

How To Be Created A New Terminology For 3- and 4- Dimensional Cadastre In Turkey

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Key words: Three Dimensional Cadastre, Terminology, Common Concepts Method

SUMMARY

The importance and necessity of 3 and 4 Dimensional cadastre in international platforms is conducted within the FIG and are highlighted in the cadastre vision of 2014 and 2034. 3D cadastre work is done at a basic level in some countries, such as Brazil, Croatia and Australia. Some projects such as TAKBIS and MEGSIS support three-dimensional cadastral transition in Turkey. However, there are some factors that can cause difficulties in the implementation of 3-4 dimensional cadastre in both our country and abroad. These factors indicate differences according to the legal basis of each country and the level of development. We can examine the problems experienced in the implementation of 3D cadastre under legal, technical and institutional headings. Problems that are experienced from the legal point of view within the scope of our study will be examined. The definition of cadastre in our country is defined in different laws such as Civil Law and Cadastre Law. However, there are differences between these definitions. In addition, there is no clear concept of 3D cadaster in these Law. But the legal definition of the cadastre supports the three-dimensional cadastre because it is intended to reflect the current situation of the land. There is also no explanatory definition of the scope and content of the 3D cadastre in the law. The current cadastre system in our country is two-dimensional and has about 35 legal sub-systems. The diversity of legal bases including the concept of cadastre, sometimes leads to complexity in practice. There are also problems in the terminology concerning the cadastral system in these laws. The same concept is expressed by various clauses in different laws. Making particular envisaged to determine the scope of the 3-4 dimensional surveying activities can be a problem in the terminology used. Within the scope of our study the 3 and 4-dimensional concepts related to cadastral surveys used in the literature in the world and Turkey is determined based on qualitative research techniques. After, the existence of these concepts in legal legislation related to the cadastre used in our country has been researched according to the common concepts method. As a result, it is aimed to determine whether it is enough for a terminology framework that can be used in 3 and 4 dimensional cadastral applications by examining existing laws.

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1. THE NECESSITY OF 3-4D CADASTRE

A standard cadastre has not been developed to date due to legal differences such as technical and economical impossibilities in every country. Various categorizations and definitions have been made for the cadastre taking into consideration criteria such as priority purposes, types of registered rights, techniques used for collecting data (FIG, 1995). However, the definitions of cadastre conflicts with existing surveying systems. Because the physical world is four dimensions. These are horizontal (x), (y), vertical (z) and time (t) dimensions. However, today's cadastral systems are defined as two-dimensional and parcel-based. It is not possible to accurately model the physical world with the existing cadastral systems today. In terms of reality in existing systems, it reveals the lack of height and time dimension (Öztürk, 2007). Due to these shortcomings, a number of international studies have been done. These include Bogor Declaration, Cadastre 2014, Bathurst Declaration, European Union Cadastre Congress and Cadastre 2034 Vision. These studies jointly emphasize the following issues.

- To be a property owner and create a cadastral system that is managed in a sustainable way. Thus, the integrity of the cadastre system and its social benefits will be preserved. The effectiveness of the management will be increased. Sources of information will be protected for future generations. In addition, modern cadastre related infrastructures should be developed, efficient land and property markets should be provided and long-term sustainable development and land management should be supported by protecting all land rights.
- A cadastre system that is accessible, easily visualized, easily understood and used will be created. When designing and installing an appropriate cadastral system, it should be able to support various technical, legal, administrative and institutional alternatives ranging from simple to more complex cadastral construction. This flexibility allows the cadastre to record custom, individual and common land rights as well as traditional land rights. Thus, the potential of the cadastre system will be maximized by creating more options for the community to be able to strengthen it economically, socially and environmentally.
- It is to establish a cadastre system linked to wider legal and social interests on the land. A cadastral system with knowledge of rights, restrictions and responsibilities related to registered or unregistered land will be established. Thus, people will be able to interact and make intelligent decisions in the field.
- A three-dimensional, dynamic and accurately measured digital cadastre will be introduced. The aim is to modernize the digital cadastre by combining the accurate,

time series and elevation data of the measurements to capture the complexity of the environment.

- An integrated cadastre system based on common standards will be established. So society will be equipped with more extensive land and real estate models to cope with global challenges.

As can be understood from these reports, two-dimensional cadastral systems cannot respond to users' requests. Because two-dimensional cadastral systems are used for underground structures (subway, underground market, underground car parks etc.), technical infrastructure facilities (pipelines, cables, telecommunication lines etc.). They cannot be registered on it. Therefore, taking ownership of the guarantee is a problem in two-dimensional systems (Karatas, 2007). Because of all these reasons 3-4 dimensional cadastre concept has emerged and studies for its development have been made. According to some researchers, the 3D cadastre is not just a parcel, but a system for digitally managing and representing layered rights, restrictions, responsibilities (legal models) and buildings, public services, and corresponding physical models (provision of registered rights above and below the 3D terrain surface) (Stoter, 2004, Papaefthymiou et al., 2004, Aien, 2013). In this way 3D cadastre facilitates the management of property rights in the real world. It also enables a wide variety of applications that create a demand for detailed and integrated 3D legal and physical objects. These applications provide important information for different applications such as urban planning management, land and property management (Rajabifard et al., 2012). For example in dense urban areas, particularly bridges and tunnels that build above or under other structures giving constructions plan support of land development process. It can also be integrated with other information layers for 3D city models (CityGML), Building Information Model (BIM), transportation, service networks, land use and different applications (Aien, 2013). However, in the studies carried out, the fourth dimension (3D + time), which is the temporal dimension of the immovable rights, which is an important aspect of the cadastre record, has not been considered besides the spatial (3D) aspect of the rights and restrictions. Because rights, responsibilities and restrictions have a temporal factor. So RRR will not be enough to 3D modeling. The need for 4D cadastre knowledge will increase in the direction of development experienced in terms of cadastre. A time of historical information or database content related to land use development in a given area will be needed to support the future land policy. In this case, the time dimension of the cadastre will be revealed (van Oosterom, Maessen, and Quak, 2002). These needs are emerging in line cadastre 2034 vision in which the specified 6 basic principles , one of the basic principles of Modeling of the land and management, for the integration of proprietary data and sustainability analyzes 3 and 4D (3D + time) reveals the cadastral.

Thus, within the scope of Cadastre 2034 vision, it was aimed to provide basic services expected from the cadastre such as knowing all rights, restrictions and responsibilities related to the real estates with these components, access to property and positional content and to direct the future cadastre with the developed policies, models and standards (Aien, 2013; Stoter, 2004)

As a result of all these studies, cadastral data reflecting the real world shows the necessity of creating a new 3-4 dimensional cadastral model containing x, y, z and t components.

2. 3-4 DIMENSIONAL CADASTAL STUDIES OF SOME COUNTRIES

2.1 Austria

Austria with a deeply rooted cadastral system have started project that the Austrian map archive to digitizing will be completed in 2024 (Lichtenberger et al, 2015). Legal entities in Austria allow to register rights and restrictions on the third dimension. However, positional restrictions are defined as 2D. In Austria, 3D objects are classified as tunnels, independent sections and traditional wine cellars. The tunnels are not shown on the cadastral maps but are recorded as constraints on the land register. Wine cellars are connected to a small house with a tunnel underground. The place where the tunnel starts on the map is represented by dotted lines. The true geometry, depth and tunnel length are unknown. condominiums unit are registered in the title deed and define the geometry of the whole structure. It specifies all apartments and their use cases. However, the cadastral maps do not show the spatial distribution of the structure of the apartment nor the use rights. The study they have done within the scope of 3-4 dimensional cadastre can be evaluated as a project of transferring map archives to digital archive (Kitsakis et al., 2016).

2.2 Croatia

In the cadastral system of Croatia, buildings are registered in cadastral surveys on one side with compulsory requests. This request should be submitted to the responsible cadastral office by a geodetic report prepared for the authorized map office. The buildings are recorded in the form of cadastre area, building use, building name and building number. The registration condition in the cadastre has already been reduced by 2D per floor, so technically it is possible to record all owners of each part of the building to the cadastre. Cadastre now accepts analog and digital graphics for each floor, but there is no legal obligation. As a cadastral object in Croatia, apartments, office spaces, buildings and other structures, utility lines, facilities, traffic infrastructure and water and related objects. As regards the study on the registration of the 3D cadastre, the detailed and separate recording of the apartments and office spaces in Croatia (the number of apartments or the size of the apartment or office area per square meter) can be counted. In addition, on a 2D parcels registered in the cadastre, the rights to use limited space will be recorded in the land register (Kitsakis, et al., 2016).

2.3 Sweden

According to the Swedish cadastre, all land and water areas, consisting of textual and spatial parts, are divided into common property units. The property unit is registered with unique identification numbers. The concept of three-dimensional ownership was introduced in Sweden in 2004 and expanded in 2009 by the addition of land ownership (property law) (El-Mekawy et al, 2014). 3D property is defined as a unit of real estate, limited entirely

horizontally and vertically (Swedish Land Code, Chap. 1, Section 1a). Property units include several apartments or offices, commercial buildings and so on. It can separate different functions such as units composed of units. Generally, the infrastructure objects consist of tunnels or other large underground facilities. According to Swedish law, 3D property can be underground and above. So it does not have to be in a 2D real estate. The apartments are set up for settlement purposes and special conditions only and restrictions on the formation of 3D property are being applied (Paulsson, 2012). There are no restrictions on the limits of rights, restrictions or responsibilities regarding three-dimensional units. The range of rights to be created in the 3D property is not different from the rights created in the 2D property such as ownership, easement/service and different access and use rights (El-Mekawy et al., 2014).

2.4 Switzerland

In Switzerland, which is divided into cantons, all infrastructure services are mapped to include cadastral boundaries, buildings and plots (Kalantari et al., 2008). The object-based cadastral data model developed in Switzerland consists of a total of eight layers including the control points, land use, linear objects, local names, ownership and administrative units as well as the altitude model and pipelines (Kaufmann et al., 2002). In the Canton of Geneva, he conducted a 3D cadastral work on the land boundaries that he was responsible for. The Geneva cadastre has launched a project to respond to the growing need for 3D data in areas such as transportation, communications, security, planning and addressing. Under the project of building of transport infrastructure such as tunnels and bridges, historical monuments, signaling system and plant species belonging to the cadastre of existing 2D data, which are intended to be made in 3D. In the first stage, the acquisition of altitude data of 76,000 units has been given to provide accuracy of 30 centimeters (Doner, 2010).

2.5 Australia

The legal and institutional structure in Australia allows for 3D cadastre. It is possible to construct parcels in Queensland that have been defined as 3D geometric data since 1997. The legal structure based on conventional law makes it possible to define 3D parcels independently of 2D surface parcels. There are also institutional arrangements for how to measure and register these property units, which are defined as "volumetric parcels". Detailed measurement plans of legally identifiable volumetric parcels are added to the deed. The restriction imposed on the parcels due to infrastructure provision in the easement rights to be established for infrastructure facilities such as water, gas, electricity, communication in Queensland can be defined in the measurement plan as 3D (Doner, 2010).

2.6 Netherlands

In the Netherlands, we can list the legal sources on which land registry, cadastre and mapping activities are based as the Civil Code, the Cadastre Law, the Integration Law, the Basic Records Act and the Cadastre Organization Act (Wakker et al., 2003, Cete, 2008). The objects

that are subject to the real properties of the Netherlands are land, buildings, airplanes and ships. All real property and forest areas in the country are under the land registration system. Also, since 2006, the land registry database has been transformed from disorganized structure to central structure (Cete, 2008). The information contained in the cadastral maps includes parcel borders, parcel numbers, geodesic network, buildings and names, house numbers, topographic features, street names, waterways and public restrictions (Stoter and Ploeger, 2003, Yavuz, 2004, Cete, 2008). Thus, citizens will be able to find out whether there is a public restriction on immigrants on the cadastral map (Stoter and Ploeger, 2003). BAG service is a service that creates basic records for addresses and buildings by street map or aerial photo which is developed according to the Ministry of Infrastructure and Environment and Land Registry Office. The service provided includes the address of the buildings, the coordinates, the purpose of use, the surface of use, the surroundings, the year of construction and the identification number. The building height is added as a feature to the 2D geometry of the buildings. In the Netherlands, 3D cadastre works and the other is that infrastructure facilities are registered in the cadastre as independent objects. Facilities (energy, communication, water, wastewater, etc.) located in the infrastructure facilities are registered by taking the number of the independent section such as parcels.

3. TURKEY'S CURRENT SITUATION

3.1 Legal aspect

Property cadastral surveying work is being done in Turkey. It is also referred to as a legal cadastre, or a border cadastre. Nowadays, these studies, which are being carried out according to the Cadastre Law dated June 21, the boundaries of the real property on the land and the rights on it are determined and the modern title deeds registered by the Turkish Civil Code are created by making the map (Cadastre Legislation, 2009). The basic regulations in the field of land registry and cadastre in our country are included in the Land Registry Law No. 2644 and Cadastre Law No. 3402. Apart from these laws, there are more than 40 laws and regulations, directives, directives and circulars in which provisions relating to title deeds and cadastres are included (Çete, 2008).

Also it described how the use of the right to property boundaries can be drawn with Article 35 of the Constitution. According to this; "Everyone has the right to ownership and inheritance. These rights may be restricted by law for public good purposes only. The use of the right to property cannot be contrary to the benefit of society. "It is stated that if the public interest is revealed in the expression, it may interfere with private property or right of use.

There is no clear statement about the third dimension, namely vertical rights, in the Constitution. There are a number of rights (easement right, floor ownership right, right of passage etc.) in our Constitution concerning the implementation of these rights in three dimensions.

3.2 Institutional Aspects

The cadastral works in our country are carried out by the General Directorate of Land Registry and Cadastre (GDLRC), which is based on the foundations of 1847 and whose current structure was determined by Law no. 2997 in 1936 (Cete, 2008). The provincial organization of GDLRC, which operates under the Ministry of Environment and Urbanization, consists of 22 regional directorates, 81 cadastral directorates, 970 cadastral directors, and 196 licensed maps and cadastral offices. Thus, GDLRC has a strong organizational structure and the execution of land registry and cadastre activities under one roof (Polat et al., 2017).

3.3 Technical Aspects

In line with the cadastre studies in order to improve our current cadastral system within the scope of modern cadaster. There are some basic projects made within the under of Cadastre General Directorate, General Directorate of Provincial Administration and General Directorate of Geographic Information Systems. These projects are: Land Registry and Cadastre Information System (TAKBİS), Spatial Property System (MEGSİS), Land Registry Archive Information System (TARBİS), Civilian and Updating and Digitization of the Administrative Border Project (MIDAS), Land Registry and Cadastre Modernization Project (TKMP), Turkey National Geographic Information System Project (TUCBS), TUSAGA-ACTIVE (Cors-TR), Map Information Bank Project (HBB), Agricultural Reform Application Project (ARIP), Completion of the installation cadastre and 2/B cadastre.

The common point of the projects is to manage and share the cadastral data in the digital platform. These projects can form a base for 3-4 dimensional cadastral studies.

4. APPLICATION OF STUDY

4.1 Qualitative Research Methods

Qualitative research is one of the processes of producing information by examining individual's lifestyles, life stories, behaviors, organizational structures (Strauss and Corbin, 1990). Unlike quantitative research based on statistical data analysis, qualitative research seeks to answer the question of what people mean to events, in other words how they describe events (Dey, 1993). The analysis of qualitative data obtained by qualitative research methods is a process in which the researcher organizes the data, separates them from the analysis units, forms them, reveals the important variables, and decides which information should be reflected in the report (Bogdan and Biklen, 1992). In other words, the researcher who performs the qualitative analysis tries to discover and reveal the information hidden in these data by acting from the fact that it is collected from the field.

According to the three stages of qualitative data analysis process (observation, interview and document review, visualization of data, achievement and confirmation (Miles and Huberman, 1994)) within the scope of our work, legislation related to the current cadastre in our country was enacted. The terms of 3-4D cadastre emerged according to their visions have been

determined. In terms related to concepts in order to investigate the existence of these concepts in our current law have been established. Finally the legal assets of these terms have been investigated so that the degree of legal sufficiency of 3-4D cadastre studies has been assessed.

4.2 The Data Recorded Within the Scope of Cadastre in Turkey

According to article 683 of the Civil Code, a person who holds something has the authority to use it, to exploit it, and to make it available on his behalf, within the limits of the law.

The power of saving includes the establishment of limited rights such as material events such as possession, use, exploitation, replacement, sale, forgiveness and similar assignments, easement, pledge and immovable liability.

The right to use and utilization the right of ownership can only be restricted to the public interest pursuant to Article 35 of the Constitution: "Everyone has the rights of ownership and inheritance. These rights may be restricted by law for public good purposes only. The use of the right to property cannot be contrary to public interest."

For this purpose cadastral map should show the current status of the land. The data recorded in the cadastral maps are listed below.

- 2D location information for property boundaries
- Ownership information
- Structure subject to property
- Surface Area
- Block and parcel information
- Roads, rivers, etc. non-registered areas
- Field of study border
- 2D graphics of a set of rights and restrictions (Yıldız, 2013)

In the LADM model which is one of the models proposed in the scope of 3-4D cadastre, the present situation of the land needs to be shown according to a certain standard. It is also any structure that build above and under land required to be shown on cadastral maps. In order to register an object in our country, it has to be related to the parcel.

4.3 Concepts Related to the 3-4D Cadaster

Land management examines activities related to land management from both the environmental and economic perspectives (UNECE 2005).

Land management is a process for the implementation of land resources in a good way. It generally covers the following issues related to land.

- Transfer of ownership, including decisions on mortgages and investments
- Real Estate valuation
- Development and management of public services
- Management of land resources such as forestry, land and agriculture

- Establishment and implementation of land-use policies
- Environmental impact assessment
- Monitoring all activities affecting the best use of land (UNECE 1996).

There is a need for an effective cadastral system to ensure that all these activities can be carried out in a sustainable way. In this context, the cadastral studies (2014 and 2034 cadastre vision) emphasized the necessity of 3-4D cadastre. There are basic concepts that have emerged for an integrated and sustainable cadastre system. These basic concepts can be listed as **Ownership, 3-4D Cadastre, Real Estate, Real Estate Registration and Land Management**.

Ownership: It is a right, and international declarations and contracts are also guaranteed. In Article 17 of the Universal Declaration of Human Rights (UDHR); "Everyone has the right to own property on his own or with others. No one can be arbitrarily deprived of his property." (Doner, 2010).

In our country according to article 683 of the Civil Code, a person who holds something has the authority to use it, to exploit it, and to make it available on his behalf, within the limits of the law. The power of saving includes the establishment of limited rights such as material events such as possession, use, exploitation, replacement, sale, forgiveness and similar assignments, easement, pledge and immovable liability.

The right to use and utilization the right of ownership can only be restricted to the public interest pursuant to Article 35 of the Constitution: "Everyone has the rights of ownership and inheritance. These rights may be restricted by law for public good purposes only. The use of the right to property cannot be contrary to public interest."

3-4D Cadastre: There are many cadastral definitions in international literature. Especially if it would express the definition accepted within the framework of FIG Cadastre 2014; "A cadastre is a systematically arranged public inventory of property-related data of a country or region that is bordering on a measure. Such properties are systematically defined by nomenclature with some distinctive features. The shape and parcel numbers of the property are normally shown on large-scale maps. These maps are integrated with records showing the structure, size, value and legal rights of each parcel" (Kaufmann and Steudler, 1998).

Furthermore, as the vision of the cadastre in 2014 and 2034 states, the cadastre aims to achieve a structure that reflects the whole legal situation of the land, including public rights and restrictions. The current 2D cadastral system does not reflect the true state of the land. So 3-4D cadastre concepts have emerged. 3D cadastre is a tool used in a land management system to digitally manage and represent layered rights, restrictions, responsibilities (legal models) and buildings, public services, their corresponding physical models (above or below the floor surface in 3D). A 3D Cadastre has the ability to aggregate, store, organize, interrogate, analyze and visualize very complex features and frames within the set of documented standards (Aien, 2013).

In our country, the purpose of the cadastre is defined in the Cadastre Law No. 3402. To create the cadastral or topographic cadastral map of the country according to the country coordinate

system. It is also to determine the legal status of immovable property by stating the boundaries of the goods on land and on the map. Thus, establishing the title deed registered by the Turkish Civil Code numbered 4721 and establishing the infrastructure of the spatial information system ". As it is understood from this definition, there is no explanation about the 3D cadastre.

Real Estate: Land; together with water-covered areas and seas, cover all things related to the fixed point of the earth (Kaufmann, and Steudler, 1998).

According to the Turkish Civil Law, the definition of real estate is expressed as follows. The land is expressed as independent sections registered on the title deed, separate and permanent rights registered on separate pages. Independent and permanent rights must be recorded on a separate page in the title deed so that they can be considered real estates (Demirel, 2005).

Real Estate Registration: Land registration is official registration of the property rights on the land in the form of deed or title deed. This means that there is an official record of the rights of the land. That is, it is a deed containing changes in the legal status of the identified units of the land. The land register responds to who and how to inquire as a parcel relation (Kaufmann and Steudler, 1998).

Land Management: Land management is to ensure effective use of land resources to support the ever-growing population and to prevent degradation of the natural environment. As well as the development of infrastructures such as settlements, water, sewerage, and equal access to the economic benefits of the land real estate market. Finally, it is described as decision-making processes for basic land management policies, such as supporting state services through taxes and fees related to land and buildings (Dale and McLaughlin, 1988; FIG, 1995). Land management, while involving many social and environmental goals, gives priority to economic objectives in most of the developing countries. Today, land management for the public regulation and securing of property rights related to land is regarded as the main component of the free market economy and as a priority step in access to improved living standards (FIG, 1995).

4.4 Investigation of The Existence of The Concepts in The Current Legislation Related to The Cadastre in Our Country

Features and the data recorded in the cadastre of the existing cadastral system in Turkey have been described in previous sections. One of the problems that arise in 3D cadastral works is the legal dimension. Current legislation in countries should support three-dimensional cadastral work. In this context, we investigated whether the registered cadastral data in our country corresponded to legal regulations if they wanted to integrate 3-4D cadastre. First, legal regulations related to Cadastre have been issued. Then, within the scope of 3D cadastre, the above mentioned concepts were researched in the legislation of our legislation. But these concepts may not exist in individual laws. For this, cadastral terms related to concepts have been established. These terms are categorized under each concept. It is shown that the terms

are related to cadastral concepts in Table 1. Finally, the legitimate assets of these terms were searched according to the quantitative research method. As a result of evaluation, a matrix of concepts and laws (Figure 1) was established. In the context of the research, different terms can sometimes be used in the law. For example, shares with percent; expropriation and compulsory purchase; time, date and period; the "independent section" and "condominium" have the same meaning. Sometimes it can be a subordinate relationship between some words. Real properties can be land, land and structures on it. All of these can be considered as real property separately. But for buildings, the term real estate is also used. The use of different terms that have the same meaning in the law can be a problem in terms of terminology.

CONCEPTS	TERMS
Mülkiyet (Ownership)	Mülkiyet hakkı (Property right), Hisse (Share), Kamulaştırma (Expropriating), Aynı haklar (İrtifak hakları (Servitudes), Kısıtlılıklar (Restrictions), Sorumluluklar (Responsibilities), Üst hakkı (Rightofsuperficies), Geçit hakkı (Rightofpassage), Yararlanma hakkı (Rightofusufruct), Devremülk hakkı (Righthoftimeshare), Şerhler (Annotation), İpotek (Mortgage))
3-4B Kadastro (3-4D Cadastre)	Harita (Cadastral map), Yatay sınır (Contour), Düşey sınır (Vertical limit), Orman (Forest), Sular ve Madenler (Waters and Mines), Tarihi kültür ve tabiat varlıkları (Historical cultural and natural assets), Koordinat (Coordinate), Zaman (Time), Yerüstü yapıları (Superstructure), Yeraltı yapıları (Underground structures)
Taşınmaz mal (Real estate)	Arsa (Parcel), Arazi (Land), Bağımsız bölüm (Condominiums), Vakıf taşınmazı (Foundation real estate), Hazine taşınmazı (Public real estate), Ulaşım ağı (Trasnport network), Yeraltı şebekesi (Utility network)
Taşınmaz kaydı (Real estate recording)	Tescil (Registration), Miras (Inheritance), İntikal (Transfer), Tapu (Deed)
Arazi yönetimi (Land management)	Vergi (Tax), Değerleme (Valuation), Kullanım türü (Type of use)

Table 1 Terms are related to cadastral concepts

When we examine the matrix of concepts and laws, the vertical boundary of the third dimension of the cadastre is particularly noticeable. Because the vertical limit is only in civilized blood and there is no provision in practice. Definition of the vertical boundary "Property on the land covers the layers above the air and below, to the extent that it is useful for its use. Plans, plants and resources are also included in the scope of this property, without prejudice to legal restrictions (Article 718 of the Civil Code). According to this definition, the extent of benefit in practice is related to the intended use of the property. For example, electrical lines over a building puts the use in danger and restricts its use. But a subway line may be outside the area that the landowner will use in a useful measure. In this case, there is no restriction and there is no operation on deed and cadastral map. To the extent that it is useful to use it is caused by different interpretations and applications because the sentence is not fully explained and its limit is not determined. This poses a legal obstacle to 3-4D cadastral applications. It is also proposed to record the underground, superstructure and underground networks in the scope of 3-4D cadastre and to show current status in cadastral maps. But it seems that our legal bases are lacking about this situation.

CONCEPTS	OWNERSHIP		3-4D CADASTRE				REAL ESTATE			REAL ESTATE RECORDING		LAND MANAGEMENT								
	Property Right	Share	Vertical Limit	Horizontal Limit	Superstructure	Underground structures	Parcel	Land	Foundation Real Estate	Public Real Estate	Condominiums	Transport Network	Utility Network	Registration	Inheritance	Transfer	Deed	Tax	Valuation	Type of Use
Türkiye Cumhuriyeti Anayasası																				
Türk Medeni Kanunu																				
Tapu Kanunu																				
Kadastro Kanunu																				
Endüstri Bölgeleri Kanunu																				
Gecekondu Kanunu																				
Gelir Vergisi Kanunu																				
Harçlar Kanunu																				
İmar Kanunu																				
Jeotermal Kaynaklar ve Doğal Mineralli Sular																				
Emlak Vergisi Kanunu																				
Kamulaştırma Kanunu																				
Kat Mülkiyeti Kanunu																				
Kıyı Kanunu																				
Köy İçme Suları Hakkında Kanun																				
Köye Yönelik Hizmetler Hakkında Kanun																				
Kültür ve Tabiat Varlıklarını Koruma Kanunu																				
Kültür Yatırımları ve Girişimlerini Teşvik Kanunu																				
Maden Kanunu																				
Milli Parklar Kanunu																				
Petrolün Boru Hatları ile Transit Geçişine Dair																				
Petrol Piyasası Kanunu																				
Sular Hakkında Kanun																				
Boğaziçi Kanunu																				
Taşınmaz Mal Zilyedliğine Yapılan Tecavüzlerin																				
Önlenmesi Hakkında Kanun																				
Telgraf ve Telefon Kanunu																				
Turizm Teşvik Kanunu																				
Doğal gaz Piyasası Kanunu																				
Türk Petrol Kanunu																				
Yenilenebilir Enerji Kaynaklarının Elektrik Enerjisi																				
Üretimi Amaçlı Kullanımına İlişkin Kanun																				
Yeraltı Suları Hakkında Kanun																				
Yıpranan Tarihi ve Kültürel Taşınmaz Varlıkların																				
Yenilenerek Korunması ve Yaşatılarak Kullanılması																				

■ It shows the existence in law.

Figure 1 Matrix of concepts and laws

How to Be Created a New Terminology for 3- and 4- Dimensional Cadastre in Turkey (9487)

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5. CONCLUSION and RECOMMENDATIONS

As a result of our research, we have researched the sufficiency of our legal submissions within 3-4 dimensional cadastre. Because, if it is necessary to establish terminology related to 3-4 dimensional cadastre, legal legislation should first support this situation. A sample application has been made to investigate this situation. Some concepts and terms related to 3D cadastre have been investigated. In addition, the legal assets of these terms have been investigated. As a result, it is seen that our legislation does not adequately support the studies about 3-4 dimensional cadastre. In general, rights and responsibilities related to underground and superstructure are represented. However, the cadastral map is not shown in 3D. There are also some legal assets in terms that allow temporal follow-up. Another issue is that the existence of underground structures such as car parks is not related to the cadastre. In most legislation there is no application for these structures. The properties defined in the law are limited to the parcel, the land and the independent section. The law also needs to be defined so that utility networks and road networks can be recorded and displayed on the cadastral map. In order to establish the terminology within the context of 3-4 dimensional cadastre, it is necessary to examine the legal provisions of the concepts to be created as priority. Otherwise, in real life practice will be subject to legal obstacles.

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