERİ

Malik	Hisse Payı/Payda	Edinme Sebebi - Tarih - Yevmiye
İNŞAAT NAKLİYAT HAYVANCILIK UN SANAYİ VE TİCARET LİMİTED ŞİRKETİ	1 / 1	Kat İrtifakı Tesisi - 7.8.2014 - 2175

Fig. 1. A Sample Cadastral Information at Analog Format

GENERAL DIRECTORATE OF STATE HYDRAULIC WORKS CASE

Property and Expropriation Department of General Directorate of State Hydraulic Works (DSİ Emlak ve Kamulaştırma Daire Başkanlığı) is responsible from managing the properties including the parcels purchased for the purpose of establishing sanitation and dam constructions.

Regarding that responsibility the department is in charge of managing more than 1 million properties which causes a high complexity rate in information flow including tabular and vector cadastral data. Furthermore, it's expected to get maximum financial efficiency from unused properties by selling or renting on time. During all those activities, receiving cadastral data composes a high importance for security and reliability reasons. An approximate of 250 requests are made all over the country in order to receive the latest situation of the property which is subject to process in a daily base.

As a solution, DSİ applied to TKGM to receive the required cadastral data through e-services named TAKBIS and MEGSIS. After the application process had been completed, DSİ developed a property management geographical information system which works on top of cadastral data received from e-services of TKGM which manages property cadastral data both tabular and vector in the same environment including sale, renting, bartering and transfers. Besides receiving the latest cadastral information, the system can also queries the properties with respect to owner information which helps the DSİ to find out properties which are accidently eluded. By using the e-services provided by TKGM, a daily process of 250 information request can be made in minutes ensuring the data quality and reliability.

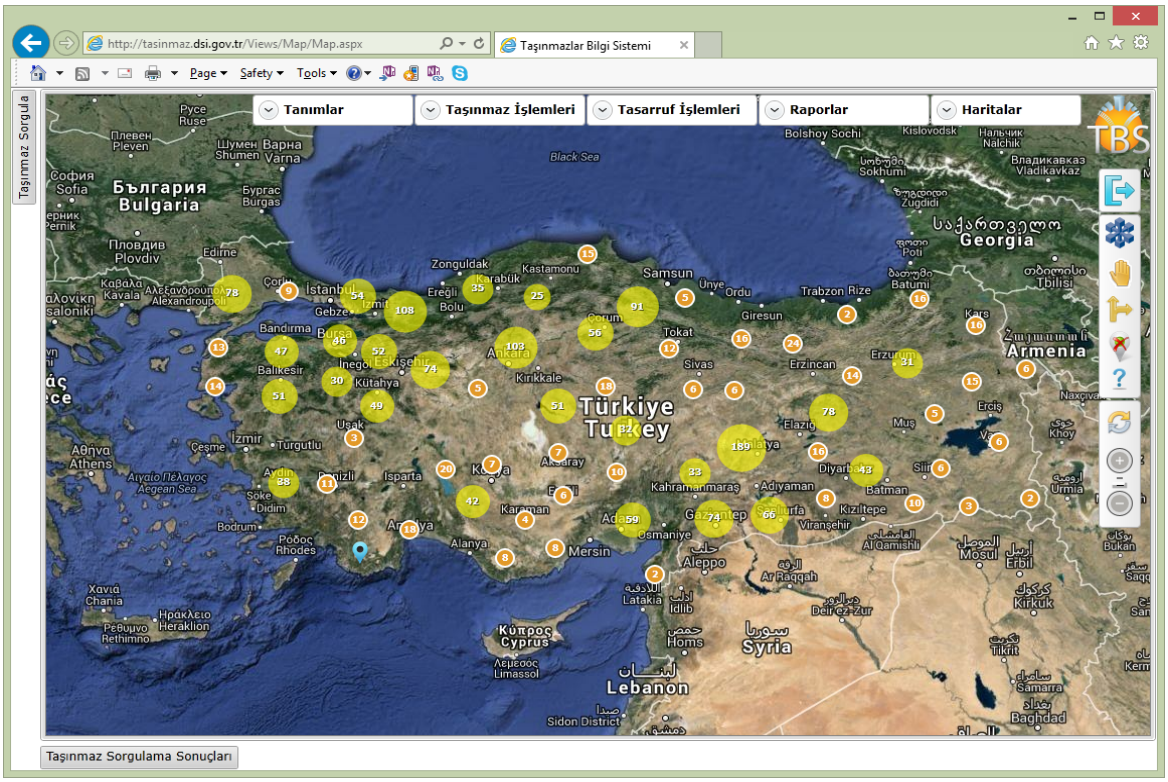


Fig. 2. A General Overview of DSI Properties

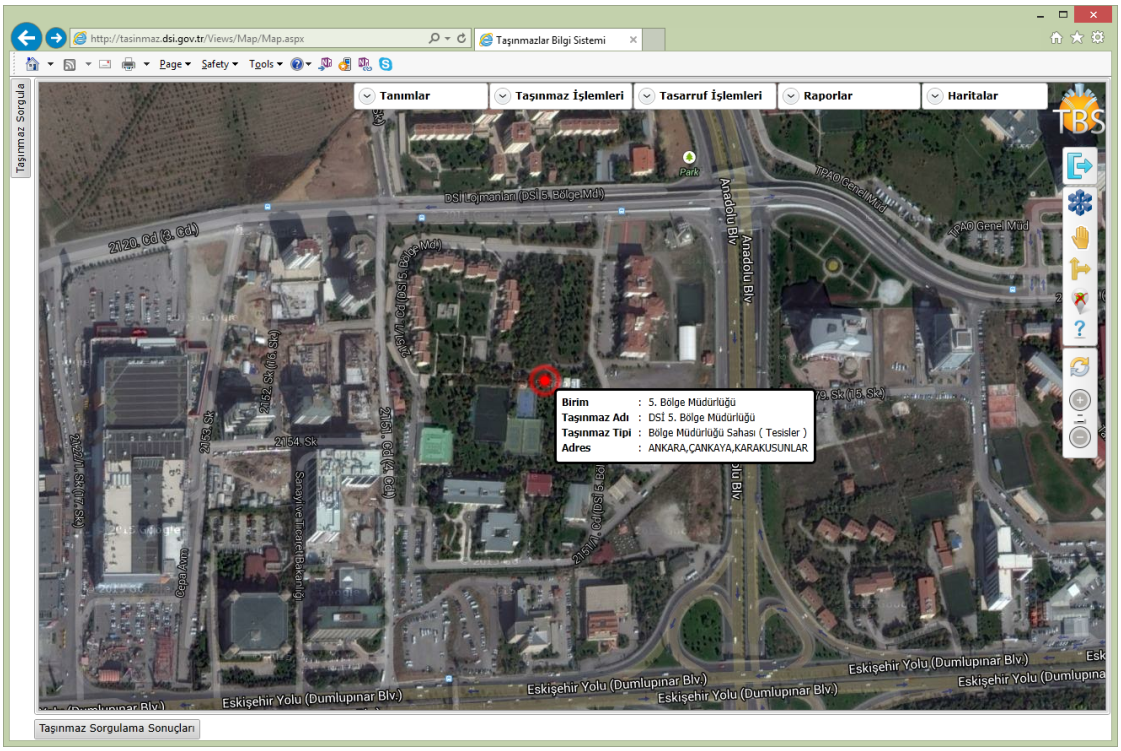


Fig. 3. A Specific Zoom to a Property in the System

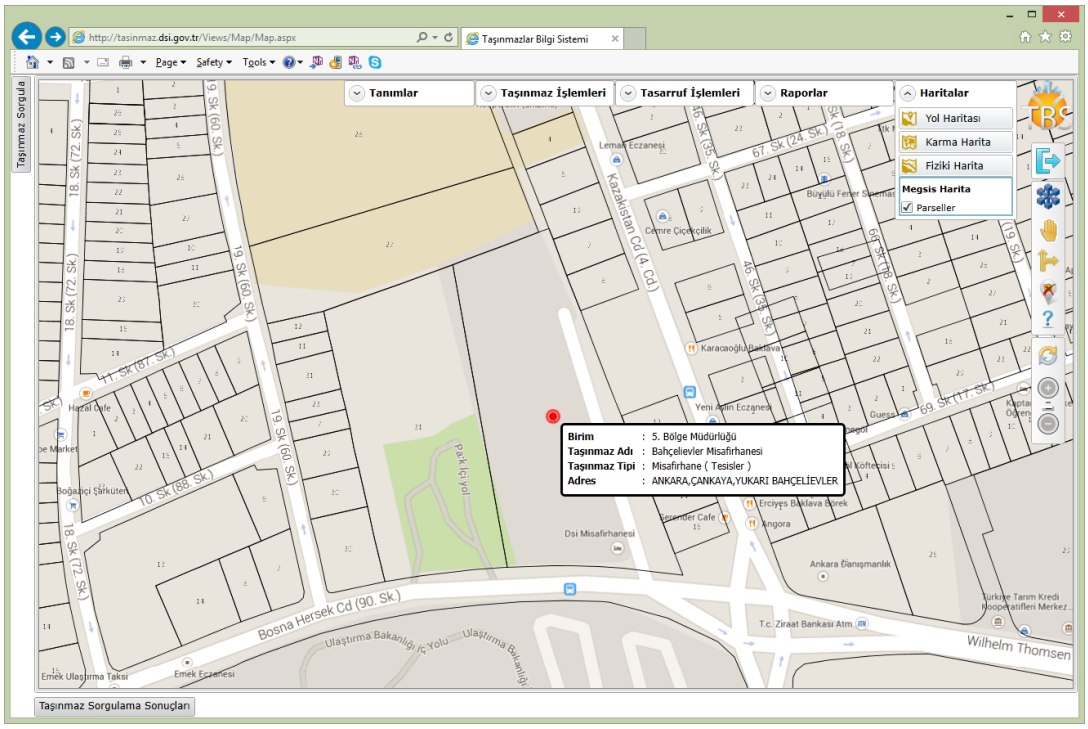


Fig. 4. A WMS View of Neighbour Parcels in the System Provided By MEGSIS

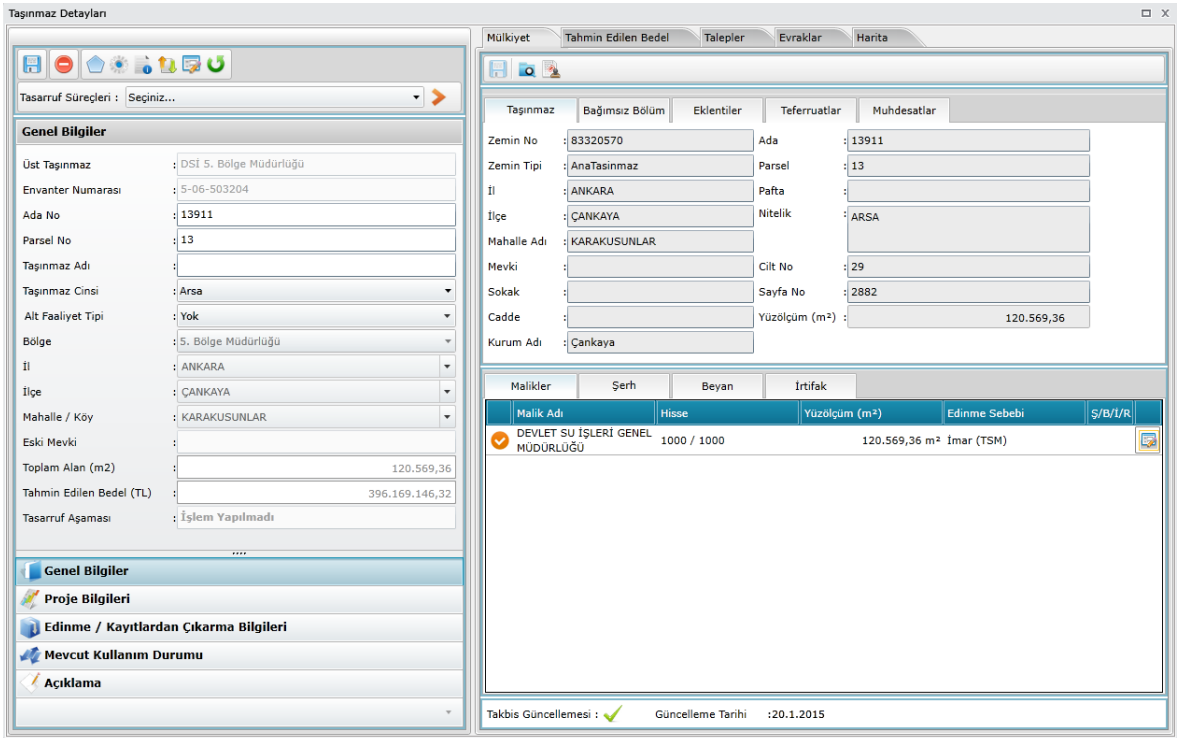


Fig. 5. The Digital Cadastral Information in the System Provided by TAKBIS

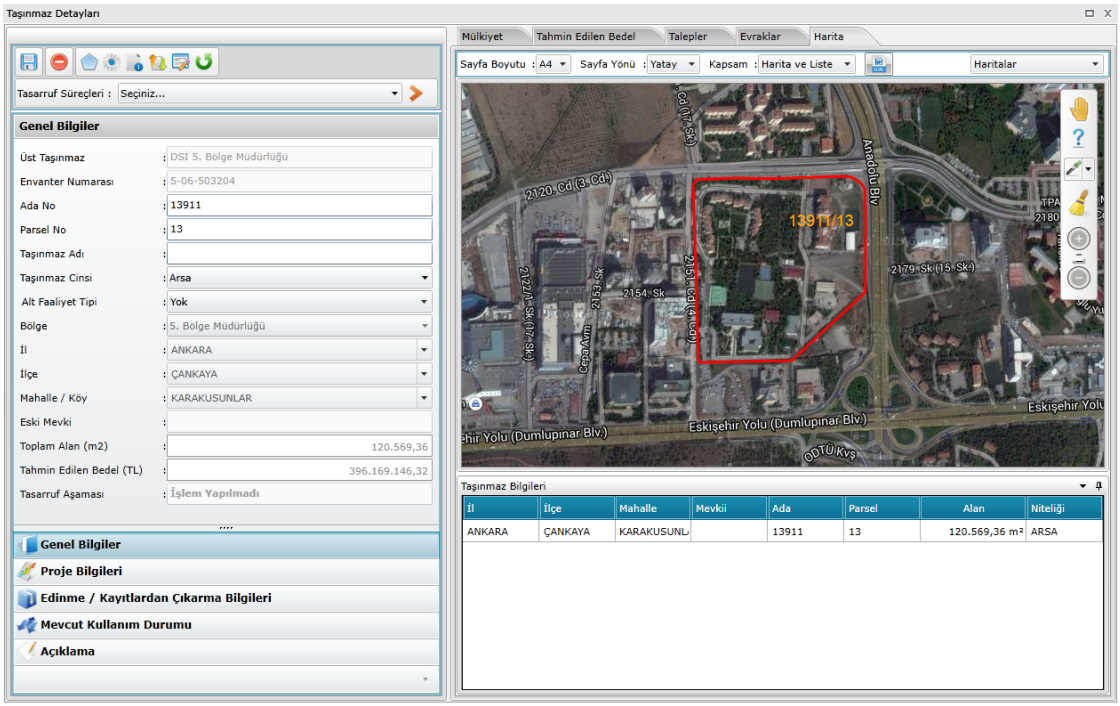


Fig. 6. A WFS View of a Specific Parcel in the System Provided by TAKBIS

GENERAL DIRECTORATE OF HIGHWAYS CASE

Similar to the DSİ, in the Properties Department of General Directorate of Highways (KGM Taşınmazlar Dairesi Başkanlığı) is responsible from managing the properties including the parcels purchased for the purpose of establishing highways and roads construction. Regarding the similar responsibility the department is in charge of managing more than 750 thousand properties which causes a high complexity rate in information flow including tabular and vector cadastral data. Especially in expropriation phase of road constructions, obtaining the correct ownership information is critical to decide correct expropriation payments and archiving the necessary documents to ensure the transparency.

Fig. 7. An Overview to the State Roads in the System

As a solution, KGM developed a web based expropriation archive and management geographical information system which accesses TAKBIS and MEGSIS to get the latest cadastral information and archive the necessary data digitally. System also scans the older archive documents and relates them to the current properties which is subject to expropriation.

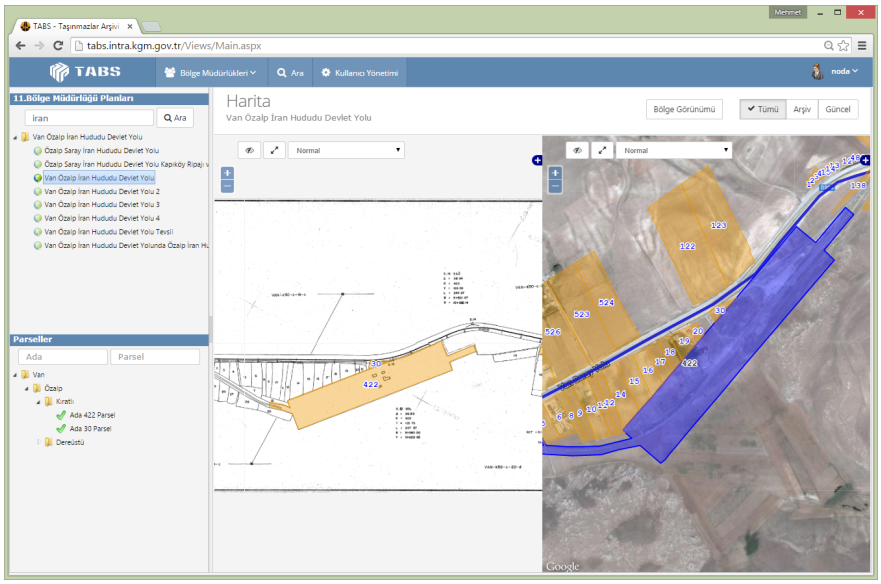


Fig. 8. Dual View of Archived Parcel and Current Parcel Info Provided By MEGSIS

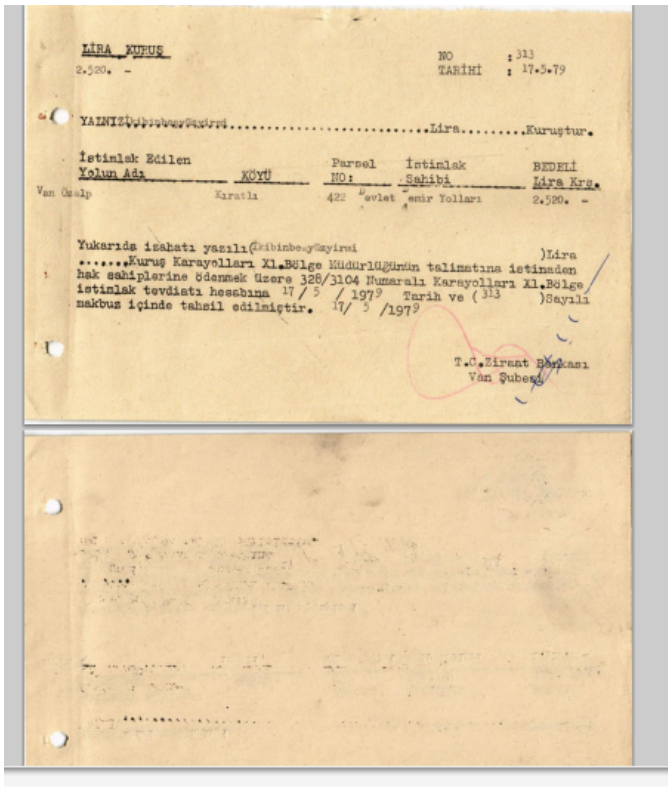


Fig. 9. Cadastral Information and Archive Documents are Related to the Parcel Entity

EXAMINATION OF USING E-GOVERNANCE IN INTERNAL SYSTEMS

Examining the use of TAKBIS and MEGSIS services in many government authority including DSI and KGM, shows that using e-governance services to obtain the cadastral data comes up with many advantages and some disadvantages.

Advantages

Cost Effectiveness

First of all, using e-services is cost effective regarding with conventional methods. After the final changes in TAKBIS and MEGSIS services costs, using the services are almost free if we don't count the connectivity and infrastructural costs.

Considerably Requires Less Time

We examined that receiving the data from e-services costs approximately 30-60 seconds depending on the connection quality. Inversely, requesting the data with conventional methods from regional cadaster offices takes 7-15 days ending up with an analog cadastral data.

High Reliability

Using the TAKBIS and MEGSIS services, the one can get the requested data directly from database without any agents. This ensures receiving the latest data and eliminates the defects caused by human factor while interchanging the data and printing it.

Disadvantages

Incompleteness

Especially the cadastral vector data provided by MEGSIS do not cover all cadastral implementations which means that the one cannot be sure that his request for a cadastral vector data will be replied by the system or not. It will take a few more years for TKGM to complete the digitalization phase of cadaster and publish it through MEGSIS.

No Litigation Ability

The data provided by TAKBIS and MEGSIS is not a legal basis for operations such as expropriation etc. This causes a double process of information request process and prevents many authority to use the e-services against using conventional methods to receive data.

RISKS OF SHARING CADASTRAL INFORMATION THROUGH e-SERVICES

On the other hand, publishing all cadaster data including property and ownership information causes a security risk in general. Especially ownership information can be used for corrupt

intents. Although an non-disclosure agreement is unexceptionally signed between TKGM and users, this does not ensure the malicious uses of cadastral information for other purposes.
As a precaution of undesired uses of cadastral data served through TAKBIS and MEGSIS, TKGM compels the users to log every request with the real user information.

Secondly, ownership data count as private personal data which shall be confidentially kept during the usage. Unfortunately, there is no restrict in TAKBIS and MEGSIS which prevents the one to query out of area of interest limited by law.

CONCLUSION

In conclusion, using e-government services for obtaining cadastral information helps organizations improving their internal process quality and effectiveness remarkably. Besides, the government authorities shall behave sensitive to prevent undesired use of ownership information inside their organizations. A well designed user access control and authentication is necessary to use the e-services inside their applications while logging every attempt to e-services to obtain cadastral information.

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CADASTRE 2014 PERFORMANCE OF TURKEY AND EXPECTATIONS FROM CADASTRE 2034

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ABSTRACT

The International Federation of Surveyors (FIG)'s 7th Commission which deals with the subjects of Cadastre and Land Management decided that a vision should be developed for cadastre in the following 20 years period in XXth ordinary congress in 1994. Within the scope of this decision, the work group completed its long-term studies and published a report named "Cadastre 2014 - A Vision for A Cadastral System in the Future" in 1998. This study called as "The Vision of Cadastre 2014" underlines the view on how cadastre will develop and how it will look like in the following twenty years. This report, which consists of views for ensuring the cadastre to be globally integrative and shaping the future of surveying occupation, is submitted to the world by FIG. Our country conducted some studies and projects in order to ensure the modern cadastral system in the direction with the Vision of Cadastre 2014 which is under the leadership of the General Directorate of Land Registry and Cadastre (TKGM). The aim of this study is to examine the studies and projects that have been completed by public and private organizations up to the present, to evaluate our country's "Cadastre 2014" performance, to determine its position among other countries and to summarize the current condition for "Cadastre 2034".

Key words: Cadastre 2014, Cadastre 2034, TKGM

ÖZET

Uluslar arası Haritacılar Birliği FIG'in Kadastro ve Arazi Yönetimi konularıyla ilgilenen 7.Komisyonu, 1994 yılında XX.olağan kongresinde önümüzdeki 20 yıllık periyotta kadastro için bir vizyonun geliştirilmesi yönünde bir karar almıştır. Bu karar doğrultusunda çalışma grubu, uzun dönemli çalışmalarını tamamlayarak "Kadastro 2014 – Gelecekteki Kadastral Sistem İçin Bir Vizyon" isimli rapor 1998 yılında yayımlanmıştır. Kadastro 2014 Vizyonu" olarak isimlendirilen bu çalışma 1994 yılının bakış açısıyla yirmi yıllık bir sürede kadastronun nasıl gelişeceği ve neye benzeyeceği hususundaki görüşün temelini oluşturmaktır. Kadastronun evrensel anlamda bir bütünlük göstermesini sağlamak ve kadastro faaliyetleri ile haritacılık mesleğinin de geleceğini şekillendirmeye yönelik görüşleri içeren bu rapor FIG tarafından tüm dünya milletlerine sunulmuştur. Ülkemizde ise Tapu ve Kadastro Genel Müdürlüğü (TKGM) öncülüğünde kadastro 2014 vizyonu doğrultusunda modern kadastro sistemini sağlamak için çeşitli çalışmalar ve projeler yapmıştır. Bu çalışmanın amacı bugüne kadar gerçekleştirilen kamu kurumları veya özel sektör tarafından tamamlanan çalışma ve projeleri irdeleyerek, ülkemizin ''Kadastro 2014'' performansını ölçmek, diğer ülkeler arasındaki konumunu tespit etmek ve de ''Kadastro 2034'' için mevcut durumu özetlemektir.

INTRODUCTION

The International Federation of Surveyors (FIG)'s 7th Commission which deals with the subjects of Cadastre and Land Management decided that a vision should be developed for cadastre in the following 20 years period in XXth ordinary congress in 1994. Within the scope of this decision, the working group completed its long-term studies and published a report named "Cadastre 2014 - A Vision for A Cadastral System in the Future" in 1998. This study called as "The Vision of Cadastre 2014" has underlined the view on how cadastre will be develop and how it will look like in the following twenty years. Within the scope of determined targets, the working group reviewed the current cadastral systems for developing the vision and researching the trends on the cadastre as a first step. For this purpose, a survey was decided to prepare for determining the existing developments related to the cadastre in the world in the first year interviews of commission members. The survey form was arranged for analyzing the existing cadastral trend in the world and these surveys were conducted for many countries. Many important suggestions occurred as a result of this survey and six subjects were determined. It was agreed on six principles which are created within the public rights and integration of limitations, the activation of services, the digital format and data model, the partnership of public and private sector and the economic productivity are suggested to implement across the world (Steudler, 2006). These six principles were published as "The Vision of Cadastre 2014" by FIG in 1998.

THE VISION OF CADASTRE 2014

According to the first principle of the Cadastre 2014, *"The Cadastre 2014 will indicate all legal condition of land including the public rights and limitations"*. The world population and the consumption of land have increased. The full monitoring of personal and legal existence of land have gradually limited by the public interests. In order to ensure the security for having lands, all facts related to land should be clearly realized by future cadastral systems (Kaufmann and Steudler, 1998; Yomralıoğlu et all., 2003). According to the second principle of the Cadastre 2014, *"The separation between maps and records would be abolished"*. Many countries have a land registration system that is composed of the land registries and cadastre components. Normally, surveyors conduct the cadastral part of components while lawyers and notaries conduct the land registry part of them. Two institutions related to the similar working areas were appeared as a result of this duty distinction. Within the scope of this principle, the distinction between maps and records would be removed and a structure working integratively each other would be created (Kaufmann and Steudler, 1998; Yomralıoğlu et all., 2003; Astle et all, 2005). According to the third principle of the Cadastre 2014, *"The cadastral mapping will be dead and a model which would be used in much longer terms will be replaced instead of it"*. Maps are always models. However, the usable technology doesn't let to be used the appropriate type of models. As a result of these, there must be maps with different scales. Different scales must be shown by different data models. It will be possible with the new model developed as appropriate for the developed technology that the maps with the same data models and different scales and records in different forms would be formed. Therefore, there would not be any drawers and cartographers in the cadastral area (Kaufmann and Steudler, 1998; Yomralıoğlu et all., 2003). According to the fourth principle of the Cadastre 2014, *"The paper and pencil - cadastre will be abolished"*. With the technologic developments, computers are used in every field. Therefore, they are used in the processes of

Land Registry. The modern cadastre based on technology must ensure the fundamental data model. All surveyors across the world should think in the manner of model and should obtain these models by using the modern technology (Kaufmann and Steudler, 1998; Yomralıoğlu and et all., 2003). According to the fifth principle of the Cadastre 2014, *"The Cadastre 2014 will be significantly privatized and the public and private sector would work together"*. Free economies ask flexibility in the immovable market, the land planning and land utilization. Flexibility may be ensured well by the private institutions. However, the public requirement is inevitable for necessary security as well as this. With the implementation of vision, the private sector would be important. Moreover, the public sector would focus on the monitoring and inspection. Many duties necessary for founding and maintaining a cadastral system could be realized by the private sector without threatening the registration security (Kaufmann and Steudler, 1998; Yomralıoğlu et all., 2003).

According to the sixth principle of the Cadastre 2014, *"The Cadastre 2014 will be cost-recovering"*. The cadastral system need to a great deal of investment. However, the land certificated with cadastre and guaranteed means investment. Countries are mostly carrying out the registration processes of cadastre and immovable registration and the costs necessary for founding and maintaining system are met (Kaufmann and Steudler, 1998; Yomralıoğlu et all.2003).With the implementation of principle, the analysis cost/profit would create a important viewpoint on the cadastral reforms and implementation.

THE CADASTRE 2014 STUDIES IN TURKEY

Turkish Land Registry and Cadastre Information System (TAKBIS): The target of TAKBIS project is to create the Turkish Land Registry and Cadastre Information System across the country and within this scope, the problems will be determined, the solutions will be found, the title deeds and cadastre services will be conducted as standard and electronic way and right, secure and updated data will be submitted to the Local Governments, the public institutions and organizations by analyzing the title deed and cadastre services within the scope of the Geographical Information System (GIS) and the Land Information System (LIS) (TKGM, 2015). As of the date 2012, all title deed directorates have started to give services. With the system working successfully, the data share is practices as online with 17 institutions. Many services such as fee interrogation, title deed interrogation are presented to the public as online with TAKBIS that is ensured its integration with E-government.

Spatial Property System (MEGSIS): The Spatial Property System (MEGSIS) is an open-source application prepared by the General Directorate of Land Registry and Cadastre by conceptualizing the project in order to match the data with .cad format in the local computers of cadastre directorates with the title deeds data by collecting on a central system, to share this data with shareholder institutions, organizations and municipalities and mapping services which work in the international standards and to submit the public with e-government application." Studies conducted under MEGSIS are collected as three main headings: i) Web based application software, ii) the international standards map service, iii) e-government services. Web-based application software is composed of modules consisting of the data entrance of internal and external users to the system, the data downloading, the title deeds data and the integration processes and interrogations, the control and follow-up of conducted works within the framework of the identification/authorization which ensures and directs the

application to use in the different levels and needs. International standard map services, the cadastral data collected within MEGSIS is shared in standard format and its conformity to the standards specified in the Guideline of Principles of Workableness Together prepared by Open Geospatial Consortium (OGC) and DPT Information Society Department and institutions, organizations, municipalities requesting under protocols is tested with open source and commercial products. E-Government Services, collected cadastral data combined with land registry data as a map service is offered to the citizens for information purposes. These services offered by the www.turkiye.gov.tr internet address have the characteristic to be the one and only geographical service.

Land Registry Archive System (TARBIS): With the realization of the project, its aims such as scanning archival documents stored at Department of Land Registry Archive and Istanbul TKBM (except for foreign records) and ensuring easy access to scanned documents linked by index system of people authorized to access to archive information and documentation within the security framework of persons authorized and developing reporting functions of the information entered into digital media by the user by reviewing the original document in the archives within the scope of Title Deed Archive Automation were carried out.

Land Registry and Cadastre Modernization Project (TKMP): The aim of this project is to update the data of title deeds and cadastre as being a base for the spatial information systems as set out by the Law on Cadastre and to bring it into use by transferring in the electronic environment in the numeric and legal form. In 2008, the budget of the Project of Title Deeds and Cadastre Modernization signed by the World Bank and the Republic of Turkey was determined as 35 million Euro (Approximately 203 Million $).

The Map Data Bank (HBB): It is a Spatial Information System developed for entering the metadata related to information and documents of maps created by using the developed technologic opportunities by institutions which practicing maps or have maps practiced for forming large-scaled spatial information systems across the country, updating them, submitting on the internet and therefore preventing the resource waste with the repeated map production.

Turkey's National Geographic Information System Project (TUCBS): TUCBS is an e-government project aiming at establishing the infrastructure for Geographical Information System in accordance with the technological developments at the national level (Turkish National Geographic Information System-TUCBS) and being created a web portal by public institutions and organizations to provide the geographic information they are responsible for on a common infrastructure, creating the content standards in the manner that geographic data can meet the needs of all user institutions and determining the standards of geographic data interchange. It was conducted under the responsibility of the General Directorate of Land Registry and Cadastre.

The Licensed Topographical and Cadastral Offices (LIHKAB): In accordance with the Law No. 5368 on the Licensed Topographical and Cadastral Engineers and Offices, the practice and control of processes which are not subject to the registration and the practice responsibility of those which are subject to the registration are conducted by licensed topographical and cadastral offices. As a result of license exam which was practiced, there are

551 licensed cadastral engineers who have gained the right to open the licensed topographical and cadastral office. In our country, important projects have been developed and implemented to 2014 from 1994 in order to practice it in the direction of principles specified in "The Vision of Cadastre 2014". The relationship between each project and these 6 principles are presented with their realization percentages on the Table 1.

Table 1: The relationship between each project and these 6 principles are presented with their realization percentages

Name of Activity/Project	Start/End date	The Six Statements on Cadastre 2014					
		1- Cadastre 2014 will show the complete legal situation of land, including public rights and restrictions	2- The separation between 'maps' and 'registers' will be abolished!	3- The Cadastral mapping will be dead! Long live modelling!	4- 'Paper and pencil - cadastre' will have gone!	5- Cadastre 2014 will be highly privatized!Public and private sector ar working closely together!	6- Cadastre 2014 will be cost recovering!
Land Registry and Cadastre Information System (TAKBIS)	2005-2013	✓	✓		✓		
Spatial Property System (MEGSİS)	2011-continues		✓		✓		
Land Registry Archive Information System (TARBİS)	2005-2009		✓	✓			
Land Registry and Cadastre Modernization Project (TKMP)	2008- continues	✓				✓	
Map Data Bank (HBB)	2004-2008			✓	✓		✓
Turkey's National Geographic Information System (TUCBS) Project	2006-2011	✓		✓			
licenced mapping and cadastre offices	2005-continues					✓	
Tax and fees							✓
Applied percentages of Statements on Cadastre 2014 (in Turkey)		60-80	100	60-80	80-100	100	100

TURKEY'S PERFORMANCE ON THE CADASTRE 2014: SWOT ANALYSIS

A SWOT analysis is a structured planning method used to evaluate the **s**trengths, **w**eaknesses, **o**pportunities and **t**hreats involved in a project or in a business venture. A SWOT analysis can be carried out for a product, place, industry or person. It involves specifying the objective of the business venture or project and identifying the internal and external factors that are favorable and unfavorable to achieve that objective (URL 1). In this study, at the corporate level activities related to Cadastre 2014 vision in Turkey were analyzed with SWOT analysis.

Strengths

The second principle of the Cadastre 2014 is for the removal of contradiction between maps and records (Kaufmann and Steudler, 1998; Çağatay, 2012). In the present day, the cadastre

maps are preparing by the technician personnel in many countries (such as England, Ireland, Canada, Australia) and the property information which reveals the verbal units of cadastre is evaluated by other units (such as lawyers, notaries). Contrary to many countries, in our country, the cadastral measures and the registration processes are practiced by the General Directorate of Land Registry and Cadastre (TKGM). With the studies which are practiced under only one institution, the contradiction between maps and records are removed. With this structure, the efficiency that the contemporary cadastre needs and is emphasized in the Cadastre 2014 is ensured.

Weaknesses

The third principle of Cadastre 2014 is to develop a model which can be used in longer time by removing the cadastral mapping. With the projects of TAKBIS and MEGSIS, the information cadastre and title deeds are matched and it is submitted to the users through only one portal. Many institutions can be obtained the information of title deeds and cadastre produced within the scope of TAKBIS project can be obtained from e-Government. This principle has the 60% and 80% realization rate in our country. Institutional works related to implementation of the third principle of Cadastre 2014 have been insufficient because of uncompleted 2D cadastre surveying.

The fourth principle of Cadastre 2014 is to remove "Paper and pencil - cadastre" and replace it with the fundamental data model of modern cadastre. In the direction with this, TAKBIS project combines the title deeds and cadastre information and transfers it into the electronic environment. Therefore, interrogation becomes the data processing functions supporting the analysis and screening, the interface support and the management system of database. With the TARBIS project, the records in different forms which belong to the Ottoman Period, have the strategic importance, we have in our achieves, are facing their physical endurance are arranged as the digital achieve and the efficient index by benefitting from technology and there are the documents and information belonging to many countries, within the burdens of the Ottoman Empire and which gain independency today, in these achieves and the support of documents and information is ensured for some countries such as Macedonia, Palestine, Bosnia and Hercegovina. With the HBB project, it ensured that the metadata related to information and documents of maps is entered by relevant institutions, they are submitted on the internet and the resource waste is prevented with the repeated map production. Since the 2 dimensional cadastre hasn't completed yet, the paper and pencil cadastre has continued but the transition to the digital cadastre based on technology is very successful.

Opportunities

According to the fifth principle of the Cadastre 2014, "The Cadastre 2014 would be significantly privatized and the public and private sector will work together". Our country took a loan (approximately 203 million $) for a finance of the Title Deeds and Cadastre Modernization Project (TKMP) from the International Bank for Reconstruction and Development and with a part of this loan, our country has conducting the service procurement with the tendering procedure with the private sector for the Work of Updating of Cadastral Map and Information (3402 S.K./22-a) which has been conducted by the General Directorate of Land Registry and Cadastre. As of the date 2014, the restoration of approximately 4.4

million parcels has been conducted (Table 2). Therefore, the private sector is ensured to participate directly to the cadastral activities and the private and public sector have begun to work together. Moreover, the private offices can get licenses as a result of exam. As required by the law, the practice and control of processes which are not subject to registration among the cadastral technical services (The practice and control of Application, Determining Place for Parcel, Determining Place for Independent Part) and the responsibility of practice of processes which are subject to registration (The practice, control and monitoring of Change of type, Constitution of servitude, The practice of services based on the request for land amalgamation processes) are conducted by licensed topographical and cadastral offices. As a result of license exam which was practiced, 551 licensed cadastral engineers have gained the right to open the licensed topographical and cadastral office. Even though these offices aren't completely in active, 330 licensed topographical and cadastral offices have giving service as of the date July 2011 (URL-2). The cadastral processes of both licensed offices and the other mapping companies which are working in the restoration processes have been completed in the control of the public and the fifth principle of cadastre 2014 has been successfully implemented in our country. Strong institutional structure of the TKGM and commissioning of the private sector has created opportunities for the implementation of the Cadastre 2014.

Table 2: Tender summary chart between 2004 and 2012 (TKGM, 2015)

Years	Number of project	Number of unit	Number of parcel	Tender price (TL)
2004	19	353	342.259	6.387.013
2005	153	2.946	3.050.240	120.121.981
2006	203	4.143	4.568.693	265.338.784
2007	122	2.786	2.710.091	107.602.993
2008	43	862	760.605	28.997.197
2009	17	371	333.005	20.205.944
2010	26	564	614.316	35.910.065
2011	Cancel	Cancel	Cancel	Cancel
2012	18	238	180.215	10.302.892
TOTAL	601	12.263	12.559.424	594.866.872
TOTAL of PROJECTS				601
TOTAL of UNITS				12.263
TOTAL of CONFIRMED PROJECTS				505

The sixth principle of Cadastre 2014, "Cadastre 2014 will be cost-recovery". The financial dimensions of investments necessary for a sustainable cadastral system are significantly costly. At least a part of costs necessary for the cadastral investments and processes must be taken back from people getting profit from these services. TKGM takes money as fees from citizens in return for the service it gives. TKGM gives service annually 20 million citizens in average. TKGM transferred approximately 6.5 billion TL in 2013 while it transferred approximately 8 billion TL in 2014 to the Treasury (Table 3). TKGM's annual transaction volume and fee income is an opportunity to apply the principles of "Cadastre 2014 will be cost recovery".

Table 3: Number of occurred transaction and value of fees in TKGM between 2010 and 2014

Years	Number of transaction	Value of transaction (TL)	Value of fees (TL)
2014	7.629.498	912.025.123.252	7.945.311.165
2013	6.751.304	808.896.290.733	6.823.826.854
2012	6.190.454	603.048.373.346	4.637.488.907
2011	5.875.531	585.074.713.349	4.272.460.130
2010	6.079.011	429.654.293.773	3.469.313.276

Threats

The first principle of Cadastre 2014 is to be recognized legally all limits and rights on the land and to ensure the legal security of these rights and limits (Kaufmann, 2004; Kaufmann and Steudler, 1998). Although the property rights on the immovable property is under the state guarantee in our country, all legal conditions related to the property aren't completely reflected. The main reason of this is that the immovable cadastre of our country is conducted as 2 dimensional and the relevant property rights are registered under this situation. At the present, 98 % of 2 dimensional cadastre was completed (TKGM, 2015). Since the 2 dimensional cadastre hasn't completed yet, 3 dimensional cadastre and the transition period to the registration haven't started. Both uncompleted 2D cadastre and failing to provide the necessary legal and technical infrastructure for 3D cadastre become a threat.

THE COMPARISON OF CADASTRE 2014 ACTIVITIES IN OTHER COUNTRIES WITH THE SITUATION IN OUR COUNTRY

According to a study conducted by Lononis (2014) in Greece, the first principle of Cadastre 2014 was realized in 60 % - 80 % rate; the second principle of it was realized in 100 % rate, the third principle of it was realized in 100 % rate, the fourth principle was realized in 80 % - 100 % rate, the fifth principle was realized in 40 % - 60 % and the sixth principle was realized in 80 % - 100 % (Table 4). According to a study conducted by Horňanský et all. (2014), the first principle of Cadastre 2014 was implemented in 60 % - 80 % rate; the second principle of it was implemented in 80 % - 100 % rate, the third principle of it was implemented in 80 % - 100 % rate, the fourth principle was implemented in 80 % rate, the fifth principle was implemented in 80 % - 100 % and the sixth principle wasn't implemented (Table 4). According to a study conducted by Land (2014a), the first principle of Cadastre 2014 was implemented in 60 % - 80 % rate; the second principle of it was implemented in 100 % rate, the third principle of it was implemented in 100 % rate, the fourth principle was implemented in 80 % - % 100 rate, the fifth principle was not implemented and the sixth principle was realized in 100 % rate

When the Europe average is considered, the first principle of Cadastre 2014 was implemented in 40 % - 60 % rate; the second principle of it was implemented in 80 % - 100 % rate, the third principle of it was implemented in 100 % rate, the fourth principle was implemented in % 100 rate, the fifth principle was implemented in40 % - 60 % rate and the sixth principle was implemented 40 % - 60 % rate (Lolonis, 2014b) (Table 4). When our country's Cadastre 2014 performance is evaluated, it is successful in terms of both countries in the example and the Europe average. While our country is giving an average performance in the practice of the

first and third principles, it is giving an outstanding performance in the practice of the second, fourth, fifth and sixth principles. If the existing deficiencies are removed, the practice of cadastre 2034 vision will be much easier.

Table 4: Applied percentages of Cadastre 2014 Vision in some countries.

The Six Statements on Cadastre 2014	Some countries and European average				
	Turkey	Greece (Lolonis, 2014a)	Slovakia (Horňanský et al., 2014)	Sweden (Land, 2014)	European average (Lolonis, 2014b)
1- Cadastre 2014 will show the complete legal situation of land, including public rights and restrictions	60%-80%	60%-80%	40%-60% (fulfilled only partially)	60%-80%	40%-%60
2- The separation between 'maps' and 'registers' will be abolished!	100%	100%	100% (applied fully)	80%-100%	80%-100%
3- The Cadastral mapping will be dead! Long live modelling!	60%-80%	100%	100% (applied fully)	80%-100%	100%
4- 'Paper and pencil - cadastre' will have gone!	80%-100%	80%-100%	100% (being applied)	100%	100%
5- Cadastre 2014 will be highly privatized! Public and private sector are working closely together!	100%	40%-60%	80%-100% (implemented to a considerable extent)	not applied	40%-%60
6- Cadastre 2014 will be cost recovering!	100%	80%-100%	not applied	100%	40%-%60

THE EXPECTATIONS FROM CADASTRE 2034

The Vision of Cadastre 2014 is presenting an effective model for a sustainable cadastral system. With this vision, the social and technologic dynamics to affect the land management is required to be regarded in the following 20 years (Özçelik, 2013). In the study named "Beyond Cadastre 2014" presented by Bennett and others in 2010 FIG congress and published in July 2010 GIM International journal, they defined six statements for Cadastre 2034 within the scope of the role and structure of cadastre (Figure 1) (Özçelik, 2013; Lemmens, 2010;2010a; GIM, 2011).

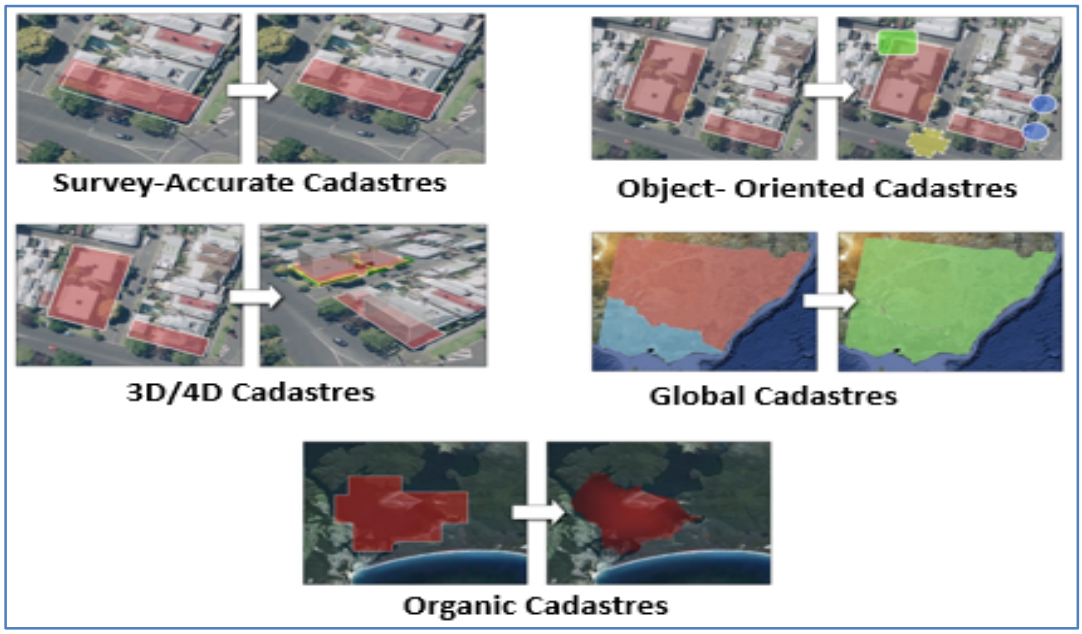

Figure 1: Potential characteristics of future cadastres 2034 (Lemmens, 2010; GIM, 2011; Bennett et al., 2011)

Özçelik (2013) explained these six statements in his study as follows:*'' The concepts of (1) Cadastre Based on Accuracy of Measurement for measuring in high accuracy for land-section harmonization, (2) Cadastre Based on Object instead of cadastre based on parcel for identifying again and legally in the manner that the limitations and responsibilities are met the present day's needs, (3) 3B and 4B Cadastre for modeling, management the land, combining the property data and the sustainable lands, (4) Instant and Current Cadastre for updating continually the cadastral data and the instant access to the cadastral information, (5) Regional and Global Cadastre which is associated with each other in terms of regional and global senses and present opportunity to work together, (6) Natural Cadastre for modeling well the natural environment will integratively play an effective role for designing the future cadastre within the scope of Cadastre 2034 (Bennett and others, 2010; 2010b;2011; Lemmens, 2010;2010a; GIM, 2011).''*

According to Steudler (2010), even if many issues such as the measure accuracy, the land object or the data layers are dealt within the scope of Cadastre 2014, the requirement of land and land usage is increased in the face of some global problems such as the population increase, the climate changes and food and nutrition and the concepts emphasized with Cadastre 2014 are required to be regarded more comprehensively with "Cadastre 2034".

CONCLUSION

Although the property rights on the immovable property is under the state guarantee in our country, all legal conditions related to the property aren't completely reflected because the 3 dimensional cadastre hasn't been started. Therefore, hundred percent success wasn't ensured in the implementation of the first principle. It is envisaged by the second principle that the separation between maps and records are abolished and is implemented under only one institution's responsibility. There is any contradiction since TKGM is the only institution

responsible for mapping (cadastre) and records (title deeds). Therefore, hundred percent success was ensured in the implementation of the second principle. Although the projects such as TAKBIS and MEGSIS were successfully implemented for long-term and sustainable cadastral modeling, the cadastral mapping has been continued because the country cadastre hasn't completed yet. Therefore, hundred percent success wasn't ensured in the implementation of the third and fourth principle. The private and public sector has worked together for the work of updating the cadastral maps and information with the Title Deeds and Cadastre Modernization Project (3402 S.K./22-a Application). The practice and control of processes which are not subject to the registration among the cadastral technical services and the practice responsibility of those which are subject to the registration are conducted by licensed topographical and cadastral offices. With these two projects which are examples for private and public sector to work together under the leadership of TKGM, hundred percent success was ensured in the implementation of the second principle of cadastre 2014. TKGM has conducted investments for better service with fees it takes in return for services it gives to the citizens. Within this sense, these fees are getting back them as services and a cost-recovering and sustainable cadastral system is implemented. Therefore, the last principle of Cadastre 2014 has been successfully implemented in our country. When our country is compared with other Europe countries, its performance on Cadastre 2014 becomes a positive reference for Cadastre 2034 and the transition to the modern cadastre will be promptly completed with the completion of deficiencies.

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AN ASSESSMENT TOWARDS TO INNOVATIVE CADASTRE INTEGRATED WITH CADASTRE 2034 VISION

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ABSTRACT

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.

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

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).

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).

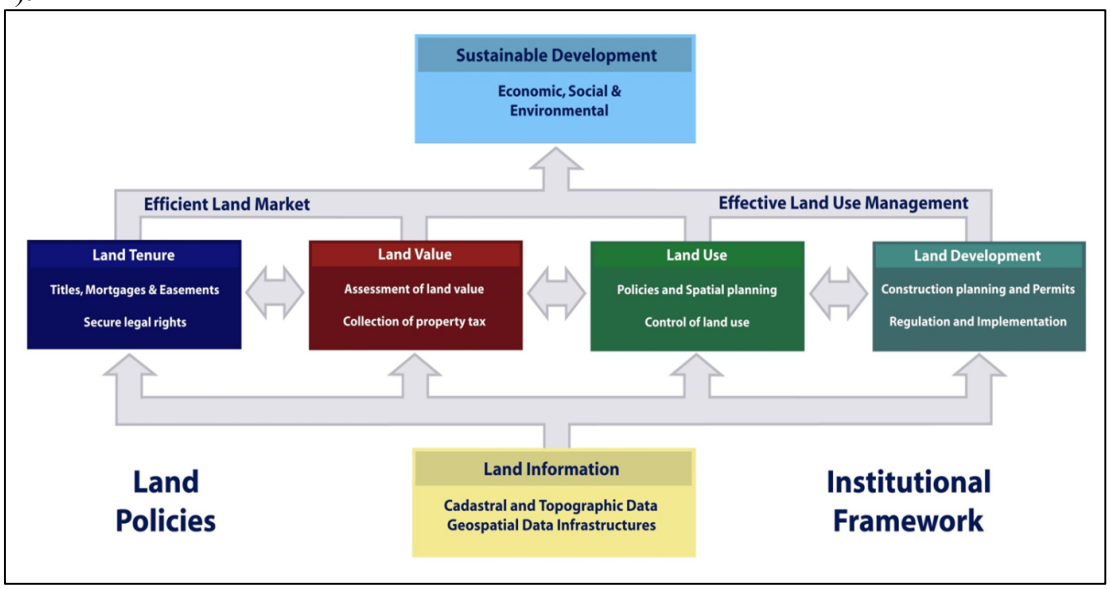

Figure 1. Land Management Framework within the Basic Needs (Enemark, 2013; Enemark et al., 2014)

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).

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).

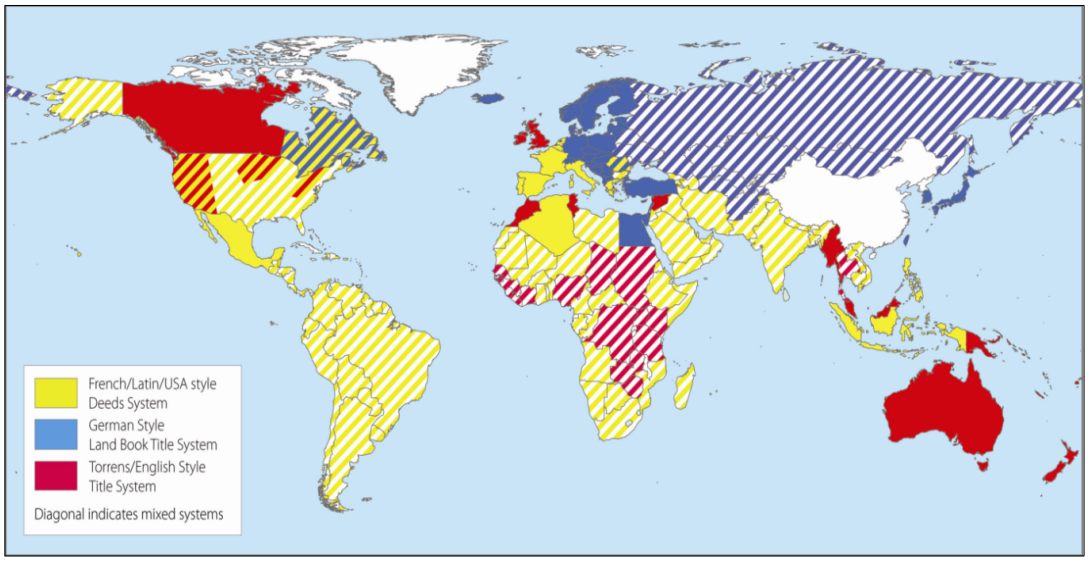

Figure 2. Land Registration System Approaches through the World (Enemark, 2010a; 2012)

"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).

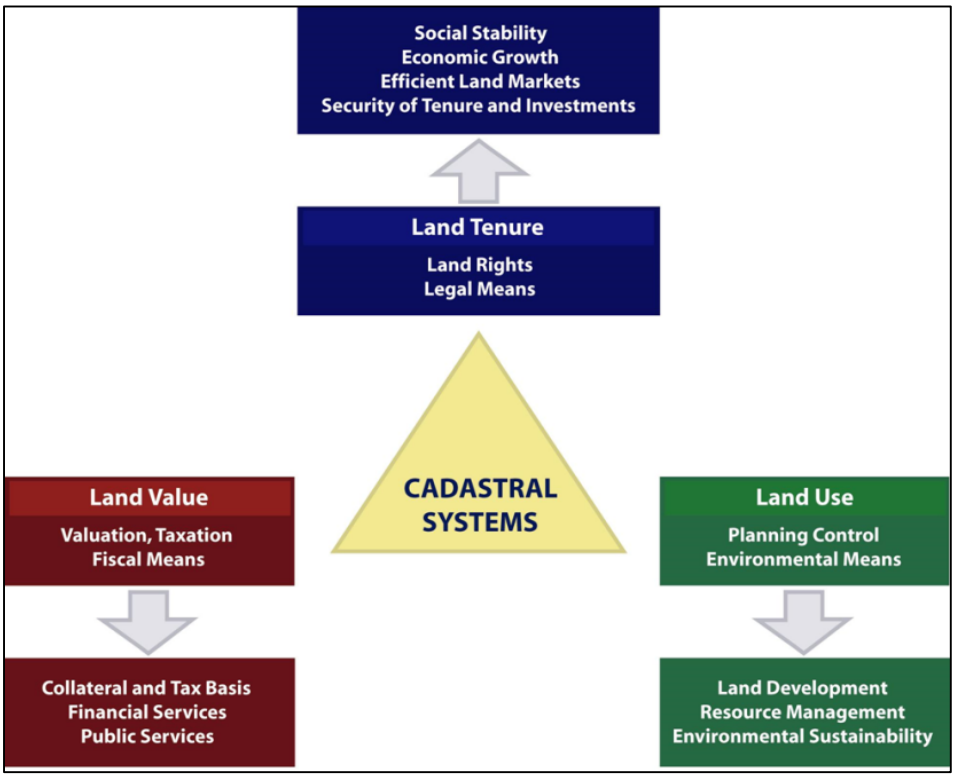

Figure 3. Cadastral System Integrated with the Land Administration Components (Enemark, 2012)

"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).

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).

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).

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 (Figure 5) 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.

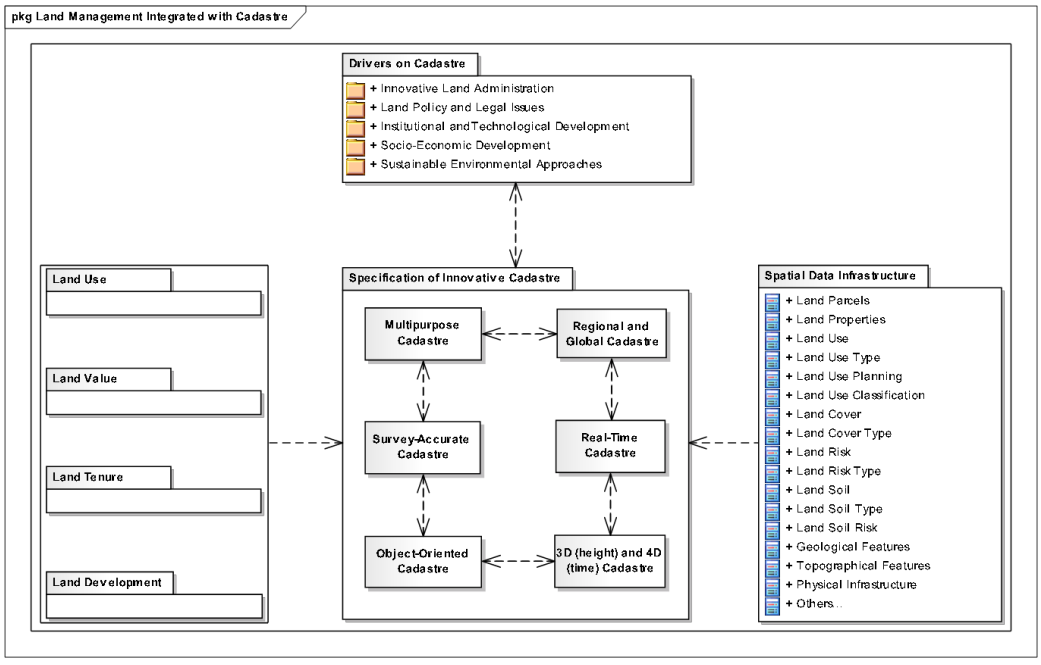

Figure 5. Cadastre as Spatial Data Framework for Land Administration (Adapted from: Ozcelik, 2013; Enemark, 2012; Bennett et al., 2010; GIM, 2011)

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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TOWARDS INTEGRATION OF CADASTRAL LAND INFORMATION SYSTEM IN REPUBLIC OF KOSOVO

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ABSTRACT

Security of ownership is a prerequisite for a functioning land market. Real property rights must be registered and the ownership information should be easily accessible. The authorities should guarantee the content and transparency of the register. This register forms a strong basement for the development for Republic of Kosovo. The functioning of the cadastral system in the Republic of Kosovo is based on a series of laws and regulations. From 15 June 2008 when the Constitution of Republic of Kosovo entered into force, the right to own the property is guaranteed, and the use of property is regulated or will be regulated by the law in accordance with the public interest. Kosovo Cadastral Agency is responsible for the development of the legal framework and the coordination of its implementation relating to the cadastre and other matters concerning the cadaster land information system in Republic of Kosovo. The KCA's areas of competence are geodesy, surveying, geographical information systems, real property registration, mapping and legal issues related to land administration. The objective of Cadastral Land Information System in Republic of Kosovo is the harmonization of the cadastral legal part (textual base) with the cadastral map (graphical part). This objective leads towards tomorrows' vision regarding the Land Administration, and meets the Cadastre's requirements for Cadastre 2014 and Cadastre 2.0 (2020) general vision, where the integration of legal and mapping data is significant step for the future Cadastre. Kosovo Cadastre Land Information System (KCLIS) has been conceived of as an integrated multi-purpose system that is composed of a number of key conceptual modules and is as a base system for NSDI in Kosovo. It replaces the Immovable Property Rights Register (IPRR), providing a more secure, robust and efficient system with increased functionality. KCLIS is a dynamic system and is designed to grow and to develop further. The primary role of KCLIS is to assure immovable property rights registration in Kosovo. It serves both KCA and MCO organizations and the management of both graphical and textual data. KCLIS integrates office routines, sales of data, additional services that relate to cadastre, functions for more effective management, security and IT support. Until now the textual part (KCLIS – T) is functional in all MCO's in Kosovo and mapping part (KCLIS-CM) will be implemented by mid of 2015. All this achievements of Cadastre development in Kosovo would not be possible without invaluable support of the donors, such as the World Bank, Norwegian Government German Government (GIZ) etc. This paper presents the developments of Cadastre in Kosovo with main focus on the integration of Textual and graphic information within Kosovo Cadastral Land Information System.

Key words: KCLIS, Cadastre, Cadastral Map, Kosovo

PËRMBLEDHJE

Drejt Integrimit të Sistemi të Informacionit Kadastral për Tokat në Republikën e Kosovës

Siguria e pronësisë është parakusht për një treg funksional të tokës. Të drejtat e pronës duhet të regjistrohen dhe informacioni i pronësisë duhet të jenë i çasshëm. Autoritetet duhet të garantojnë për përmbajtjen dhe transparencën e regjistrit. Ky regjistër formon një bazament të fortë për zhvillimin e Republikës së Kosovës. Funksionimi i sistemit kadastral në Republikën e Kosovës bazohet në një varg ligje dhe rregullore. Prej 15 qershorit 2008, kur Kushtetuta e Republikës së Kosovës ka hyrë në fuqi (Kushtetuta e Republikës së Kosovës 2008), garantohet e drejta e pronës, dhe përdorimi i pronës rregullohet ose do të rregullohet me ligj, në përputhje me interesin publik. Agjencia Kadastrale e Kosovës është përgjegjëse për zhvillimin e kornizës ligjore dhe koordinimin e zbatimit të tij në lidhje me kadastër dhe çështje të tjera që kanë të bëjnë me sistemin e informacionit kadastral për tokat në Republikën e Kosovës. AKK-ja ka kompetenca në këto fusha: në gjeodezi, matje, sistemet për informacione gjeografike, regjistrimin e pronës së paluajtshme, përpilimin e hartave dhe çështjet ligjore që kanë të bëjnë me administrimin e tokës. Qëllimi i Sistemit të Informacionit Kadastral për Tokat në Republikën e Kosovës është harmonizimi i pjesës kadastrale ligjore (pjesa tekstuale) me hartën kadastrale (pjesa grafike). Ky objektiv çon drejt vizionit të së ardhmes lidhur me Administrimin e Tokës, dhe i plotëson kërkesat e kadastrit për Kadastër 2014 dhe Kadastër 2,0 (2020) vizion të përgjithshëm, ku integrimi i të dhënave ligjore dhe ato të hartës janë hap i rëndësishëm për të ardhmen e Kadastrit. Sistemi i Informacionit Kadastral për Tokat e Kosovës (SIKTK) është konceptuar si një sistem i integruar për shumë qëllime, që është i përbërë nga një numër i moduleve të rëndësishme konceptuale dhe është si një sistem bazë për IKJH-në në Kosovë. Ky sistem zëvendëson Regjistrin mbi të Drejtat e Pronave të Paluajtshme (RDPP), duke siguruar një sistem më të sigurt, të fuqishëm dhe efikas me rritjen e funksionalitetit. SIKTK është një sistem dinamik dhe është dizajnuar që të zgjerohet dhe të zhvillohet më tej. Roli primar i SIKTK-së është që të sigurojë regjistrimin e të drejtave pronësore mbi pronën e paluajtshme në Kosovë. Ajo i shërben AKK-së si dhe organizatave të ZKK-ve si dhe menaxhimit të të dhënave si në pjesën grafike ashtu edhe në atë tekstuale. SIKTK integron përditshmërinë e zyrave, shitjen e të dhënave, shërbimet shtesë që kanë të bëjnë me kadastrin, funksionet për menaxhim më efikas, siguri dhe mbështetje TI-së. Deri tani pjesa tekstuale (SIKTK – T) funksionon në të gjitha ZKK-të në Kosovë ndërsa pjesa e hartave (SIKTK-G (CM) do të zbatohet diku kah mesi i vitit 2015. Të gjitha këto arritje të zhvillimit të Kadastrit nuk do të kishin ndodhur pa ndihmën e çmueshme të donatorëve, siç është Banka Botërore, Qeveria Norvegjeze, Qeveria Gjermane (GIZ) etj. Ky punim prezanton zhvillimin e Kadastrit në Kosovë duke i dhënë prioritet informatave Tekstuale dhe Grafike në Sistemin e Informacionit Kadastral për Tokat në Kosovë.

Fjalët kyçe: SIKTK, Kadastri, Harta Kadastrale, Kosovë

INTODUCTION

The existing Cadastral Map data for all properties in Republic of Kosova, are in digital format and the maintenance of those data until now is made using the *Geomedia* platform with the adopted module *GeosPro-Procalc*.

Geomedia-Professional is used as desktop GIS software, supported with optimised module GeosPro-Procalc, based on the official data model in Kosova. The optimised module is used for the maintenance of graphical cadastral data, processing of land survey data and management of data. Those data are stored in local data base and the backup of data is made manually.

Implementation of new KCLIS-CM (Kosovo Cadastre Land Information System - Cadastre Map) module for maintenance of cadastre graphical data, is continuous development at Kosovo Cadastral Agency with the aim for general completion of the unified and integrated Kosovo Cadastre Land Information System, which is the part of the KCA-s approved strategy for KCLIS.

Technical specifications for development of KCLIS-CM are made by KCA supported by Norwegian and GIZ experts. The founding of application development and project implementation in general is also supported by Norwegian government through authority Statens Kartverket.

The contract for application development is signed in March 2013 with the consortium IN2/IGEA/Cactus (Croatia and Kosova) and the acceptance is done in December 2013.
Below are parts of the KCLIS concept which have been already in operation:

- KCLIS Textual – management of cadastre text information
- KCLIS Graphical – management of map features (raster and vector)
- ARIS – Address registry
- KCA Geoportal – web portal for dissemination of data from KCA

And the KCLIS-CM Cadastre Map component is seen as an extension of the KCLIS Graphical. The component have a close cooperation with KCLIS Graphical and KCLIS Textual, but the main purpose is to provide storage and specialized functionality to manage land survey data and cadastre graphics, and finally functionality for distribution of this information to other systems, for example the Geoportal.

Also the KCLIS-CM contains all the necessary tools for the maintenance of cadastral map data based on applicable legislation in force (laws, administrative guidelines, frameworks, guidelines etc). Starting from March 2014 until now the KCLIS-CM is implemented in total at 24 MCO-s and implementation in remained 11 MCO-s in the Republic of Kosova is planned to be finished in July 2015.

KCLIS-CM is the official unified tool for maintenance of Cadastre Map data during the sporadic and systematic registration of immovable property rights. The system contains all the necessary tools for the maintenance of cadastral map data based on applicable legislation in force (laws, administrative guidelines, frameworks, guidelines etc).

OVERALL SYSTEM CONCPETS

Main Purpose of the System

Management of Cadastre Map information

The main purpose of the Cadastre Map component is to store, edit and manage the graphical information about the all immovable property units in Kosovo. Textual information about the cadastre units and related documents are managed by other components of the KCLIS.

Management of Land Survey Data

The Cadastre Map component will also manage land survey data (point, lines, and areas) which are the measurement result from the field when using GPS, total stations, etc. Land survey data can be loaded into the database and will be available for construction of different features in the graphical databases, for example in case of defining a Boundary Point. Fig. 1. below shows the system context of the Cadastre Map (in red colour) which also indicate its relationship to the existing KCLIS Graphical.

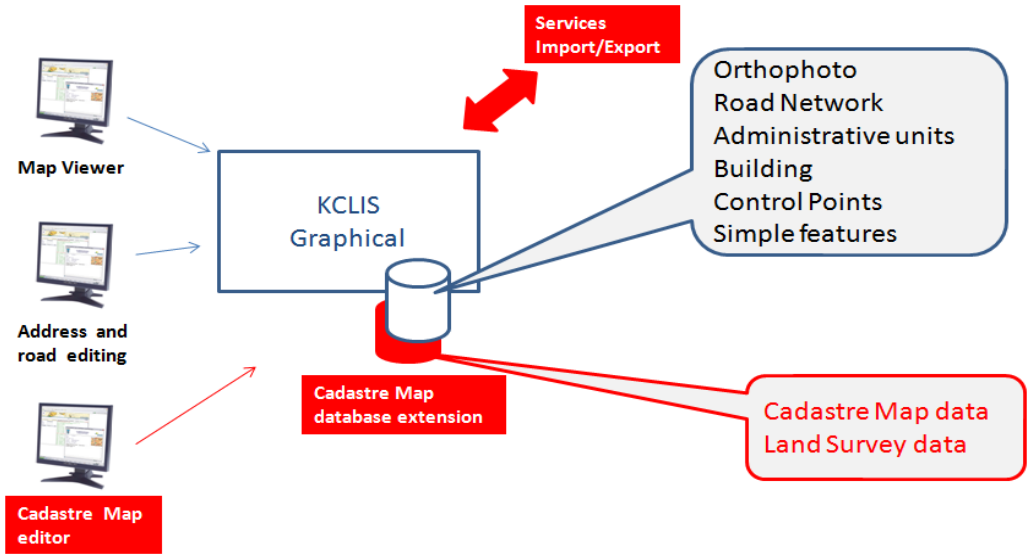

Fig.1. Cadastre Map as an extension of KCLIS Graphical

Based on existing functionality in KCLIS Graphical, the Cadastre Map extension comprises:

- Database storage and management of land survey and cadastre graphics
- A graphical editor for managing land survey and cadastre graphics
- Import and export of land survey and cadastre graphics
- Interoperability with other KCLIS components (services)

The Cadastre Map can alternatively be implemented as extension to existing databases and software components, or as separate databases and an independent software component.

KCLIS Architectural Principles

System Architecture Principles

The KCLIS system is based on the principles of Service Oriented Architecture (SOA), namely:

1. Each system module operates independently of other system modules.
2. Each system module completely controls the data for which it is responsible.
3. The system modules communicate with each other and with various other clients via interoperability services.

Over the last 10 years, SOA has become a well-known and accepted method used for integration of software modules within a software system. The SOA principles are also applied to the integration of independent systems.

Interoperability Principles

The integration and communication between actual systems will be implemented by use of services. The components in KCLIS will deal with two types of interoperability services, namely: invocation services and web services.

Web Services are services applied between two systems without user interaction. A request for service is sent by one system as a message, and the response from the other system is a message too. SOAP Web Service, WMS and WFS are examples of Web Services.
Invocation services are used when the service involves user interaction directly to the system which provides the service.

An invocation service implies that a unique (session) key is defined by the Client. The key will be associated with results which will be stored at the Service Provider. The Client will therefore be able to request the stored data using the key via a final Web Service.

KCLIS-CM Main Technical Characteristics

System has the following main technical characteristics:

- High security in relation to stored data and system access
- High reliability and availability (>99%)
- High scalability and performance
- Support for multiple languages, on both user interface and stored data level
- Enhanced interoperability capabilities for cooperation with other KCLIS systems (Geoportal, ARIS-address register, KCLIS-Textual, KCLIS-Document Management)
- Historical data storage
- Shared geometry model (topological data model)

Through KCLIS-CM special services which are develop, the all types of cadastral units (parcels, buildings, parts of buildings, right and restrictions and utilities) are replicated in real time in Geoportal (http://geoportal.rks-gov.net) for wide range of public users.

Conceptual Architecture

Generally, KCLIS-Cadastre Map component is an extension to the main KCLIS-Graphical module, which will provide basic viewing and editing functionalities. This module is used directly by internal users and indirectly by external ones through the publicly available Geoportal. Geoportal users are read-only with the additional ability to report errors and order/purchase data. In total there are 5 groups of users shown in Fig. 2.

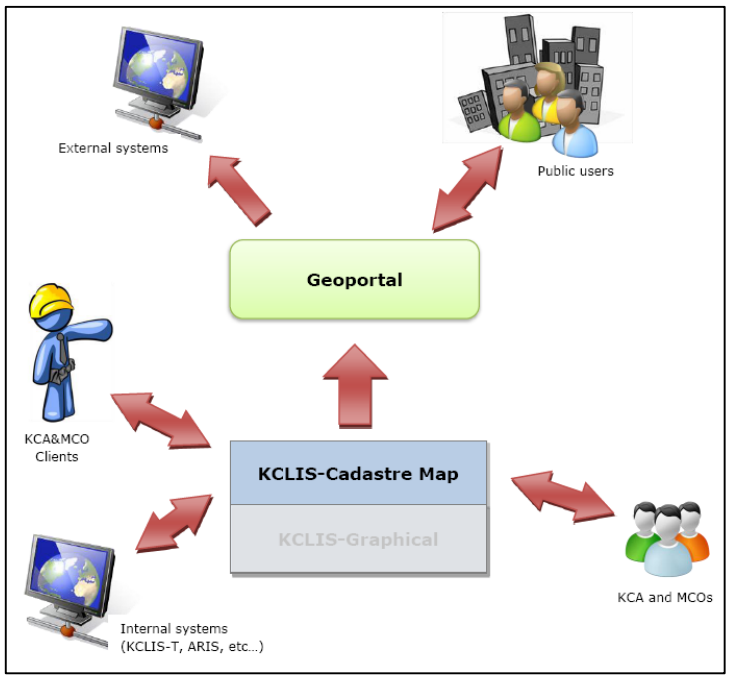

Fig. 2. Conceptual architecture of KCLIS-CM

System is developed as an extension of the KCLIS-Graphical component, utilizing its modular design. Design principles are partly dictated by the ones used for the previous KCLIS-Graphical:

- Use of open industry standards
- Use, as much as possible, of Open Source and free technology
- Utilization of existing KCLIS-Graphical functionalities
- Integration with other existing and future KCA systems
- Main solution for management of graphical cadastre data
- Technical design based on Service Oriented Architecture
- High availability and scalability

Software Solution

All software, except for Microsoft Windows Server, Microsoft SQL Server and Microsoft IIS is fully OpenSource and as such does not incur any licensing costs.

Table 5. Software List

Name	Description	Manufacturer
vSphere	Virtualization platform	VMware
Windows Server 2008R2	Operating System	Microsoft
SQL Server 2008R2	RDBMS	Microsoft
IIS	Web and Application server	Microsoft
Reporting Services	Reporting tool	Microsoft
Geoserver	GIS server	OpenSource
GeoExt	Web Mapping API	OpenSource
Nagios	Monitoring tool	OpenSource

IMPLEMENTATION KCLIS-CM

Process for project implementation is divided in the three main phases:

- Development of application by company and partial testing of delivered functionalities through three iterations
- Testing of completed application at KCA with the two pilot Municipalities
- Final application acceptance
- Training of users in test environment (data base) in average 5 working days,
- Data correction and migration (upload) of corrected data in production-real environment.
- Support of users (on job training) for independent work in production-real environment.

Fig. 3. KCLIS-CM training of end users

ADVANTAGES OF KCLIS-CM

Advantages of KCLIS-CM in offering the services and connection of geo-information with property right records are:

- Integration of the two bases with cadastral data (Textual -Cadastral Map), Fig. 5
- Quick comparison and analysing the consistency and reliability of the cadastral data between data bases,
- Correction of inconsistencies on cadastral data between the two databases,
- Increase the data quality and update status in cadastral data,
- Presentation in real time on National Geoportal on updates and changes made on all graphical cadastral data, as information for the owners and interested public users, Fig. 4
- Facilitate the check and processing of the cadastre data which represent the situation before 1999 and it is expected to be returned by Serbia,
- Creation of several statistical reports: QA/QC report, report on changes, report on neighbour units, report on inconsistency between graphical and textual data, comparison of all existing data (textual and graphical) etc.
- Wide flexibility for user administration and editing rights management

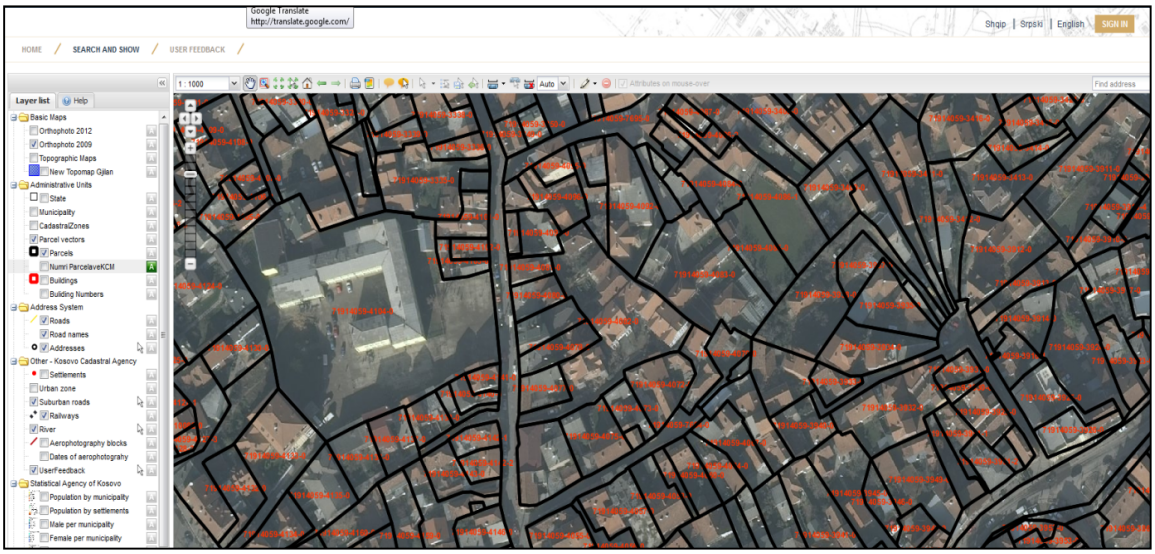

Fig. 4. Replicated cadastral data in National Geoportal

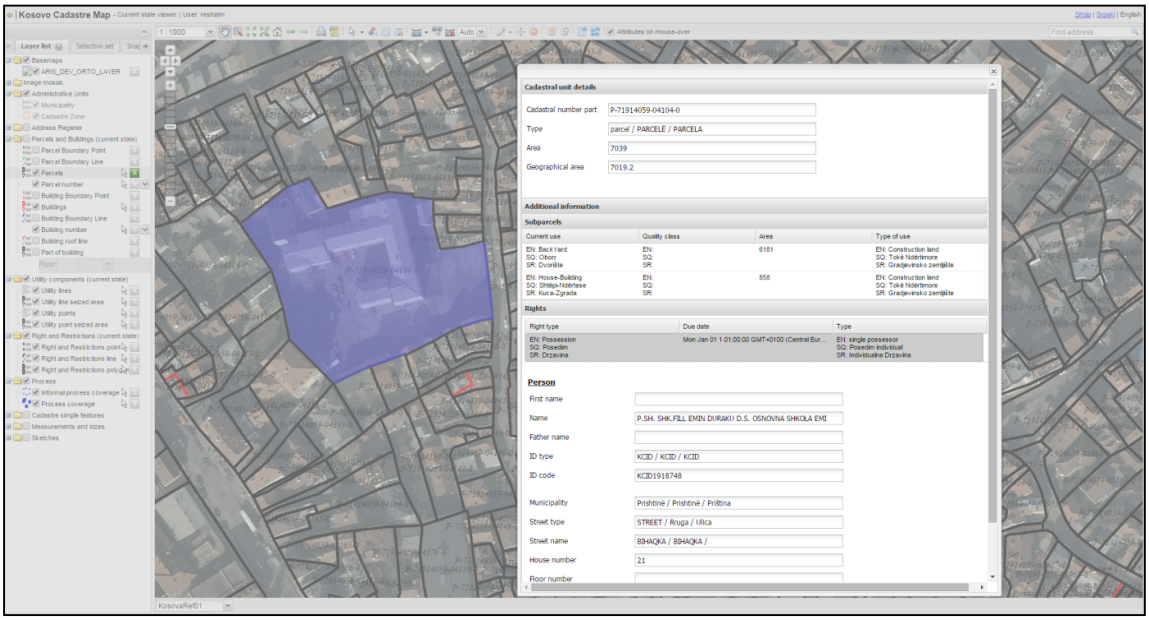

Fig. 5. KCLIS-CM (comparation of data Graphical-Textual)

CONCLUSIONS

The objective of Cadastral Land Information System in Republic of Kosovo is the harmonization of the cadastral legal part (textual base) with the cadastral map (graphical part). This objective and implementation of KCLIS-CM leads towards tomorrows' vision regarding the Land Administration, and meets the Cadastre's requirements for Cadastre 2014 and Cadastre 2.0 (2020) general vision, where the integration of legal and mapping data is significant step for the future Cadastre.

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