




ORIGINAL ARTICLE

Do geographic location and historical conditions affect the quality and availability of open cadastral data? From early cadastral maps till now

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Abstract

Since the early days, cadastral data represent the geographic extent of the past, current, and future rights and interests in real property. Thus, these data are extremely important for the proper development of statehood and society. The article analyses the process of formation of the real estate cadastre in two countries – Poland and Ukraine – from the time of its establishment to the present. Both countries were in the past (and Ukraine still is) victims of various historical events that deprived them of statehood, stability and opportunities for development; therefore, it affected the development of the cadastre and its accessibility to all stakeholders. The authors attempt to answer the question of if and how geographic location and historical conditions can affect the quality and availability of open cadastral data (OCD). After all, our perception of reality is a direct result of processes originating in history. This paper contains comparisons between a post-Soviet (Ukraine) and a post-communist country (Poland) and their path from early cadastral maps to OCD.

Key words: cadastre maps and data, land and building register, geoportal, open cadastral data

Highlights

- History and geographical location can slow down the development of OCD but cannot stop it.
- Poland and Ukraine share data in geoportals based on

ISO19.100 standard.

- OCD is publicly available on 21 and 15 thematic layers in Poland and Ukraine, respectively.
- Both countries have achieved modern standards of OCD and its accessibility.

- Russia's aggression against Ukraine has halted the process in Ukraine.

Note: A great merit of the work is the very detailed description of the national geoportals in Ukraine, which, due to the fact that it is not available online (due to hostilities in Ukraine), may be one of the few available descriptions and a valuable source of data for other research work.

1 Introduction

The spatial information necessary to describe the geographic extent and the rights and interests includes surveys, legal description reference systems, and parcel-by-parcel surveys and descriptions (Apollo et al., 2023; Buško et al., 2022; Maciuk et al., 2021; Williamson, 2001; Williamson et al., 2010; Zevenbergen, 2002). Cadastral data, also known as a cadastre, contains official, legal documentation concerning the quantity, dimensions, location, value, tenure and ownership of individual parcels of land (Buško, 2017; Buško et al., 2022; Buško and Apollo, 2023; Dale and McLaughlin, 2000; Szafranska et al., 2020; Sobolewska-Mikulska and Cieniała, 2020). Therefore, cadastral systems are commonly used for apportioning taxes; establishing land ownership; supporting land market values; calculating agriculture subsidy payments; mortgage applications; forest and vegetation management; municipality property management; utilities; outlining zones based on value and purpose of use; maintaining a graphic record of information regarding water resources, geology, population, industry, and agriculture; and in creating countries' spatial data infrastructure (Dale and McLaughlin, 2000; Larsson, 1991; Silva and Stubkjær, 2002; Zevenbergen, 2002).

The oldest cadastral document in Europe was produced in England in 1086 under the name *Doomsday Book* (1086), with many countries introducing equivalents of this document at much later dates. Detailed and legally empowered cadastral systems have appeared over the last two centuries. From the beginning of the introduction of a cadastre system, the problems of determining the course of real estate boundaries, marking the boundary points of registered parcels and documenting their reliability for the purpose of determining the extent of property rights have accompanied social development for centuries and, regardless of the passing of time, are still relevant. The first half of the nineteenth century was a great age of cadastral surveys. Many of these records, like the records and notes of the Federal Land Survey and the Ancien Cadastre, await computerised data processing for their full and effective exploitation (Kain, 1975). However, before focusing on detailed research we need to explore the history of cadastre development, as presented in this paper. Of course, with the development of technology, the methods of obtaining data for the modernisation of the real estate cadastre are becoming increasingly accurate; in connection with the rapidly happening digitisation, the availability of source materials obtained with the help of modern technologies is also increasing.

Therefore, taking into account the geographical location and historical conditions, this article presents the process of formation of the real estate cadastre in two countries – Poland and Ukraine – from the time of its establishment to the present. At various times in the past both countries (and Ukraine also now) fell victims to various historical events that deprived them of statehood, stability and opportunities for development. In spite of these adversities, in both countries determination to work towards the creation of a full-fledged real estate cadastre database, as well as the integration of data with other databases and public registers can be seen. Equally advanced work is being carried out towards making geospatial data available in

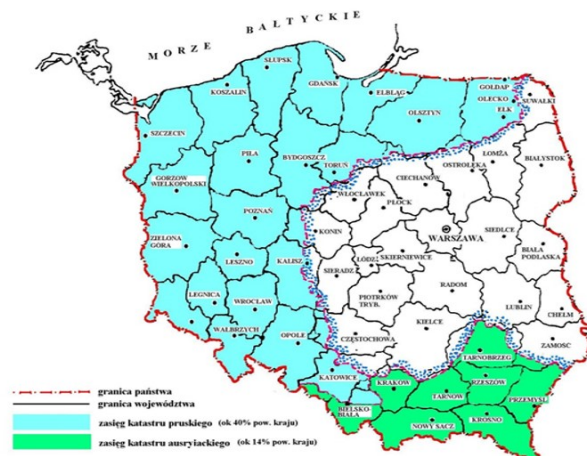


Figure 1. Areas of influence of the Prussian and Austrian cadastre on the territory of Poland (Buško and Meusz, 2014)

open national and regional portals, along with visualisation in Web Map Services (WMS). The research area of this article includes the areas of south-eastern Poland and western Ukraine, which at the time of the partitions were covered by the Austrian cadastre as the Galicia region, as well as the central and eastern parts of Poland under the Russian partition. For this reason, and due to the volume of the article, the Prussian cadastre is not discussed. The paper uses a critical analysis of source data (literature, legal acts and maps) and a comparative analysis.

2 History of the real estate cadastre formation in Poland and Ukraine

2.1 Historical Background

The construction of the real estate cadastre in Poland and western Ukraine began after the end of World War I. After 1918, when Poland regained its independence after 123 years of partitions, there were two main cadastral systems on its territory: there was a Prussian cadastre in the western and northern parts of Poland, and an Austrian cadastre in the southern parts (Figure 1). Both of these systems covered about 54% of Poland's territory, of which about 40% was the Prussian cadastre (blue in Figure 1) and 14% the Austrian cadastre (green in Figure 1). In the areas of the former Russian partition, shown in white in Figure 1, there was no consistent cadastral system (Buško and Meusz, 2014). The territories of western Ukraine in terms of the sources of construction of the real estate cadastre also belonged to the Austrian cadastre.

After Poland regained its independence in 1918, the first codification attempt was undertaken in the Sejm (the lower house of the bicameral parliament of Poland) to develop uniform Polish civil law. At the same time, the Polish authorities recognised that until a new, unified legal system was established, the laws of the partitioned countries relevant to the territories in question should be applied to the real estate cadastre.

2.2 Areas of the former Austrian partition

The basis for the establishment of the Austrian cadastre was a patent dated 23 December, 1817 by Emperor Francis I on land tax (Fedorowski, 1974). The Austrian cadastre covered the territories of the former Austro-Hungarian Monarchy, now occupying, among others, the south-eastern territories of Poland, as shown in Figure 1. The Austrian cadastre also covered the

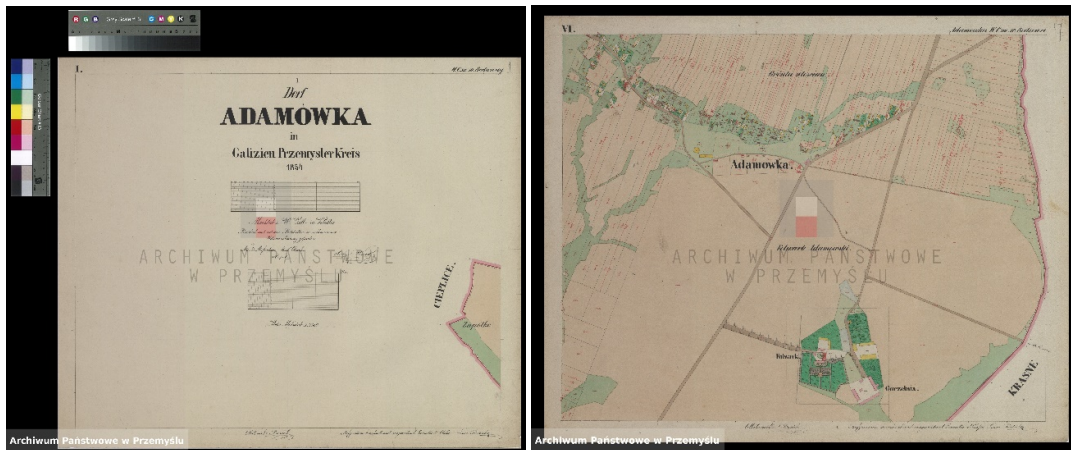


Figure 2. Cadastral map of the village of Adamówka in Galicia in Przemysł Oblast from 1854 (Source: State Archives in Przemysł)

western part of Ukraine, to which the research presented in this article also refers. The real estate cadastre was established and updated mainly for the purpose of conducting land taxation. Cadastral measurements were based on mathematical and cartographic bases. A scale of 1:2880 was adopted for the cadastral maps. The Austrian cadastre was conducted in the parcel system. According to a 1904 instruction, a parcel of land is ‘any plot of land that belongs to the same owner, lies in the same plot of land, in the same municipality or self-contained manorial area and in the same type of cultivation’ (Instructions, 1904).

The real estate appraisal report of the Austrian land cadastre consisted of a cartographic and descriptive part. The cartographic part included, among others:

- a cadastral map at a scale of 1:2880, as the basis for the cartographic part of the cadastre (Figure 2),
- indicia sketches, identifying changes in the land,
- manuals, i.e. original field sketches showing how boundaries were determined, which allowed them to be used as a survey matrix for supplementary measurements.

In complement, the descriptive part of the Austrian cadastre included such documents as:

- Parcel protocols which gave, among others, parcel numbers – separately land and building; names of the levees, total area of use and land classes, and pure income (Figure 3, Figure 4);
- Sheets of landed estates, compiled for each owner separately with the pure income;
- Summaries, i.e. summaries of the general areas of each landowner’s estate sheets;
- Alphabetical list of holders;
- Mortgage extracts, i.e. extracts from the land register of a given cadastral unit, containing, among other things: the mortgage record number, the owner’s name, place of residence, and the numbers of building and land parcels (Figure 5).

The cadastre of real estate – if it is to meet its objectives – should be based on measurements of cadastral objects, carried out on the basis of a geodetic warp in the adopted coordinate system. The Austrian cadastre used 7 separate reference systems. Figure 6 shows by means of crosses the places that constituted the application points (starting points) of each system. For these points, geographic coordinates were determined based on astronomical observations, as well as the direction of the local meridian. In each system, a rectangular coordinate system was defined, and a southern orientation was used.

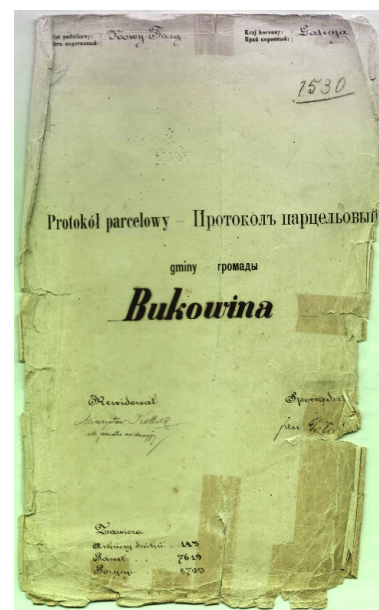


Figure 3. Lot protocols – front page

Parcelation points	Inchajacze opisy	BUDYNIKI - PRZYBY	
		Wielkość powierzchni	Wartość
Parcela 1
Parcela 2
Parcela 3
Parcela 4
Parcela 5
Parcela 6
Parcela 7
Parcela 8
Parcela 9
Parcela 10
Parcela 11
Parcela 12
Parcela 13
Parcela 14
Parcela 15
Parcela 16
Parcela 17
Parcela 18
Parcela 19
Parcela 20

Figure 4. Lot protocols – content of the document

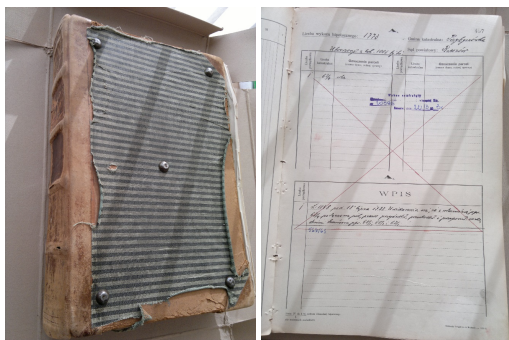


Figure 5. Land book of a given cadastral unit, containing, inter alia, the number of the mortgage register (LWH) (Source: Own archive)



Figure 6. Cadastral systems in the Austro-Hungarian Monarchy (Fedorowski, 1974; Taszakowski, 2011)

The southern part of Poland and part of the modern territory of Western Ukraine, which was then part of the Austro-Hungarian Empire known as Galicia, were mainly covered by the Lviv reference system, with the touchdown point at the High Castle in Lviv – the Mound of the Union of Lublin (Figure 7). The Lviv datum, based on a triangulation grid, covered the modern regions of Ukraine: Lviv, Ivano-Frankivsk, Ternopil (except for the northern part), and the areas of the modern Podkarpackie, Malopolska and Lower Silesia provinces in Poland.

Guidelines for cadastral supplementary and reambulation surveys (making changes to an obsolete map to reflect the changes in the field; vindicating the map) were contained in instructions (Instructions, 1904, 1907).

2.3 Areas of the former Russian partition

In the Polish lands lying within the Russian partition, after the January Uprising in 1863, the enfranchisement of land used by landowners was carried out on the basis of tsarist decrees. Confirmation of ownership rights to the enfranchised lands was provided by liquidation and vesting tables, which were assigned depending on the type of property being enfranchised. Liquidation tables contained data on the numbers of settlements, a list of landowners with a breakdown by category of enfranchised landowners, the area of the settlement with an indication of the area of the corresponding land uses, the rights of the landowners to easements (with an indication of the type of easement), the amount owed to the owner for the enfranchised land, and the estimated amount of duty to be paid by the settlement to the owner. The given type of table concerned the en-



Figure 7. The beginning of the Lviv pact (Source: Own archive)

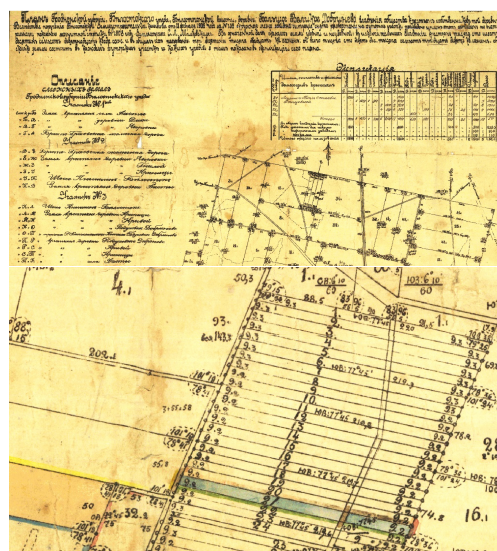


Figure 8. Fragments of the plan of the territories annexed by Russia from 1910

franchised private and institutional estates, with the majority being Polish estates confiscated from people who took part in the January Uprising of 1863 against Tsarist Russia. It is worth noting that the tables in question – although they provided proof of ownership of a particular property – did not accurately determine the extent of ownership, since the enfranchisement was carried out without measurements on the land.

To this day the areas under the Russian partition in historical times are characterised by a small amount of surveying material from that period. In addition, surveying material obtained from the areas of the former Russian partition is more difficult to access and is also less accurate compared to cadastral materials from the areas of the other partitions (Prussian and Austrian). It often happens that cadastral maps, consolidation plans, or other cartographic materials from those years are stored in private archives of local residents rather than in the state geodetic and cartographic resource. Examples of cartographic documentation from the Russian partition are shown in Figures 8 and 9.

The green colour in Figure 8 marks the plots (registered plots) that, in addition to the ones existing in the cartographic part of the Russian cadastre, were also included in the descrip-



Figure 9. Fragment of the first drawing of the village land from 1931

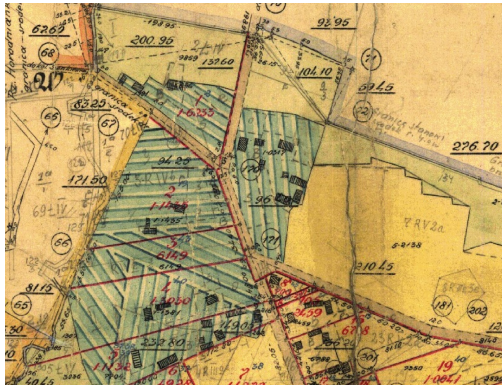


Figure 10. Fragment of the land plan of the village from 1925

tive part of the land register (an equivalent of the modern land register). It can be seen that these plots were few (only one on the plan – Figure 8), which corresponds to the actual state of the cadastre in the areas of the former Russian partition in historical times. It is worth mentioning that the measurements marked on the map were given in fathoms – a non-metric measure corresponding to the length of an adult man's outstretched arms. Russian fathoms, introduced in the Russian partition, corresponded to a length of about 2.13 metres.

Much more material has been preserved in the Polish state surveying and cartographic resource from the interwar period (i.e. between World War I and World War II). After 1918, when Poland regained its independence, the preparation of the first surveys and plans, made to scale and containing appropriate technical documentation, began with the aim of laying the foundation for the construction of a real estate cadastre in the areas of the former Russian partition in Poland (Figure 9). The legal basis for their preparation was embedded in the Decree of the Minister of Agrarian Reform of 2 June, 1924 (Regulation, 1924).

The land plans, unlike the first drafts, also included information about the land use, which was depicted using a variety of colours. This increased the legibility and aesthetic value of the plans compared to the first drafts. Figure 10 shows a land plan of the village from 1925.

In the interwar period, numerous consolidation works were carried out in the territories of Poland, which made it possible to acquire a collection of consolidation plans along with technical files for the areas included in the consolidations. They are of great substantive value for the establishment and regulation of the legal status of real estate, so in recent years large-scale digitisation of the plans and technical files has been undertaken in order to protect the data from physical destruction, and to make these documents available to interested parties in the form of digital files.

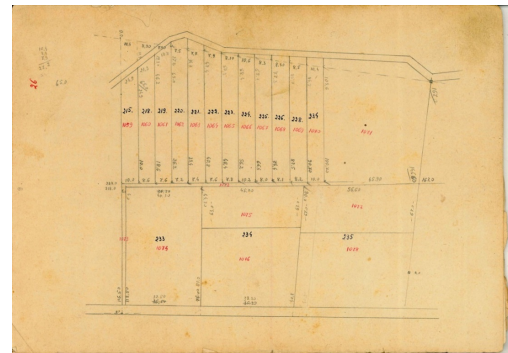


Figure 11. Plan of the parcelled out private property from 1946

2.4 Development of the cadastre in the post-war period in Poland

The consecutive period of construction of the real estate cadastre in Poland, as well as the process of land enfranchisement and the regulation of property relations, took place after the end of World War II and was carried out in accordance with laws issued after World War II. Thus, on the basis of the issued Decree of the Polish Committee of National Liberation of 6 September, 1944, on the implementation of land reform (Decree, 1944), a large number of land estates were parcelled out in Poland. As a result of this land reform, a completely new legal status was created in the villages. By the end of 1949, more than 6 million hectares of land in Poland had been divided among the peasants. In the Lublin region alone (which is one of the research objects in this article), estimated 318,000 hectares of private land estates were parcelled out. The result of the parcelling work were plans of the parcelled estates (Figure 11) and accompanying measurement and assessment registers.

In Poland, in the 1960s and 1970s, large-scale protocol-based determination of the boundaries of the right of possession was carried out on the basis of direct surveying measurements on the ground. On the basis of the results of these measurements, the establishment of a land registry was carried out, mainly in much of the former Russian partition. However, this was not accompanied at the time by the regularisation of property rights to real estate. The next important stage in the regulation of the legal status of real estate in Poland began with the enactment of the provisions of the Act of 26 October, 1971 on the Regulation of Ownership of Farms (Act, 1971). The Act was intended to regulate – on a one-time basis and at the state's expense – the titles to real estate in favour of the owners, i.e. farmers who had been using agricultural land as freeholders for years, and who had not yet had their titles regularised. The farmer took ownership of the used land under the law (*ex lege*), as long as he had been the spontaneous possessor of the land continuously for five years (acting in good faith) or for ten years (if he acted in bad faith). The document confirming title to the property was the so-called 'Land Title Deed', which had the rank of an administrative decision. In addition, cartographic documents, the so-called 'survey outlines', were created at the time and measurement and classification registers were established, with the final result being the preparation of a registration map.

Unfortunately, the determination of ownership carried out in the 1960s and 1970s was based solely on the official documents presented by the interested parties. In doing so, the surveyor was not obliged to conduct meticulous investigations to determine the person who owned the land. It was up to each interested party themselves to prove their rights to the land if they had the relevant documents to do so. If the doc-

uments were not provided, or if they contradicted each other or were questionable, the surveyor put the name of the owner, i.e. the person actually using the land, on the record. Such an incomplete legal status, resulting in many conflict situations, prevailed in Poland in the areas of the former Russian partition until the turn of the 20th century.

In 1989, Poland underwent a political transformation bringing independence from the Soviet influence and a gradual adaptation of the economy and infrastructure in Poland to European standards. The final result of this process was Poland's accession to the EU in 2004. In the field of geodesy and cartography, the issuance of the Geodetic and Cartographic Law (Act, 1989) in 1989 and the issuance of the Regulation on land and building registration (Decree, 2001) in 2001 were significant. From the 1990s to 2004, no significant activities leading to large-scale improvement of the quality of the cadastre database took place, mainly for financial reasons. There were, of course, continual individual updates of the cadastre base, but these were not mass activities. The breakthrough came only in 2004, when Poland was admitted to the EU, which resulted in an influx of funds for infrastructure development. The digitisation of analogue cadastral maps began at that time and moved rapidly, often combined with a comprehensive modernisation of the cadastre resource (Cienciała and Florek-Paszowski, 2019). The major project that led to the modernisation of the cadastre database and the integration of its resources with other public registers was the development of the Integrated Property Information System (ZSIN). The aim of the project was to improve the functioning of the public administration and the quality of the real estate cadastre data, bringing it into line with the current legislation, and harmonise the cadastre datasets with other public registers. The preparatory stage of the project began in 2010, as a result of the introduction of the Spatial Information Infrastructure Act (Act, 2010): stage I of the ZSIN project lasted until the end of 2015, and stage II covered the years 2015–2020. Within the framework of these projects, large-scale modernisation of the cadastre in Poland and digitisation of the geodetic and cartographic resource, including the cadastre, took place. The total cost of stage I of the ZSIN development was PLN 74 million, of which PLN 62.9 million came from EU funding (newsletter: <http://www.gugik.gov.pl/projekty/zsin-faza-i>). The value of the ZSIN – stage II project is over PLN 92 million, of which the EU contribution is over PLN 78 million. In parallel with the ZSIN projects, open cadastral data resources such as Web Map Service (WMS) and national geoportal, regional geoportals have been developed in Poland since 2010.

2.5 Development of the cadastre in the post-war period in Ukraine

In Ukraine, for almost half a century between 1939 and 1991 (with the exception of the German occupation of 1941–1944), the mapping of the territory of western Ukraine took place under Soviet rule. Chronologically, the first Soviet-era topographic plan of Lviv was issued by the Red Army's Military Topographic Service at the Saratov Military Cartographic Factory in February 1944. The military topographic plan at a scale of 1:15,000 was compiled on the basis of photographic plans at a scale of 1:20,000, and aerial photographs from 1941, using selected material available (current) as of January 1944. The list of military-industrial sites and monuments of the city is given according to the state of 1939. The publication of the plan at the beginning of 1944 testified to the early preparation of the cartographic support of the Soviet troops before the liberation of the city.

In September 1947, a military topographic plan of Lviv at



Figure 12. Fragment of a schematic city plan (Sossa, 2020)

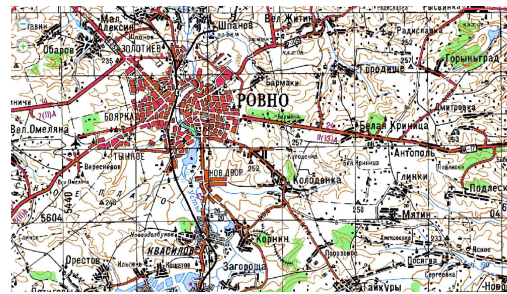


Figure 13. Fragment of a topographic map (Sossa, 2020) (http://www.etomesto.ru/map-genshtab_m-35)

a scale of 1:10,000 was published. The plan was based on the Polish plan of 1938 with reconnaissance (field intelligence) carried out in 1944–1945 and published by the Kyiv Military Cartographic Factory (Figure 12).

The affiliation of Ukrainian topographic, surveying and cartographic departments in the USSR to the military-industrial complex from the second half of the 1960s had a major impact on the creation of cartographic materials of cities in the Soviet era. On the one hand, the priority of financing surveying and cartographic work was evident, while on the other hand the unjustified secrecy of cartographic information and the regime restrictions on the creation and use of maps were apparent. During this period, surveying and cartographic activities were gradually monopolised by the state. The Civil Cartographic and Surveying Service, represented by the Main Directorate of Geodesy and Cartography under the USSR Council of Ministers (GUGK), provided topographic maps of the USSR area at scales of 1:10,000 and 1:25,000, including urban settlements, and published maps for the public at these scales. Topographic plans at scales of 1:5,000 and 1:2,000 were marked 'Secret' and maps at scales of 1:1,000 and 1:500 were marked 'For official use' – Figure 13 (Sossa, 2020).

During the Soviet era, all land resources in Ukraine were owned by the state, and real estate (buildings, structures) could be owned by the state or privately owned, depending on their use. Therefore, during this period, all cadastral information focused on land data (information). Cartographic documents during the Soviet era were merely graphical representations of the land area on paper, presented in the local coordinate system and executed in the form of plans, maps, charts, cartograms and other documents. These cartographic materials formed the basis for the creation of descriptive documents for registered land. These documents, divided into basic, subsidiary and primary, were the basis for the land cadastre. These records were divided into sections covering accounting and reporting. The accounts included accounting by category of land and its func-

tional use, enterprises, institutions, organisations and citizens. Real estate objects (houses, flats) of private property were registered in the record books of enterprises, which were established for technical inventory, expertise, record-keeping and accounting. At that time, two separate, unconnected cadastres were created and continue to function in Ukraine: the land cadastre, which includes land, and the real estate cadastre, which includes the real estate located on it.

Ukraine's gaining of independence in 1991 resulted in the adoption of a number of normative documents, such as: 'On Agrarian Reform' (Act, 1990), 'On Forms of Land Ownership' (Act, 1992a), the Land Code of 1992 and 2002 (Act, 2001). The concept of denationalisation and privatisation of enterprises, land and housing was established, and redistribution of land ownership and privatisation of real estate was regulated. The management of the cadastre is regulated by the Law of Ukraine 'On the State Land Cadastre' (1993 and 2012) (Act, 2021), and 'On the Basics of Urban Planning' (Act, 1992b). The procedure for maintaining the State Land Cadastre (1993 and 2012) set out in the Resolution (Act, 2012) regulates the creation of the State Land Cadastre (land) and Urban Cadastre (for settlements) of Ukraine.

The period of privatisation in Ukraine between 1992 and 1998 was characterised by the legalisation of property rights with the issuance of title documents to real estate, but without adequate security (updating of data) in geodetic and cadastral databases. In 1997 with the adoption of the 'Programme for the creation of an automated system for the maintenance of the state land cadastre' (Act, 1997), a new approach was adopted in Ukraine with maximum automation of the generation of information in the real estate cadastre.

2.6 A brief conclusion of the real estate cadastre development in Poland and Ukraine

The course of the development of cadastral information in Poland and Ukraine is summarised in Table 1. Historical events influencing the development of the cadastre are also identified.

As can be seen from the list in Table 1, starting from the 2000s, the border between the areas of the former Austrian and Russian partitions in Poland began to blur in terms of geodetic and cartographic materials, especially cadastral maps maintained in district geodetic and cartographic centres. The time of digitisation of the resource has begun. However, archival, site-specific materials are still stored and used during works related to the regulation of the legal status of real estate, and especially in the event of boundary disputes.

In Ukraine, at milestone of the development of a modern real estate cadastre was the independence and sovereignty regained in 1991.

3 Open Spatial Data - Development of Geoportals in Poland and Ukraine

Historical conditions and geographical location have had a direct and indirect impact on the development of geoportals, both in terms of the quantity and quality of the data they contain. The development process of open cadastral databases is outlined below.

Note: The thematic scope of the national geoportal in Ukraine is presented in great detail due to the fact that it is currently unavailable online, due to the hostilities in Ukraine.



Figure 14. Geoportal in the European Union countries introduced by the INSPIRE Directive (Source: <https://inspire.ec.europa.eu/inspire-your-country-map/27543>)

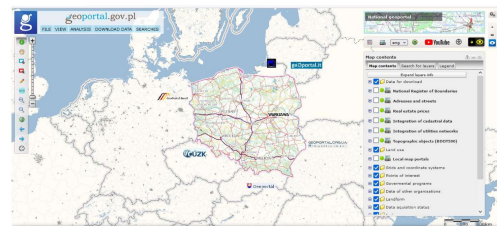


Figure 15. Visualisation of open data for Poland on the website: www.geoportal.gov.pl

3.1 Geoportals in Poland

Poland's national geoportal

In 2004, Poland joined the European Union (EU). As a result, the voivodeships received funding for the digitisation of analogue land registry maps. Subsequently, in 2007 in the European Union countries, the INSPIRE Directive (INSPIRE, 2007) introduced free public access to spatial data services (Reczyńska and Hanus, 2020). The digitisation of real estate cadastre material and preparation for launching the Web Map Service (WMS) – <http://inspire-geoportal.ec.europa.eu> (Brönimann et al., 2013) began. The INSPIRE Directive introduced an obligation for EU Member States to provide Open Government Data (Figure 14).

In Poland, access to open geospatial data was given to the general public in 2011 (Act, 2010). Since then, the publicly accessible resource made available at www.geoportal.gov.pl has been successively expanded (Figure 15) (Balawejder et al., 2016; Ogryzek et al., 2020).

In recent years, there has been a great deal of dynamism of change in the Polish legal foundations concerning land surveying and related issues (Bieda et al., 2013). The Regulation on land and building registration issued in 2001 (Regulation, 2001) was amended several times in the following years (in 2013, 2015, 2017, 2019, 2021) (Regulation, 2021). Subsequent amendments to the Regulation introduced considerable changes that had a significant impact on the real estate cadastre base. Unfortunately, on more than one occasion, legislative changes resulted in partial loss of validity of the data contained in the real estate cadastre database. Consequently, subsequent modernisations of the land register were necessary in order to adapt the cadastre to the current legal status.

Widespread access to the data makes it possible to use it extensively in various fields of science. On 31 July, 2020, the legal basis in this respect was updated through an amendment to the 'Geodetic and Cartographic Law' (Act, 1989). Fees for the provision of many types of data have been waived, for example in the field of:

Table 1. Real estate cadastre formation in Poland and Ukraine (Source: own elaboration.)

The time interval	Historical event influencing the development of the cadastre	Poland		Ukraine
		Areas of the former Austrian partition	Areas of the former Russian partition	
up to 1918	Primary Archives and Other Cadastral Materials	1817–1918 A large amount of archival materials, but chaotically kept, with a large number of errors. Map at a scale of 1:2,880	1863–1918. Virtually no coherent archival cadastral materials	From 1772 to 1806, the first topographic work (determination of the position of reference points by triangulation) was started. Map at a scale of 1:2,880. Between 1869 and 1886, the Military Geographical Institute carried out work to update the triangulation network.
1918–1960	The initial establishment of the land register. Change of the border between Poland and Ukraine after the end of World War II in 1945.	Carrying out cadastral supplementary and reambulation surveys.	Preparation of land plans of selected villages. Land parcelling.	Continue triangulation surveys with more accurate survey instruments.
The 60s and 70s of the 20 th century	Issue of Land Deeds	Entry into force of the Act of 1971 on regulating the ownership of farms. Determining the boundaries of the right of ownership (without full regulation of the ownership of real estate), establishment of measurement and classification registers, preparation of an evidence map. Failure to regulate the legal status of the real estate.		Nationalisation of the lands of western Ukraine. Creation of cartographic materials by the Central Department of Geodesy and Cartography. Monopolisation of cartographic information by the state and making it secret.
1989–1991	Poland's systemic transformation and independence from Soviet influence. Regaining of independence by Ukraine	The analogue cadastral map in the scale 1:2,880 is still in force in the majority of the area of the former Austrian partition.	An analogue map from the 1960s and 1970s in the area of the former Russian partition is still in force.	Creation of cartographic materials in local coordinate systems.
1992–2001	In 2001 in Poland – Regulation on EGİB	Introduction of digitisation of the EGİB map.		Legalisation of property rights with the issue of documents, without corresponding entries in the land cadastre.
2004	Poland's accession to the European Union	EU funding for the digitisation of EGİB analogue maps.		Operation of two separate cadastres (for land and for real estate).
2007	INSPIRE Directive	Digitisation of EGİB and preparation for Web Map Service (WMS): http://inspire-geoportal.ec.europa.eu		Continuation of previous activities.
2010	In Poland – Law 2010 on Spatial Information Infrastructure	Member EU States Obligation to Open Government Data: www.geoportal.gov.pl		No action related to Open Government Data
2013–2019	In Poland – Change of legal bases – Regulation on EGİB 2013, 2015, 2019	Cadastral modernisation. The change of the legal basis makes the EGİB database obsolete. Introduction of county Geoportal 2, e.g.: http://powiatlubartowski.geoportal2.pl/map/ , https://powiatrzyszowski.geoportal2.pl/map/		2013 – access to the Public Cadastral Map of Ukraine: https://map.land.gov.ua
2020–to the present	Amendment to the GIK Law Act	Open data – www.geoportal.gov.pl	Orthophotomap in	Access to website* www.geoportal.org.ua . Pilot Project for the City of Lviv on the Creation of a National Geospatial Data Infrastructure: https://gis.loda.gov.ua/map/land-cadastre#map

* In view of Russia's aggression against Ukraine, which began on 24 February 2022 and continues to this day, the Ukrainian authorities have decided to withhold the website on which the above-mentioned geoportal is run.

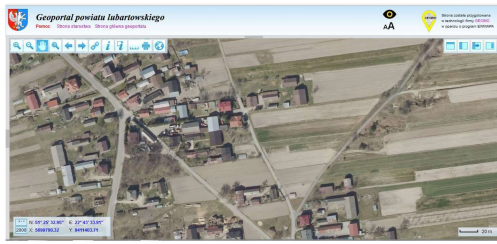


Figure 16. Visualisation of the orthophotomosaic database (Source: <http://powiatlubartowski.geoportal2.pl/map/>)



Figure 17. Visualisation of the orthophotomosaic database (Source: <https://powiatrzyszowski.geoportal2.pl/map/>)

- orthophotos,
- elevation data (including point clouds and numerical terrain models from airborne laser scanning),
- databases of topographic objects (BDOT10k),
- core networks.

In addition, until the COVID-19 outbreak, the current and archived orthophotomosaic is an open and free database (Act, 2020). Currently, the open dataset is an orthophotomosaic obtained from the resources of the Central Office of Geodesy and Cartography. This database is systematically updated with smaller and smaller pixels size, both in terms of RGB and CIR composition. County geoportals are created on its basis.

Districts geoportal in Poland

District geoportals in Poland are created on the basis of the Act of 4 March 2010 on spatial information infrastructure (Act, 2010). In contrast to the National Geoportal, the district geoportals in Poland are called Geoportal 2. Examples of two county Geoportals 2 are shown in Figures 16 and 17.

Data made available through the county geoportal 2 constitute access to services (search service, view service) as referred to in Article 9, paragraph 1, points 1 and 2 of the Act of 4 March, 2010 on spatial information infrastructure (Act, 2010) for spatial data sets maintained by the Starost (the head of the executive body of the district [powiat]). The information contained in the geoportal 2 of the county, as well as the printouts generated from it, do not constitute documents in administrative and other proceedings. They only have an illustrative character and can only be used in the scope of approximate identification and spatial location of the land and building register objects and objects in other databases.

3.2 Geoportals in Ukraine

Ukraine's national geoportal

For Ukraine, the publicly accessible resource is run on the website www.geoportal.org.ua. Due to Russia's aggression against Ukraine, which began on 24 February 2022 and has continued to this day, the Ukrainian authorities decided not to make the website on which the above-mentioned geoportal is run publicly accessible. A new system for maintaining the cadastre

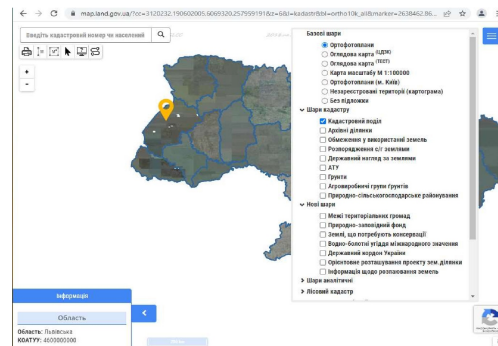


Figure 18. Public Cadastral Map of Ukraine (Source: <https://map.land.gov.ua/>)

was being developed there, with maximum automation of the creation and display of information in it (Act, 1997).

In 2013, the so-called process of digitalisation of land cadastre materials began in Ukraine, opening access to the Public Cadastral Map of Ukraine. The main ideas for the creation of a public cadastral map were the recommendations of the International Organisation of Surveyors (FIG) on the development of cadastral systems in the work 'Cadastre-2014: a vision for cadastral systems of the future'. This included changing the role of cartographic materials in the running of the cadastre and providing optimal services based on them. This can be achieved by combining information from different information resources (land cadastre, real estate cadastre, geodetic and cartographic resource) and providing universal services on a general basis. The structure of the service is very simple and convenient, represented by a single web page (Figure 18).

There are 23 information layers on the public cadastral map. Among these are layers that do not contain information from the state land cadastre and are intended to facilitate navigation on the map when searching and viewing information: 'Overview map (CDC)', 'Overview map (TEST)', 'Map at a scale 1:100,000', 'Orthophotoplans (Kiev)', 'Soils', 'Regional Centres', 'Snap Location', 'Conditional Coastal Protected Strip', 'Forests', 'Nature Reserves', 'Special Permits', 'State Land Supervision', 'Mineral Deposits', 'Oil and Gas Wells'.

The Overview Map (TEST) is based on open data from the international online mapping project OpenStreetMap, edited, updated, supplemented and maintained by the administrator of the State Land Cadastre.

Information from the state land cadastre includes the following layers:

- 'Orthophotoplans' developed at a scale of 1:10,000, created on the basis of the agreement between Ukraine and the International Bank for Reconstruction and Development of 17 October, 2003 and in accordance with the Resolution of the Cabinet of Ministers of Ukraine of 17 October, 2012. No. 1051 'On approval of the procedure for maintenance of the State Land Cadastre'. On the basis of this agreement, the project 'Issuance of laws on rural land ownership and development of the cadastral system' was developed in Ukraine, and the Bank provided Ukraine with a financial loan for these purposes.
- 'Cadastral division' is a layer that contains information about the cadastral division of Ukraine – the boundaries of index cadastral maps (green lines) and the boundaries of land parcels (blue polygons).
- 'Areas with geometric errors' is a layer that reflects the boundaries of those parcels of land that have errors in the coordinate values of the boundary breakpoints (the coordinates of the breakpoints of these objects deviate from the values corresponding to their actual location in the field),

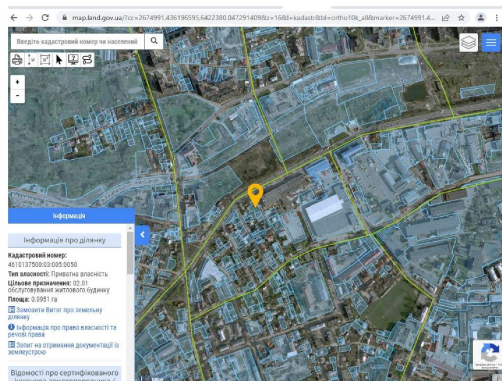


Figure 19. Extract from the presentation of parcels and orthophotoplans on a publicly available cadastral map (Source: <https://map.land.gov.ua/>)

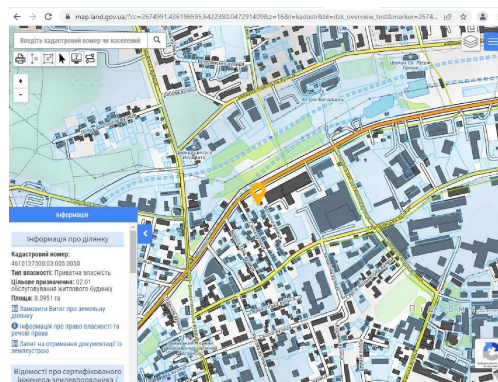


Figure 20. Fragment of the presentation of land plots on the overview cadastral map of the Public Cadastral Map of Lviv (Source: <https://map.land.gov.ua/>)

and for which actions are being taken to correct such information in accordance with the state land cadastre.

- ‘Land use extent’ is a layer that reflects the land use boundaries that are included in the state land cadastre.
- ‘ATU’ is a layer that reflects the administrative boundaries of territorial units of Ukraine (settlement boundaries, districts, etc.), which are included in the state land cadastre.

The information layers are as follows:

- ‘Archive parcels’ is a layer that maps the contours of land parcels that have been given the archive status.
- ‘Agricultural land management’ is a layer that shows (highlighted in blue or green) those land parcels on which certain documents have been issued, such as permission to draw up documentation of land management conditions, or documentation related to land management or approval of land ownership.
- ‘Unregistered land’ is a layer of territories outside settlements (hamlets), for which information is not entered into the automated state cadastre system. The area of unregistered land is calculated by local governments.

An important positive aspect of the Public Cadastral Map is the use of orthophotos as a uniform cartographic base for the entire national territory. Recently, a possibility of uploading maps and satellite images from the Google Maps platform has been added.

As a raster information background for the development of the Public Cadastral Map, both Soviet topographic maps at a scale of 1:100,000 and relatively ‘fresh’ orthophotos, which were created on the basis of aerial imagery in 2011–2012, were used. These are the main cartographic materials of the cadastre, providing verification of the geodetic measurements made and the mapping of new parcels on cartographic materials. Real estate objects located on parcels (such as buildings) are not presented here. Their presentation corresponds to topographic maps from the Soviet period. This is due, as already mentioned, to the separation of the land cadastre and the real estate cadastre.

However, the main information content of the Public Cadastral Map of Ukraine is, of course, land data: boundaries, cadastral number, form of ownership, land use, area. Since 7 October, 2015, a possibility of obtaining information about the owner or user of any land plot has been introduced on the website: <https://map.land.gov.ua> (currently, due to the hostilities, also inaccessible). A set of available filters allows you to find a specific area and the ‘Layers’ panel allows you to select the desired layers of cartographic information. The map includes the traditional tools for navigation and measuring length and area. Of interest is a possibility to add cadastral subdivision or

land location information to projects carried out in ArcMap or GIS software (Figures 19 and 20).

Summarising the construction of the geoportal in Ukraine, the fact that land cadastre data is publicly available is definitely positive from the perspective of a potential user. However, there are a number of shortcomings, among which the main one should be noted: it happens that land plots are located in the wrong place and there is an overlap or gaps between land plots. These errors have resulted from the use of different coordinate systems and the lack of a uniform reference system when conducting surveying work for the creation of the real estate cadastre. Ukraine has been using the SK-42 coordinate system and its derivative SK-63, which are the basis for local coordinate systems, for more than 70 years now. Currently, there are 1,146 local coordinate systems in Ukraine. The establishment of a uniform topographic and geodetic base would help to avoid a significant number of errors in the location of plots.

Taking into account the experience of the leading countries in the world, Ukraine has embarked on creation of a single geodetic network using satellite methods for its construction. The implementation of the USK-2000 coordinate system (Resolution of the Cabinet of Ministers of Ukraine ‘Some issues related to the use of the geodetic coordinate system’ dated 22 September, 2004, No. 1259) will ensure high accuracy in determining the coordinates of the state geodetic grid, within 2 – 3 cm within the country; in addition, there will be a transition from 1,146 local coordinate systems to 27 regional coordinate systems. The State Service of Ukraine for Geodesy, Cartography and Cadastre is taking steps to correct errors contained in the State Land Cadastre. A separate information layer ‘Areas with geometric errors’ has been created on the Public Cadastral Map, which displays parcels of land that have a locational collision with other parcels of land (e.g. overlapping). In addition, a mechanism has been developed to eliminate these errors.

In connection with the administrative reform, problems have arisen with regard to providing the newly established territorial communities with reliable information about land and its resources, cadastre objects and properties, as well as the correctness and accuracy of their presentation. The country’s activities are directed towards the digitisation of all data, and the construction of the National Geospatial Data Infrastructure (<https://nsdi.gov.ua>). The main objective of its creation is to meet the growing needs of society for all types of geographic information, to increase the efficiency of geospatial data development, and the application of GIS technologies in the context of sustainable development of society. The structure and elements of the national geospatial data infrastructure include a set of unified regional, sectoral and cross-sectoral informa-

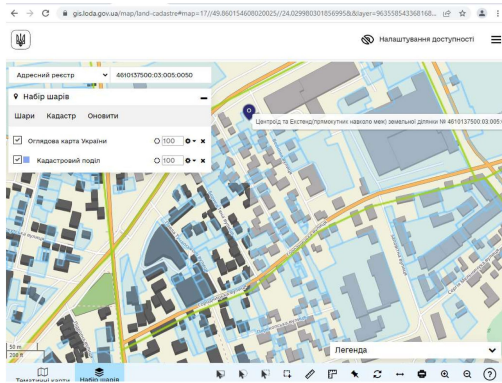


Figure 21. Fragment of the Geoportal of the urban cadastre of the city of Lviv (Source: <https://gis.loda.gov.ua/map/land-cadastre>)

tion systems, based on GIS technologies, using and producing unified geo-information resources employing a single digital topographic and geodetic database and a single system of technical regulations, standards, classifiers and data codifiers.

District geoportal in Ukraine

Pilot projects of a nationwide geospatial data infrastructure portal are being tested in Ukrainian cities, particularly Lviv. The urban cadastre geoportal of the city of Lviv presents a cadastral map that shows the size of plots of land, buildings and structures and other natural resources (Figure 21).

The project envisages that the geospatial data of the national geospatial infrastructure will be stored in the National Geodetic Coordinate System USK-2000 and the Baltic Altitude System of 1977. In the establishment, operation and development of the national geospatial data infrastructure, the requirements are accepted of the international standards of the ISO 19.100 series ‘Geographical Information/Geomatics’ and the national standards for geographic information, meeting the requirements of the national standard DSTU ISO 19157:2013 – ‘Geographic Information. Geospatial data quality’. Descriptive information is included in the metadata and geospatial data specifications.

The Geoportal will provide information on layers. The cadastre layer will allow information on parcel boundaries, their geospatial data and much more to be made available. Geospatial and cadastral data will be collected in the National Data Infrastructure and visualised on the Public Cadastral Map. In addition, information on the administrative and territorial structure of the city of Lviv, spatial development, cultural heritage, urban planning documentation, regional spatial planning and civil protection will be made available. The portal contains more than 500 data sets of various types. This data will be automatically uploaded to the Unified State Web (a unified open data portal): <https://data.gov.ua>. The construction of such a system will ensure the openness of geospatial data, bringing it down to a single digital topographic and geodetic database, which will ensure the accuracy of geodetic measurements, the openness of coordinates of land parcel boundaries, buildings and structures and other information, as well as the updating of cartographic materials.

The main socio-economic beneficial consequences of the introduction of the unified geodetic datum should be considered as the radical restructuring of the geodetic, cartographic and navigational support of the territory of Ukraine and the rapid integration into the world scientific space. The practical value of the introduction of the unified geodetic datum is also a possibility of effective use of GNSS (Global Navigation Satellite Systems) technologies in geodetic measurements, which have a

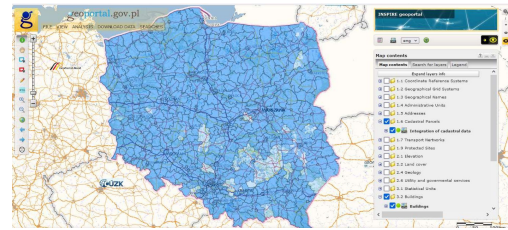


Figure 22. INSPIRE geoportal in Poland (Source: <https://inspire.ec.europa.eu>)

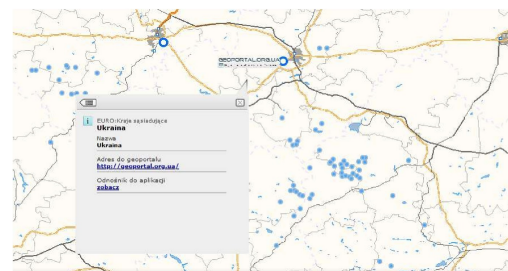


Figure 23. INSPIRE geoportal in Ukraine (Source: <http://geoportal.org.ua>; the online version of Ukraine’s geoportal is temporary shut down due to the on-going war)

number of advantages over traditional measurement methods.

3.3 Comparative analysis of the availability of current open information contained in Geoportals in Poland and Ukraine

The INSPIRE Directive (INSPIRE, 2007) imposed an obligation on EU member states to implement at least ISO 19.100 standards. In Poland, based on the INSPIRE Directive (INSPIRE, 2007), the law of 4 March, 2010 on spatial information infrastructure was introduced and the ‘Spatial Data Themes’ were written in the Annex (Act, 2010). These themes are shown in Table 2 and Figure 22. Ukraine, although not a member of the European Union, is attempting to follow the guidelines.

For Ukraine, the obtained research results are practically realised in the developed national standard of Ukraine DSTU 8774: 2018 ‘Geographical information regulations of geospatial data modelling’, which is the Ukrainian translation of the international standards ISO 19.100 ‘Geographic Information/Geomatics’. By doing so, it ensures the integration of Ukraine into international structures for the creation of an open information society and a unified European Geospatial Data Infrastructure and Global Geospatial Data Infrastructure. These topics are presented in Table 2 and Figure 23.

In the provided Table 2, ‘Spatial data themes’ [ISO Standard 19.100] (Act, 2010) are the same for Poland as for Ukraine. The Geoportals for Poland – www.geoportal.gov.pl and for Ukraine – www.geoportal.org.ua (the website currently not available) have compatible layers – 36 of those in total. As detailed research shows, in Poland, data on 21 thematic layers are publicly available; and in Ukraine on 15 thematic layers, respectively. Poland lacks open data on: Hydrography, Orthoimagery, Soil, Human Health and Safety, Agricultural and Aquaculture Facilities, Atmospheric Conditions, Meteorological Geographical Features, Oceanographic Geographical Features, Bio-geographical Regions, Habitats and Biotopes, Species Distribution, Energy Resources and Mineral Resources. In contrast, Ukraine lacks open data on the same thematic scopes as in Poland, and additionally on: Protected Sites, Geology, Land Use, Utility and

Table 2. Spatial data themes – Comparative analysis of ISO 19.100 implementation *

No.	No. layers	Expand layers info	Polish Geo-portal	Ukrainian Geo-portal
1	1.1	Coordinate Reference System	1	1
2	1.2	Geographical Grid Systems	1	1
3	1.3	Geographical Names	1	1
4	1.4	Administrative Units	1	1
5	1.5	Addresses	1	1
6	1.6	Cadastral Parcels	1	1
7	1.7	Transport Networks	1	1
8	1.8	Hydrography	0	0
9	1.9	Protected Sites	1	0
10	2.1	Elevation	1	1
11	2.2	Land Cover	1	1
12	2.3	Orthoimagery	0	0
13	2.4	Geology	1	0
16	3.1	Statistical Units	1	1
17	3.2	Buildings	1	1
18	3.3	Soil	0	0
19	3.4	Land Use	1	0
20	3.5	Human Health and Safety	0	0
21	3.6	Utility and Government Services	1	0
22	3.7	Environmental Monitoring Facilities	1	1
23	3.8	Production and Industrial Facilities	1	1
24	3.9	Agricultural and Aquaculture Facilities	0	0
25	3.10	Population Distribution and Demography	1	0
26	3.11	Area management, Restriction, Regulatory Zones and Reporting Units	1	1
27	3.12	Natural Risk Zones	1	0
28	3.13	Atmospheric Conditions	0	0
29	3.14	Meteorological Geographical Features	0	0
30	3.15	Oceanographic Geographical Features	0	0
31	3.16	Sea Regions	1	1
32	3.17	Bio-geographical Regions	0	0
33	3.18	Habitats and Biotopes	0	0
34	3.19	Species Distribution	0	0
35	3.20	Energy Resources	0	0
36	3.21	Mineral Resources	0	0
Total			21	15

* Source: own elaboration based on data from Act (2010) and <https://map.land.gov.ua/>

Government Services, Population Distribution and Demography and Natural Risk Zones.

4 Discussion

All data concerning cadastral parcels – defined as a continuous volume of land identified by a unique set of homogeneous property rights – should be maintained in an easily accessible repository that clients and staff can quickly browse, query, and update. Therefore, publicly accessible geoportals are of great value and are even essential for any human activity. In European countries, the INSPIRE Directive (INSPIRE, 2007) introduced access to open geospatial data, and this data is available on websites in many countries (Cienciała, 2018). Thus, Belgium's geoportal has been written about Belgium (Kotsev et al., 2015), the Czech Republic (Janečka and Souček, 2017), Germany (Abramic et al., 2017), Italy (Capolupo et al., 2021; Ogryzek et al., 2020), Poland (Balawejder et al., 2016; Bieda et al., 2020; Dawidowicz et al., 2020; Ogryzek et al., 2022; Szopińska et al., 2022), Slovakia (Buško et al., 2022), Turkey (Çoruhlu and Çelik, 2022) and Serbia (Radulović et al., 2017).

Scientific research and analysis of the geoportal in Ukraine is not found in international scientific publications, perhaps because Ukraine is not part of the European Union – hence this study may be one of the first, and due to the ongoing war, access to data may be limited for some time. In order for the answer to be substantively grounded, it seems reasonable to compare the achievements in the construction of open cadastral information of the two analysed countries (Poland and Ukraine) with countries that were never under partition, their statehood was not threatened, and the change of power usually took place in a democratic manner, i.e. France, Switzerland, Spain and Italy, and others (see e.g.: (Gao et al., 2023; Macedo and Lemos, 2022; Wang and Shepherd, 2020)).

France

In one such country mentioned above, France, the construction of a unified cadastre for the entire territory of the state began as early as the end of the 18th century, when the Constituent Assembly, by the Act of 1 December, 1790, abolished the previous declaratory tax burdens, replacing them with a single property tax. Effective work has been carried out to ensure that the cadastre performs the following functions: fiscal, legal, documentary and technical. Since 2008, cadastral maps have already been able to be viewed free of charge on the Internet via the Service de Consultation du Plan Catastral (SCPC). This free service makes it possible, among other things, to obtain an extract from the cadastral map, a list of the relevant plots of land with their address and area, and a map of their location (Antoine, 2007; Ruijter et al., 2020).

Switzerland

Also in Switzerland the construction of the cadastre began during the Napoleonic era, but initially in the various cantons separately. However, as early as 1864, several cantons initiated the harmonisation of cadastral information by creating the so-called 'Geometerkonkordat' (geometer concordat). The final result is the fact that in 2018 a 3D Geoportal for the whole of Switzerland was initiated. The Swiss mapping agency SWIS-STOPO has completed the 3D building model for the entire country, from which point on users have had almost unlimited access to the Swiss 3D Geoportal (Hersperger et al., 2022) (<https://www.swisstopo.admin.ch>, <https://www.cadastre.ch>, <https://geoforum.pl>, <https://www.geoportal.ch>).

Spain

Another country with developed access to cadastral information is Spain. Similarly to many other European countries, Spain started to develop a property cadastre as early as the 18th century. In 1715, by decree of King Philip V of Bourbon, the Patino Catalan cadastre was introduced, covering some 32,000 km² or 6.3% of Spanish territory. In 1749, by decree of King Ferdinand VI, the Ensenada cadastre was introduced for the 22 provinces of the former Crown of Castile, which covered 70% of the current Spanish territory, and the Planimetría General de Madrid. At present, the Spanish cadastre characterizes by a division that corresponds to the assumptions of the Integrated Cadastral System (Modelo unificado de catastro). The cadastral data are collected by the Internet Cadastral Service (Sede Electronica del Catastro) (Femenia-Ribera et al., 2022; Nava et al., 2022).

Italy

The final cadastre included for comparison is the Italian cadastre. This was implemented through the subsequent creation of two separate subsystems: the first – the so-called Catasto Terreni (Land Cadastre) – containing a list of all rural properties and undeveloped plots of land; the second – called Catasto Edilizio Urbano (Urban Building Cadastre) – covering buildings for civil, industrial and commercial use. The ‘establishment’ of the land cadastre, provided for by Law no. 3682 of 1 March, was completed in 1956. The Regulation for the ‘maintenance’ of the cadastre was approved by Royal Decree no. 2153 of 8 December, 1938. The land cadastre contains information on both the geometric nature and the technical-economic characteristics. (<https://www.agenziaentrate.gov.it/portale/documents>; accessed 26.07.2022).

The National Cartographic Cadastral Geoportals is currently maintained (<https://geoportale.cartografia.agenziaentrate.gov.it>). This is a free online platform that allows easy searching and viewing of cadastral parcels contained in the cadastral map, without the need to download software. Legislative Decree No. 1.32/2010 implements the INSPIRE Directive for metadata in Italy and has become the national infrastructure for spatial and environmental information (Ogryzek et al., 2022). The geoportals provides access to 100 thematic layers. The user can choose from five background maps – these are orthophotos from 1998, 1994, 2000, 2006 and 2012.

5 Additional considerations

With the development of the cadastre in the territories of Poland or Ukraine, it is possible to trace the development of technology and, consequently, of cadastral cartographic documentation. The beginnings of the Austrian cadastre in the Polish territories were connected with the creation of cadastral maps (Figure 24); cadastral maps were created in Galicia on the basis of field measurements, conducted with the help of a topographic table between 1844 and 1854, mainly at a scale of 1:2,880. Subsequent changes were introduced to the original cadastral maps, hence their gradual loss of legibility. Due to the poor technical condition of cartographic materials dating from the 19th century, efforts were made in Poland to reproduce some of them (initially still in an analogue form) in order to preserve the legibility of the map content (Figure 25).

Nowadays, in the era of digitization, archival cadastral maps does not look in their original state (see Figure 24), however, still serve as starting material during the process of regulating the legal status of properties. They are then subject to vectorisation and constitute comparative material in the current state of the geodetic and cartographic resource (Figure 26). The next



Figure 24. Cadastral map from the Austrian partition

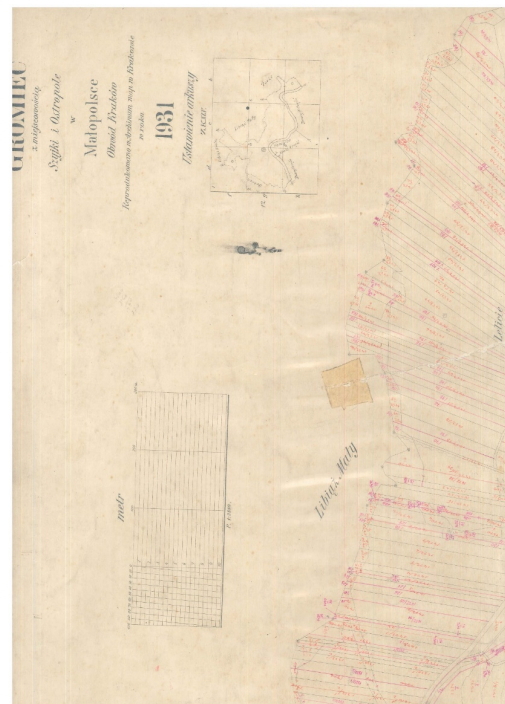


Figure 25. Archival cadastral map reproduced in an analogue from in 1931

stage of cadastral cartographic documentation development – occurring in Poland in the 1960s and 1970s – was connected with the emergence of cadastral maps in an analogue form on a considerable part of the Polish territory (Figure 27). It was only in the 2000s, with the development of digitisation, that digital cadastral maps began to dominate (Figure 28).

The culmination of this process of cartographic development in the field of the real estate cadastre are geoportals, on which cadastral information is presented. However, it should be borne in mind that data from geoportals can only play an illustrative and auxiliary role, while the only legally binding state of knowledge about real estate is the data collected in the state geodetic and cartographic resource.

6 Conclusion

Based on the analysis regarding the question – Do geographic location and historical conditions affect the quality and availability of open cadastral data?, the answer is a clear: Yes, geographic location and historical conditions can affect the quality and

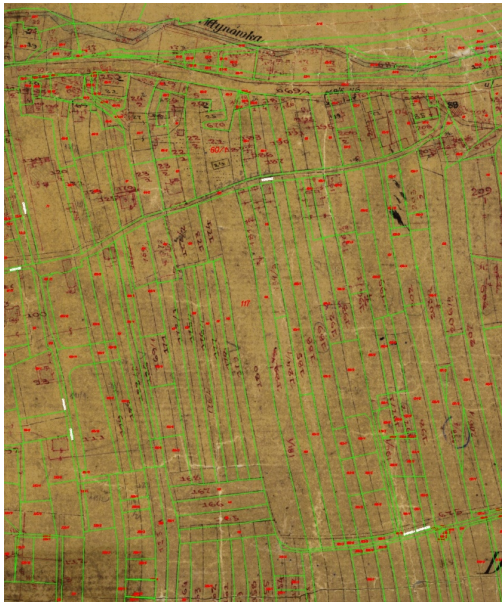


Figure 26. Example of vectorisation of an archival cadastral map

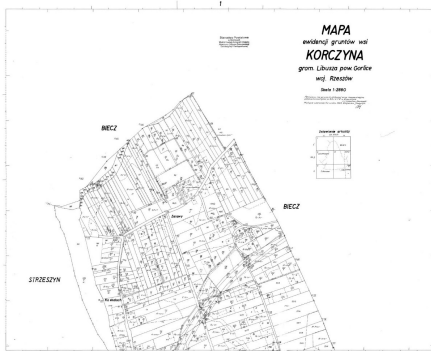


Figure 27. Analogue cadastral map of 1968



Figure 28. Scan of the 2013 cadastral map in digital form

availability of open cadastral data. The very comparison between Poland and Ukraine, i.e. countries that have historically been under the jurisdiction of other countries due to their geographical location, shows that the country (Poland) that gained independence and self-determination earlier has significantly more developed access to an open cadastral database. Unfortunately, both countries are still lagging behind the countries that which were not subordinated. However, it should be noted that being under the jurisdiction of other countries has not stopped the process of lagging behind itself but slowed it down. Unfortunately, Ukraine, which has been ruthlessly attacked by the Russian Federation, will again stunt its development in this respect. This only confirms the thesis set out in the title of the article that geographical location and historical conditions are of definite importance in the development of open cadastral resources, and that without these resources development is significantly hindered.

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