

PUBLIC PRIVATE PARTNERSHIP APPLICATIONS AND COST RECOVERY IN CADASTRE ESTABLISHMENT, TURKEY EXPERIENCE

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1. INTRODUCTION

A Cadastre is normally a parcel based, and up-to-date land information system containing a record of interests in land (e.g. rights, restrictions and responsibilities). It usually includes a geometric description of land parcels linked to other records describing the nature of the interests, the ownership or control of those interests, and often the value of the parcel and its improvements. It may be established for fiscal purposes (e.g. valuation and equitable taxation), legal purposes (conveyancing), to assist in the management of land and land use (e.g. for planning and other administrative purposes) and enables sustainable development and environmental protection (Österberg et al, 1995). This statement of the International Federation of Surveyors highlights, from an international perspective, the importance of the Cadastre as a land information system for social and economic development. It gives examples of legal, organizational, and technical issues that need to be addressed in order to establish and maintain a Cadastre.

Identifying ownership of real property, using it, sharing it, gaining it into the economy, etc. are the main issues that need to be solved in today's world. Many organizations such as FIG, UN GGIM, GLTN, WB, FAO work to solve this problem and develop solutions. Since the initial investment of the legal ownership system is an expensive project, they are developing a fast and easily applicable (not the best but inexpensive as a first investment) models such as Fit for Purpose – FFP (Enemark et al, 2014) and private sector participation - PPP on a contract level.

Cadastre 2014- “A Vision for a Future Cadastral System” (Kaufman et al, 1998) concept is a very important document that reveals technical developments as a roadmap. Since its publication the document, has become a "transformation and application" booklet for Cadastre organizations. The fifth principle of Cadastre 2014 refers to privatization and closely working together Public and private sector. Due to the flexibility of the private sector and the speed of doing business private to public involvement is indispensable. According to the sixth principle of Cadastre2014, cadastre will be cost recovering! Cadastral systems need considerable investment. The investment and operation costs have to be paid back at least partially by those who profit. Cost/benefit analysis will be a very important aspect of cadastre reform and implementation. Surveyors will have to deal more with economic questions in future.

Due to the importance of the issue, the United Nations Sustainable Development Goals (SDG) program "Target 1.4 Secure Tenure Rights to Land" has taken its place under the title. However, Goal 2 Ending Hunger, Goal 5 Gender Equality, Goal 11 Sustainable Cities, Goal 15 Life on Land, Goal 16 Peace, Justice and Strong Institutions are closely related to the Cadastre.

Another important practical implementation guide has prepared by The Global Land Tenure Network (GLTN) namely "Framework for Costing and Financing Land Administration

Services (CoFLAS)”. The costing and financing of land administration services directly addresses one of the 18 core land tools.

As it is stated by the World Bank Group there is no standard, internationally-accepted definition of a Public Private Partnership (PPP). The term is used to describe a wide range of types of agreements between public and private sector entities, and different countries have adopted different definitions as their PPP programs evolved (www.worldbank.org). PPP is preferred to provide faster implementation of the public projects, reduced operation and implementation costs, transfer of managerial skills of the private sector to the infrastructure management and public service provision, enhanced public management system.

Initial cadastre works is extremely important in social, economic, legal, geospatial and environmental terms. In this framework, a project has been prepared in order to establish a cadastre in the whole country. In order to complete the project in a short period of time, private sector power and dynamism were utilized. In this paper, cadastre establishment works in Turkey have been described in detail and cost – benefit analysis has been made to recover the investment. However, another Public Private Partnership application, Licensed Surveying Cadastre Engineers and Bureaus (LIBKAB) has been examined in terms of private sector participation in post-cadastral services.

2. HISTORICAL BACKGROUND

The first land registry organization in Turkey was established in 1847, under the name of Defterhane-i Amire Kalemi and maintained its mission under a variety of names till the declaration of the Republic. Cadastral works were involved in 1925 within Directorate-General of Land Registry that was founded in 1924.

The present structure and duties of the Directorate-General of Land Registry and Cadastre (hereinafter referred to as TKGM) defined in 1936. By this law the organization was linked to the Finance Ministry, then was linked to the Ministry of Justice in 1939, to the Prime Ministry in 1951, to the Ministry of Public Works and Settlements in 2002. In 2005, the Ministry of Public Works and Settlement was closed under the restructuring of the Government. After that TKGM is linked to the newly established Ministry of Environment and Urbanization.

3. LEGAL FRAMEWORK

Property rights are mainly defined and protected by the constitution and the civil code which was adapted from Switzerland civil code in Turkey. 345 articles of the Turkish Civil Code are related to the property ownership and 187 to the inheritance. In other words, more than half of the Turkish Civil Code (55%) is related to property issues. Ownership rights that are legally protected, secure, recorded in a single, accurate, widely accessible electronic registry and that lead to high levels of formal ownership for all citizens. According to the Constitution, everybody has ownership and inheritance rights. Such rights can only be restricted with laws for the public interest.

In the Turkish land registration system, it is the official land register, which is under the guarantee, supervision and responsibility of the State and on which the legal status of the real

properties is recorded, not only ownership right but also all real rights other than ownership bear legal consequences through registration to land register.

As an applied cadastre system in Turkey, the juridical cadastre has as a rule two parts. The first is a written record or registry containing information about each parcel, such as the name of the owner and rights which appertain to the land; the second is cross-referenced to the first and contains a detailed description of the parcel, in form of either maps or survey measurements.

According to the Civil Law Article 719 (formerly 645); the boundaries of the real estates are determined by the boundary points indicated in the cadastre plans and on ground. In case of non-coincidence of the points in cadastre (plan) and ground, those indicated in the plan will be referred. These regulations reveal the relevance of the land registry book and cadastral maps from the stand point of real estate possession.

The keywords of Turkish land registry and cadastre can be summarized as follows; state guarantee of registers, legal security, fast service for users, complete coverage terms of cadastre and land registration, a comprehensive, liable and secure system, legally computerized and automated land registry system, spatial property system – that also serves other purposes (i.e. as a basis for Land Related Information Systems such as agriculture, municipalities, spatial planning, census, address, tax offices etc.), integration of different systems, land registry & cadastre mapping in one organization, legal support, legal basis, private sector involvement, licensed cadastre engineers/bureaus, successful cost recovery system, deep involvement in economy, centralized management.

4. THE FIRST CADASTRE TENDERS AND LESSON LEARNED

As cadastral works are considered as a “public service” within the scope of public infrastructure projects (which must be prepared and implemented by public institutions), first cadastre establishment on district / village basis were carried out by TKGM's own staff until the second half of the 1980s.

With the law on Cadastre amended in 1987, the technical works of the cadastre could also be made by the private sector.

4.1 The First Initial Cadastre and Geodetic Works Tenders

In 1988, TKGM had tendered the geodetic network densification works for 5K photogrammetric mapping purpose within the scope of eight projects to the private companies. However, surveying of boundaries and fixtures/cadastral mapping works were also tendered to the private companies in mentioned year. The projects were successfully completed in technical point of view, but it was decided that these projects did not meet the expectations of the TKGM management considering the project content, labor force, cost and time criteria. These projects play an important role in establishing a working culture together with the private sector in TKGM.

Lessons learned from this result are;

- i. TKGM staff have gained a culture of making projects together with the private sector.
- ii. Technical of References of the projects (ToR) were not appropriate, should be reworked on it.

4.2 Marmara Earthquake Emergency Reconstruction Project (MEER) / Marmara Earthquake Region Land Information System Project (MERLIS)

Turkey has experienced devastating earthquake on August 17, 1999. There were great damages in the Marmara Region and its surroundings. As the natural consequence of such large crustal movements is that discrepancies between the cadastral maps and the ground condition, which are subject to ownership, have necessitated the improvement of land registry and cadastral information and documents.

The Government of the Republic of Turkey defined the work program for emergency restructuring together with the help of the World Bank to improve living conditions in the earthquake region, and supporting the development of the economy, earthquake risk management and reduction of earthquake damage, for the development of an institutional framework. The Marmara Earthquake Emergency Reconstruction (MEER / MERLIS) Project covers the Bank-financed elements of this program. The sub-components of the MEER Project were A4-Cadastral Renovation and Land Management.

ToR preparations, which could overcome the negative result in the first private sector implementation described above TKGM has prepared a new ToR with a team consisting of senior management of the Institution, practitioners from the local cadastre offices and World Bank experts.

In Turkish system, the cadastral team consists of two technicians, the mukhtar of the cadastral area being surveyed and three expert witnesses sworn before the court. Supervision of the cadastral team is carried out by engineers and cadastre technician. During the cadastral survey undertaken parcel delineation and surveying tasks were carried out by a single team.

When cadastral works are completed, the results are announced twice. While objections made regarding the first announcements (within 15 days) are assessed by cadastral commissions consisting of TKGM personnel, objections made regarding the second announcements (within 30 days) are assessed by specially authorized cadastral courts. After cadastral works are completed; parcels for which no objection has been made to the cadastral court are finalized, and for parcels for which an objection has been made to the cadastral court, the parcel will not be processed further until a satisfactory solution to the objection has been reached.

Owners are determined due to the result of the assessment of all pre-cadastral documents of evidence and rights together with the statements by parcel owners, statements by owners of neighboring parcels, statements by expert witnesses selected from among the villagers and the mukhtar for the area being surveyed. Thus, all appropriate information and documents are collected and rectified as required.

Sometimes, a solution cannot be reached, so the last resort for the objectors is to take their case to the civil courts within ten years of completion of the work in their cadastral unit. Under the Cadastral Law, the ten-year period is determined to be final. Upon completion of the cadastral works, all processes must then be continued through the land registry system. In this way, with the cadastral works;

- Participation and transparency are ensured (through involvement of local people and all relevant institutions and organizations in the cadastral works, as well as public announcements of the outcomes),
- Unrecorded processes are prevented in units, of which cadastre have been finalized; and
- Ownership is secured.

The cadastral processes in the tender document prepared within the scope of the World Bank National Competitive Bidding method are defined as follows;

- i. Preparation Works
 - The definition of the works has to be done by the head quarter, regional directorate and local cadastre office
 - Authorities and responsibilities of each unit
- ii. Technical work
 - Demarcation of boundaries
 - Surveying of boundaries and fixtures/cadastral mapping
 - Reception of claims/collection of evidence/adjudication of rights
 - Documentation/preparation of full record for public display/quality control
- iii. Verification and resolution
 - Public display of the draft adjudication and cadastral records/public verification/appeal
 - Dispute resolution (by cadastre commissions, if the resolution is negative, then court goes court)
- iv. Finalization
 - Formal adjudication and registration
 - Issuance of titles/certificates.

In this framework, which works will be done / supervised by the personnel of the institution and which works will be contracted to the private sector is structured as follows;

- i. Cadastral work items **tendered to the Private Sector**
 - Geodetic Works
 - Ground Control, Establishment, Surveying, Calculation, Elevation Determination, Plotting, Levelling works
 - Digitization of analogue 5K photogrammetric maps if available, accuracy and completeness control,
 - Surveying of boundaries of cadastral working area,
 - Cadastral block segmentation and blocking
 - Delineation of parcels,
 - Evidence collection of parcels,
 - Surveying boundaries of cadastral parcels
 - Drawing the cadastral sheets,
 - Area calculation,
 - Preparation of announcements,
 - Issuance of titles, certificates

ii. Cadastral work items not contracted to the Private Sector

- Survey and document evidence audit plus public display announcements
- Finalization and recording of land register
- Preparation of the lists as a basis for taxes and charges
- Preparation of ownership registers and technical files
- Preparation of title deeds

Tender preparation work was completed in about a year. In this context, the works performed can be listed as follows;

- Preparation of training documents/guide both for own staff and contractor personal
- Estimated cost of each tender lot
- Establishing project management office
- The following information was collected through the Local Cadastre Directorates at the stage of preparatory work for each tender area;
 - Inventory of 1/5000 scale standard topographic maps,
 - Locations and numbers of forest related villages,
 - Average area of villages as hectare and
 - Estimated number of cadastral parcels
 - Village related exist/historical documents,
 - Determine / assign witnesses
 - Get an information about slope, land cover, meteorological information, average working days in field,
 - Public awareness (Cadastral region announcements, Cadastral work area announcements and block/site announcement)

TKGM has established a significant management structure for procurement and supervision, technical control and quality checks, controlling works progress, preparing progress payments and for the conduct of overall accounting, and works approval - acceptance groups in the headquarter, regional and sub-regional offices and staff have been officially appointed by regulation.

After the tenders were made and approved by the World Bank Office, the projects started. For reasons of importance of ownership/cadastral parcel boundaries determination and new ToR preparation, TKGM has prepared a 15 - day training program for the engineers and other technical staff of the companies that won the tender. Companies started their cadastral projects after this training and worked strongly together with local cadastre office.

In the MEER / MERLIS Project, the tender for 90.650 cadastral parcels in 102 villages was made as 4 lots.

The preparation process of the projects as a result of the preparatory work, tender procedure and the company-cadastre office started late in 2003 and the project was completed in May 2005 and the MEER project cadastre sub component was closed by the World Bank.

World Bank MEER Project cadastral tenders were the first and successful applications in terms of private sector involvement in Turkey.

5. COMPLETION OF INITIAL CADASTRE IN THE ENTIRE COUNTRY

From the year the Republic was established until 2003, the cadastre of 39.422 units was completed and 23.72% villages / districts of the country were not cadastrated yet. Cadastre realizations as of the date of implementation of cadastral laws are given in Table 1.

Table – 1: Cadastre production by years

YEARS	LAW	UNIT	RATIO
1924-1933	Law dated February 5, 1912	463	0.90%
1934-1949	2613 numbered cadastre and delineation law	1,180	2.28%
1950-1963	5602 numbered rural cadastre law	7,407	14.33%
1964-1965	509 numbered rural cadastre law	1,039	2.01%
1966-1986	766 numbered rural cadastre law	18,894	36.56%
1987-2003	3402 numbered cadastre law	10,439	20.20%
	TOTAL	39,422	76.28%

With the success of TKGM in the cadastral projects realized with the participation of private sector, the PPP method and self-confidence, the TKGM management presented the project called "Completion of the Initial Cadastre in the Entire Country" to the Ministry and the project was approved by the Prime Minister.

It is planned that initial cadastral works will be completed in 3 years and 3.000 villages of approximately 10.000 will be treated in one year. The required fund ensured, and project was started in 2005. It is expected that tenders of the project will be finalized in 2008. Initial cadastre works of the total 4.032 villages has been began in the country in 2005.

The sources of the project were;

- i. World Bank funds namely Agricultural Reform Implementation Project (ARIP),
- ii. TKGM's Revolving Fund,
- iii. Beside that TKGM continued to make an initial cadastre works with his own cadastre teams using direct government allocated budget.

Table – 2: The project tenders and average parcel cost list

YEARS	FUNDED BY REVOLVING FUND				FUNDED BY ARIP PROJECT				PARCEL COST (USD)
	TENDERS	UNITS	PARCELS	CONTRACT PRICE (USD)	TENDERS	UNITS	PARCELS	CONTRACT PRICE (USD)	
2005	96	1.510	1.670.444	49.570.856	57	1.436	1.382.471	40.399.295	29.47
2006	157	2.976	3.355.286	131.368.614	46	1.155	1.213.545	53.209.203	40.40
2007	107	2.398	2.392.031	68.275.398	15	389	313.515	14.002.728	30.41
2008	43	862	760.605	22.319.093					29.34
2009	17	371	333.005	12.995.011					39.02
2010	26	558	614.316	23.806.726					38.75
TOTAL	446	8.675	9.125.687	308,335.701	118	2.980	2.909.531	107.611.227	34.57
				GRAND TOTAL	564	11.655	12.035.218	415.946.928	

The units, which were the cadastre not established at that time and were tendered as part of the project, were in the most remote, mountainous and wooded corners of the country. The project tenders and parcel cost list are given in Table – 2. The total cost in the table is converted to parcel by using the average USD value of that year and presented as such.

As it is shown in Table - 2, in the scope of 564 tenders, cadastre of 12.035.218 parcels in 11.655 village / district was completed using World Bank ARIP and TKGM Revolving Fund budget. The average parcel price was realized as US\$34.57.

Within the scope of the project, GNSS techniques were used, and planimetry + height was digitalized in the villages where 5K analogue photogrammetric maps available.

9.125.687 of the 12.035.218 parcels in 11.655 units were produced using the TKGM Revolving Fund resources. The remaining 2.909.531 parcels were finalized using the World Bank ARIP Project budget. In statistical terms, World Bank loan was used in 24.17% of the project.

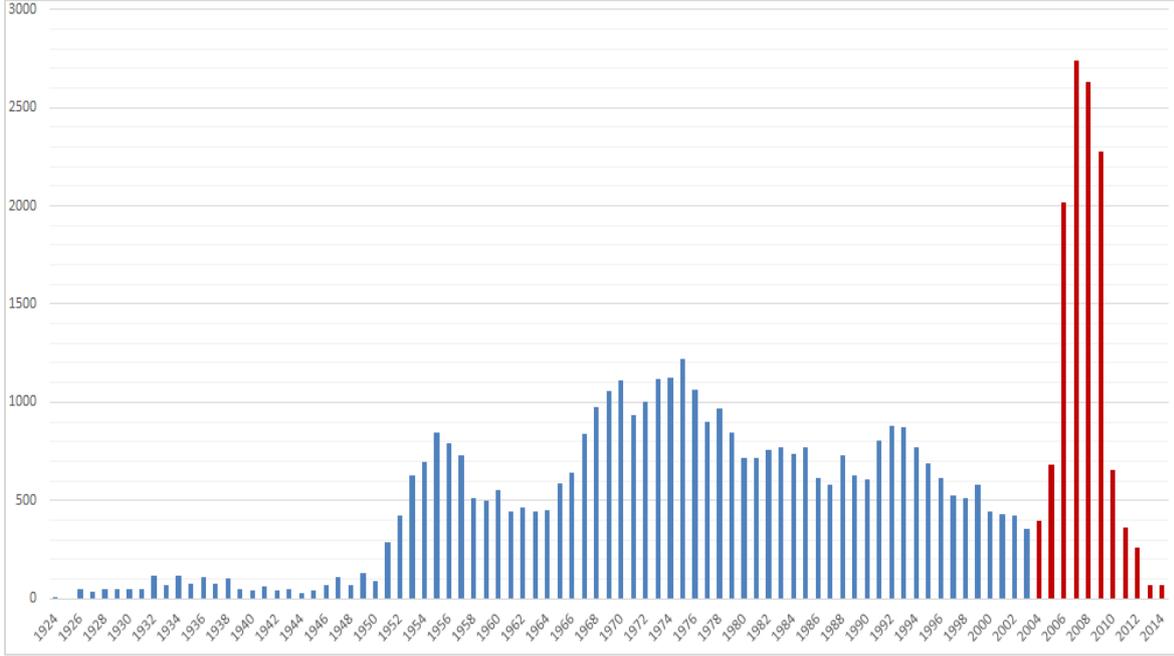
During the project, TKGM made a cadastre with “its own teams” as well. Consequently; 12.487.694 parcels in total registered in the land registration book. According to the data of the Ministry of Justice, the number of parcels applied to the court, including cadastral renovation and digitization projects carried out by TKGM during this period, is 236.436 as is seen in Table – 3. In other words, 2.20% of the registered parcels were applied to the “**cadastre court**” for the solution of the disputes. According to the Ministry of Justice 2017 statistics, the finalization period of cadastral cases is about 992 days. Since the tendering of cadastral works started in 2005 and since each tender lasted about two years, the registrations of the produced cadastral parcels to the land registry books started in the second half of 2007. For this reason, the number of lawsuits filed to the court was started as of 2007 and was taken until 2012 in Table – 3.

Table – 3: Number of cases opened to the court

YEARS	REGISTERED PARCELS (INITIAL CADASTRE)	REGISTERED PARCELS (RENOVATION & DIGITIZATION)	TOTAL OF REGISTERED PARCELS	NUMBER OF CASES (CADASTRE COURTS)	RATIO
2007	2.958.901		2.958.901	77.291	2.61%
2008	2.868.018		2.868.018	55.275	1.93%
2009	2.512.711		2.512.711	34.98	1.39%
2010	938.631	12.34	950.971	40.43	4.25%
2011	527.319	421.046	948.365	15.538	1.64%
2012	581.666	364.504	946.17	12.922	1.37%
TOTAL	10.387.246	797.89	11.185.136	236.436	2.20%

TKGM conducted cadastre establishment of 500 units a year in the country before 2003. Within the scope of the project, the tender process was completed mostly between 2005 - 2006 – 2007 with an average of 3.288 units per year (Table – 2). Detailed information about village based initial cadastre works can be seen in Figure – 1. Overall this is about a 7 - fold increase in the annual production by TKGM as usually some 500 villages are started each year. This means that TKGM has “completed its cadastre establishment work in 5 years instead 24 years” thanks to its “Private Participation PPP model”.

Figure – 1: Initial cadastre works on village / district base by years



After the project, TKGM completed the remaining cadastral works by using its own Revolving Fund resources and working together with the private sector.

5. COST – BENEFIT ANALYSIS

5.1 Project Cost Calculation

The total cost of contracts and the cost of personnel assigned by TKGM have been considered in the calculation of project cost.

5.1.1 Contract Values

Within the scope of the project, 564 packages were tendered, and 12,035,218 parcels were registered with the title deed. The total contract price of the project is **US\$ 415,946,928** (Table – 4).

Table – 4: The contract values of the project covered by TKGM and World Bank

	FUNDED BY REVOLVING FUND				FUNDED BY ARIP PROJECT			
	TENDERS	UNITS	PARCELS	CONTRACT VALUE (USD)	TENDERS	UNITS	PARCELS	CONTRACT VALUE (USD)
TOTAL	446	8.675	9.125.687	308.335.701	118	2.980	2.909.531	107.611.227
				GRAND TOTAL	564	11.655	12.035.218	415.946.928

5.1.2 TKGM Personnel Cost

In order to control the works carried out by the private sector companies such as technical controls works both in the field and in the office, survey and document evidence audit plus public display announcements, finalization and recording of land register, preparation of the lists as a basis for taxes and charges, preparation of ownership registers and technical files, preparation of ownership certificates TKGM has paid **US\$62.616.402** as a salary and daily allowance.

A total of 54.165 man / months worked as engineer, control engineer, technician and office worker in the project (Table – 5).

Table – 5: TKGM personnel cost

TITLE	BY PARCEL NUMBERS (Man/Month)	AVERAGE SALARY (USD)	AVERAGE DAILY ALLOWANCE*30 (USD)	TOTAL (USD)
Control Engineer	7.142	1.375	166,74	11.017.482
Control Staffs (legal and technical)	11.836	1.038	164,96	14.248.798
Cadastre Technicians	35.187	905	156,09	37.350.121
TOTAL	54.165			62.616.402

5.2. Project Revenue Calculation

5.2.1 TKGM Revolving Fund Fee and Land Registration Fees

TKGM has its revolving funds within the local or regional offices in order to generate income from all kinds of land registration, surveying, mapping, and archival information and documentation it produces.

The land registration service fee that is collected from the citizen during the purchase and sale of real property is called "land registration fee". If land registration fee is not deposited, land registry transactions cannot be performed.

According to the type of transaction, citizens are required to pay either a revolving fund fee or a land registration or both. Land registry revenues are deposited in the account of Ministry of Finance Revenues Directorate.

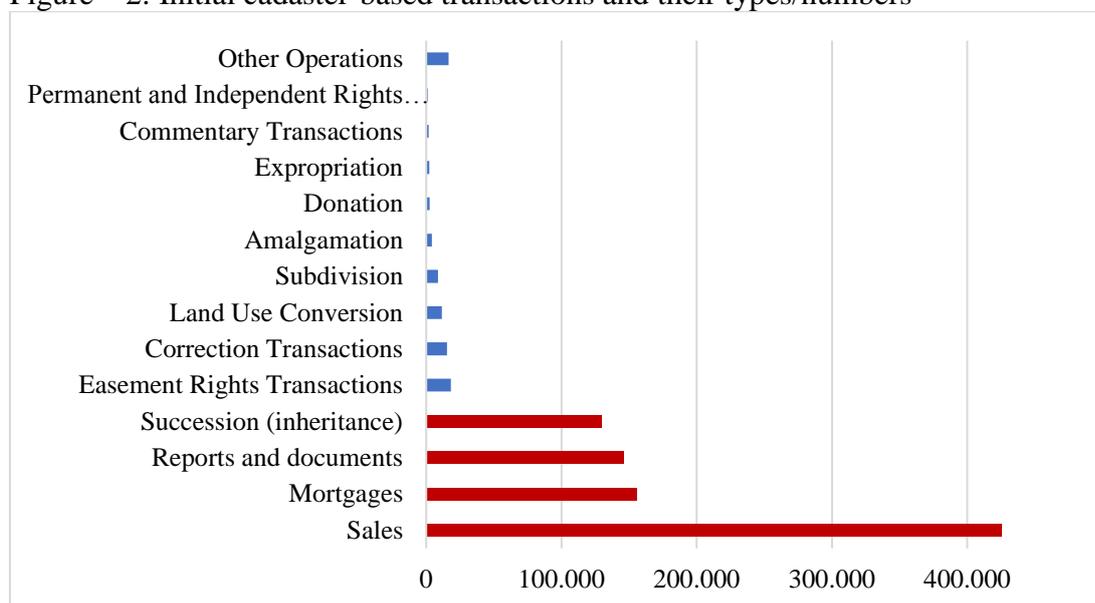
The financially measurable income account is based on TKGM Revolving Fund Fee, Land Registration Fee and Cadastre fee. All these revenues are available in the TAKBIS (Turkish Land Registry and Cadastre Information System). These data used in the calculation are actual figures from TAKBIS.

Since the cadastral projects tendered in mid of 2005 and the project lots were completed and registered in approximately 13 - 14 months so the income amounts were taken as the second part of the year 2007. The tenders within the scope of the project were made until the end of 2008 and they were all completed in 2012 by registration.

Starting from 2007, the parcels were checked in TAKBIS with the registration reason as "initial cadastre" so these parcels selected and checked for the transactions performed on it and paid

fees related with these transactions as is seen in Figure – 2 a total of 939.593 transactions were performed over newly produced parcels.

Figure – 2: Initial cadaster-based transactions and their types/numbers



The sum of revenue income from the parcels registered to the land registry is **US\$143.848.460**. Detailed information is given in Table – 6. Annual Revolving Fund and Land Registry transaction revenues are low in the first years then increased rapidly as the years passed due to growing number of transactions.

Table – 6: Revenues of the initial cadastre based transactions

YEARS	NUMBER OF REGISTERED PARCELS	NUMBER OF TRANSACTIONS	REVOLVING FUND PAYMENTS (USD)	LAND REGISTRY TRANSACTION FEES (USD)
2007	2.957.007	449	26.201	28.36
2008	2.868.321	5,585	290.416	474.187
2009	2.513.047	15.234	755.335	1.712.514
2010	938.853	25.273	1.235.709	3.399.280
2011	527.335	39.046	1.559.281	8.815.905
2012	582.227	73.234	3.146.069	10.226.385
2013		95.89	3.565.975	11.134.526
2014		111.242	4.236.824	14.174.258
2015		116.466	4.258.454	15.002.843
2016		143.752	4.995.783	16.963.547
2017		150.78	4.322.345	16.159.127
2018		162.642	4.010.620	13.354.517
TOTAL	10.386.790	939.593	32.403.011	111.445.449
			GRAND TOTAL	143.848.460

5.2.2 Cadastre Based Transaction Fees

TKGM has started to keep its cadastral incomes in 2015. Therefore, there is no data related to "cadastral revenue" from 2007 - 2012 period. In order to generate a cost projection related to cadastral revenues, the average of 2015 - 2018 data obtained in TKGM was averaged and approximately 20% of the rate was taken from the initial cadastre. As can see in Table - 7, the estimated annual average income is US\$2.739.790 (US\$54.795.800/4years*0.2). As of 2018, the estimated annual average revenue can be calculated (US\$2.739.790 * 12 months) as **US\$32.877.480**.

Table – 7: Incomes from cadastral transactions

YEARS	BY TKGM		BY LIHKAB		TOTAL (USD)
	NUMBER OF TRANSACTIONS	REVOLVING FUND PAYMENTS (USD)	NUMBER OF TRANSACTIONS	REVOLVING FUND PAYMENTS (USD)	
2015	269.071	13.246.357	187.205	2.054.125	15.300.483
2016	269.399	13.373.541	207.609	2.100.095	15.473.636
2017	241.104	10.805.889	262.511	2.147.412	12.953.301
2018	268.22	9.378.968	253.93	1.689.412	11.068.379
TOTAL	1.047.794	46.804.755	911.255	7.991.044	54.795.800

5.2.3 The difference between the cost of cadastral parcels produced by TKGM and the cost of parcels produced by private sector

The cost of the parcel was calculated as US\$44,00 / parcel if the village cadastre was carried out with the own teams of TKGM.

- i. The cost including appointed TKGM personnel payments and contract values of the cadastral tenders carried out by the private sector calculated ((US\$415.946.928+US\$62.616.402)/12.035.218parcel)) as US\$39,76/parcel.
- ii. Profit obtained per cadastral parcel is US\$44,00 – US\$39,76 = US\$4,24/parcel.
- iii. TKGM's profits from the tendering of the cadastre works to the private sector is (12.035.218 parcel * US\$4,24 / parcel) **US\$51.029.324**.

5.3 Cost Benefit Calculation

Costs and revenues described in sections 5.1 and 5.2 are summarized in Table - 8.

Table – 8: Cost benefit calculations

COST (USD)		BENEFIT (USD)	
Contract Values	415.946.928	Revolving Fund Payments and Land Registry Fees	143.848.460
Personnel Cost	62.616.402	Estimated average revenue from cadastral transactions	32.877.480
		Difference in production cost between TKGM and private sector.	51.029.324
GRAND TOTAL	478.563.330		227.755.264

The important result from this study is that initial cadastral works recovered 47,6% of the total cost within 11 years as of the completion dates of tenders.

5.4 Revenues that cannot be measured financially

All in all, of the completion of the cadastre, technical and financial profitability was provided too many projects. These costs are not modeled in the cost and benefit calculation. Some of these are summarized as follows;

- The project was completed in 5 years. TKGM could complete the project with its own teams in 24 years. The difference between the above mentioned 24 years was not included in the financial model,
- In these areas, the credit and mortgages received to support the rural economy are not covered,
- Payments made under Direct Income Support (DIS) are performed based on the area of the cadastral parcel. Serious reductions have been made as the transactions were made over the real cadastral area instead of the declaration. These amounts were not modeled and added to the cost benefit calculation,
- Completion of cadastral projects accelerated land consolidation projects. Between 2009 and 2014, land consolidation tender was carried out for 1.000.000-hectare rural areas per year,
- With land consolidation projects, the cost of expropriation, which is a problem in large engineering projects, and which holds large sums, has been avoided,
- Forest occupied areas were determined and registered in land registry via cadastre works. These areas were eventually sold to users to obtain large incomes. Without the cadastre establishment, this social and technical problem could not be solved. The financing obtained from this study was not included in the cost / benefit analysis,
- Rural areas have accelerated development projects and thus contributed to the development and economy of the country,
- A total of 15.000 staff members consisting of approximately 5.000 engineers and technicians and approximately 10.000 administrative and other staff were recruited within the project. This number is the social and economic side effect of the project and has also been a remedy for improving the unemployment rate in the country,
- Thus, private sector has gained the necessary qualified man power, work experience and modern equipment/software that would facilitate their competition on the international platforms.

6 LICENSED SURVEYING ENGINEERS AND BUREAUS (LIHKAB)

Post cadastre services previously performed only by the TKGM's local cadastre offices has been transferred to the private Licensed Surveying and Cadastre Engineers and Bureaus by law enacted in 2005. The establishment of such a special office and the fulfilling some of the specified post cadastre activities by these offices with public responsibility and authority is a complete PPP application.

Licensed Surveying and Cadastre Engineers and Bureaus perform, as specified in the law; staking out transaction which is not subject to registration, showing the location of parcel or the single space in the field, establishment of easement and its cancellation, land use conversation and amalgamation operations are subject to registration. They are considered as public servants

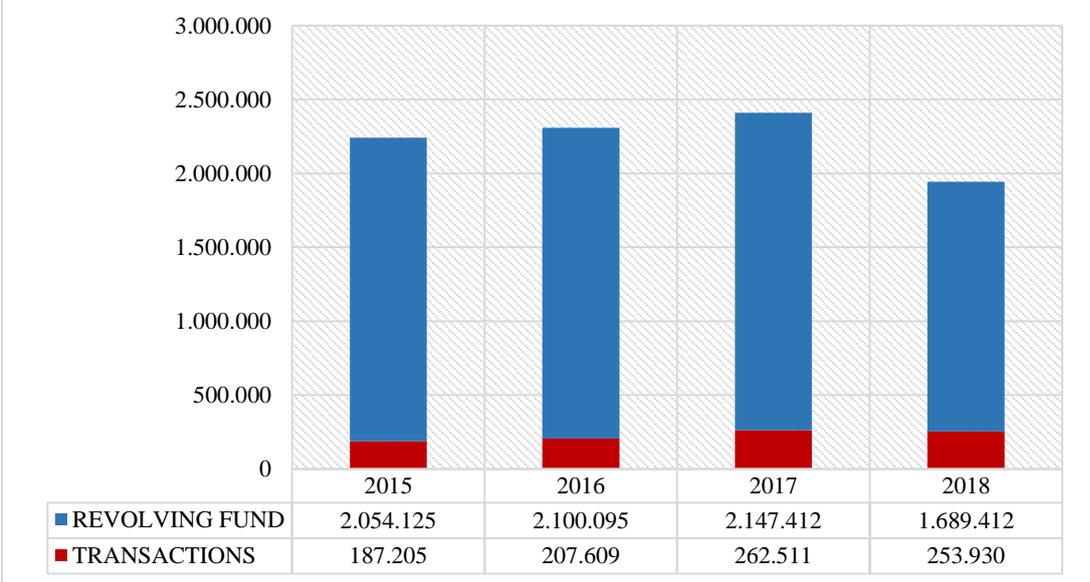
when performing these transactions and are liable to compensate for the deficiencies caused by the defective or defective processes.

Licensed engineers are determined by the written examination by TKGM among the Surveying and Cadastre Engineers who have at least 5 (five) years of experience. Licensed bureaus are obliged to employ at least two people as one engineer and technician other than the licensee in order to carry out their activities and services without interruption.

Licensed bureaus shall pay 5% of the contract price determined by TKGM (calculated based on yearly value) in transactions which are not subject to registration, In the case of transactions subject to registration, they shall pay 10% of the contract price as the revolving fund.

There are 225 LIBKAB's in 60 out of 81 provinces in the country. 482 Surveying and Cadastre engineer, 756 technical staff, 72 others work in these offices. Post cadastre operations are carried out by the relevant local cadastral directorates in remaining 21 provinces where currently there are no licensed bureaus.

Figure – 2: LIHKAB's number of transactions and Revolving Fund payments



An average of 228,000 transactions is performed annually by the LIHKAB. TKGM personnel who carry out these works have been assigned to digitization, forest cadastre and cadastral renewal projects after the establishment of the LIHKABs. The amount of TKGM revolving fund by the LIHKAB is approximately US \$ 1.998.000 per year (see Figure – 2).

7. CONCLUSIONS

Cadastre is a system modeling people and land relations. Cadastral studies are human-oriented and are a tool for development of the country. The cadastral works determine the geometry, ownership, rights, responsibilities, restrictions of the parcel are officially registered in the land registry and by this way state guarantee is given. The land cadastre and land registry should cover the entire country.

Security of land tenure, access to credit - mortgages, productivity of land, establishing real property market, equitable collection of land taxes, improved opportunities to implement land policies, sustainable development of land, sustainable cities, rapid rural development, protecting natural resources, gender equality, peace, justice can be provided with cadastre establishment.

Cadastre establishment is very important both in human life and in the development of countries, but its initial investment is expensive. Therefore, it is crucial to provide financial resources and budgeting before starting the project. However, a strong institutional structure, qualified workforce and feasible project management are also required. Due to the flexibility of the private sector and the speed of doing business private to public participation is indispensable in cadastre establishment.

Having established the Republic of Turkey to date, it has completed about 76% of the country's cadastre. The absence of cadastre in the remaining parts of the country began to create bottlenecks in engineering and social projects. For this reason, TKGM has prepared and implemented the whole country's cadastre completion project. The project has been completed successfully. The experiences gained from the project are summarized below;

- i. In the first stage, financial resources and intention to make the project are necessary. Starting with international organizations such as the World Bank is important for the government support to the project. Governments should not only be satisfied with international financial support but should be able to use all their possible financial resources. In Turkey, cadastre establishment projects working together with private sector was initiated by the World Bank project and supported by the government, thus resulted in becoming successful project.
- ii. The Revolving Fund is a great opportunity for project finance. In the sense of cost recovery, the establishment of the Revolving Fund is a requirement. 79% of the project cost has been funded by TKGM Revolving Fund.
- iii. Establishment of initial cadastre using by institutions their own teams is both costly and very time consuming.
 - a) While the completion time of village based cadastre carried out by TKGM's own teams was approximately 24 months (two working seasons) but within the scope of the Cadastre Completion Project were completed in about 12 - 14 months,
 - b) Before the project, TKGM worked in an average of 500 villages per year. Within the scope of the project, an average of 3.288 villages a year were tendered out. Thus, the production rate has increased by about 7 times.
 - c) While the cost of the parcel in the village cadastre works carried out by TKGM's own teams was US\$44,00 this price decreased to US\$39,76 thanks to private sector participation.
- iv. The dynamism and flexibility of the private sector should be utilized in cadastral establishment. In this context, preparation of Term of References is quite important. Despite the successful completion of the first tenders of TKGM in 1988, the results were not satisfactory because of inappropriate ToR.
- v. Institutions should establish a well-designed project management office, which consists of experts, who work hard and can make quick decisions. TKGM has established a significant management structure for procurement and supervision, technical control and quality checks. From the Director General to the Regional Director, from the local

- Cadastre Office Director to the engineer / technician, everyone has been given responsibility and these responsibilities have been put into practice.
- iv. Turkish surveying private sector gained experience in cadastral establishment, TKGM and the private sector have learned to work together, the private sector has learned to prepare documents for World Bank tenders and has been able to work everywhere in the world,
 - v. The **47,6%** of the investment and operation costs of the cadastral projects paid back within 11 years as of the completion of tenders.
 - vi. Geodetic studies are one of the most difficult parts of cadastral projects. At the beginning of the project, traditional geodetic measurement methods and systems were used. To overcome this problem, the CORS-TR system was developed and implemented.

Licensed Surveying and Cadastre Engineers and Bureaus is the good sample of Public Private Partnership. A total of 1.310 people work as licensed engineers, technicians and support staff in these bureaus.

Due to the the transfer of some of the duties of TKGM to these offices, TKGM provided the following managerial and financial benefits;

- i. Technical staffs were diverted to other projects such as cadastre renovation, digitization so the projects completed on time.
- ii. Nevertheless, TKGM has created another financial resource for its Revolving Fund. The annual average contribution of LIHKAB bureaus to TKGM is about US\$ 2.000.000 per year.

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BIOGRAPHICAL NOTES

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Turkish citizen born in Turkey at 1959, a surveying engineer, got his PhD in the year 1997. Have worked for the Turkish Government for almost quarter century and realized many cadastre, land information systems and land administration works. Besides he has been involved in many geodetic and surveying infrastructure projects; namely, CORS-TR, Preparatory Study on NSDI-TR (phase I and II), Turkish Land Registry and Cadastre Information System, Public-Private-Partnership etc. in Turkey. Parallel to his practitioner engagements, he was also active in academic and research institutions and a part-time lecturer at the university. After retiring from the Turkish General Directorate of Land Registry and Cadastre, he has been working in the private sector for several years. He has realized diverse national and international mapping, agriculture and regional planning projects.

Beside others, he is the Vice President of FIG (International Federation of Surveyors).

Mert Yasin ÖZ

He was born in Turkey at 1975. He graduated from Yildiz Technical University, as a surveying engineer in 1999, Istanbul. He has been working in IT Department since 2009 at General Directorate of Land Registry and Cadastre (GDLRC) and taken part in open source software development projects; namely Parcel Inquiry Application, Spatial Information System (MEGSIS), Licensed Surveying Engineers and Bureaus (LIHKAB) Software, Online Appointment Application etc. He was honoured with the “Afghanistan State Medal” for his contributions in Institutional Development Programme for Land Administration (IDPL) prepared under the coordination of The Food and Agriculture Organisation (FAO) of the United Nations.

He is already acting as Geographic Information Systems Section Manager at GDLRC.