

# 18 Analysis of Perspective Cadastre and NSDI in Digital Kosovo

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## 18.1 Abstract

The beginning and the continuation of the third millennium, the 21st century, has come with many additions and technological changes that have clearly influenced the accessing and the security increase of immovable property data everywhere in the world. During this period, the cadastral information system and SDI data were successfully developed in Kosovo by introducing the geoinformation for geometry and geographic position of the immovable property. Registration of immovable properties in cadastral registers through the cadastral information system has provided precision, security, and stability in the free land market. It was precisely that approach to immovable property that was urgent to allow for economic development of the country. This article does not deal with the long history of the cadastre development in Kosovo, as it is not a subject of this article, but it is worth noting that the history of the cadastre and property registration in Kosovo can be split into three periods:

- a) until 1989,
- b) the period 1990-1999 under the influence of discriminatory laws from Serbia, and
- c) the third period 2000-2019.

The 2000-2019 period has met the standards of "Cadastre 2014", which was given by FIG in 1994 in relation to the preparation of the vision for modern cadastre development in the next 20 years. The results of the 2014 cadastre vision were published in 1998 by the International Federation of Surveyors (FIG), called the digital cadastre and registration of immovable property period. Therefore, this period of the cadastre is characterized by the updating of immovable property, moving from the analogue system (maps, forms and registers) to the digital system, with a positive impact on increasing the security of investment in agriculture, energy, mining, infrastructure etc. The geospatial data generated in Kosovo according to the cadastral requirements for immovable property is the core of three annexes with 34 topics deriving from the Inspire EU / 2007/2 Directive. The post Cadaster 2014 and EU Directive Inspire are highly relevant as a policy and basis for envisaging the cadasters and NSDI of tomorrow. In this way, institutional coordination between actors on land administration in throughout the territory of Kosovo will be analyzed.

Bases or core spatial datasets are: Land cadaster, Building cadastre, Utility cadastre, register of spatial units, Topographical datasets, and Agricultural land usage database. The traditional cadastral system was not sufficient to fulfill the citizens' requirements regarding cadastral and NSDI data. Nowadays, based on new cadastral system in Kosovo, the following processes have become easier: managing and maintaining the list of spatial data sets; managing the detailed descriptions of the spatial data themes; managing the spatial information geo-portal; and harmonizing and maintaining the metadata information system. This cadastral system and its results will be described in this article, of course interpreted through GIS. The relations between Spatial data services and Cadastre has provided a quality increase of data sharing, fast access to data, and has enabled locating divergences between graphical data and immovable property register. As it is described on the article Seeger (2008) many experts, citizens, producers and non-producers are all interested in open data, so all these approaches are in favor of transparency and decision making.

This article will show the vision for the future development and activities. In this case, we note how the usage of the open data is necessary to have access and transparency in the immovable property and land market in R.Kosovo.

**Key words:** Cadaster, NSDI, immovable property, data quality, geoinformation.

## 18.2 Introduction

Land registers, cadastral records, cadastral maps and other land documents around the world have their own history, depending on the historical developments of the country. The cadastral system so far is mainly developed in two versions:

- analog version, pencil and paper,
- digital versions, GIS software's.

Some valid clarification regarding these two versions of development, preparation and presentation of the version of real estate data is needed. Generally, the analog version of the cadastral system is characterized by the presentation of data by purpose through technical description, drawing and writing on paper and media similar to the letter. The analogue documentation has started with cadastral maps compiled from various data sources: from graphical measurements from field surveys to geodetic instruments (theodolites to GNSS), based on existing geodetic networks of the state. The technical description starts with the official reference system coordinates, in the analog data format with their attributes. The analogous cadastral system has long served in Kosovo from 1929 until 2004.

Immovable properties regardless of the format of their data preparation, they are valid geoinformation, directly related to the data security and economic and social development of the country. Cadastral data creates the necessary information for making the necessary decisions and for further development of the cadastral system. It is known that cadastral data enables the creation of a structured cadastral information system, because as such have the required value. The beginning and the continuation of the third millennium, the 21st century, has come with many additions and technological changes that have clearly influenced the accessing and the security increase of immovable property data everywhere in the world.

Technological progress significantly influences the development of the digital version of cadastral data, of course, as a result of land use and land registration requirements. The key components of impact related to digital developments in Kosovo with a particular focus on the development of the digital cadastre are:

- globalization through technological development,
- increasing the demand for a multidimensional cadastre,
- free land market
- transparency

These innovations or digital platforms have been strongly supported by experts from different backgrounds in Kosovo, improving their knowledge and preparing to enter and apply the rules in an information society, Long Life Learning LLL (Learning Society). Digital platforms are quite appropriate in research, especially in decision-making for land administration.

## 18.3 The Future of the Cadaster

The beginning and the continuation of the third millennium, the 21st century, has come with many additions and technological changes that have clearly influenced the accessing and the security increase of immovable property data everywhere in the world. The impact of global trends on technological development in digitalization in Kosovo has been made through:

- implementation of the European Community rules in Western Balkan countries (including Kosovo) for the digitization of real estate data,
- creation of National Spatial Data Infrastructure (NSDI) for the entire territory of Kosovo.

For each point in the definition boundary polygon and the building in 2D digital cadastre interpreted via GIS are the coordinates in the state coordinate system ... The plot area with marked boundaries on the ground with physical signs (stone, concrete or just physical *mezra*) with the coordinates presented on the map, recorded in the cadastral records, is called the legal surface in the two-dimensional cadastre. These cadastral data fulfill the conditions for managing, managing and determining the location for rural areas. While for urban

environments, 2D cadastral data has been shown to be insufficient due to the complexity of presentation and viewing in three dimensions. Since the beginning of the digitalization process, requests for cadastral data have increased since the last decade of the 20th century. So rightly, the digital cadastre is called multidimensional cadastre.

## 18.4 World Trends on the Collection and Interpretation the Cadastral Data

Cadaster is dynamic process, always requiring new better solution for the land registration and free land market to support economic development of country. Main cadastral development are:

**Analog Cadaster.** Cadastral data are on registers and cadastral maps since 18th century when we head the first registration first European cadaster. Analog Cadastral systems (pencil and paper) were mainly established to serve a legal and/or a fiscal purpose

**Cadastre 2014.** This cadaster is based on digital database, operating on GIS system. A Vision for a Future Cadastral System. The cadastral mapping will be dead, ongoing live modeling. Statement 3 on cadastre 2014, (Kaufmann 1998).

**Cadastre 2020.** This is the Cadaster is based on GNSS and on total stations-geodetic measurement, means coordinate cadaster. The Cadastre 2014 is the base for the coordinate cadastre and very important to provide required services to the private and public institutions. Models of Cadastre 2020 is going to fulfill aspects of functioning cadastral systems, with the secure and updated content of cadastral data, easy access to these data and better connection and harmonization with other GIS systems

**3D Cadaster** is a new approach of maintenance cadastral unites: land parcels, buildings and utilities.

## 18.5 From 2D to 3D Cadaster

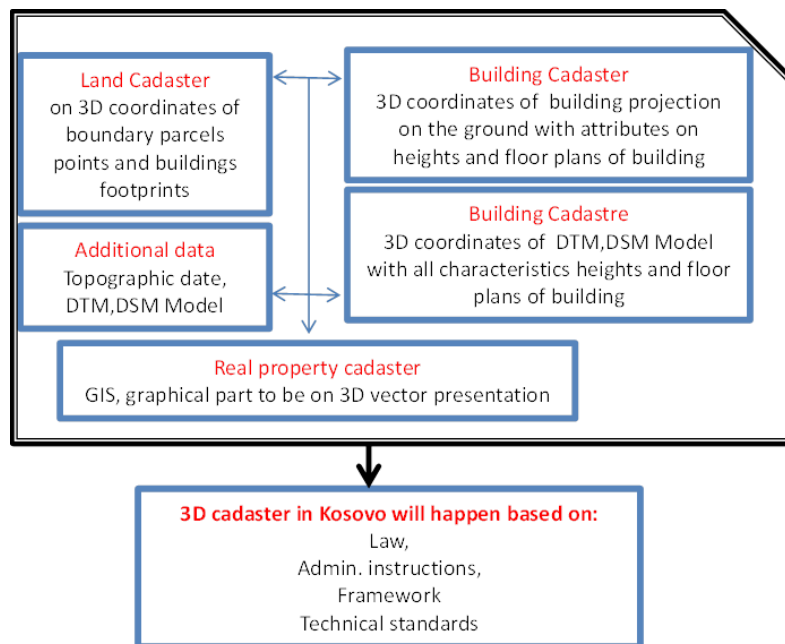
Man is a good researcher of good things from the earth. He conducted these researches in order to improve living conditions by linking welfare to rational use of land. 2D cadaster we can call parcel cadaster-horizontal cadaster. The aim of 3D cadaster is to integrate data of land parcel with the data of building and utilities in the parcels that are on, under and above the ground.

Traditionally, land administration and management, is made on the basis of cadastral data, cadastral maps and registers started from records in Ga-Sur 2500 B.C. designed in size 7,6x6,8cm. Circumstances and life requirements in time have influenced the way of organization, administration, management and land use. So, cadastral data are core data for the immovable property and in total of NSDI. In these terms of this conclusion many authors have added questions about the validity of the geoinformation as follows: How will data be valued in the future and what are the key implications, in this terms what will the value for business for society and for individuals around the world?

## 18.6 Perspective of 3D Cadastre in Kosovo

Registering the rights of a 3D parcel should provide certainty of ownership, protection of rights and unambiguous spatial location. In European no on of countries continue with the analog cadastre but in the world the situation can be different. Therefore, still we can consider, cadastral jurisdictions in the world, that maintain cadastral database on the concepts of analog registration me and paper-based cadaster.

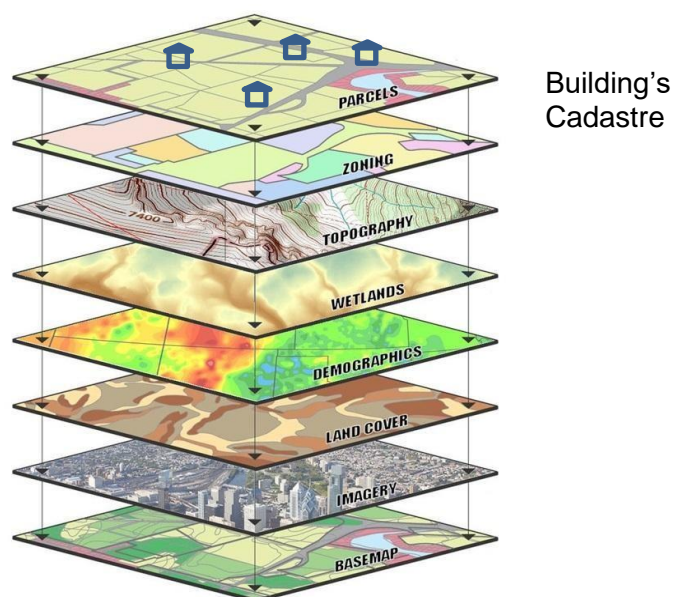
Based on the 3D cadastre development and analysis in several European countries: Sweden, Germany, the Netherlands, Norway, etc. Figure 1 summarizes the proposed methodology for establishing a 3D real estate cadastre in Kosovo.



**Figure 1:** Proposal to establish 3D cadastre in Kosovo

## 18.7 Cadaster and NSDI for Land Managing in Kosovo

The basis for the formation of the NSDI is the data on immovable property. Geoinformation and other information together, are related to the designation of a location that forms the actual infrastructure introduced through the GIS system. The National Spatial Data Infrastructure (NSDI) is preceded by the state's legal base and strategy. Geospatial data has been produced before the law, but based on the strategy for NSDI, which means that even after the adoption of the law, it will be an obligation to continue the harmonization according to the European directive INSPIRE.



**Figure 2:** Organizing open data in Kosovo

Geoinformation is associated with land that is an important and expensive resource that needs to be efficiently managed to move towards maximizing production and other services required. Geoinformation through GIS technology therefore provides solutions to:

- fulfillment of citizen and state requirements in general for the use of land by providing up-to-date geoinformation.
- providing transparency for the flow of geoinformation and other information in the decision making process, from one manufacturer or user to another, and what obligations it has,
- analysis of policy development based on geospatial data in the definition of priorities,
- selection of necessary geoinformation resources,
- setting standards of implementation and methods for their monitoring,
- Improving the existing geoinformation and land information system by incorporating it into new multi-dimensional technological systems and models.

A good example of the use of geoinformation and other information through the GIS system is the compilation of Kosovo Map Plans completed in June 2019. Kosovo's Zoning Map is a document according to the Law on Spatial Planning, a requirement for implementation in all Kosovo Municipalities. The implementation of these maps enables coordination of actions, harmonization of measures and activities in the period 2020-2028. It also interrupts the negative phenomena by facilitating monitoring of planned developments in space with a clear presentation before decision-makers. The source of geoinformation with other information for the compilation of the Zonale Map was from the main governmental producers, starting from orthophotos, cadastral maps, topographic maps, land cover and others as shown in figure 2.

## 18.8 Future SDI in Kosovo

Spatial Data Infrastructure (SDI) has been recognized since the early 1990s when its policy development preparations begin. SDI is the result of three components: demand-supply-technology, which in the open market usually go together. For the development of the SDI, the state governments have been careful to provide the institutions and then citizens with quick and secure access to spatial data.

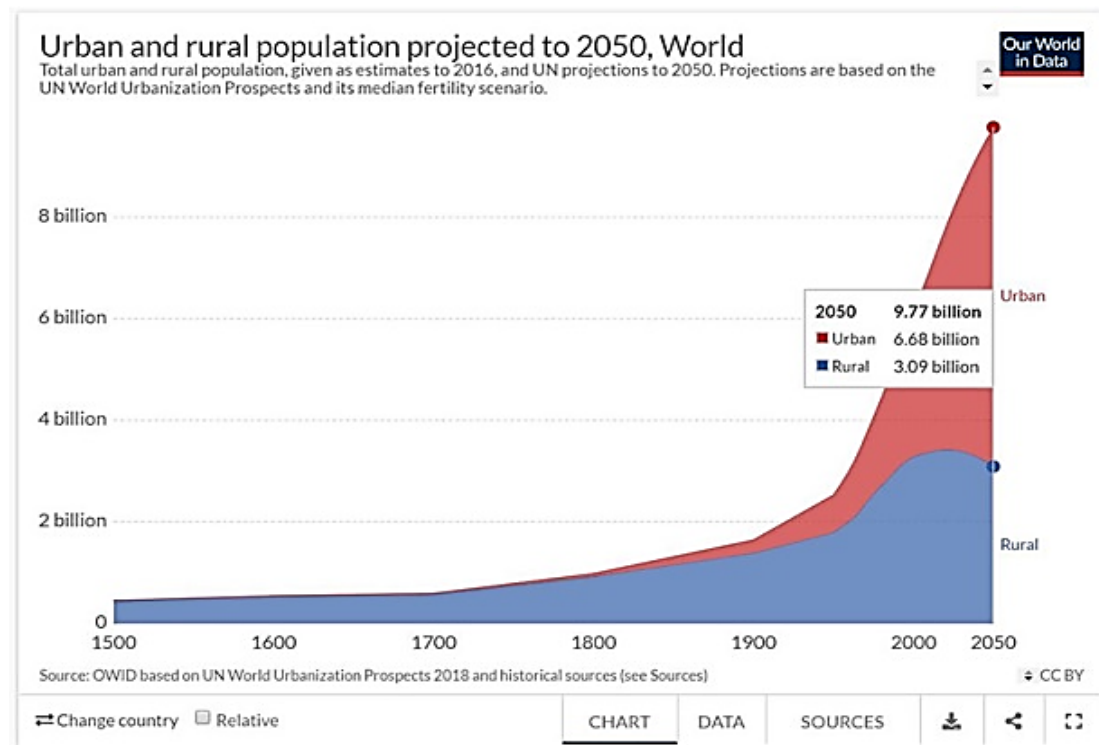
Many authors have analyzed how valuable SDI-NSDI has a key role in monitoring and managing data, as well as data that have a significant role in decision-making. The answer comes: technology is playing a significant role in changing the way to manage and monitor all geospatial and textual data everywhere in the world. We're in a digital economy where data is more valuable than ever see next two sentences and below figure 3.

- "the world's most valuable resource is no-longer oil but data"
- immovable property and cadastral plot, is not only certificate and map,

What will this mean for economic growth for business, for society and for individuals around the world is in brief described below in the figure 3.



**Figure 3:** Data: "the worlds most valuable resource. America v China – The battle for digital supremacy". Source: economist. Photos: David Parkins



**Figure 4:** Urban and rural population in projected data.

From the brief description of the context related data provided in this chapter, means no progress without data. “When your business is growing, more and more people have opinions about which steps need to be taken. It helps to work with a ‘good data beats opinion’ philosophy”. In the context of growing urban population, the UN analyzed the growth of urban, smart cities and rural population in the world. Results of the projected population in 2050 are shown in figure 4 ([www.economist.com](http://www.economist.com)).

## 18.9 Variety of Geo-Spatial Data in Kosovo

The state geoportal in Kosovo offers over 70 topics with open data and are in the process of harmonization according to the INSPIRE directive figure 5. Combinations of topics for carrying out tasks and research using GIS software and WMS can be done by using data from the state geoportal: <http://geoportal.rks-gov.net/>. It was estimated that in Kosovo over 70% of local and central government decisions are made based on geospatial data. Geo-information on geoportal with open data contains different thematic maps of different scale, five orthophoto layers for the entire territory of Kosovo, DTM and other data from different geoinformation producers. Figure 5 shows clearly the inability to use closed data that is an oasis in itself and the possibility of using open data and combining them from different manufacturers with open roads in all directions



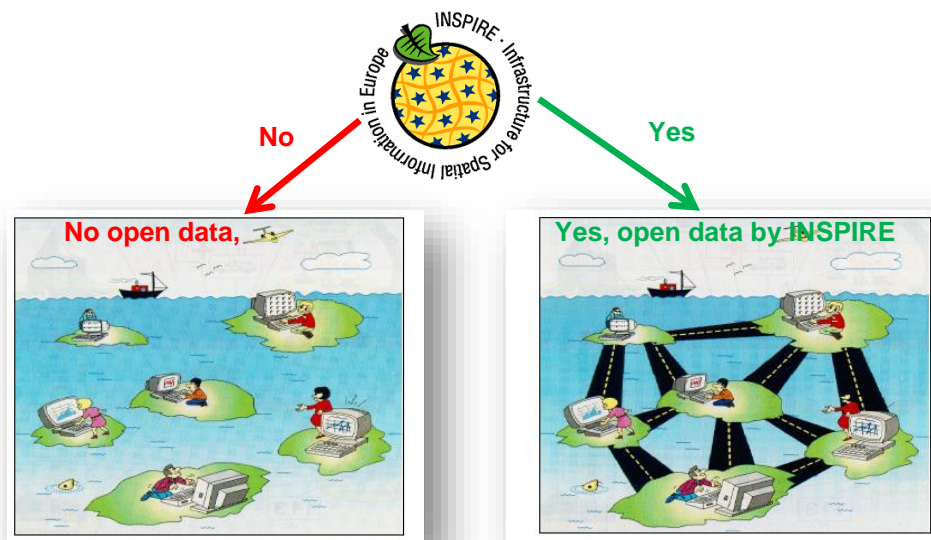


Figure 5: Organizing the open data in Kosovo

As was explained, using WMS services in combination with, geoportal and ArcMap or other software, selecting data by attributes or by location you can go directly to the required topic see the figure 6.

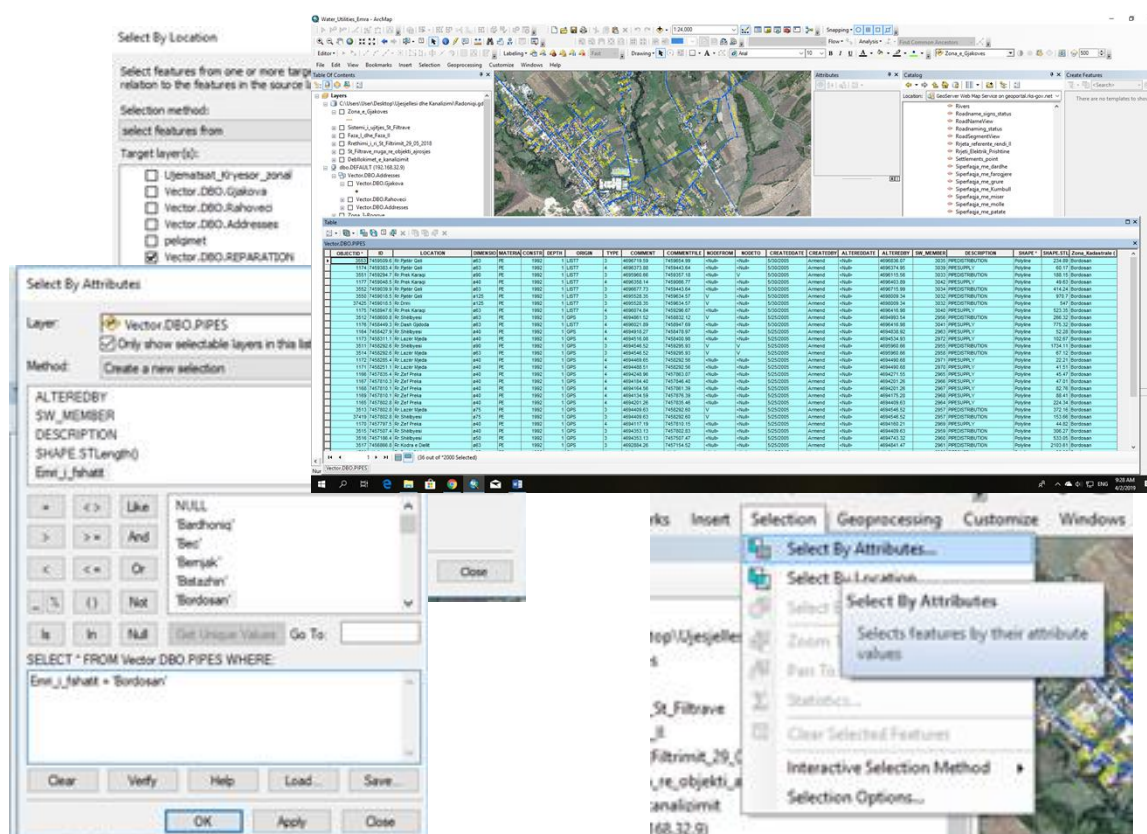


Figure 6: Selecting data by attributes or by location

Digitization and harmonization of geoinformation for Kosovo was characterized by great demands for enormous expansion of urbanization because there were wrecks of over 100,000 dwelling houses of war in Kosovo in 1998-99. All this is in line with the INSPIRE Directive 2007

/ EC / 02 and its guidelines for interoperability and overall for the harmonization of geospatial data.

Western Balkan countries, including the Republic of Kosovo with EU financial assistance or special assistance as Swedish SIDA with various European experts have organized trainings (2014-2019) valid through the INSPIRATIN project and the IMPULS project.

From the research of international and local experts on geoinformation in the Western Balkan countries, there is a great need for the digital society:

- Spatial data, accessible and easy to use for everyone
- Spatial data providers are responsible/accountable for data reuse
- Quality and variety of spatial data are determined by user needs
- Spatial data are transparently described and published
- Spatial data are available without restrictions (open data)

At the same time was concluded that there are lack of:

- structures or specialists especially in charge for the geospatial information;
- infrastructure to support the maintenance of the geo-information;
- hardcopy format, not digitized;
- digital form but not update;
- impossible to Access;

## 18.10 Summary

Based on the INSPIRE Directive, based on collected and analysis data is shown a very good and feasible perspective of the combination of cadaster with NSDI for digital Kosovo. The facts and future needs were well analyzed and the implementation of NSDI will be successful. The central and local government have created conditions for manufacturing, analyzing, demining and archiving of geospatial data. Very important element that should be offered to all stakeholders, producers and users of NSDI is the legal basis, which is submitted to the Government, and should be approved quickly by the Parliament of R. Kosovo. Co-operation among all Stakeholders for NSDI is carried out on a voluntary basis with the aim of realization:

- to collect, archive, analysis and share data
- to increase services efficiency, to harmonize and improve quality of data, to share information with the private, public sector and citizens.
- transformation of all geodata at the national coordinate system,
- to follow EU trends on cadastral and NSDI developments.

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## 18.11 References

- [1] Enemark, S., Williamson, I. P., & Wallace, J. (2005). Building modern land markets in developed economies. *Journal of Spatial Science*, 50(2), 51–68. <http://dx.doi.org/10.1080/14498596.2005.9635049>.
- [2] FIG (1999). The Bathurst Declaration on Land Administration for Sustainable Development. FIG publication no. 21. Published by The International Federation of Surveyors (FIG) ISBN: 87-90907-01-9, December 1999, Frederiksberg, Denmark.
- [3] FIG (2016). 3D Cadastre. FIG joint commission 3 and 7 working group on 3D cadastres. <http://www.gdmc.nl/3dcadastres/>
- [4] Geoportal (2019). <http://www.geoportal.rks-org> (Accessed 17.04.19)
- [5] Meha M. Joep C, Çaka M, Murati R. 2015.: Towards Integration of Cadastral Land Information System in Republic of Kosovo (61). WCS-CE - The World Cadastre Summit, Congress & Exhibition. Istanbul, Turkey, 20 –25 April 2015



- [6] Michael Bell (2010). SOA Modeling Patterns for Service-Oriented Discovery and Analysis. Wiley & Sons. p. 390. ISBN 978-0-470-48197-4Bennett, R., Tambuwala, N.,
- [7] Rajabifard, A., Wallace, J., & Williamson, I. (2013). On recognizing land administration as critical, public good infrastructure. *Land Use Policy*, 30(1), 84–93. <https://doi.org/10.1016/j.landusepol.2012.02.004>.
- [8] Rohan F. Britto 2017: Data is TODAY the world's most valuable resource. Published on May 30, 2017.
- [9] <http://www.fig.net/pub/figpub/pub21/figpub21.htm>
- [10] <https://www.linkedin.com/pulse/data-today-worlds-most-valuable-resource-rohan-f-britto>.
- [11] <https://www.gpsworld.com/surveyors-and-smart-cities-partners-in-technology/>