GEODESY AND CARTOGRAPHY
Vol. 68, No. 2, 2019, pp. 283–303

DOI: https://doi.org/10.24425/gac.2019.128469

Research paper

Information about real estate – a comparative study of Poland and Latvia

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Received: 09 September 2019 / Accepted: 18 October 2019

Abstract: Each European Union Member State keeps a register of data on properties located in its territory. The number, type and scope of these properties are determined by each Member State's needs. The INSPIRE Directive enables the scope of data to be harmonised, and the data to be made available for the purpose of assisting legislators in taking decisions and actions likely to have either direct or indirect impact on the environment. The aim of the study was to indicate the basic differences between the data contained in Polish and Latvian cadastres. Unlike other similar studies analysing the content of data in the cadastre, this article pays special attention to the number of available sets of data about the parcel and its surroundings, the ease of access to these data and the possibility for acquiring them by an interested party without incurring additional fees. This is particularly important in activities related to spatial management and the development of an information society. The results show that in both countries, the decision makers have approached the INSPIRE Directive differently. Direct analyses conducted for the cities of Wrocław (Poland) and Riga (Latvia) demonstrated that the information system in Wrocław contains a considerably greater scope of information available free of charge, is easier to use and offers more services. The Latvian Republic's spatial information system provides a less-developed scope of information about real estate (without fees) that is dispersed on several websites, which slows down and hinders its use.

Keywords: cadastral data, INSPIRE, differences and similarities in scope of information

1. Introduction

Information is a concept that is difficult to define due to its primordial, elementary nature. According to Jadacki (2001) and Lissowski (2002), it is a set of properties of objects and relations between them, which serves to reduce the degree of uncertainty. From the perspective of the space surrounding people, it is a set of data (including those on sounds, odours, etc.) that can be used for planning, designing, space administration and management purposes. In the economic environment, decision making is supported thanks to data which can be obtained from spatial information systems. In the European Union, the concept of real estate cadastre is widely used; and the real estate cadastre itself is the foundation of spatial information (Zevenbergen, 2004), and the means to verify ownership (Janus and Łopacka, 2016). According to the International Federation of Surveyors (FIG) cadastre is an up-to-date land information system based on parcels, containing a record of property rights to land. It usually includes a geometric description of parcels of land in connection with other registers describing the nature of these rights, as well as frequently the values of the plots and their changes (Bogaerts and Zevenbergen, 2001; Buśko and Meusz, 2014; Noszczyk and Hernik, 2017).

The way in which the information about real estate is organised and made available is determined by local law as well as historical and local conditions. For example, information about immovable property in Belgium can be found in the documentation held by offices of three kinds: the land register properly (kadaster/cadastre), the registration offices (registratiekantoren/bureaux de l'enregistrement) and the mortgage depositories (hypotheekbewaringen/conservations d'hypothèques) (Comparetii and Raimondi, 2018). Similar to Poland and France, two independent registers are maintained in the Latvian Republic. The first – the cadastral information system (*kadastrs*) is used for registering the individual components of property and for consolidating these components for the purpose of recording the property in the land register, and the second – the land register (*zemesgrāmata*) – is used for recording property rights (E-JUSTICE, 2019). In Lithuania and Hungary, a single central system is used. The Lithuanian register of real estate (Lietuvos nekilnojamojo turto registras) contains both available factual data about land and legal data (Parsova et al., 2012). Similarly, in Hungary the official name of the legal and administrative system managing the registry of real estate is the "unified land registry system" (egységes ingatlan-nyilvántartási rendszer) (Timár and Biszak, 2010, Cegielska et al., 2018). It is considered "unified" because cadastral mapping data and legal data (telekkönyv, "Grundbuch") have been managed in an integrated form both legally and institutionally. Hungary's unified, title-based land registry system was the first of its kind in Europe (E-JUSTICE, 2019).

Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) (Act of 2007, COM, 2016) enabled the establishment of uniform spatial data sets that can be used by many users from the European Community and numerous applications. This applies to a selected data set (Portele, 2017). The main purpose of this document was to enable the shared use of spatial data collected at one level of public authorities by other public authorities for environmental activities, economic objectives,

policies and public awareness (Bielecka et al., 2018). The five main assumptions of the INSPIRE Directive include: (1) data shall be acquired only once, and shall be stored and managed in the most correct and efficient way by competent institutions and services; (2) spatial continuity of data shall be ensured so that various resources can be acquired from various sources and made available to multiple users and for various applications; (3) spatial data shall be stored at an appropriate (single) public administration level, and made available to entities at all other levels; (4) spatial data that are necessary for appropriate spatial management at all public administration level shall be widely available (i.e. without conditions limiting and/or hindering their free use); (5) access to information on what spatial data are available and under what conditions, and information allowing the user to assess the suitability of these data for their purposes shall be ensured (Vilches-Blázquez et al., 2010).

Thanks to the Directive, every citizen can have access to a set of information about real estate. However, it was reserved that the data do not have to be free of charge. The countries implementing the INSPIRE Directive principles have adapted to the requirements imposed on them by applying various data sharing rules (Vandenbroucke et al., 2008; Bartha and Kocis, 2011; Balawejder et al., 2016). The first group includes the countries in which data are generally made available free of charge (e.g. Belgium, Estonia, Poland, Portugal, the Czech Republic, Germany, Latvia, Hungary and Sweden); fees are collected where an interested party wishes to obtain a document confirming the existing state of affairs, or to acquire more precise data. The second group of countries makes data available in full for a fee (Lithuania, Spain, Italy, Cyprus, Luxembourg, Malta, the Netherlands, Austria, Slovakia, Finland, the United Kingdom (E-JUSTICE, 2019).

The aim of the study was to carry out a comparative analysis of basic data on real estate located in Poland and Latvia, which are available on-line free of charge. The study was conducted in two stages. The first part of the study compared the basic similarity and difference attributes of maintaining the cadastre in both countries (as the main real estate information system); the second part compared the scope of information about real estate and the space surrounding the real estate (available on-line, free of charge) along with the services offered (user interface). The final part of the study discussed and summarised the conducted studies and analyses.

1.1. Cadastral system in Poland

A real estate cadastre is a uniform, systematically updated collection of information about the land, buildings, apartments and their owners (Kocur-Bera and Piórkowska, 2018; Kocur-Bera, 2019). In general, the cadastre in Poland operates at the national and sectoral levels. Pursuant to Article 53a of the *Land Surveying and Cartographic Law* Act, "by the time the Land and Property Register is transformed into the Cadastre, the term "Cadastre" shall be taken to mean the register concerned". This means that, by the time of its transformation, the function of the (national) cadastre will be served by the Land and Property Register (Act of 1989). It results from the actual incomplete information

about real estate, included in the existing Land Register. The register serves as the basic source of information about real estate.

Sectoral cadastre is usually related to specific information on the objects it contains, e.g. the forest cadastre, the water cadastre, the "cadastre of subsidies for farmers", the cadastre of roads, developed by the General Directorate For National Roads and Motorways, etc. Each ministry and other institutions have created their own cadastres, sometimes using the reference cadastral parcel database, but – more often – the cadastral systems were created independently. As a result, the same cadastral objects are stored in various reference data sets in an inconsistent and not harmonised way (Pietrzak et al., 2012). This results from various source data, methods of development, different usefulness, the use of various reference systems, attributes, identifiers and geometric descriptions prepared in different ways, etc. The first initiatives aimed at integrating data have already been undertaken (Michalak, 2012). Figure 1 presents examples of objects originating from various databases (integrated on a single platform), which show various spatial scopes of the same object (in terms of location, the shape of boundaries and the area). The objects shown in Fig. 1 have various data on the spatial range of the same objects on the map – the object boundary found in the cadastre (the broken line – green colour), the object boundary originating from the spatial management database, and the boundary of the maximum area eligible for EU payments from the Agency for Restructuring and Modernisation of Agriculture database (the object in blue).

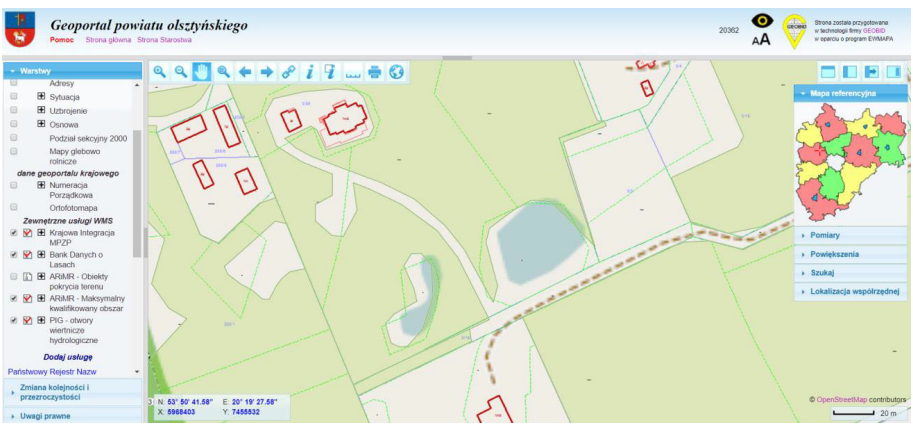


Fig. 1. Data on objects integrated on a single platform, which present various scopes of the same spatial objects. Source: own elaboration based on http://powiatolsztynski.geoportal2.pl (accessed on 15.07.2019)

The real-estate cadastre in Poland comprises data on: (a) parcels, in particular, their location, boundaries, area, land use classification, soil quality and designation in the land and mortgage register; (b) buildings, among others, their location, class (according to the Polish Classification of Types of Constructions), functional utility, living space, designation in the land and mortgage register (if necessary) and general technical details (year of construction, number of storeys, material of external walls, etc.); (c) apartments (covering both residential and commercial units), in particular, their location, permit-

ted use, living space, information about appurtenances and designation in the land and mortgage register (if necessary). The records contain also information about owners and other individuals and legal entities that possess parcels, buildings or apartments. The register embraces the whole territory of Poland and is systematically updated. A descriptive part of the cadastre is kept entirely in a digital form, whereas cadastral maps are 75% vectorised (Góźdź and van Oosterom, 2016).

The Land and Property Register (real estate cadastre) contains geometrical and topological data on parcels and buildings as well as legal information on the owners (Mika, 2018). The data describing the legal status originate from a register known as Land and Mortgage Register. In terms of rights and encumbrances on the real estate, it is the main source of information which operates independently but the information is made available to the Land and Property Register. This means that both registers have autonomy in terms of both organisation and supervision. This does not mean that both registers generate completely independent information; data on real estate owners are communicated to the real estate cadastre pursuant to Article 36 of the Act of 1982 (Act of 1982). The land and mortgage register includes information about the legal status of properties. Every land book is broken down into four sections: (a) the first section contains a physical description of the property; (b) the second section reveals an owner and perpetual usufructee (where necessary); (c) the third section contains encumbrances and restrictions in possession of the property (e.g. easements, usufructs, pre-emption rights, restrictions in disposals); (d) the fourth section is related to mortgages. The register is kept by district courts competent for the relevant territory of the state (Góźdź and van Oosterom, 2016). The contents of land books have been collected in the Central Database of Land and Mortgage Register, localised in the Main Centre of Data Processing of the Ministry of Justice.

Cadastral institutions are responsible for the objective data (real estate cadastre), while local courts for information about real estate rights (the land and mortgage register).

The legislative acts of 1989 (Act of 1989) and of 2013 (Act of 2013) established an integrated real estate information system in Poland, i.e. an electronic platform that integrates data on real estate originating from various registers. Not only does it contain data from the real estate cadastre (on a parcel, building or premises) but also from other information sources, e.g. an orthophotomap, an area eligible for EU payments, local area development plan, forest data bank, drill holes and hydrogeological boreholes, register of geographical names, protected landscape areas, Polish waters, areas at risk of flood or inundation, deposits, mining areas and regions, drill holes, issues related to health care, education, transport, a geological map, real estate (future) prices, etc.

1.2. Cadastral systems in Latvia

The Latvian Republic was established in 1918, but until 1991 it was occupied and administered by the USSR. In 1991, it achieved independence and joined the United Nations, in 1988 it joined the World Trade Organization (WTO), and in 2004 it became a member of

both the European Union and the North Atlantic Treaty Organization (NATO) (Parsova et al., 2012). Not only have these historical perturbations affected the political system of the state but also the form of cadastre maintenance in Latvia. The earliest forms of landowner taxation in this area were introduced as early as in the 9th-11th century as the so-called "feudal rent" or "vacas"; this resulted in the development of lists of taxable land. For centuries, the forms of both taxation and land description were changing depending on who occupied or administered the territory of present-day Latvia. It was not until 1918, when the establishment of the Latvian Republic was proclaimed, that political and agricultural reforms began to be implemented in the interest of landowners. The first task of the cadastre at that time was to create cadastral information for the purposes of the agricultural reform, and to identify and register the current situation of real estate. The registers contained: abandoned land, desolated farmsteads and forest stands, bunkers and trenches arranged in time of the war, destroyed roads, bridges, and other constructions. In 1931, the Law on Cadastre and other regulations resulted in real estate being measured and estimated. The aim of cadastre was to obtain information on land, the current situation of real estate throughout the country, to clarify and determine their legal status. After the Second World War, Latvia was under the USSR regime and the cadastre was not maintained for the entire country; however, in 1968, a legislative act was issued which ordered the establishment of a register for the entire country, containing land registration, recording of the amount and quality of land, quality assessment of the soil, and economic valuation of the land. After the declaration of independence, a land reform (Act of 1991) was implemented. During the reform, the former landowners or their heirs, all the existing land users as well as other persons could apply for land use rights and were entitled to resume their former land ownership rights or privatise the assigned land for a charge. It was clear that Latvia was in transition period from the Soviet system (where a comparatively small number of agriculture enterprises with large territories played an important role in the country's economy) to the market economy characterised by an enormous number of land properties of comparatively small territories (Parsova, 2012). The process of the reform during the transition period was characterised by very changeable and multiform patterns of land use and land ownership. At the same time, the boundaries of land parcels changed constantly. Reliable information was necessary to get an overview of the land reform process, namely, the distribution of land between groups of land users and landowners and national economy sectors, municipalities and state institutions (Parsova et al., 2012). In 1991, the Parliament ordered the establishment and maintenance of the national land cadastre. The state land cadastre should contain the following: the register of land use, cartographic materials, land registration and valuation data (Act of 1993). The first surveying divisions of regional governments started to register land users and land areas assigned for use (Kopostins, 2002). This means that a legal basis was created in Latvia both for the development of the national land cadastre and the land register. The land register was defined as a component of the state land cadastre. In those days, the normative acts regulated only matters relating to land. Only later were buildings and apartments recognised as independent properties, and maintenance of such data in the cadastre was considered important. The task of the State Cadastre of Latvia was the provision of (1) formation of

properties for their registration; (2) consolidation of use and tenure rights of properties, legal possessions and land uses; (3) unified cadastral designation system of properties and property objects; (4) representation of property objects on cadastre map; (5) activities of land cadastral surveying; (6) land classification and registration; (7) cadastral evaluation of the land and buildings; (8)'national statistics, spatial planning institutions, as well as natural and legal persons with necessary information for efficient use of land and buildings (Parsova and Boruks, 2009). The cadastre in Latvia is divided into national cadastre and sector cadastre. Legislation determines various sector cadastres – cadastre of mineral deposits, cadastre of land amelioration, national cadastre of natural resources, national cadastre of protected areas, State Register of Forests (Forest cadastre), cadastre of fishery resources of water bodies of Latvia, etc. Either each economic sector or state and local government may establish and maintain respective sector cadastre for fulfilling their functions. Such a cadastre should be made using the basic data of the national cadastre supplementing them with specific necessary information.

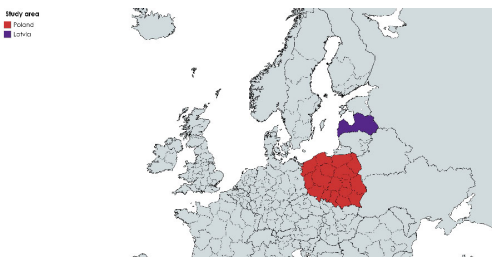
The reform carried out in 1991 also contributed to the creation of building property. Such real estates had not previously been registered since the law authorised only the registration of land with a building (both elements belonged to the same person). The formation and registration of building properties is prescribed in the law on registration of real estate in the Land Book. A building property may consist of one or several buildings. When a building is registered in the Land Book as an independent property, a separate folio is opened, and property data are recorded according to the general procedure. When the owner of building property acquires land under his building property, buildings are subjoined to the land property and the folio of the building property is closed. Situations when buildings are located on another owner's land are rather common in Latvia, especially in urban areas. Relations between the building owner and the landowner have to be regulated by a lease contract. If owners cannot reach an agreement about the land area to be leased and the amount of rent to be paid, a claim may be brought to the court. Issues of easements and encumbrances are not properly regulated either. This creates many problems and leads to conflicts between owners of buildings and landowners (Parsova et al., 2012).

Residential property is based on the act of residential property (Act of 1997). The Law states that residential property is an independent property and consists of individual property together with a share in the indivisible part of a dwelling house and land. Before registration of any residential property in the Land Book, the dwelling house itself shall be registered in the Land Book. When the dwelling house is located on the land owned by a natural or a legal person, legislation provides that owners of privatised apartment properties and landowners have to conclude a land lease contract.

2. Materials and methods

Latvia, one of the Baltic States located in north-eastern Europe, was established in 1918. In the north, it borders with Estonia, in the east with Russia, in southern-east with Belarus, and in the south with Lithuania. The area of this country is 64 573 km^2, including

62 154 km^2 of land. This ranks Latvia as the 124th country in the world, and 24th in Europe. The length of the territory in the north to south direction is 210 km, and in the west to east direction it is 450 km. Most of the Latvian territory is covered by forests and arable land. Latvia is inhabited by less than two million people and is 147th in the world and 32nd in Europe in terms of population (EURES, 2018). In administrative terms, Latvia is divided into 110 municipalities (which comprise both urban and rural communes) and 9 cities. Latvia is a lowland country. 57% of its territory is situated below the altitude of 100 m ASL, and only 2.5% above the altitude of 200 m ASL. The average altitude above the sea level is 87 m (Parsova, 2012, Spekke et al., 2019).



	Republic of Poland	Latvia Republic
Area	312 679 km^2	64 573 km^2
Population	38.43 million	1.95 million
Population density	123/km^2	31/km^2
Number of parcels	approx. 30 million	approx. 1 million

Fig. 2. Basic data on the analysed area (Source: own study on https://mapchart.net/europe-nuts2.html)

Poland borders with Russia, Lithuania, Belarus, Ukraine, Slovakia, the Czech Republic and Germany. The area of the country is 312 379 km^2. Poland is almost five times larger than the Latvia. The length of the territory in the north to south direction is 649 km, and in the west to east direction it is 689 km. The population of Poland is 38.43 million inhabitants i.e. almost nineteen times more than in Latvia. In administrative terms, Poland has been divided since 1999 into 16 voivodships and 314 *poviats*. As at 2019, Poland comprises 2477 municipalities and communes: 1537 urban communes, 638 urban and rural communes, and 302 municipalities of which 66 are also cities with *poviat* rights (GUS, 2019). In Poland, lowland areas (situated below the altitude of 200 m ASL) are definitely predominant since they cover as much as 75% of the country area; the average altitude is only 173 m ASL, and the median is 149 m ASL. Lowlands are found in the north and the centre, while mountainous and upland areas in the south. The lowest point is situated at an altitude of 1.8 m ASL (in the region of Żuławy Wiślane), while the highest point is Rysy mountain in the Tatra Mountains, with a summit reaching the height of 2499 m ASL (WA, 2019).

The first stage of the study (2.1) selected and compared the basic attributes of Polish and Latvian cadastres, including the division into spatial units, types of real estate, map scales, the design of object identifiers (a parcel, building, premises, property, etc.) as well as the rules for assigning new numbers to emerging objects (see Table 1). The second stage of the study (2.2) selected two cities, Wrocław (Poland) and Riga (Latvia). Both cities have populations and area of a similar size. The possibilities for collecting information about the space/real estate, available to an average user, were compared (see Table 2). The focus was on both the information content (thematic scope of maps) and the offered services.

3. Results

3.1. A comparison of the basic attributes of Polish and Latvian cadastres

The characteristics (differences and similarities) adopted for comparison in relation to the maintenance of Polish and Latvian cadastres are listed in Table 1.

Table 1. Basic comparative data of the data contained in the Land and Property Register in relation to Polish register and in the Latvian register

Republic of Poland	**Latvian Republic**
1	2
1. Breakdown of sources of real estate information	
National cadastre (Land and Property Register)	National cadastre
Sectoral cadastre (e.g. forest database, agricultural farm register, etc.)	Sectoral cadastre (similar to Poland)
No obligation to synchronise sectoral data in relation to the national cadastre	Obligation to synchronise the sectoral cadastre with the national cadastre
2. Basic subdivisions for the purposes of land and property register	
Cadastral unit (commune, city)	Administrative unit (commune, city)
Cadastral district (which coincides with the administrative division or index card)	Cadastral group (it does not need to coincide with the administrative division)
Cadastral parcel	Cadastral parcel
3. Cadastre content in relation to real estate type	
land property (undeveloped, developed)	land property (undeveloped, developed)
Building property (under the right of perpetual usufruct of land owned by the Treasury or local government units)	Building property (under the right of lease of land owned by state, legal or natural person)
Premises property (confirmation of premises independence)	Residential property (a set of rooms with the common area with no obligation to confirm independence)
4. Sale of building property	
with no obligation to obtain the landowner's consent	the landowner has pre-emption right
5. Cadastral map scale	
1:500	1:2 000 (urban areas invested into)
1:1 000	1:10 000 (rural areas)
1:2 000	
1:5 000	

1	2
6. Designation of a parcel/building/premises	
Land parcel	
WWPPGG_R.XXXX_AR_NR.NDZ	11-digit cadastral designation, e.g. 54820020717
WW – voivodship ID No	4 digits – cadastral territory (rural municipality, city, town)
PP – *poviat* ID No	3 digits – the number of cadastral group within the administrative unit (001 do 999)
GG – commune/municipality ID No	4 digits – a digit number of the land parcel within the cadastral group (0001 do 9999)
R – municipality/commune type indication	
X – district ID No	
NDZ – parcel No	
AR – map sheet No (optionally, where the district is maintained on several sheets)	
building	
WWPPGG_R.XXXX.NDZ.NR_BUD	14-digit cadastral designation, e.g. 54820020717001
B – *building* designation	11 digits identifying the parcel on which the building is located
Nr – No of building on parcel	3 digits – No of building on parcel (001 to 999)
or	
WWPPGG-R.XXXX.AR_NR.NDZ.NR_BUD	
or	
WWPPGG_R.XXXX.NR_BUD	
premises	
WWPPGG_R.XXXX.NDZ.NR_BUD.NR.LOK	17-digit cadastral designation, e.g. 54820020717001001 (set of spaces within a building)
A description containing building ID supplemented with premises No	14-digit building No including e.g. No of parcel on which it is located
	3 digits – No of the set of spaces within the building (001 to 999)
Land property	
parcel ID provided above	Building belonging to the landowner 11-digit numerical code – the cadastral designation of one land parcel belonging to the property

Building properties	
Building ID according to the above pattern	11-digit cadastral number e.g. 96485920033
	4-digit code of the cadastral territory
	3-digit code obtained by adding 500 to the cadastral group code
	4-digit ordinary number denoting a building property within the cadastral group
Residential properties	
Premises ID provided above	11-digit cadastral number e.g. 01009000023
	4-digit code of the cadastral territory
	7-digit ordinary number denoting a building property within the cadastral territory (9000001 to 9999999)
Part of land parcel	
none	15 digits e.g. 648400200018001
	11-digit designation of the land parcel
	4-digit number designation part of the land parcel within the same land parcel (8001 through 8999)
7. Designation of a new parcel resulting from the division	
q/p q – initial parcel No p – the smallest natural number	New parcels resulting from the division are assigned with a subsequent available No in the cadastral group, while the undivided part of the parcel has the old No.

Source: own study based on (Act of 2016; Parsova et al., 2012)

3.2. The content of information about the space and real estate available to an average user (without the need to log in)

The comparative analyses of the space and real estate data sets were conducted based on the information acquired from the website https://gis.um.wroc.pl for Wrocław, and http://kartes.lgia.gov.lv, https://www.kadastrs.lv, https://geolatvija.lv, https://ozols.gov.lv/pub for Riga. The real estate information system in Latvia is divided. Data on tax objects (parcel boundaries, object IDs, the area, cadastral tax rate, etc.) are kept in the Latvian Cadastral Information System, while other information on the surroundings is kept in the so-called LGIA org. *Latvijas Ěeotelpiskās Informācijas Aěentūra* (base map, addresses, Copernicus Land Monitoring Service, LIDAR surface model, orthophotomap), www.geolatvija.lv (topographic map, administrative division map, groundwater areas map, spatial development map and maritime area development map), www.ozols.gov.pl (areas and objects under natural protection). Table 2 lists the

scope of available data on located real estate (including the fees) from different sources. Figures 3 and 4 show several thumbnails which present data for the analysed area, both cadastral and originating from other available registers of real estate in Latvia (Riga) and Poland (Wrocław).

Table 2. The attributes of information about the space/real estate under comparison

Attributes		Wrocław		Riga	
		Free of charge	charge	Free of charge	charge
product	Base map				
	parcel ID	✓	–	✓	–
	building ID	–	✓	✓	–
	premises ID	–	✓	✓	–
	address	✓	–	✓	–
	the use	–	✓	✓	–
	parcel area	✓	–	✓	–
	tax rate	–	–	✓	–
	reference system	✓	–	✓	–
	coordinates of the analysed point	✓	–	✓	–
	Ownership map/description of the owner	✓	–	✓	–
	Topographic map	✓	–	✓	
	Spatial development	✓	–	✓	–
	Maritime area development	–	–	✓	–
	Orthophotomap	✓	–	✓	–
	Oblique rectified mosaic images	✓	–	–	–
	Demography	✓	–	–	✓
	Education	✓	–	–	✓
	Communal register of historic monuments	✓	–	–	✓
	Nature map/map of objects under protection	✓	–	✓	–
	Hypsometric map	✓	–	✓	–
	3D model	✓	–	–	✓
	Acoustic map	✓	–	–	–
	Transport, problems	✓	–	–	✓
	Bicycle route map	✓	–	–	✓
	Water and sewage system map	✓	–	–	✓
	Urban investments	✓	–	–	✓
	Groundwater	–	–	✓	–
	LIDAR surface model	–	–	✓	–
	Housing programme	✓	–	–	–

	Metadata	✓	Not applicable	✓	Not applicable
Service	Scale	✓		✓	
	Identify object	✓		✓	
	Move	✓		✓	
	Zoom in	✓		✓	
	Zoom out	✓		✓	
	Full view	✓		✓	
	Previous view	✓		✓ –	
	Next view	✓		✓ –	
	Selection/analyses	✓		–	
	sketching	✓		–	
	Show coordinates	✓		✓	
	Measure the distance	✓		✓	
	Measure the area	✓		✓	
	Add WMS	✓		✓	
	Add WFS	✓		✓	
	Add WCS	–		✓	
	Link to the application	✓		✓	
	Map view export	✓		–	
	Legend	✓		✓	
	Select map/thematic layer	✓		✓	
	Search for object/name/address	✓		✓	
	General map	✓		✓	
	Print	✓		✓ –	

Source: own study

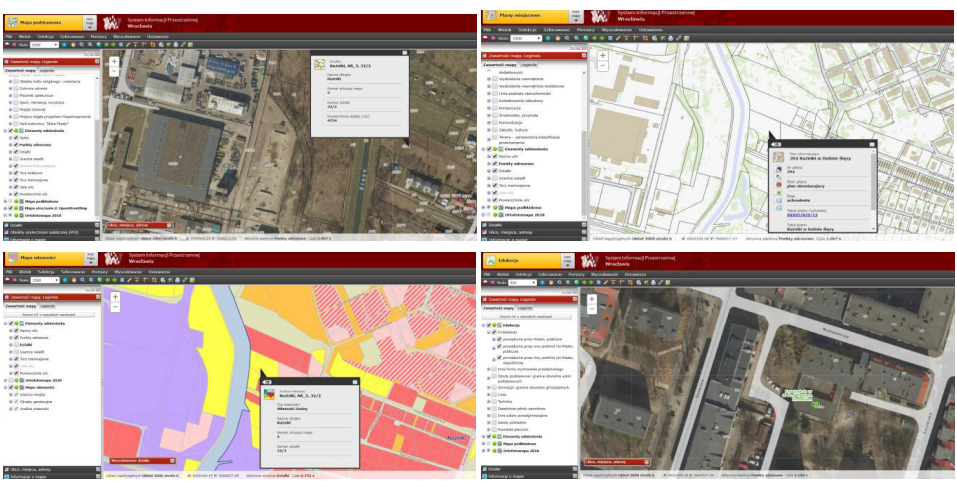


Fig. 3

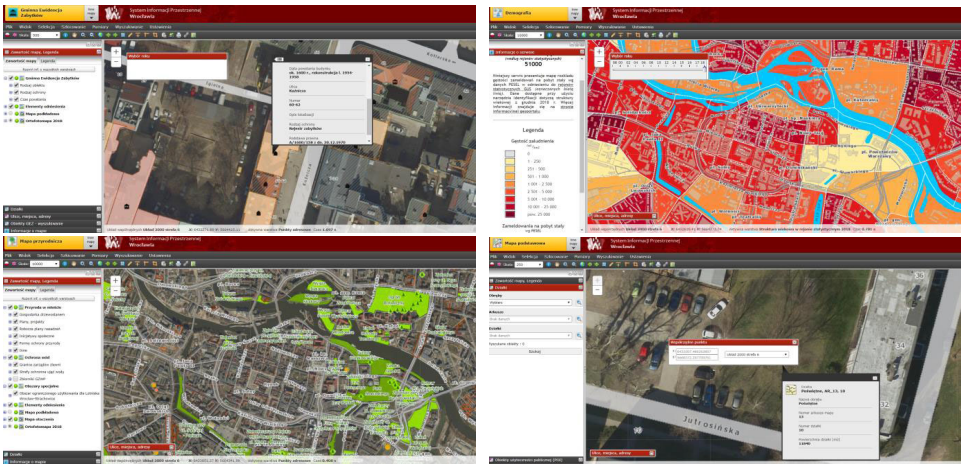


Fig. 3. Examples of thematic map thumbnails made available by the Wrocław Spatial Information System. Source: own study based on (GIS PL, 2019)

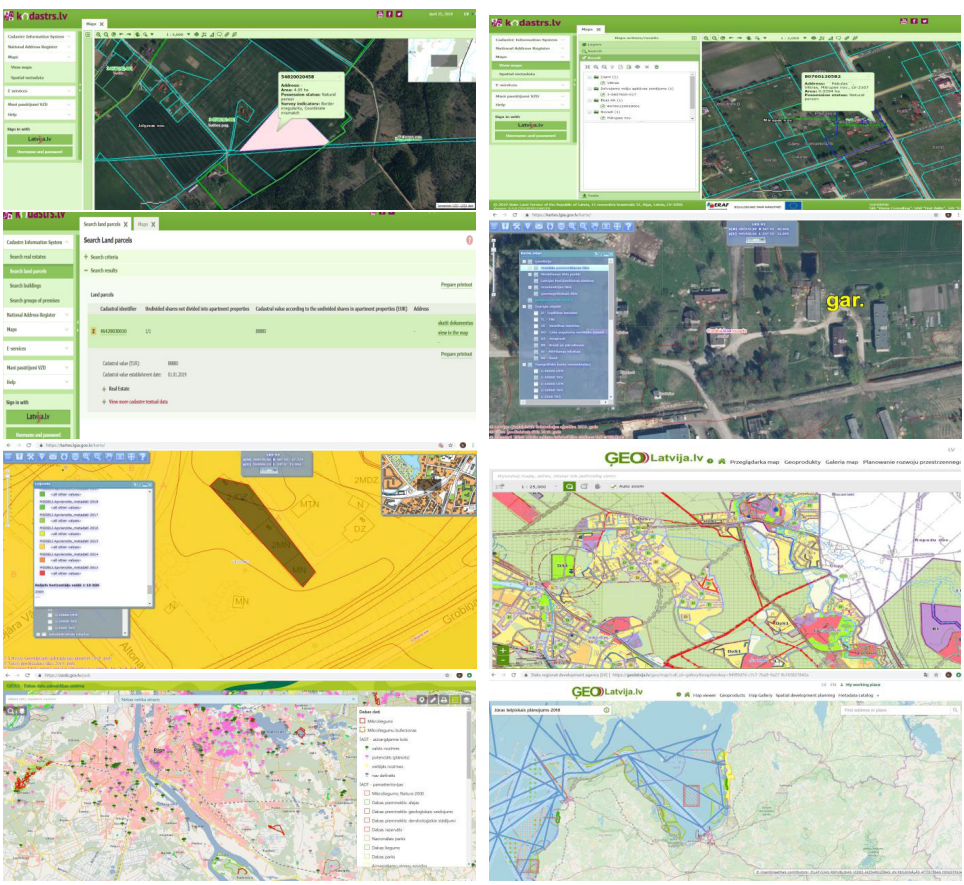


Fig. 4. Examples thumbnails of the available data on real estate in the Latvian Republic. Source: KADASTRS, 2019; LGIA, 2019; GEOLV, 2019; OZILS, 2019

4. Discussion

Both analysed cadastres, Polish and Latvian, are maintained in the national and sectoral system (see Table 1). The national cadastre serves *inter alia* taxation purposes, while the sectoral cadastre contains detailed and supplementary information that is of importance to the institution maintaining it. In Latvia, each sectoral database collecting data on real estate and objects located on real estate and in its surroundings must be synchronised with the national cadastre data. In practical terms, data from the national cadastre are extracted and supplemented with an additional content. In Poland, most institutions collecting information can maintain them within their own reference system and describe them in a manner appropriate for the theme being collected. According to Pietrzak et al. (2012), the data collected by various institutions are not harmonised with the data contained in the cadastre, even though they should serve as a reference database.

Since the spatial division used for cadastral purposes in Latvia does not need to coincide with the administrative division, so-called "cadastral groups" have been established, owing to which the changes in administrative borders do not affect the spatial registration units. In Poland, a cadastral district coincides with the administrative boundary; however, for the districts maintained on several sheets, this type of division is also taken into account.

The division into property types in Latvia is similar to that existing in Poland. *Land property* is a parcel owned by one or more natural or legal persons, including developed land property. *Building property* is a building located on a property owned by another person; unlike the requirements of Polish law, ownership of land owned by a natural and legal person is also allowed. Each building property owner must have a lease agreement for the land on which the building is located. *Residential property*, similar to the property in Poland, is a set of rooms including the indivisible (common) area of the building and land. For taxation purposes, *special cadastral objects* are also distinguished where they are intended for rent (Table 1). This is not a property that functions independently, and it can be a part of a land parcel owned by the state or a commune.

The data contained in the cadastral systems of Poland and Lithuania should be updated on a regular basis as they provide the basis for socio-economic activities of each country (Noszczyk and Hernik, 2016; Głowacka et al., 2017; Kocur-Bera and Stachelek, 2019), while the effects of the lack of timeliness affect the state revenues (Sadowski, 2012), may cause barriers to the development of space (Busko and Przewiezlikowska, 2016) as well as social conflicts (Elieseev et al., 2014). In Latvia, the rules for updating data are set out in the 2011 Regulations on the cadastral survey of land (Latvian: *Zemes kadastrālās uzmērīšanas*) (REG, 2011). The data contained in the cadastre are updated in the cases where the parcel boundary (a) was not established under the agricultural reform; (b) a detailed spatial planning plan or project is being implemented in an area under analysis; (c) land units are being consolidated; (d) an indicated boundary is surveyed; (e) a parcel is subjected to division; (f) a separate operation related to a cadastre examination at the initiator's request is carried out. In each of these processes, the owners should appear on the land and confirm, or fail to confirm, the present status of the area. As Latvia is a young state (it gained independence in 1991) and occupies

a small area (it is five times smaller than Poland), the country's authorities focused on boundary recording and surveying, which resulted in up-to-date data contained in the cadastre.

In Poland, data in the cadastre are most frequently changed at the time of (a) sale or purchase of a (land, building, premises) real estate; (b) performance of a new survey of a real estate; (c) real estate consolidation; (d) division of a real estate; or (e) allotting a part of a real estate. The modernisation process is also carried out on a periodic basis. The timeliness of the data contained in Polish Land and Property Register has been increasing from year to year; this is, however, a long-term and very costly process (Noszczyk and Hernik, 2016; Wilkowska-Kołakowska, 2017).

The real estate information system operating in Wrocław (see Figure 3) is a coherent database which enables the acquisition of multiple information concerning not only real estate but also its surroundings and the investment plans to be implemented in the surroundings. It comprises twenty (20) various themes visualised as a thematic map. The scope is very broad and includes basic data on cadastral objects and utilities networks, spatial development (including data that enable finding a regulation approving a legal plan or other planning document), data on historic monuments, demography, education or noise (broken down into road, railroad, tramway and airway noise). In general, the services are provided free of charge, yet it is prohibited to reproduce, sell, make available, place on the market in any other way or disseminate the contents, entirely or partially, in particular to send or make it available in computer systems and networks or any other communication and information systems (Act of 1989; Act of 2010; Act of 2005). Moreover, the platform offers multiple tools (user interface) which enable the selection of a map, scaling, finding the selected point, information, data scope or map view export, etc. Owing to these services, the operation of a web browser is facilitated (Horbiński and Cybulski, 2018) and allows the user to obtain multiple information supporting the decision-making system. It is also possible to obtain information on the data origin source (metadata), which considerably facilitates searching for, obtaining and reusing spatial data. These allow a potential user to assess the suitability of a particular spatial data set for the performance of its tasks and its application in a specific application (Dawidowicz and Klimach, 2017).

The real estate information system existing in Riga (Latvia) is divided (see Figure 4). The cadastral part (parcel No, boundary, data on the area and owner, etc.) is found in the cadastral system (available on www.kadastrs.lv), while the part containing other thematic maps is made available by the geoinformation agency (https://kartes.lgia.gov.lv, https://geolatvija.lv, https://ozols.gov.lv). All registers offer an opportunity to change the language of basic data with the details remaining in Latvian.

Cadastral data available to an average user include the number of the object to be taxed (according to the rules for the description provided in Table 2), address data, the area, information on the owners (with sensitive data protected) or on their absence, and the cadastral tax rate. Moreover, we can obtain information there on the coordinates of parcel boundaries and their synchronisation. In Latvia, measurements are carried out to update data; where such boundaries have not been established, such information can be found in the system (*border irregularity, coordinate mismatch*).

The other registers made available by the Latvian geoinformation agency primarily contain information on the space around real estate; however, there is no possibility for referring them to the boundaries of cadastral parcels since they are only made available on www.kadastrs.lv. The thematic scope is much narrower than that for the data made available at the Wrocław Spatial Information System being compared. It is possible to obtain more detailed information and cartographic images; they are, however, paid for and made available after placing an order.

Both the cadastral register and other registers are equipped with tools allowing the operator to search for object, select data, measure or print (see Table 2). Their number is comparable to that of the tools offered by the Wrocław Spatial Information System. The differences are due to the fact that in Latvian cadastral register, a previous or next view can be selected (⟹ ⟸), while in other registers this function is not available. Another missing function is that related to data selection, analysis performance, data export, or sketching. Printing is possible only in the cadastral register (www.kadastrs.lv) and in the register containing protected areas (www.ozols.lv); in other registers, there is a possibility of data viewing or, optionally, the use of a keyboard option *PrtSc* (print screen). All registers (in their respective tabs) contain information on the origin of data.

The use of GIS technology and sharing data with the public has become a common practice, and is in line with the rules set out in the INSPIRE Directive that has been implemented not only by the EU Member States but also by states such as Switzerland, Norway, Liechtenstein, Iceland, North Macedonia, Serbia and Turkey. A land information system accessible to the average citizen opens the door to new opportunities and applications (Pubellier, 2005). The information made available in a descriptive and graphic form, related to the geographical location of a structure, enhances the development of an information society thanks to the integration of the available public sector data. This is a powerful driving force for an increase in competitiveness and number of jobs while improving the quality of citizens'lives.

5. Conclusion

In the era of information technology development and the availability of data, information about real estate has become a very important element supporting decisions taken by decision makers. Several states have adapted their information systems to the INSPIRE Directive requirements. The range of available data is great; however, they are dispersed. The conducted comparative analyses of data on real estate, available on-line for Poland and Latvia, showed that both countries offer a broad range of information. The availability of data on a single information platform (as in the case of the city of Wrocław) and the possibility for selection of data of interest to the observer is a great facilitation. As regards the data on real estate located in Latvia, registers are not integrated which considerably facilitates work. Another facilitation is the possibility for generating descriptions in English; for Poland, the amount of information available after the selection of this language is not reduced, while for Latvia, a broader scope of information is ob-

tained in Latvian (certain maps are not available in English), which significantly hinders the understanding of the collected data.

The authors of the manuscript are aware of the limitations arising from the conducted study. One of them is the number of data sets being compared that are available on-line. The first part of the study (2.1) focused on seven groups of information describing real estate. No differences in detailed descriptions of land use or the accuracy of the survey of the land situation components were analysed. Another limitation is the number of locations (cities) that were compared. For Latvia, the number of data sets at each location is similar, while in Poland the situation is different (differences between urban and rural areas in various regions of the country). These subjects will be further elaborated on in future research.

Acknowledgments

The publication was written as a result of the author's internship in the University of Life Sciences and Technologies in Jelgava, Latvia, co-financed by the European Union under the European Social Fund (Operational Program Knowledge Education Development), carried out in the project Development Program at the University of Warmia and Mazury in Olsztyn (POWR.03.05. 00-00-Z310/17).

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