

A Case Study for Determining the Turkish Cadastre Contents

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Key words: cadastre, property, forest cadastre, information system, renewal cadastre.

SUMMARY

Cadastral surveys have been carried out by different methods such as graphical, photogrammetrical, orthogonal, tachometric and digital methods in Turkey. The cadastre data produced by these methods have not regularly been updated and as a result, there have been remarkable differences between maps and lands. This makes cadastral maps incompatible by their scale, accuracy and coordinate systems. Especially the bases achieved by graphical, photogrammetrical and tachometric methods have not responded to daily demands.

Over the time, some parts of rural areas were included in urban areas. In these specific areas, the value of real estate has dramatically increased and the accuracy has become more important. Therefore, the accuracy, scale, geodetic control points and coordinate network system of these basic data have to be standardized to establish the national standards. Today's archive data are inadequate to solve these problems. To overcome these problems, General Directorate of Land Titles and Cadastre (GDNLR) have carried out same projects recently. However, these projects have not succeeded due mainly to the incompatibilities in the qualities of the cadastral data in place. Naturally, the outcome had tremendous negative impact on public and private sectors and let them solve their data problem in their own way. Local governments, one of the major clients of cadastral data, have been using several approaches such as coordinate transformations, regional zoning plan applications, revision of cadastral maps, and zoning plan improvement applications to resolve the problem. However, to a greater extent these methods have not produced satisfactory results. Indeed they have introduced new problems. Many of the academic research over this problem have concluded that Turkey's cadastral data are of heterogeneous quality and a "renewal" of the cadastre is indispensable. This has yet brought up another issue, which is whether all or part of the cadastre is to be renewed. There have been, however, some jurisdictional impasses to renew the present cadastre. For this reasons some legal arrangements have to be formulated before conducting revised or second cadastre in the country.

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1. INTRODUCTION

From beginning to present, different systems have used in cadastral works in Turkey. The written cadastre used in the first years and the borders of properties defined without coordinates to guarantee properties and tax. The cadastre based on drawing was in use during 1900 years. The planned cadastre works started in 1950 and have come up to date.

After the Second World War, the needs of agricultural products and definition of agricultural lands increased the necessity for the cadastral surveys and thus the cadastre survey of the whole country initiated in the early years of 1950's. In the mean time, techniques and legal changes have been made in cadastre law and cadastral surveys continued. Up to now %98 of urban cadastre, %81 of district cadastre and % 66 of rural areas cadastre have been completed in Turkey.

The new technologies and advantages are used in works increasing the workloads. The digital cadastre age started after GIS development and cadastre data could only be used in digital form. Some changes made in the cadastre law to use this advantages and 3D cadastre works arrangement added to 2D cadastre works. Up to now %5 of whole cadastre bases are in digital form. The information systems use digital data and the cadastral bases have to be transformed into digital form. To realize this, two projects, TAKBİS and HAKAR, were developed and some serious problems occurred in this stage.

It appeared that the targeted aims not easy to reach. In addition to these projects, renew works started to solve cadastral bases problems. With the renew law the maps aimed to renew but property changes were not possible. So, second cadastre obligation appears in Turkey that necessitates some legal arrangement.

In this stage, during the second cadastre works, it is very important to describe the cadastre contents again and establish the spatial information systems data substructure. Because the surveyors can collect reliable spatial and non spatial information not only for cadastre but also different disciplines. Thus, the necessary bases for spatial information systems can be established rapidly and this give great power to development of the country.

2. THE CADASTRAL WORKS IN TURKEY

The stage of cadastre in turkey can be classified under the tree group; (i) *Written cadastre*, (ii) *Line cadastre*, (iii) *Digital cadastre*

The written cadastre application was carried out perfectly during the Seljuk's, Anatolia Seljuk, and ottoman and up to republic years. This records and applications responded all the needs (Biyik, Yomralıoğlu, 1994)

Written cadastre products were registered at “register book” in first republic years for areas without cadastre. These records were used as a title deed in those years. With the 2613 numbered law, these applications were canceled.

The application of line cadastre works begun in the beginning of 1900, but took effect in 1950’s due to lack of technical and economic support during war times. Serious works, proprietorship research, surveying etc have been done and continuing today as well (Bıyık, 1999).

3. THE PROBLEMS OF TURKISH CADASTRE

The first cadastre implemented over the last 50 years in Turkey with some problems. First, all work are not the same quality and the second, they are not showing the current situation. First years, old equipments were used in works and today the new technologies (photogrammetry, GPS etc) are in use. Today, digital cadastre with three dimension is applied in country coordinate system. Another problem is the decreased number of stable ground control points. Population increased, people used their lands. Some legal applications took effect and the maps became unreadable. These problems created a lot of technical and accuracy errors. The change of varieties untreated in maps and today’s map became useless. The cadastral bases (classic tachometric and photogrammetric) produced so far were loaded with serious errors (Bıyık, Demir, Atasoy, 1999). A lot of location errors exist on the bases. The researches done about location errors up to now indicated the some point that these bases have many location problems. One of these researches results is given in Table 1 (İnam, 1999). Some renew works have been continuing according to detailed determined program to solve this kind of problems. Table 2 explains these renew works in Turkey (Akay, 1999).

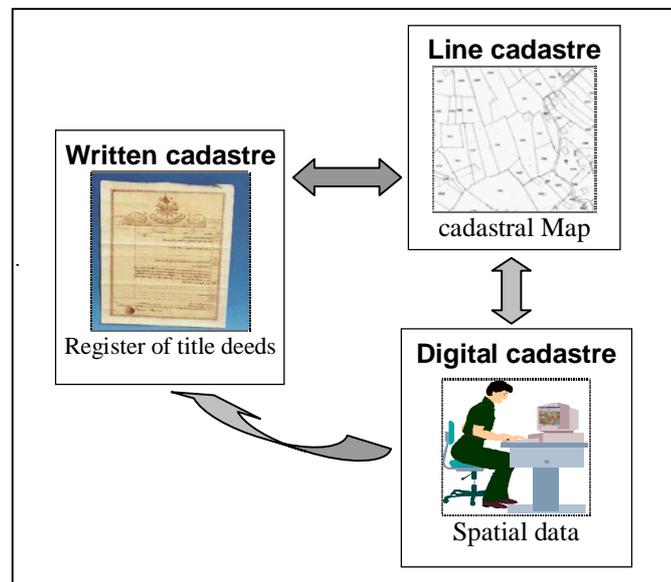


Fig 1: The cadastre types application in Turkey

Table 1: The accuracy criterion used in digitizing cadastre maps

Measurement Method	Scale	Test point Parcel number	Mean Root Squared Error (mp) m
Orthogonal	1/1000	225 – 42	0.37
Graphic	1/5000	87 – 34	2.79
Photo plan	1/5000	187 – 59	13.30
Photogrammetry	1/5000	384 – 59	1.52
Digital(X,Y,Z)	1/1000	412 – 88	0.32

Table 2: Distribution of cadastral parcels to be renewed across the country

Settlement Unit	Total Unit	Total parcel	Total decar	A section of a map
District	359	421.825	3.288.764	4.938
Village	4.310	4.732.503	45.242.481	80.758
Turkey in general	4.669	5.154.328	48.531.245	85.696

The data in Tables indicate that the cadastral works finished up to now have no stable standard and Turkey's cadastre has to be revised for; *quality, quantity, technical standards, priority regions, updating, organization, investment and budget, adequacy of law* (Biyik,1999).

Table 3: Government Organizations and their responsible information coverage (Banger,2000)

Responsible institution	General data layers
Ministry of Environment	Waters pollution, air pollution, soil pollution, noise pollution, solid waste, special environmental protection areas
Ministry of Energy and Natural Resources	Power houses, electric lines, electric distribution network
Ministry of Agriculture and Rural Affairs	Vegetal production, bestial production, agriculture input, land cover, soil maps, roads
The Ministry of Defense	Topography, waters, land cover, cultural heritage
Ministry of Public Works, General Directorate of Highway	Highway, state highway
General Directorate of Village Affairs	Slope, erosion, land use types, agriculture lands, land types, land use classes
Ministry of Transportation, Turkish national railway system	System of railroad maps
General Directorate of Land Registry and Cadastre	Cadastral maps, register of title deeds
General Directorate of Plot of vacant land	National treasure lands
Ministry of internal Affairs, Governorship	Coastal borders, administrative borders, infrastructure
	Development plan, plan for regulating a city's

Responsible institution	General data layers
Municipalities	development, current maps, access plan
General Directorate of Catastrophe Affairs	Natural disaster hazard maps
General Directorate of State Water Affairs	Water wells, lakes, ponds, dam lakes, streams, water resources, watering canals and maps, watersheds
Ministry of Tourism	Tourism regions, tourism development areas
General Directorate of Forestry (GDF)	Forest boundaries, forest vegetation map, national parks, forest cadastre, forest cover type maps

Beside all these factors, there is confusion about preparing maps in Turkey. The same bases on the same areas are produced by different organizations with different coordinate systems. So an institutional arrangement is strongly necessary. Otherwise time and money wasting is inevitable.

The government organizations produced and used cadastre service and their collecting data are given in Table 3. These organizations produced their own data. Every organization produces their data and this causes the institutional problems in preparing maps. Determining the cadastre contents again can solve organizations problems. Because of the mentioned problems above, the current cadastre's contents should be expanded or revised for second cadastre.

4. DETERMINING THE PRIORITY AREAS FOR SECOND CADASTRE

The important point of implementing the second cadastre is, the starting areas of the cadastral works. Scientific criteria must be taken into consideration. Objective criteria should be determined and priority regions selected. Therefore, determining objective criteria each cadastre organization should start to cadastre works for its working area from priority location (Turhan, 1984). In a research done in 14-cadastre districts, it seemed that, despite the title deeds and cadastre, processes density are very rarely specially in rural areas after the cadastre works, the demands in urban areas are very dense (Table 4).

Table 4: The ratio of title deeds and the number of cadastre processes in sample (selected) cadastre districts

District characteristic	Number of districts	Number of title deed cadastre process/ (%)
Rural area	11	89 / 23
Urban area	3	284 / 77
Total	14	373 /100

So, while specifying priority of second cadastre, specially the districts, which have densely title deed – cadastre processes should take into consideration. Besides, while specifying priority districts for cadastre, the criteria below are important (Bıyık, 1987).

- Population density and increase proportion,
- Relationship to urban growing districts,
- Relationship to forests,
- Relationship to the big projects that has wide areas,
- Productivity and likely arrangement Works in agricultural areas,
- Operating of national treasury and public properties,
- The districts that have densely title deed – cadastre process capacity,
- The areas in renew extension in urban growth areas etc.

5. RENEW DETERMINING OF CADASTRE CONTENT IN SECOND CADASTRE

The Turkish written cadastre, started in Ottoman emperorship period and also continued in Turkey Republic period, was meeting the needs in constituted periods, because, cadastre had not geometry and map in those periods. The applications named as “Title deed writing” and describing property rights on real property, were sufficient for eliminating injustices and problems on financial and law matters recording to title deed. These records resembled to the French cadastre constituted by Napoleon. The most important difference between two cadastre works was about cadastre objectives. While, the main aim of French cadastre was collecting land taxes completely, the main aim of Turkish written cadastre was supplying the actual users of parcels as lawful owners and registration of parcels in law. The second aim was introducing the property tax system to justly. These applications continued from 1858 to 1934.

In early 1900’s, the cadastre works based on map started but also effects of the wars impeded the wide area applications. After the Turkish Civilized Law came into effect in 1926, cadastre applications based on map become widespread in 1934. After the year of 1950, photogrammetric method has been used for these works and until now, %95 of Turkey cadastre was completed. Because of its geographical, law and socio-economic structure, cadastre services must be sensitive and faultless in Turkey. Citizens think that their real estate is a piece of their life and they cannot invest in other’s lands in Turkey. Every Turkish citizen’s first desire is getting a real estate and then investing to it. They know that their investments will stay for their children and relatives after their death. This belief encourages them to benefit from real estates. Started from this point, Turkey’s first cadastre’s aim was specifying legally and geometric situations of parcels and then taking them to state guarantee. Because of the country conditions, the content of the cadastre, which is growing slowly, cannot meet the needs. Because of increased migrations to cities, especially after the republic’s declared, unsystematic and uncontrolled cities came into existence in Turkey. Therefore, not only for agriculture and stockbreeding areas but also for cities difficult applications started. This process is still going on. However, it is estimated that the situation will be different in near period and real estates will need for engineering applications in rural areas. It is thought that, the content and extension targeted for first cadastre will not be sufficient for second cadastre.

How outputs are expected is related to cadastre’s served area’s request. The cadastre, which is applied in Turkey, determines technically position of borders, topographical structures, buildings and features, and also legally rights and responsibilities on real estates. It produces

some information indirectly about real estates usage form. Whereas, urban and rural land, production of various positional information is not difficult anymore, in cadastral works. In this situation, production cost can increase because of decreasing work speed. However, because services will be offered to wider areas, afterwards there will be no need in time and cost consuming land works. During second cadastre thought as multipurpose, there are needs in information about arrangement of agricultural areas (physical and chemistry structure of land, productivity capability, geographical position, slope degree, existing usage type and income gathered from unit area, objective taxing depending on income), information about productivity determination in agricultural production and guessing of harvest, in urban areas, works on urban lands and usage of buildings, incomes and taxes and information about technical infrastructure. In cadastral maps, required sensitivity on borders should not demand the other information that is not related to real estate, because, borders specify possession areas of owners or holder of a right. The other information is in these borders and cannot carry legal status. Besides, whether urban infrastructure foundations done respect to technical standards and legal principles should be specified geometrically and legally in urban areas. The cadastre works have been carried out in Turkey in different areas. The properties belong to public, private and the areas used public benefit are also surveyed. Forest areas, rangelands, pasture surveys can be conducted with less accuracy methods. Some regions have no cadastre up to now. The new cadastre covers the whole country. Determination of contents of new cadastre and its process is given in Fig 2.

First, data sets produced and required by government institutions and then standards and contents of new cadastre were determined. Legal arrangements are also necessary for the new cadastre. So, with these legal, technical and institutional arrangements cadastre works realized by private sector and controlled by cadastre organization. Then all information transferred into CBIS environment for use. After all explanations; three stages should be realized for new cadastre;

- Technical arrangement
- Legal arrangement
- Institutional arrangement

Technical arrangement: Technical substructure should be established to produce the bases in country coordinate system and standards are determined. Which graphic and attribute information (spatial data) should be collected in which standards and methods are also determined

Legal arrangement: According to current cadastre law if an area has cadastre new cadastre is invalid. To overcome this matter, the cadastre's content should be changed. Some legal arrangements are also necessary to allow private sectors to conduct technical works and government (GDNLR) to control team.

Institutional arrangement: property cadastre is carried out by GDNLR and forest cadastre by GDF. Different organizations produce, different spatial sensitivity maps. So, this causes some confusion. Some radical institutional legal arrangements are therefore necessary.

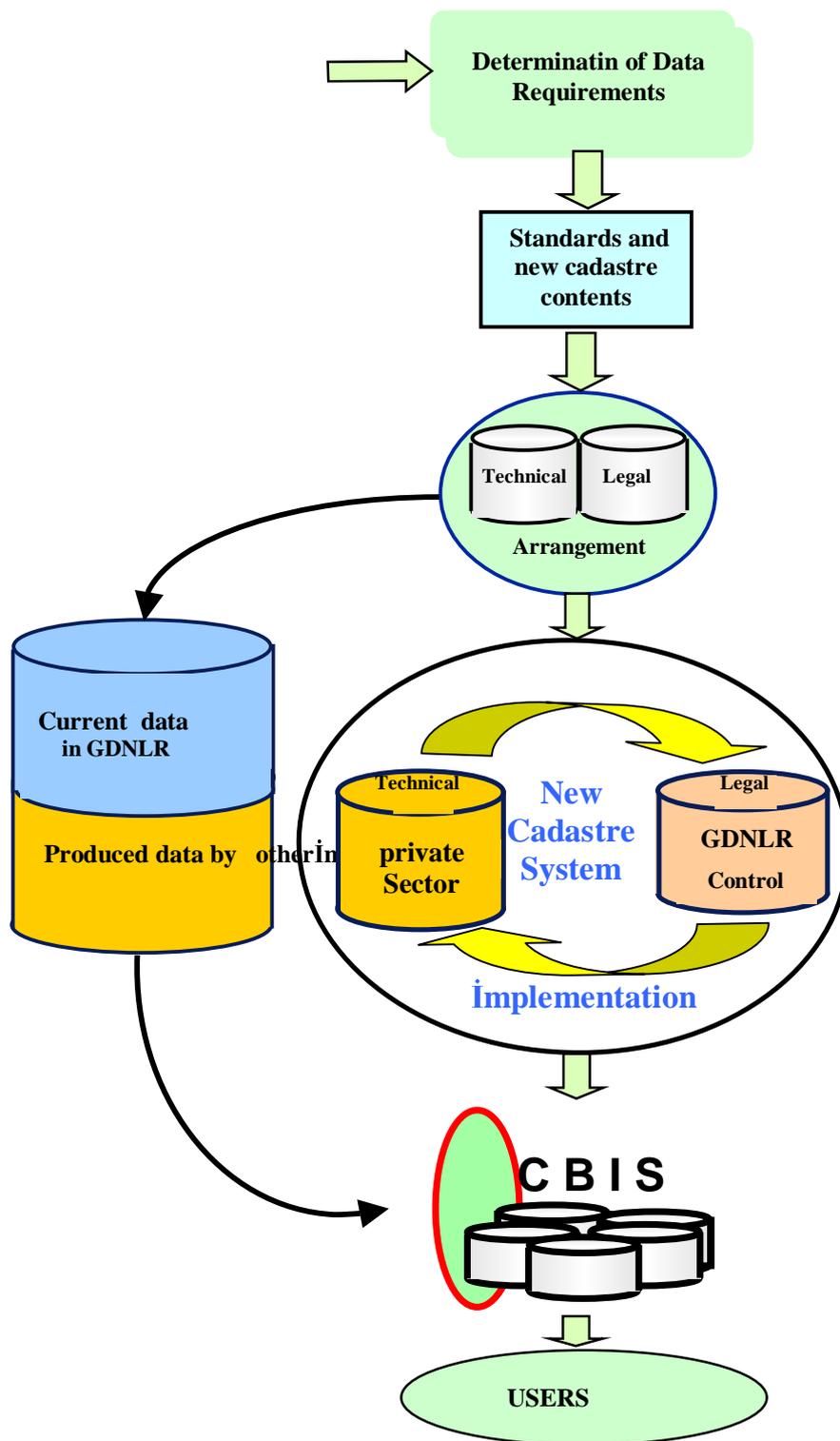


Figure 2: The Contents the process of cadastre based information system (CBIS)

6. CONCLUSIONS

The cadastral bases of Turkey are insufficient now. For this reason, there are some serious problems for establishing title deeds and cadastre data and also the bases and data for CBIS. To overcome these problems new cadastre is necessary. So, the first important step is to form new bases and contents of new cadastre. Currently, different maps, details and data are produced from different organizations. All these details necessary for organizations can be collected accordingly to CBIS during new cadastre. Cadastre organizations can produce bases in demanded scale and spatial sensitivity forms needed by institutional organizations and then display in digital forms. The survey groups can be organized for these aims. Some experts should be joined to this group. With this arrangement, cadastre works can be done by private sector and the cadastre organizations can control these works

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