

Registration Needs in the Third-Dimension Cadastre

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SUMMARY

All over the world the population and population density is growing especially in the urban area. As a result of this, land surface and subsurface is used for the residential and commercial purposes and public services. Turkey's national cadastre services are carried out by The General Directorate of Land Registry and Cadastre (TKGM) according to the principles of The Cadastre Law, Number 3402. The cadastral works and land registry activities focus to the two-dimensional ownership in Turkey, but a lot of activities have three dimensional ownership structure, like subways, pipelines, communication lines, underground shopping centers and car parks ect. As a result, a lot of registry problems occur in the land registry offices and other public organizations. Turkish cadastral works have been completed across the country by the Land Registry and Cadastre Organization. The Organization has to be draw a new road map and the new roadmap should include a three-dimensional cadastre. In this study, current cadastral system in Turkey was briefly evaluated in the light of three-dimensional ownership. Some determinations were made about of three-dimensional ownership activities.

ÖZET

Dünya genelinde kentlerde nüfus ve nüfus yoğunluğu artmaktadır, bunun sonucu olarak arazinin yüzeyi olduğu kadar ve yüzeyin altı da gerek konut ve yerleşme, gerek kamu hizmeti ve gerekse ticari amaçlar için kullanılmaktadır. Türkiye'de kadastro hizmeti 3402 sayılı yasa hükümlerince Tapu ve Kadastro Genel Müdürlüğü tarafından verilmektedir. Türkiye'de Kadastro ve tapu işlemleri iki-boyutlu taşınmaz mal mülkiyeti esaslarına göre yürütülmektedir, ancak yeraltı metro hatları, boru hatları, iletişim hatları, yeraltı otopark ve alışveriş merkezleri gibi pek çok uygulama üç boyutlu mülkiyet yapısına sahiptir. Bunun sonucu olarak tapu müdürlüklerinde mülkiyetin kayıt altına alınması hususunda birtakım problemler yaşanmaktadır. Türkiye'de kadastro çalışmaları yurt genelinde tamamlanmıştır. Tapu Kadastro teşkilatı bu aşamadan sonra üç boyutlu kadastro kavramı ve uygulamalarını da içeren bir yol haritası belirlemelidir. Bu çalışmada Türkiye'nin mevcut kadastral sistemi değerlendirilmiş ve üç boyutlu mülkiyet uygulamaları hakkında belirlemeler yapılmıştır.

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1. TURKISH CADASTRAL SYSTEM

The history of the land registration and cadastral works reach to the middle of the 19th century in Turkey. After establishing of Turkish Republic Cadastral works were started in 1925 under law No. 658 by The General Directorate of Land Registry and Cadastre (TKGM) (Yaşayan et al. 2011). Then cadastral work was started in some major cities and urban areas in 1934 under the law 2613. In 1950, the Land Registry Law numbered 5602 was put into practice to speed up cadastral work in rural areas. Known as ‘land cadastre’ was changed in 1964 and 1966 and became the Land Registry Law (No 766) (Demir, and Coruhlu 2008). Cadastral work had been carried out in urban and rural areas under two different laws until 1987. The Cadastre Law Numbered 3402 was put into practice to eliminate the problems originating from having two different laws and to gather all cadastral regulations into one law. However, in the forest areas the cadastral works are still carried out under a different law (Number 6831) undertaken by the General Directorate of Forests. Up to the 1990’s over three hundred thousand cadastral maps were produced in non-digital (analogue) format. The production method, coordinate system, scale, and base type of these maps were different. Table 1 shows the distribution of maps by production method.

Table 1- The classification of cadastral maps in Turkey (Sisman 2014).

Method of Production	Number of Maps	(%)
Digital maps	258 801	41.6
Non-digital maps (photogrammetric and classical)	271 505	43.6
Non-digital maps (graphical)	91 804	14.8
Total	622 110	100.0

Cadastre Law numbered 3402 was amended by law numbered 5304 in 2005. It was include great changing about cadastral work, one of the most important changing was private sector could take a place in cadastral works with the new law of cadastre. After the last changing in cadastre law, the cadastral production rise fivefold in Turkey (Fig. 1). A total of 32982 (98.7%) units’ cadastral works were completed in 2014 (URL 1)

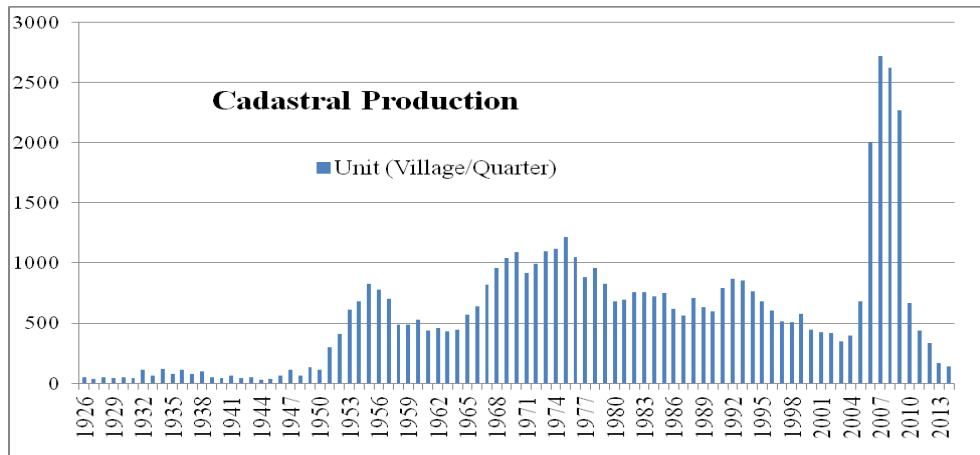


Fig. 1: Cadastral Production in Turkey (URL1)

2. THIRD DIMENSION IN CADASTRE

The first article of current Turkish Cadastre Law is instruct that “The purpose of the Turkish Cadastre Law is, defining boundaries and the legal status of real estate’s and making cadastral or topographic cadastral map according to the national coordinate system and establishing Turkish Land Registry system and building the infrastructure of spatial information systems”. (URL 2) .According the current cadastral law there isn’t any obligation about surveying under surface objects in the cadastral works. As mentioned above about six hundred thousand cadastral maps were produced however most of them produced in two-dimension (XY). Recently, new cadastral maps have been produced in XYZ coordinates by the public and private sector depends on Turkish National Fundamental GPS Network standards (TUTGA) since 2005, but this kind of maps cannot be accepted as a three-dimension cadastral maps because we don’t know about how to use the above surface and underground space (Aydm, 2008).

Cadastral parcels like living organisms, they can be divided two or more parts or, two or more parcels can be joint as a one parcel, in this way the owner of the parcels can be changed, but all of this process occurs in two dimension surface (Fig. 2).

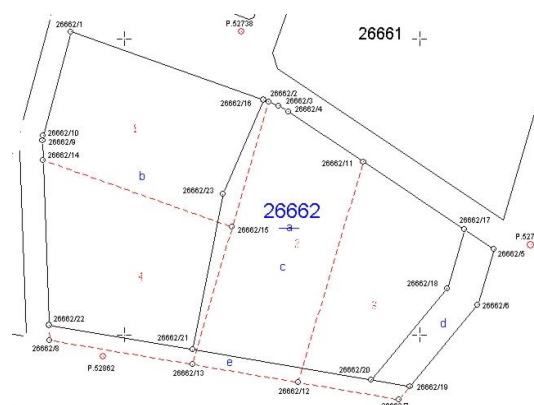


Fig. 2: Cadastral parcel changing

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A building is built on a parcel, each separate unit of the building which located under or over the surface has to be registered in land register system as a property unit of the land parcel, so the ownership status of the land parcel completely changes and a three dimension ownership occurs according to the condominium law number 634. A pipe line project is applied in a region, using of some parcels will be restricted, therefore before project the all route of pipe line which located in registered parcels either expropriated or appurtenances procedure is applied for all parcels. After then, the route of pipe line is uploaded on cadastral map and a three dimension ownership occurs according to the Turkish Civil Law number 4721. But all ownerships are drawn in two-dimension cadastral map. A three dimension cadastre is a cadastre which registers and gives insight into rights and restrictions not (only) on parcels but on three dimension property units, (Stoter, 2004) but in the current situation Turkish Cadastral system cannot be accepted as a three-dimension cadastral system.

2.1. Problems on Registration in 3D

Nowadays to provide growing demands of living in the city and to serve them better, in urban area land surface and subsurface is used, and especially their business centers has led to overlapping and interlocking constructions (Stoter, 2004). Subways, streets, rail roads, underground pipe lines, power lines, communication lines, drinking water, wastewater lines etc. are the important urban infrastructures (Table 2).

Table 2- The usage of underground and its surface structures (Aydin, 2008)

Under Surface	Surface
Metro stations	Car park, pavement, offices shops
Shopping centers	Road, pavement, building, offices shops
Pedestrian subways	Pavement
Parking lots	Road,
Bus/tram/railway stations	Car park, pavement, offices shops
Infrastructure Objects: Electricity, water, communication, cables, pipelines, sewers, etc.	---

As mentioned above there isn't any obligation about surveying under surface objects in the cadastral works according the current Turkish Cadastral Law. The boundaries of land parcels and other objects subject to registration are measured (Karataş, 2007) however so many objects located underground do not take a place in cadastral maps. Public places like roads, squares, bridges are not registered according to the Turkish cadastre law article 16 they only drawn in cadastral map (URL 2). This point is starting the problem of registration third dimension.

2.2. Some Cases about Infrastructural cadastre needs.

We can find interesting examples about third dimension ownership accident. In august 2006 a building contractors had pierced the tube of the Taksim-Levent subway while they were making a geological drilling (Fig. 3a, b). According to the news the parcel owner didn't get

any permission and they didn't know there was a metro line under their parcel (URL 3). It was a dramatic accident; thankfully nobody was died or injured.

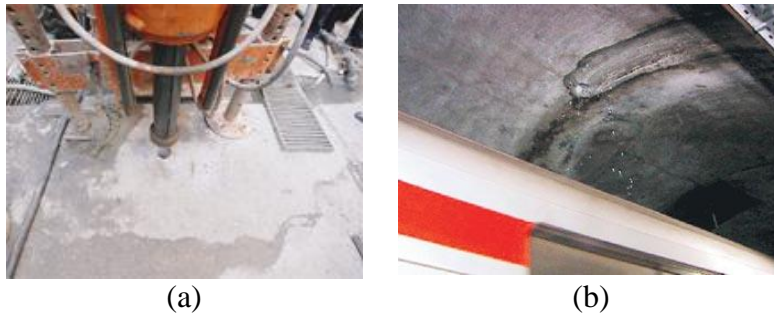


Fig. 3 a, b: Pierced tube of the Taksim-Levent subway

The BIST (IMKB) is one of the important stock exchange of the Europe. In November 2007 an excavator operator had broken off the main fiber optic cables of IMKB while he was digging of the street. It was an important accident thankfully nobody was died or injured but any stock market operation and trading activities weren't made in the morning session. Approximately 500 million dollars the stock market operation could not be performed in IMKB (URL 4).

Natural gas is an important fuel and a raw material in manufacturing. It was used electric power, industry, vehicles and homes. In Turkey 74 cities were provided with natural gas other 7 cities are in engineering or construction phase (URL 5) so almost all cities in Turkey used natural gas. Due to the natural gas is an explosive and flammable material, distributing natural gas to homes is an important and serious work. Although natural gas distributors work very carefully, a lot of accidents can happen. One of the important reasons of these accidents is unregistered infrastructure objects. Pipelines and other infrastructure objects don't belong to any registered parcel so they cannot be registered in city center.

The shops located under street (Fig. 4a, b) aren't registered according to the current cadastre law, because they don't belong to any registered parcel as pipe lines. To solve this problem TKGM has declared some opinions and streets were registered according to these opinions (Fig. 5a, b). Shops located under the street were registered as a real estate in spite of the cadastre law article 16.



Fig. 4 a, b: The shops located under street

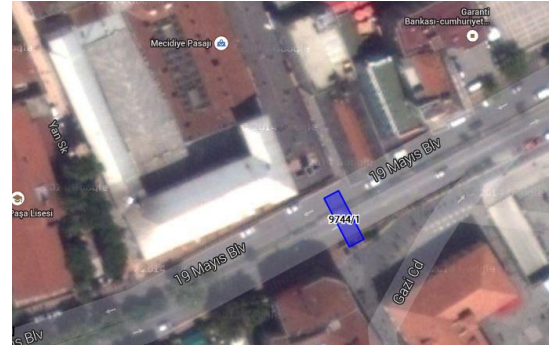
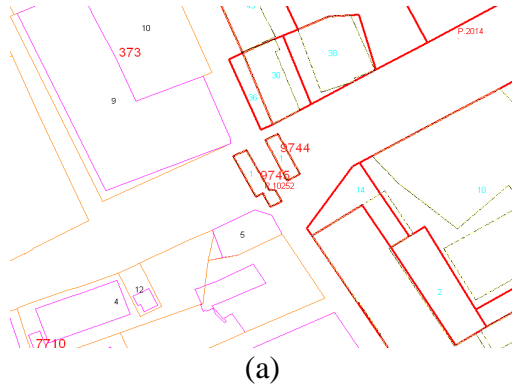


Fig. 5 a, b: Registered a part of street

3. RESULTS

The current Turkish cadastral system can be defined two-dimension cadastre and there isn't any obligation about surveying and registering public places like roads, squares, bridges. Nowadays to provide growing demands of living in the city and to serve them better, in urban areas land surface and subsurface is used. Some infrastructure objects don't need registration like drink water and wastewater lines but we have to register tunnels, pipelines (natural gas, crude oil) metro lines, subways, pedestrian subways ect. But registering subsurface objects don't have any legal basis. Under these circumstances following works have to be done;

Some regulations are needed about three-dimension cadastre

Public places should be registered,

The outlines of ownership must be defined, how deep or how height,

Three dimension cadastre data model should be defined.

TKGM has completed the first Turkish national Cadastre and Land Registry, now second cadastre should be discussed and application principles determined in the light of the three dimension and multipurpose cadastre.

Growing population and developing technology made our world smaller. We have to recognize our world better.

REFERENCES

Aydin, C.E 2008, Usage of Underground Space for 3D Cadastre Purposes and Related Problems in Turkey Sensors 2008, 8, 6972-6983

Demir, O, Coruhlu Y.E. 2008, The graphical cadastre problem in Turkey: the case of Trabzon province. Sensors 2008, 8, 5560-5575.

Karataş K, 2007, Urban Technical Infrastructure Facilities, Cadastre and The Organization of Its Applications in Turkey, Phd Thesis, Karadeniz Technical University, Institute of Natural Science, Trabzon.

Sisman A, 2014, An Experimental Design Approach on Georeferencing Boletim de Ciências Geodésicas, 20, 3, 548-561.

Stoter E.J, 2004 3D Cadastre, NCG Nederlandse Commissie voor Geodesie Netherlands Geodetic Commission Delft.

Yaşayan A, Erkan H, Seylam SG, 2011, Kadastro Kavramı Ve Türkiye Kadastrosu, TMMOB Harita ve Kadastro Mühendisleri Odası 13. Türkiye Harita Bilimsel ve Teknik Kurultayı 18-22 Nisan 2011, Ankara

URL 1 .<http://www.e-tkbm.gov.tr/publisher/projeizleme.htm> 20.02.2015

URL 2 <http://mevzuat.basbakanlik.gov.tr/Kanunlar.aspx> 10.01.2015.

URL 3 <http://www.hurriyet.com.tr/gundem/4898570.asp> 21.12.2014.

URL 4 <http://www.gazetevatan.com/500-milyon-dolarlik-kepce-149289-ekonomi> 16.12.2014.

URL 5 <http://www.botas.gov.tr> 22.02.2015

BIOGRAPHICAL NOTES

He graduated from Karadeniz Technical University. He worked in The General Directorate of Land Registry and Cadastre in between 1998-2006. He is working in Ondokuz Mayıs University Department of Geomatics as an Assistant Professor from 2007.

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