

# **Analysis of Cadastral Data in the Perspective of Land Administration in Kosovo**

**Murat MEHA, Republic of Kosovo**

**Key words:** cadastre, land administration, database, accuracy.

## **SUMMARY**

Cadastral data are important for development economy and planning in each country. These cadastral data are of major importance especially in transition countries like Republic of Kosovo. There are no homogenized cadastral data for the whole territory. Sources of cadastral data are varying, e.g., the graphical part was created in the 1980s. The legal part as textual data is from a newer period (2000-2008). It will be possible to homogenize data municipality by municipality. This can be achieved with good cooperation with the Government, donors and professionals. It is also advisable to integrate cadastral data in a Land Information System or Geographical Information System in relation with services rendered based on the legal basis and to improve quality in the same time. This takes some time, but having homogenized cadastral data will facilitate land administration, create better planning and reduce disputes of owners and stakeholders. Good quality and accurate data are necessary for many purposes, especially for running a reliable cadastre, for construction work and agricultural development, which are in expansion in Kosovo. The future challenge is to develop the conditions of sustainable land administration step by step and looking for low cost cadastre solutions.

Quality and purpose of cadastral data depend on the legal and the technical part. The legal part, or laws, in Kosovo regarding cadastre have been installed after 2001. The technical part like statistical database and maps are mostly outdated or not maintained. The situation varies between municipalities. The question remains open how technical and legal quality can be combined and we must always look for new solutions within limited time and resulting in acceptable quality. Cadastral data are correct by law but in reality there are unacceptable differences.

Research should be concerned with the search for solutions that fit the technical and legal data. The paper presents examples and various cases of discrepancies between field reality and cadastral data in Kosova. The intention is to find solutions for these problems.

# ANALIZA E TË DHËNAVE KADASTRALE NË PERSPEKTIVEN E ADMINISTRIMIT TË TOKAVE NË KOSOVË

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**Fjalët kryesore:** kadastri, administrimi in tokave, baza e të dhënave, saktësia.

## PËRMBLEDHJE

Të dhënat kadastrale janë të rëndësishme për zhvillim ekonomik dhe planifikim të çdo vendi. Këto të dhëna kadastrale kanë rëndësi të veçantë veçanërisht për vendet në tranzicion si është edhe Republika e Kosovës. Këtu nuk janë të homogjenizuara të dhënat kadastrale për tërë territorin. Burimi i të dhënave kadastrale ndryshon si psh të dhënat grafike janë të krijuara në vitet e 80ta. Ndërsa të dhënat juridike si pjese tekstuale e të dhënave janë të periudhës me të re (200-2008). Mundësitë janë qe të homogjenizohen të dhënat prej komunës në komunë Kjo mund të arrihet me kooperim të mirë me Qeverinë, donatorët dhe profesionistët. Gjithashtu është e nevojshme me i integrua të dhënat kadastrale në sistemin e administrimit të tokave dhe në sistemin e informimit gjeografik, me qellim të shërbimeve të bazuara në ligjet dhe përmirësimin e kualitetit në të njëjtën kohë. Natyrisht se kjo kërkon kohë, por duke i pasur të dhënat e homogjenizuara do të lehtësohet administrimi i tokave, krijohet mundësi për planifikim dhe zvogëlohen konfliktet dhe debatet në mes të pronarëve dhe shfrytëzuesve. Të dhënat me kualitet të mire dhe me saktësi të kërkuar janë të nevojshme për shumë qëllime, veçanërisht për krijimin e besueshmërisë në kadastër nga këndi i punëve ndërtimore dhe i zhvillimit të bujqësisë të cilat janë në hov të madhe në Kosovë. Sfidat e ardhme janë për zhvillimin e qëndrueshëm të administrimit të tokave hap pas hapi duke synuar për kosto të ulët të zgjidhjeve kadastrale.

Kualiteti dhe qëllimi i të dhënave është i lidhur në pjesën juridike dhe atë teknike. Ana ligjore për kadastër në Kosovë është e punuar pas vitit 2001. Ndërsa pjesa teknike e lidhur edhe me atë statistike të regjistrave të ndryshëm dhe hartat janë të vjetruara apo të pa mirëmbajtura. Gjendja është e ndryshme në komuna të ndryshme. Pyetja mbetet e hapur si te kombinohen mirë pjesa teknike dhe ligjore duke shikuar qe ato të arrihen në kohën e caktuar dhe me kualitet të pranueshëm. Të dhënat kadastrale janë korrekte sipas ligjit por në realitet aty ka diferenca të pa pranueshme.

Hulumtimi do të jetë i orientuar në gjetjen e zgjidhjeve i cili i bashkon të dhënat teknike dhe juridike. Punimi paraqet shembuj nga rastet e ndryshme të ndryshimeve në mes të realitetit në terren dhe të dhënave kadastrale në Kosovë. Synimi është qe të gjinden zgjidhjet për këtë problem.

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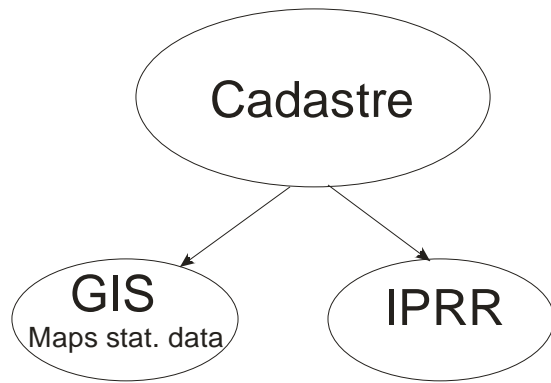
## 1. INTRODUCTION

Registration of property rights in the Immovable Property Right Register (IPRR) has to deal with legal and technical cadastral documents. Research has been done in three municipal Cadastre Offices in Kosovo during the period of December 2007 to March 2008. The purpose was (Technical R. 2008) to examine the quality of the maintenance of the 'manual' registration books, to examine the quality of the maintenance of the 'digital' IPRR database, and to compare the data in the books with the data in the 'digital' IPRR database. There were different findings as it is shown in section 2.2. Comparison of the current field situation with cadastral records, which date from at least three (3) years ago, reveals that coincidence is not high enough. In fact, maintenance of the cadastral data is ongoing, which means that the Municipal Cadastral Offices (MCO) have been updating the cadastral documents. Identification of land parcels is based on new data with a new approach to the graphical and GIS data securing land rights. This was an important task since the cadastral data incomplete or missing as a result of the recent war. Kosovo institutions were and still are facing different challenges on land administration when developing new projects on urban and agricultural land.

The word Cadastre has different meanings and different organizational patterns in different countries. Kosovo has a unified cadastre. It shows that the content of cadastre in Kosovo is based on two parts:

- GIS-data, from which graphical maps and statistical extracts can be derived and
- Immovable Property Right Register (IPRR) data.

These two parts can show all the needed data on ownerships, property rights and obligations, see fig.1.



**Fig. 1.** Main parts of cadastre in Kosovo

Land administration has an important role for economic development. Changing the existing legal system is a serious matter and the development of new or additional legal procedures takes time. The aim of the cadastre in Kosovo is to harmonize and update the cadastral data on a high level in digital form. The fact that the cadastral system in Kosovo is a unified system does not simplify this task although it reduced the number of involved institutions.

Identification of land parcels facilitates land registration in critical phases for the society in Kosovo. Especially after the recent war, a restart of the economic development was necessary. Quite clearly, the society or people in general do not think of cadastres and registries as something very exciting in order to fulfil their needs. It is seen rather as a bureaucratic barrier to be overcome because they have to pass through the cadastre office if they want to achieve their goals. Sometimes people also do not trust bureaucracy aggravating the difficulty of establishing cadastral procedures.

A cadastral system is important for Kosovo's economy and rural development – especially now ((EC) No 1698/2005) – if it provides data about the property and the respective owners with high quality and accuracy. The main issue is economic development, which is closely linked to the property and status of the country. We can find out an important focus of the European Commission “Rural development and land development is not only a national but above all a European concern”; and that is the reason why the European Commission has to be concerned with a most efficient implementation of its development strategies (Thomas 2006).

## **2. ANALYSIS OF QUALITY OF CURRENT CADASTRAL DATA IN KOSOVO**

Quality and accuracy of cadastral data should promote new investments and inspire new approaches to different economic branches. Quality of geographic information is an important research topic in the field of geographic information science (Goodchild, 1992). A good legal base with clear rules set by the government is necessary to achieve satisfying results in the cadastral field. Analysis of cadastral data is a big challenge because sometimes cadastral records in Kosovo are missing because they were either taken away during the recent war or

have been damaged (Meha 2004). Other data, however, were up to date. Various factors influence the quality of data:

- sources of cadastral data are very heterogeneous,
- maps and registers belong to different periods (different decades) and
- identification of land parcels is based on maps of weak security.

Each of these factors has a high impact on the contents, vision and goals for a better planning and overall land administration. A current problem is that the vectorized boundaries of parcels on the map do not fit with boundaries defined on the ground within an acceptable error.

A process of establishing a systematic property registration has been in progress over recent years. Now a system for recording cadastral data is based on land administration laws (Law on Cadastre, Law on IPRR, Law on Mortgages) and other laws related to property rights. Formation and transactions of property rights should be performed according to the above-mentioned laws. Municipal courts are authorized as a first stage to deal with disputes on real property boundaries and renew property boundaries marks in case of conflicts on parcels boundaries and other property right issues. Court procedures on property boundaries will use cadastral data only in cases when both counter-parties agree.

The legal basis for the registration of an immovable property right in cadastral register is:

- a valid document of a competent authority (judicial or administrative),
- a final decision of a competent court, or
- a legal transaction, evidenced by any document that complies with applicable law.

The main question before using cadastral data is “Do those data contain all necessary information to realize my project or to solve my problem?” Answer should be yes and a product that will be useful if the amount of deviation is within limited error. Quality of data should be separate into a legal part, a technical part, and current the field situation. All parts have big impact on quality of cadastral data but it is possible to solve starting from the current (field) situation – technical part–legal part. In this case cadastral model should contain homogeneous data.

## **2.1. How Can One Improve the Quality of Technical Data?**

The quality of cadastral data (areas) in Kosovo is defined based on Cadastral guidelines I&II. (Meha 2005). In the section Guidelines 2005/09 for the vectorization of parcels is setting the quality as an important issue as shown in table 1:

**Table 1.**

Map scale	Tolerances
1:500	$0.2 \times \sqrt{Area}$
1:1000	$0.4 \times \sqrt{Area}$
1:2500	$1.0 \times \sqrt{Area}$

What will be the influence of transformation compared to other errors of cadastral data? Following general error sources and their values were derived considering the applied technology and based on the results of two pilot projects done in 2003 in Gllgovc and Klina municipality (Technical R. 2003, Andersson. 2004). Some *a priori* reflections were made in order to classify the expected results. Stakeout errors are not taken into consideration; see table 2.

**Table 2.**

Error sources of basic cadastral data	□ for map scale 1:500
Quality of surveying (Photogrammetry or conventionally)	0.10 m
Drawing of plans	0.05 m
Printings from the original plans	0.05 m
Vectorization of scanned plans after georeferencing	0.05 m

The error margin is based on standard deviation and maximal error according to formula [1]. The expected total error of all influences for cadastral data of a plan in scale 1:500 is:

$$\Sigma\sigma = \sqrt{\sigma_{surveying}^2 + \sigma_{drawing}^2 + \sigma_{printing}^2 + \sigma_{vectorization}^2} = 0.13m \quad (1)$$

Taking into consideration formula (1) and based on adjustments of measurements the maximum limited error will be

$$\Delta_{max} = 2 \square \text{ or } 3 \square \quad (2)$$

where

$\Delta_{max}$  - maximum limited error

□ - standard deviation

□□ - total of influences of errors in cadastral maps according to scales

This maximum error can be met by the accuracy of vectorized cadastral maps but it cannot satisfy the accuracy requirements of owners. The land price in urban area and in areas close to the main roads is high compared to the average incomes. Tolerance or, as owners usually like to say, error of about 0.4 to 0.5 m in urban area, and errors of 1 m in rural area is too high. Often owners rejected the surveying results. This big error margin also creates gaps between the vectorized data and original measurements on the mathematical model. The next step is to bring the case to court if geometrical accuracy of a demarcated area is not sufficient and owners still cannot agree.

Vectorized cadastral maps are in function since the Kosovar coordinate system is in place and vector data are useable for the whole territory of Kosovo.

Measures for quality control of data and how the data should fit in the current field situation can be made in different ways:

- by first comparing the vector cadastral data with orthophotos from 2004;
- based on probability, comparing the original surveying with maps and vectorized data;
- comparing all the surveying during the maintenance of cadastre with old maps and vectorized data;
- increasing the number of Kosovar points within an urban area;
- testing the user's needs;
- statistical approach to users if they are satisfied with quality;

Based on this we should have different stages of quality of cadastral maps and records. The quality cadastral data will serve many other important activities and long term expectations in economic development. Good quality and a well-maintained cadastre will empower people and the institutions that serve them.

## **2.2. Research of IPRR**

People want to use cadastre and secure rights on land. IPRR is the existing IT application of Kosovo Cadastre system. From the assessment made in October – December 2006 it is clear that the IPRR needs extensive modification to meet the needs of the Kosovo Cadastral Agency and Municipal Cadastral Offices in maintaining the Immoveable Property Right Register (Technical R.2008). The ongoing maintenance has also identified several weaknesses of the application. Some relevant issues of the IPRR application are:

- *The database design is not documented.*
- *There are circular links in the data model.*
- *Some logic of the data model is stored in the form of software algorithms.*
- *The present approach to cadastral object IDs, keys, indexing is insufficient.*
- *There is a significant amount of redundant data.*
- *There are inconsistent data instances.*

This means that the cadastral institutions must develop a new and thoroughly thought out database design that can meet the present and future needs.

In this paper research from in two Municipal Cadastre Offices in Kosovo during the period December 2007 to March 2008 is presented (Technical R. 2008). Investigations were made in a sample of cadastre zones in each MCO.

The purpose of the research was:

1. To examine the quality of the maintenance of the 'manual' registration books;
2. To examine the quality of the maintenance of the 'digital' IPRR database;
3. To compare the data in the books with the data in the 'digital' IPRR database.

### **Results from research in two municipalities**

- **MCO Gjilan.** 410 registrations were checked. IPRR books are well maintained. No significant problems were reported with the use of IPRR application, apart from electrical power cuts. There were 48 miss-matches between the books and database, of which 4 were of high importance.

- **MCO Lipjan.** 790 registrations were checked. Maintenance of IPRR books is not satisfactory; the main problem is unclear writing. No significant problems were reported with using the IPRR application, apart from electrical power cuts. There were 394 miss-matches between the books and database, of which 352 were of high importance.

It became evident that there is a high number of miss-matches.

### **2.3. Examples as Case Study**

Sometimes the high-precision surveys are unnecessary provided that there is a suitable documentation of real-property boundaries. This is important for projects based on cadastral data but linked to the user's needs of cadastral maps and records like:

- land and property taxation;
- land planning and management;
- land reform;
- land mortgages;
- public utilization;
- development control;
- public communication;
- credit security;
- demographic analysis;
- monitoring of statistical data;
- environmental impact assessment;
- spatial planning;
- site management and protection.

In those cases it is necessary to have registered all property rights of certain parcels and the buildings linked to them. Cadastral data for other technical and cadastral purposes like the definition of parcels boundary need high accuracy. Law affects the data available in a variety of ways. The following list of the data contains two of the most important aspects: Quality of the data collection and purpose of the data collection (Navratil 2004). The question of how technical and legal quality combines remains open; the effect is that cadastral decisions are

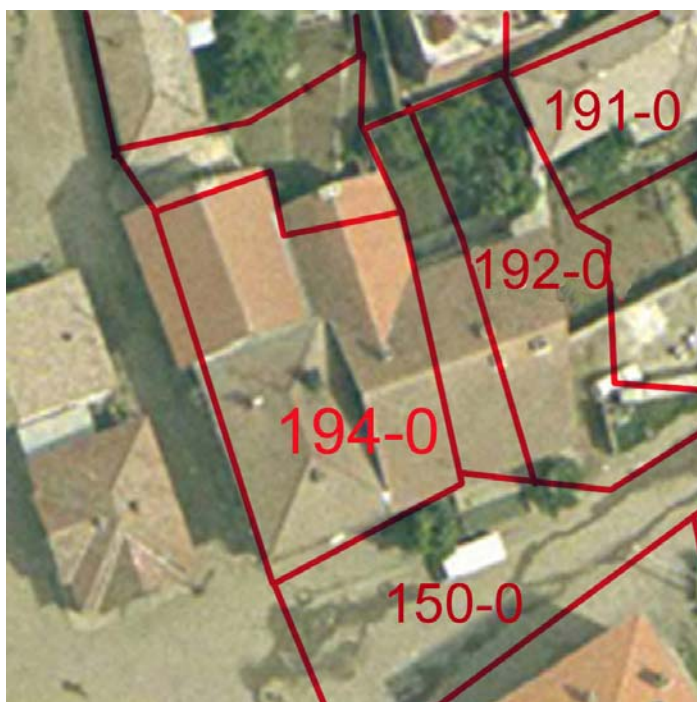


often closely related to liability. From a legal perspective, security factors are very clear and have no error and no tolerances reapply.

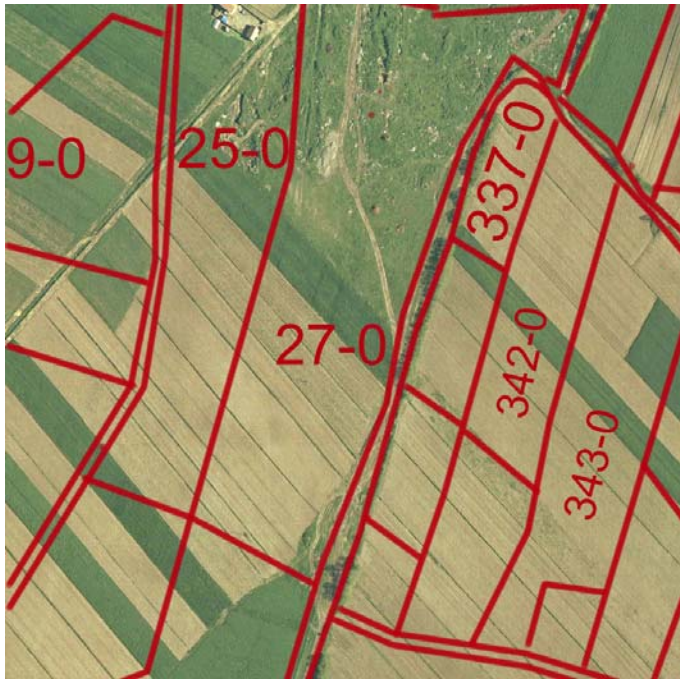
Disagreement between different quality of data and different level of users in our country caused trouble to the users and producers of land information data. For this purpose Government of Kosovo appointed a group for National Spatial Data Infrastructure (NSDI) where the main role should have Cadastral information system.

The next two figures present the difference between vector data from old maps and the situation in 2004 for the same territory. Vector data are taken from the old maps and those are to a large extent outdated. Orthophotos have been produced from aerial photographs in spring 2004.

Fig 2, shows the situation in urban area. On the field is a lot of new construction – new buildings, creating new parcels as it is on orthophotos from 2004 but nor registered on cadastral model. In fig. 2. red lines show vectorized data from the old maps which are in cadastral model. Discrepancy is very high. In fig. 3. the rural area is shown. Compared with cadastral data and compared to orthophotos of 2004, there is an obvious difference. In fig. 3. red lines on orthophotos are from vector of old maps. In both cases the maintenance of cadastre has not been done. These big differences between vectorized data from the old maps and the current situation lead to the assumption that about 30% of the whole territory of Kosovo have similar problems.



**Figure 2.** Discrepancy in urban area



**Figure 3.** Discrepancy in rural area

The reason for the vectorization of the old maps is the fact that, during the recent war and the tragic history, the more actual cadastral maps and records are missing and that maintenance was not carried out regularly. This has led to an extraordinary situation in the cadastre, which has become increasingly outdated (Meha. 2004).

### 3. CONCLUSIONS

Cadastral documents must be stored within database fulfilling all requirements of laws. Based on law of IPRR textual cadastral data which are in register are correct and cannot possibly be corrected without court procedure. In reality, parcels have unacceptable difference in area between field situation and register. In case that seller and buyer want to do transaction, the seller has to sign contracts for the area that is on the register. However, the area on the field will be different than the one in the register. The law defines that a contract is only valid if all people, who are signing the contract, have full contractual capacity as owners. In other case, the seller has to have authorization or inheritance. Looking on case study presented in this paper in municipality of Gjlani, from 410 registrations were 48 miss-matches between the books and database, of which 4 were of high importance. Than in municipality of Lipjan from 790 check registrations there were 394 miss-matches between the books and database, of which 352 were of high importance. Referring to results from two municipalities and expressing it in percentage means that discrepancy is about 28%. Cadastral data are part of public infrastructure. It is necessary to have good legal and technical quality of cadastral data. It became also evident that quality is only meaningful when the use is specified well and land rights are the same for all people.

We must see to it that the cadastral information system is running in both parts but it is also necessary to harmonize them as soon as possible.

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## **BIOGRAPHICAL NOTES**

**Murat Meha** has been teaching at the University of Prishtina - Kosovo since 1988. He has also taught for ten years at Tetova University (FYR of Macedonia). He worked for five years as Manager of SEO Ferronikeli, for three years as a CEO of the Kosovo Cadastre Agency. Now he is in projects funded by EAR, USAID, KTA ,etc.

His teaching and research conectrates on surveying, cadastre, land administration, land management, and related educational and capacity building activities. He is currently the member of the Kosovo Surveyor Association.

Main publications of Mr Meha are on survey, cadastre, land administration and land management. He published two University books, two books for the Kosovo Cadastre Agency, one book translated, and several school geographic atlases and maps. He published more than 75 professional and scientific papers in different professional magazines, symposiums, conferences etc. Most of those articles are available on Internet at: FIG, ICC, Euro Geographic, WPLA, CELKCenter, FAO GIM International etc.

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