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Extended LADM Country Profile for Property Valuation in Serbia

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Key words: LADM, Valuation, Taxation.

SUMMARY

Real property valuation in the Republic of Serbia is a procedure in which the value of real property is defined on a certain date. Many different factors directly or indirectly affect the value of real property, and for that reason, the process of estimating the value of real property is very complex. In the Republic of Serbia, the field of real property valuation is regulated by appropriate laws and bylaws. Valuation of real property in the Republic of Serbia is done by different state bodies, and it is performed for different needs. A key element for real property valuation are public registers that enable regular maintenance and updating of data, as well as links between these registers that have the necessary information for assessment. The real estate cadastre provides data on real property that is necessary to assess the value of real property, however they are not sufficient for today's complex valuation practice. By recording information produced through valuation activities and recording market indicators, it is possible to enable further market analysis, and more reliable real property valuation. The data sources for the real property valuation model are the real estate cadastre, the real estate price register and the central register of planning documents. In addition, other data sources can be used to provide an accurate and fair assessment of real property values. Real property valuation is performed by procedures of individual and mass real property valuation. Mass real property valuation is prescribed by the law and divided into four steps of which the first one is fully finished in Serbia. Republic Geodetic Authority implemented the Real Estate Price Register for that purpose. For the purpose of taxation, the value of real property is determined by usable area of the property and the average price per square meter of the corresponding real property in the zone where the real estate is located. The average price is determined based on the prices realized during the sale of appropriate real estate by zones.

Taking into account the importance of real property valuation, an existing LADM country profile for Serbia (Radulović et al., 2017) is extended to include property valuation. The developed model for real property valuation is based on the LADM Valuation Information Model proposal (Kara et al., 2021) and appropriate national laws and bylaws. This model can be used for individual but also for mass valuation which is planned but not yet finished. Since data used for valuation come from different sources (Jočković, 2021), examples of specific valuation procedures are presented. One purpose of valuation is related to taxation process for which the tax administration is responsible. For this purpose, a web service architecture and mappings of appropriate data and code lists between geodetic authority and tax administration are discussed.

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1. INTRODUCTION

Real properties are one of the most important and valuable resources for the economy of every country. The value of real property is most often expressed in money and represents the amount of all income that real property can bring. Real property valuation is a procedure in which the value of real property is defined on a certain date. Many different factors directly or indirectly affect the value of real property, and for that reason, the process of estimating the value of real property is very complex.

Taking into account the importance of real property valuation, a model of real property valuation in Serbia is presented. This model is an extension of the previously developed Serbian LADM country profile. The model for estimating the value of real property will enable an assessment based on a large number of real property characteristics and market prices of real properties. The developed model for real property valuation is based on the Land Administration Domain Model - Part 4: Valuation information and on national laws and bylaws. The LADM Valuation Information model is a valuation model that provides detailed information on real property that are valuation units. This model has been extended with classes and attributes in order to meet national legislation. In this way, a national profile for real property valuation was formed.

Çağdaş et al., (2016). introduced an initial design of LADM based valuation and taxation data model. Kara et al. (2021) describe a prototype for the implementation of the LADM Valuation Information Model and valuate its operability through a case study for Turkey. Tomić et al. (2021) presented property valuation system in Croatia using the LADM valuation information. Impacts of property taxation on residential real property development was analysed by England et al. (2013). An overview of property valuation system and practices in the Netherlands within the context of LADM Valuation Information Model are described by Kara et al. (2019). Radulović et al. (2021) analyzed the legal regulations and laws and the way of functioning of the current information system for the tax administration in Montenegro in order to develop LADM based tax administration model. Kara et al. (2020) analyze how three-dimensional (3D) information can be used in process of valuation of property units. Tomic et al. (2012) analyzed the use of 3D cadastral data for real estate mass valuation in the urban areas.

This paper is structured as follows. First section contains introduction in which the motivation for this research and related work are described. Second section describes the property valuation and taxation in Serbia based on the actual laws and common practice. Third section presents the new data model for property valuation in Serbia based on LADM. Fourth section

shows valuation examples for the municipality of Novi Sad. Conclusions and future work are given afterward.

2. PROPERTY VALUATION AND TAXATION IN SERBIA

Many different factors directly or indirectly affect the value of real property, and for that reason the process of estimating the value of real property is very complex. In the Republic of Serbia, real property valuation is regulated by appropriate laws and bylaws, like 'The Law on State Survey and Cadastre' (2009), 'The Law on property tax' (2001), 'The Law on tax procedure and tax administration' (2002) and 'The Rulebook on real estate valuation' (2014). Valuation of real property in Serbia is done by different state bodies, and for different needs. The real estate market is influenced by the tax system, planning, urban planning and construction regulations and it is very important because significant funds are collected from real property taxes.

Accurate and up-to-date real property data are needed to assess the value of real property. A key element for real property valuation is public registers, which enable regular maintenance and updating of data, as well as links between these registers, which have the necessary information for valuation. The Real Estate Cadastre provides real estate data needed to assess the value of real properties, but they are not sufficient for today's complex valuation practice. By recording the information produced through valuation activities and recording market indicators, further market analysis can be enabled, and a more reliable assessment of the value of real properties can be made.

Assessment of the market value of real property is a careful determination (prediction) of its market value based on established standards, collected data on real property, its location, legal status, market situation, experience, etc. The process of real property valuation is complex and involves many factors that directly or indirectly affect the value of real property. Real property valuation is performed by individual and mass valuation procedures. The differences between these two approaches are reflected in different data volumes, market analysis and quality control. Regardless of the approach, there are numerous needs for real property valuation. The need for valuation arises in taxing, in real estate transactions, in taking mortgage loans, in litigation, in making investment decisions and in other cases.

Individual valuation of real property means determining the value of individual real property on a certain date. Three basic valuation methods are most often used in individual real property valuation: cost-based approach, sales comparison approach (approach based on sales comparison) and income capitalization approach.

Mass valuation of real property is defined as the systematic valuation of a group of real properties on a given date, using standardized procedures (collection, verification and classification of physical, legal and market key characteristics of real property) and methods of mathematical statistics. Mass valuation, as opposed to individual real property valuation, requires the development of a valuation model that is capable of incorporating the impacts of supply and demand in large areas.

Real property valuation in Serbia is the responsibility of several institutions like the tax administration, local self-government, the cadastral authority, court experts and certified appraisers. Obligations of mutual cooperation are not legally defined, so real property valuation data are duplicated and collected in different ways and for different needs.

Following the example of other countries (e.g., Slovenia, Sweden, etc.), mass valuation of real properties was introduced into the legislation of the Republic of Serbia in 2009 within the Law on State Survey and Cadastre. This law defines the keeping of records of real property market prices by the cadastral authority for the purposes of mass valuation. Recently, numerous methods of mass valuation have been developed, but the method that has stood out for its simplicity, applicability, efficiency, and is the most commonly used, is multi-parameter regression analysis. Multi-parameter regression provides the ability to analyze the relationship and impact of multiple market factors such as area, location, number of floors, rooms, quality of construction and other characteristics.

According to the law, establishment of a system of mass real property valuation should be carried out in several phases: preparation and adjustment of legal regulations; improvement of the real estate price register; verification and analysis of data from the real estate market; formation of a model for mass valuation; collection of assessment data for the entire real estate fund with the formation of the register of facilities and mass valuation of real properties. In order to carry out all the steps, cadastral authority implemented Real Estate Price Register (2021). This register is the first step towards the mass valuation and it assures collection of data from the real estate market. Other steps have yet to be implemented.

A large amount of data is needed to assess the value of real property, and this data is collected from a variety of sources. Access to information on the location and characteristics of real property is a key component of an effective valuation model. Therefore, an appropriate link is needed between public registers that have information on real property. The data sources for the real property valuation model are the Real Estate Cadastre, the Real Estate Price Register and the Central Register of Planning Documents. In addition to the mentioned data sources, alternative data sources can be used.

All data from sales contracts are entered into the system of the Real Estate Price Register system, such as data for the identification of transactions (certification authority, number and date of certification), data on the price from transactions (contract date, amount, currency, unit price), data on parties (name and surname, personal number, place of residence), data on the type of the transaction (land, buildings, parts of buildings, mixed), basic data on real property (type of real property, area, share in transaction) and additional data on real properties related to their characteristics at the time of transaction that are required for market analysis.

An important factor in the assessment is also urban planning, possibilities and limitations of construction, current and planned land use and for such information the Central Register of Planning Documents is consulted.

Beside cadastral authority, the tax authorities also do property valuation. Property tax is paid for real properties located on the territory of the Republic of Serbia. The rights on real

property that are subject to taxation are the right of ownership, the right of lease and the right of use. The taxpayer of the property tax is a legal and natural person who is the holder of these rights. The value of real property is determined by a usable area and an average price per square meter of the corresponding real property in the zone where the real property is located. The usable area of the land is its total area, and the usable area of the building is the sum of the floor areas between the inner sides of the outer walls of the building. Average prices are determined by zones for the appropriate types of real property. Zones represent parts of the territory of a local self-government unit divided according to the type of settlement (village, city) or according to communal equipment and public facilities, etc. Based on the real property transaction prices by zones, the average price of the real property by the zone is determined. At least three transactions in the zone are required. When there were not enough transactions, data from neighboring zones are used.

When the market value is determined by the tax authorities, the basic problem is that they do not have sufficient data on real property and rights to them, due to the lack of connection between tax and cadastral authorities. This raises the question of the objectivity of the tax bases for the calculation of real property taxes. Since the cadastral authorities have up-to-date data on real properties, the assumption is that the market value of real property can be determined more objectively by the cadastral authorities than by the tax authorities. One way to solve this problem is to ensure that tax authorities can obtain up-to-date data on properties. This can be done by implementing a service-oriented architecture on top of the real estate cadastre data and that way to provide access to real-time data. Also, one of the most important roles of the system for mass valuation is the calculation of property taxes, and it is based on postulates that ensure fairness, equality and uniformity. Full implementation of such system could solve mentioned problem as well.

3. DATA MODEL FOR PROPERTY VALUATION

Land Administration Domain Model (LADM) is an international standard in which a conceptual model for land administration systems is presented. It provides a shared ontology, defining a terminology for land administration like parties, rights, restrictions, responsibilities and spatial units with a 2D/3D geometry. LADM also provides external classes that are connection to other databases like valuation, taxation, address system, utilities, etc. Since the valuation is recognized as a process for which LADM can be a good basis, in the new version of the standard, Part 4 is reserved for valuation information.

Like for many other countries, the country LADM profile for Serbia was developed (Radulović et al., 2017). In the referenced paper, detailed descriptions of classes can be found. Since the law in Serbia propose that cadastral authority should conduct mass valuation for the multiple purposes like taxation, and this process is ongoing, the idea of extending the country profile with valuation data arises. Based on the laws, LADM Valuation Information Model and already developed valuation country profiles (Kara et al, 2021; Kara et al.,2019) and previous research in the area (Jocković, 2021), extended model is developed (Figure 1). Classes colored in light blue belong to LADM country profile for Serbia and the ones colored in light green belong to valuation model.

Unit of valuation (RS_VM_ValuationUnit) can be parcel, building or part of the building like apartment, business space or garage. Valuation unit is specified by utility services and zone in which is located. Classes RS_VM_Parcel, RS_VM_PartOfParcel, RS_VM_Building and RS_VM_PartOfBuilding contain attributes that are necessary for valuation process and are not already within the profile classes. These attributes are used to store information such as planned or current land use, existence of drainage and irrigation system, land class, construction material, heating system, existence of elevator, etc.

In the process of valuation, the assessed value, date of valuation and type of valuation is populated (RS_VM_Valuation). Class RS_VM_ValuationUnitGroup is used for grouping or zoning valuation units. Class RS_VM_MassAppraisal is added for future use, when the process of implementation of mass valuation in Serbia is completed. Classes RS_VM_TransactionPrices and RS_VM_SalesStatistics are introduced to address information regarding transaction prices and sales statistics like date of contract, type of transaction, transaction price, average price per m² and date of analysis.

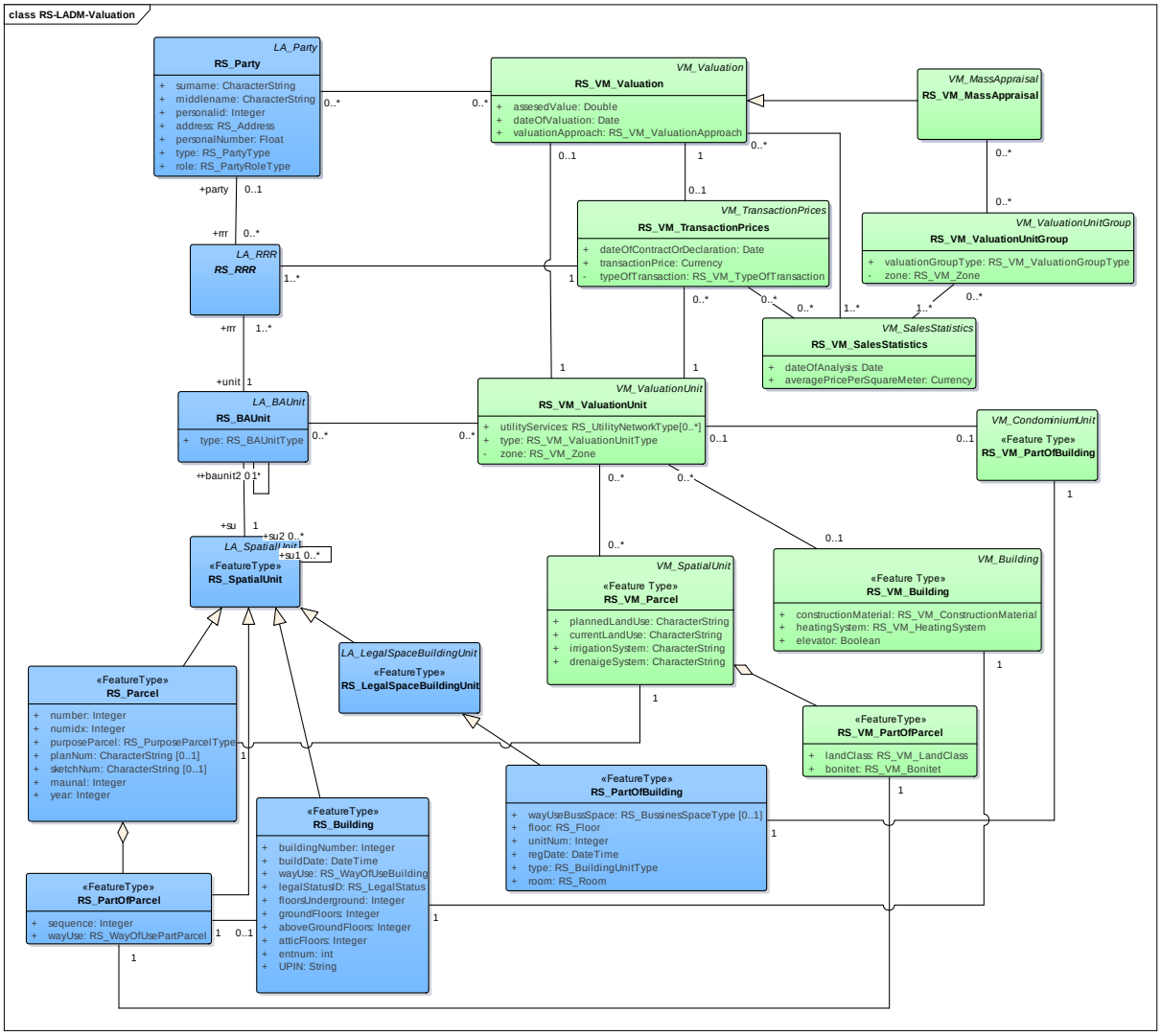

Figure 1. LADM based model for property valuation in Serbia

4. VALUATION EXAMPLES FOR MUNICIPALITY OF NOVI SAD

This section presents three different cases of valuation, depending on the unit that is subject of the assessment. The location of the assessment units is the municipality of Novi Sad. The municipality of Novi Sad contains an urban area in which there are mostly buildings with apartments and business spaces, suburbs in which there are mostly residential houses, and rural settlements with agricultural land. One case is analyzed for each of the different areas in the municipality. For this analysis the Real Estate Cadastre (REC), the Real Estate Price Register (REPR) and the Central Register of Planning Documents (CRPD) are consulted.

Fist case is located in the cadastral municipality Rumenka in which there are areas with agricultural land, mainly fields for growing various agricultural crops. The unit of assessment is the parcel of agricultural land number 3453 with area of 1113m² (Figure 2). Type of the land is the 1st class field. Existing and planned land use for the area is agricultural land. The parcel is not communally equipped and there are no irrigation and drainage systems. Based on the parameters that describe valuation unit, like type of land, location (zone), area, land use, land class, existing and planned land use, drainage system and irrigation system, queries are sent to the REC, REPR and CRPD databases in order to obtain data on similar parcels according to the given model parameters.

Similar parcels 3521, 3699 and 3624 are found as a result of the query (Figure 2). They are parcels of agricultural land on the territory of cadastral municipality Rumenka, fields of the first class, area that differs up to 82m², communally unequipped, and do not have irrigation and drainage systems. According to the REC they were sold in the recent period and data about transaction prices is obtained. Table 1. shows the values of parameters for similar parcels and one that is the valuation unit.

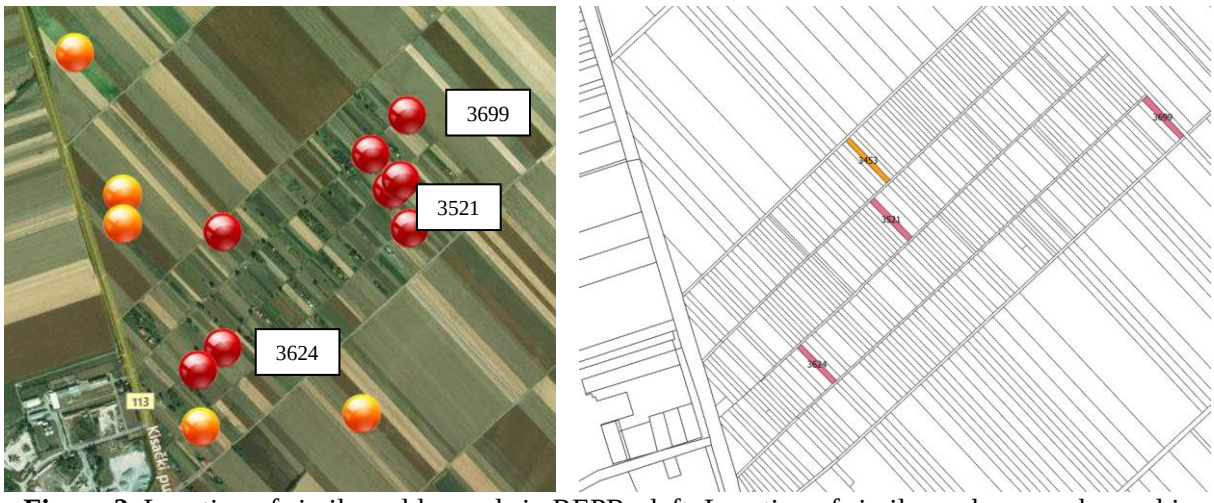

Figure 2. Location of similar sold parcels in REPR - left. Location of similar and assessed parcel in REC-right

Based on the obtained data about the transaction prices of similar parcels, the value of parcel 3453 is calculated. First, the price per m² for each of the similar parcel is calculated. The

average value of the price of parcels per m² represents the estimated value of the requested parcel per m². The estimated value of parcel 3453 calculated in this way is 2450€.

Table 1. Values of parameters for similar properties and valuation unit – case agricultural land

RS_Parcel/ RS_PartOfParcel	**RS_VM_ValuationUnit**	**RS_VM_Parcel/ RS_VM_PartOfParcel**	**RS_VM_TransactionPrices/ RS_VM_SalesStatistics**	**RS_VM_Valuation**
number=3521 *purposeParcel*= agricultural land *wayuse*=filed *area* = 1158 *address*=Leje	*utilityServices*=0 *type*=parcel *zone*=4	*plannedLandUse*= agricultural land *currentLandUse*= agricultural land *irrigationSystem*=0 *drenageSystem*=0 *landClass*=1 *bonitet*=11	*dateOfContractOrDeclaration*= 8.7.2020 *transactionPrice*=2400€ *typeOfTransaction*= contract *averagPricePerSquereMeter*=2.071	
number=3699 *purposeParcel*= agricultural land *wayuse*=filed *area* = 1174 *address*=Leje	*utilityServices*=0 *type*=parcel *zone*=4	*plannedLandUse*= agricultural land *currentLandUse*= agricultural land *irrigationSystem*=0 *drenageSystem*=0 *landClass*=1 *bonitet*=11	*dateOfContractOrDeclaration*= 19.7.2021 *transactionPrice*=2250€ *typeOfTransaction*= contract *averagPricePerSquereMeter*=1.91	
number=3624 *purposeParcel*= agricultural land *wayuse*=filed *area* = 1032 *address*=Leje	*utilityServices*=0 *type*=parcel *zone*=4	*plannedLandUse*= agricultural land *currentLandUse*= agricultural land *irrigationSystem*=0 *drenageSystem*=0 *landClass*=1 *bonitet*=11	*dateOfContractOrDeclaration*= 5.11.2020 *transactionPrice*=2700€ *typeOfTransaction*= contract *averagPricePerSquereMeter*=2.6	
number=3453 *purposeParcel*= agricultural land *wayuse*=filed *area* = 1113 *address*=Leje	*utilityServices*=0 *type*=parcel *zone*=4	*plannedLandUse*= agricultural land *currentLandUse*= agricultural land *irrigationSystem*=0 *drenageSystem*=0 *landClass*=1 *bonitet*=11		*assesedValue*=2450€ *valuationApproach*=sales comparison approach

Second case is located in the cadastral municipality Sremska Kamenica that is a suburb, mainly with residential buildings. The valuation unit is residential house with area of 112m² on parcel 4221/3 with area 447m² (Figure 3). The house is made of brick, with gas heating, with no elevator, approved for use, fully equipped with utilities and built in 2002. Similarly, like in first case, all three databases are queried to obtain the similar houses in the same location that were sold in recent time. Similar houses (on parcels 4253, 4970/4, 5113/1) are located in the same street, or nearby street (Figure 3). Detailed values of used and obtained parameters can be found in Table 2. Based on the obtained data about the transaction prices of the similar houses, the estimated value of the house on the parcel 4221/3 is calculated (143647€).

Figure 3. Location of similar and assessed house in REC

Table 2. Values of parameters for similar properties and valuation unit – case residential house

RS_Parcel/ RS_PartOfParcel/ RS_Building	**RS_VM_ValuationUnit**	**RS_VM_Parcel/ RS_VM_PartOfParcel/ RS_VM_Building**	**RS_VM_TransactionPrices/ RS_VM_SalesStatistics**	**RS_VM_Valuation**
number=4253 *purposeParcel*= urban construction land *parcelArea*=424 *buildingNumber*=1 *wayuse*=residental *area* = 120 *buildDate*=2003 *legalStatus*=building approved for use	*utilityServices*=electricity, sewerage, water, heating, telecommunication *type*=building *zone*=3	*constructionMaterial*=brick *heatingSystem*=gas heating *elevator*=0	*dateOfContractOrDeclaration*= 26.8.2021 *transactionPrice*=168000€ *typeOfTransaction*= contract *averagPricePerSquereMeter*=1400	
number=4970/4 *purposeParcel*= urban construction land *parcelArea*=648 *buildingNumber*=1 *wayuse*=residental *area* = 135 *buildDate*=2000 *legalStatus*=building approved for use	*utilityServices*=electricity, sewerage, water, heating, telecommunication *type*=building *zone*=3	*constructionMaterial*=brick *heatingSystem*=gas heating *elevator*=0	*dateOfContractOrDeclaration*= 23.3.2021 *transactionPrice*=165000€ *typeOfTransaction*= contract *averagPricePerSquereMeter*=1222,2	
number=5113/1 *purposeParcel*= urban construction land *parcelArea*=339 *buildingNumber*=1 *wayuse*=residental *area* = 102 *buildDate*=1998 *legalStatus*=building approved for use	*utilityServices*=electricity, sewerage, water, heating, telecommunication *type*=building *zone*=3	*constructionMaterial*=brick *heatingSystem*=gas heating *elevator*=0	*dateOfContractOrDeclaration*= 1.9.2021 *transactionPrice*=125000€ *typeOfTransaction*= contract *averagPricePerSquereMeter*=1225,5	
number=4221/3 *purposeParcel*= urban construction land *parcelArea*=447 *buildingNumber*=1 *wayuse*=residental *area* = 112 *buildDate*=2002 *legalStatus*=building approved for use	*utilityServices*=electricity, sewerage, water, heating, telecommunication *type*=building *zone*=3	*constructionMaterial*=brick *heatingSystem*=gas heating *elevator*=0		*assesedValue*=143647€ *valuationApproach*=sales comparison approach

Third case is located in the cadastral municipality Novi Sad II that is an urban city area with buildings that contain apartments and business spaces. The valuation unit is an apartment of 56m² within the building 1 on parcel 3931/5 (Figure 4). The apartment contains two rooms, with central heating, it is located on the first floor and it is fully equipped with utilities, building is built in 1989 and has an elevator. Like in previous cases, all three databases are queried to obtain the similar apartments in the same location that were sold in recent time. Similar apartments (on parcels 3930/11 building 1, 3931/29 building 1, 3930/42 building 3) are located in the same street, or nearby street (Figure 4). Detailed values of used and obtained parameters can be found in Table 3. Based on the obtained data about the transaction prices of the similar apartments, the estimated value of the apartment within the building 1 on parcel 3931/5 is calculated and amounts 77840€.

Figure 4. Location of buildings with similar and assessed apartments in REC

Table 3. Values of parameters for similar properties and valuation unit – case apartment

RS_Parcel/ RS_PartOfParcel/ RS_Building/ RS_PartOfBuilding	**RS_VM_ValuationUnit**	**RS_VM_Parcel/ RS_VM_PartOfParcel/ RS_VM_Building/ RS_VM_PartOfBuilding**	**RS_VM_TransactionPrices/ RS_VM_SalesStatistics**	**RS_VM_Valuation**
number=3930/11 *wayuse*=residental *buildingNumber*=1 *buildDate*=2002 *type*=apartment *room*=two rooms *floor* = first floor *unitNum* = 321 *area*=54	*utilityServices*=electricity, sewerage, water, heating, telecommunication *type*=part of building *zone*=1	*constructionMaterial*= reinforced concerete *heatingSystem*=cental heating *elevator*=1	*dateOfContractOrDeclaration*= 22.12.2021 *transactionPrice*=82000€ *typeOfTransaction*= contract *averagPricePerSquereMeter*=1518	
number=3931/29 *wayuse*=residental *buildingNumber*=1 *buildDate*=1988 *type*=apartment *room*=two rooms *floor* = second floor *unitNum* = 173 *area*=53	*utilityServices*=electricity, sewerage, water, heating, telecommunication *type*=part of building *zone*=1	*constructionMaterial*= reinforced concerete *heatingSystem*=cental heating *elevator*=1	*dateOfContractOrDeclaration*= 4.2.2022 *transactionPrice*=69000€ *typeOfTransaction*= contract *averagPricePerSquereMeter*=1302	

number=3930/42 *wayuse*=residental *buildingNumber*=3 *buildDate*=2000 *type*=apartment *room*=two rooms *floor* = first floor *unitNum* = 8 *area*=55	*utilityServices*=electricity, sewerage, water, heating, telecommunication *type*=part of building *zone*=1	*constructionMaterial*= reinforced concerete *heatingSystem*=cental heating *elevator*=1	*dateOfContractOrDeclaration*= 27.12.2021 *transactionPrice*=74250€ *typeOfTransaction*= contract *averagPricePerSquereMeter*=1350	
number=3931/5 *wayuse*=residental *buildingNumber*=1 *buildDate*=1989 *type*=apartment *room*=two rooms *floor* = first floor *unitNum* = 115 *area*=56	*utilityServices*=electricity, sewerage, water, heating, telecommunication *type*=part of building *zone*=1	*constructionMaterial*= reinforced concerete *heatingSystem*=cental heating *elevator*=1		*assesedValue*=77840€ *valuationApproach*=sales comparison approach

5. CONCLUSION

Real property valuation is a process in which the value of a real property is determined based on various parameters that describe the real property itself, but also based on the market and the transaction prices for similar real properties. The assessment is done for different needs, with the taxation as the most important one. In Serbia, the valuation is performed individually, while the law also prescribes a mass valuation of real properties. The implementation of mass valuation is still under development. As one of the first steps, the Real Estate Price Registry was built and within it, information on real property transactions is recorded. Previously, LADM country profile for Serbia was developed. As the valuation is envisaged to be found in Part 4 of the LADM standard, in this paper the existing country profile has been extended to contain valuation information. In future work, the values of the code lists will be defined in accordance with the law. This model, as well as the implementation of mass valuation will contribute to faster, more accurate and fairer valuation.

Tax administration is responsible for taxation process. In this process, information on real properties is often duplicated and not up-to-date, and the right holders are left with the obligation to update this information. Since most of the data necessary for taxation is available from the cadastral records, the development of a service-oriented architecture would enable the delivery of current data in real time. As future work, the web services that would enable the delivery of current data, and harmonization of the existing code lists between two organizations will be implemented.

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BIOGRAPHICAL NOTES

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