



Research paper

Technical and legal aspects of introducing strata ownership in Poland

Szczepan Budkowski¹

Abstract: The real estate cadastre is currently available as the core of the land management system. Cadastral maps resulting from the presentation of complete and comprehensive information about the purpose of presenting the rights and rights of their owners and rulers. The scope of this research, both in Poland and abroad, shows that the legal projection carried out on two-dimensional maps cannot be integrated, overlapping properties, therefore it is extended to three-dimensional space. The purpose of the publication is to provide technical and legal analyzes that may cover the introduction of layered products in Poland. The main research includes: understanding the concept of layering, including defining what is a consequence of layering and diagnosing the scope of changes within legal provisions; research on legal provisions and regulations regarding recommendations regarding changes in legal provisions and technical procedures. Scientific research methods concern a holistic product, legal and technical aspects, a review of the subject literature, legal regulations and a case study. Using a manuscript available on the technical and legal platform, in the context of the possibility of implementing a multidimensional cadastre in the Polish legal system. The author's note also concerns the conceptual model of spatial subject data, the registration unit, the extension of the warranty for specific plots, and the setting of milestones for the integration of Ladm, Ifc and CityGml solutions. A new term has been introduced for multi-dimensional, multi-task, relational and synergistic systems, included in integration units with other standards: Smart Cadastre

Keywords: CityGml, spatial plot, land and building records, 3D cadastre, Smart Cadastre, property

¹PhD., Eng., University of Agriculture in Krakow, Faculty of Environmental Engineering and Land Surveying, Balicka 253A, 30-149 Krakow, Poland, e-mail: Szczepan.Budkowski@urk.edu.pl, ORCID: [0000-0002-1806-1173](https://orcid.org/0000-0002-1806-1173)

1. Introduction

The foundations of the concept of a modern real estate cadastre were developed as part of the work undertaken by the Congress of the International Federation of Surveyors (FIG) in Melbourne. The result of the work was the presented vision of the designed cadastre model of the future, which went down in history under the term “Cataster 2014” [1]. The presented concept assumed the creation of modern cadastral systems taking into account the dynamic development of information technologies corresponding to the growing social and economic needs. According to the considerations, the real estate cadastre is to be an important component of analytical systems enabling the operator to work in real time using three-dimensional visualization of data collected in the system. Therefore, in the opinion of the committee operating within the FIG, the cadastre should enable the systematic registration of the full legal status including property rights, limited property rights and rights of an obligation nature, defined in specific provisions. Clear identification in physical and legal space should apply not only to plots, buildings or premises, but also to land development and air plots.

The next stage of the conceptual model of cadastre development was the ISO 19152 standard Geographis Information – Land Administration Domain Model (LADM), which was published by the Polish Committee for Standardization under the number PN-EN ISO 19152:2013-05E. The descriptive standard defined the creation of a reference model of the register, which included information on entities, spatial elements such as type, area, volume assigned to real estate, as well as standardization of terminology. The most important part of the standard should be considered the one relating to its multidimensionality, assuming the existence of spatial units, which included three-dimensional plots whose boundaries were marked by planes.

Despite the passage of time, the multidimensional cadastre in Poland is still in the future. The aim of this manuscript is to analyze the currently existing technical and legal conditions regarding the possibility of introducing strata ownership in Poland. The choice of this topic was caused by the desire to develop one’s own interests, as well as the need to verify hypotheses formulated in studies carried out in the past. The research hypothesis posed in this article concerns the technical and legal possibilities in the context of implementing a multidimensional cadastre as a database of relational and spatiotemporal objects.

2. Materials and methods

This manuscript is part of the trend of considerations aimed at implementing a multidimensional cadastre. The main research method is the analysis of legislation in Poland and research conducted in other countries regarding the broadly understood subject of the cadastre, with particular emphasis on its functioning and implementation. The above-mentioned research method is complemented by a case study covering Polish legislation.

Reports published by international organizations such as the International Federation of Surveyors (FIG) and the United Nations (UN) [2, 3] clearly indicate that the currently used legislative solutions do not keep up with the dynamic development of infrastructure and cause limitations in the management of rights assigned to real estate. The vision of the future cadastre

appears in many studies by foreign authors [4–9] and Polish authors [10–22]. The analysis of the literature on the subject leads to the conclusion that currently used cadastral systems must constantly evolve to meet new trends. Current research by specialists dealing with the functioning of the multidimensional cadastre focuses on geoinformatization of the register, creation of data collection tools, cloud solutions, data management, process optimization and standardization of 3D visualization [1, 23–25]. The need for optimal use of space has become the reason why many countries have decided to introduce the so-called “virtual spatial plot” as a graphic representation of three-dimensional property rights [26–29].

2.1. Register of land and buildings in Poland – current status

According to the legal status in force in Poland, the act regulating land and building records is the Geodetic and Cartographic Law [30] and, as an implementing act, the regulation on the register of land and buildings. According to the definition, the register of land and buildings (real estate cadastre) is a uniform, systematically updated set of data on land, buildings and premises, their owners and other legal persons managing these lands, buildings and premises. The system operates based on a kind of dualism, which means that in addition to the register of records that discloses the actual status, there are also land and mortgage registers that reveal the legal status of the property. The above-mentioned dualism is not only of a formal nature, but also of an institutional nature, due to the fact that land and building records are kept by poviats offices, and land and mortgage registers are kept by land and mortgage courts. The basic units of division of the country are the cadastral unit, cadastral district and cadastral plot. The plot is a continuous area of land located within one district, uniform in legal terms, separated from the space by boundary lines. In addition to geometric data, the database also collects descriptive data such as: plot ID, surface area, land and mortgage register number and land designation confirming ownership. In the case of buildings, the registration requires a numerical description of the building’s outline along with descriptive attributes such as: building identifier, number of above-ground and underground floors and surface area. The land and building register in Poland also provides for the registration of premises, but it should be emphasized that the premises listed therein do not contain information about geometry, but only descriptive information. Moreover, it is important to include in the register only independent premises, which are disclosed on the basis of a starosta’s certificate [30].

In the system of land and building records kept in Poland, the concept of real estate may be defined in two ways. Pursuant to Art. 46 §1 of the Civil Code [31] Real estate includes parts of the earth’s surface constituting a separate object of ownership (land), as well as buildings permanently attached to the land or parts of such buildings if, under specific provisions, they constitute an object of ownership separate from the land. Therefore, real estate may be separated based on legal or physical criteria (on land). Another definition says that real estate is part of the land area for which a land and mortgage register has been kept. The fact of creating a new land and mortgage register is a formal requirement for the existence of real estate and is the basis for determining the legal status.

Requirement for the existence of real estate and is the basis for determining the legal status (Fig. 1).

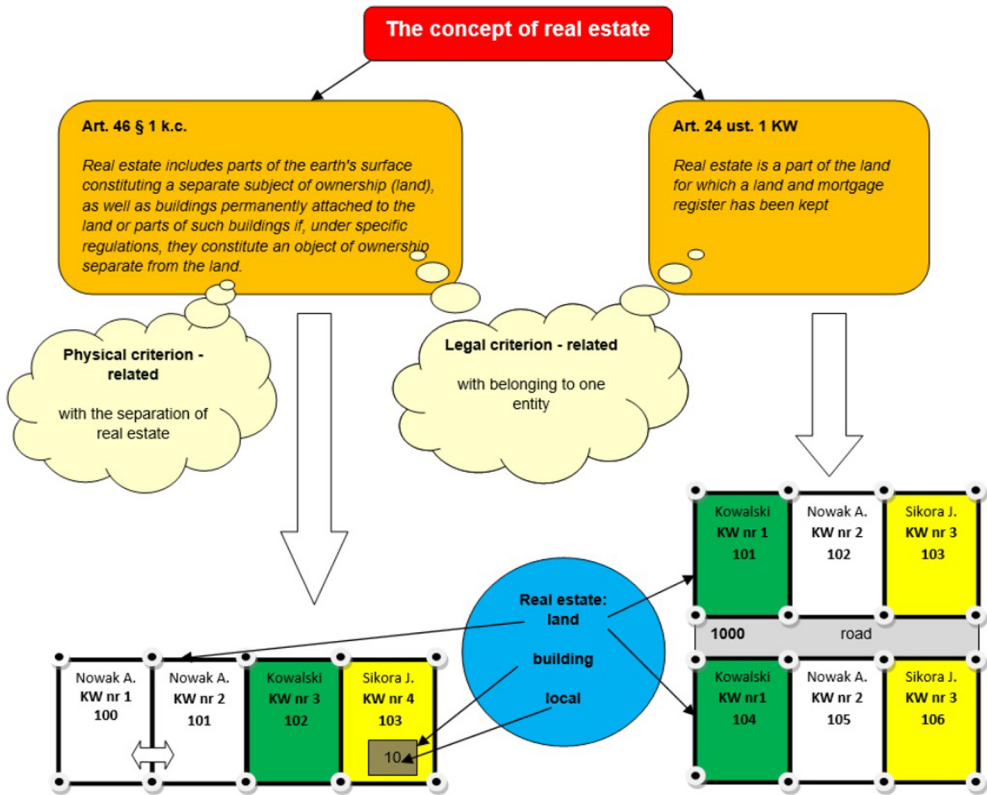


Fig. 1. The concept of real estate in the Polish legal system; Explanation of the abbreviations used: k.c. – Civil Code, KW – land and mortgage register, ust. – paragraph; source: own study

2.2. Strata ownership – government proposals for changes

The need to optimally use the space above and below the ground is currently the main determinant of work towards the creation of new legal regulations creating this possibility. This idea, in the form of the so-called strata ownership, appeared in a document of the ruling coalition published in 2021 entitled “Polish Order” [32]. The document in question demonstrates the need to introduce new legal regulations in order to better use space, especially in large cities, including areas above railway lines. The document does not formulate any specific legal solutions, but its content highlights the need to introduce regulations that will result in a simplification of the investment process thanks to the possibility of easier financing.

The concept of strata ownership has not appeared on the government agenda for the first time. Earlier, in 2012, thanks to interpellation no. 9652 of MP (Member of Parliament) John Godson [33], the topic of changes to civil law provisions was raised, which were to enable the registration of rights in a vertical approach. As part of the interpellation, it was noted that the lack of legal solutions in this area “has a negative impact on the broadly understood economy, as it results in the inability to invest (...).

After many years, the topic of the 3D cadastre returned thanks to the parliamentary group established in August 2020. According to the regulations, the team's tasks include, among others:

- Analysis of issues related to strata property rights,
- Taking positions on matters relating to strata property rights
- Taking initiatives regarding strata property rights.

During two meetings of the team on the introduction of stratified ownership, most of the issues that could arise in the event of the introduction of vertical ownership registration were discussed. Ultimately, however, it is difficult to consider the meetings as a milestone in the development of strata ownership in Poland. Firstly, because it is difficult to resist the impression that the meetings were initiated by the railways. And although there is nothing wrong with PKP's (Joint Stock Company of the Polish State Railways) involvement itself, such important legislative changes should be targeted not only at a narrow group of stakeholders. Another argument is the number of meetings, of which there were only two from the establishment of the commission to December 2023. Another argument may be the fact of focusing, to a large extent, on the project to amend the Civil Code Act, which has existed since 2009 [34]. This approach did not result in an evolution of the issues raised, but on the contrary – it focused mainly on the analysis of previously proposed changes. The said draft Civil Code Act assumes the introduction of development rights into the Polish legal system, which would belong to the group of limited property rights, but would have priority over other limited property rights. According to the assumptions, the law could be established for a period of 30 to 100 years, and its establishment would have to be entered in the land and mortgage register.

It should be noted here that this legal structure is very similar to the existing perpetual usufruct right, which was not planned to be extinguished or replaced at the stage of the project in question. The planned development law would therefore not have a strictly spatial character and would not involve a change in the definition of real estate, and, moreover, such a structure could potentially lead to a quite "original" legal structure. The project showed that a plot of land that had been put into perpetual usufruct could potentially also be encumbered with a development right, which would de facto lead to the elimination of the main idea of the existence of the right of perpetual usufruct. Additionally, the consent of the owner or perpetual usufructuary would not be required to establish separate ownership of premises in buildings erected on the basis of development rights, which could lead to constitutional doubts and a violation of the essence of property rights (Article 64 §3 of the Constitution) [35].

To sum up, the proposal for changes should be considered not very successful, although it is worth appreciating the attempt to take the right direction to meet socio-economic needs.

2.3. Multidimensional cadastre – scope of technical changes

In addition to the legal aspects related to the introduction of a multi-dimensional cadastre presented above, it is also worth noting the need for proper registration of ownership relations, which cannot be presented on two-dimensional maps. Below are selected groups of objects for which the registration of ownership relations on 2D maps is problematic. This is another argument (apart from the investment one) in favor of introducing multidimensional cadastre solutions.

a) Registration of bridges, tunnels and viaducts

The case of registering bridges, tunnels, overpasses and viaducts is one of those that cannot be presented properly on two-dimensional maps. One example is the Kotlarski Bridge in Krakow. The ownership relations presented on the two-dimensional map do not record the fact of the existence of the bridge, which, unlike plots of flowing water, has a different ownership structure. Plots of flowing waters, in accordance with Polish law, are owned by the State Treasury and are managed by the State Water Management Company Wody Polskie (light pink), while the owner of the road over the waters is the Kraków commune, and the road manager is the Kraków City Road Authority – light yellow (Fig. 2).

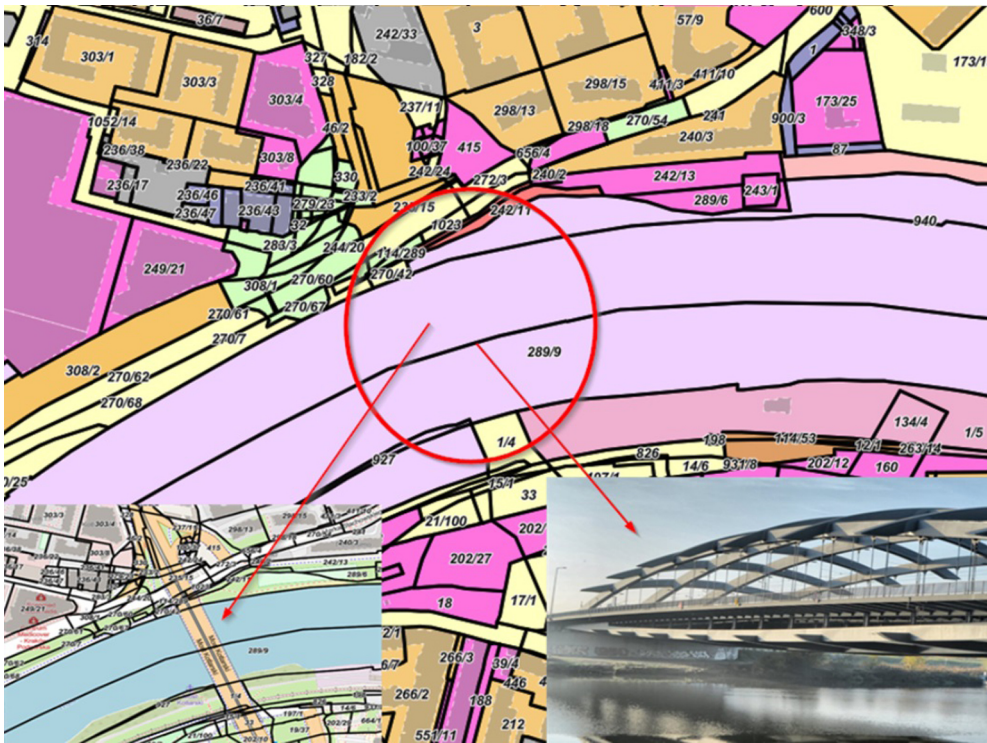


Fig. 2. Kotlarski Bridge in Krakow, ownership structure and site plan; source: own study based on the Kraków Observatory

b) Registration of building structures

An example of a building with a modernist shape is the Aspel hotel building in Krakow, whose correct representation on a two-dimensional map is not possible. Hotel Aspel has a non-standard shape. As the photo shows, the central part of the building has a different number of floors than the rest. The building itself, however, is a uniform solid whose outline in the XY plane, together with the supplemented descriptive attributes, does not properly reflect the shape of the solid. The problem that arises is how to determine the height of the building and, consequently, determine the appropriate number of storeys as a descriptive attribute (Fig. 3).

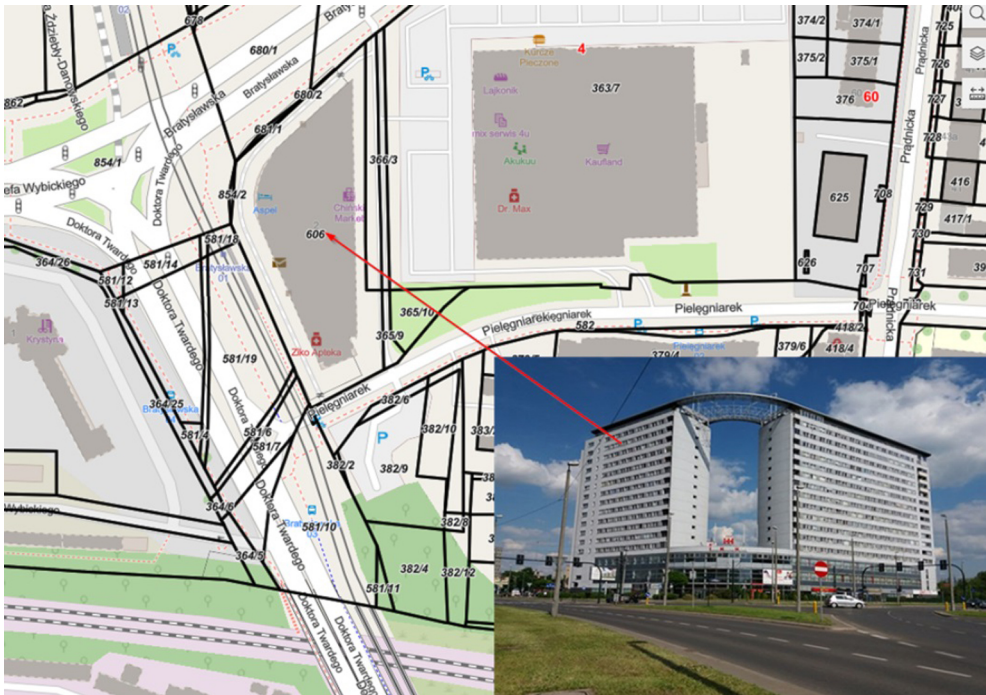


Fig. 3. The building of the Aspel hotel in Krakow at Bratysławska Street; source: own study based on the Kraków Observatory

3. Findings

The analysis of the legislation and the diagnosis of significant technical problems lead to the conclusion that the real estate cadastre, as a legal institution which, in the public perception, is supposed to ensure legal order securing the scope of rights and the security of the subject entries disclosed therein, does not meet social expectations. As the analyzes performed show, the subject data contained in the cadastre do not allow for a clear determination of the scope of rights to the cadastral plots allocated and disclosed in the register. A similar analogy should also be seen in the field of buildings. It often happens that buildings with an irregular character cannot be presented properly on 2D maps, and the uniform shape (in the sense of the foundation structure without expansion joints) of the building does not allow it to be clearly defined using attributes, for example: the number of floors or the function performed. “In the case of buildings (premises) for various purposes, the classification of an object into the appropriate subgroup and type is determined by its main purpose – legal provisions [36], which means that there are buildings that perform more than one function, but this is not reflected in the register kept.

A separate problem is posed by all types of easement rights, which are currently not included in the registration database. Both land and personal easements and transmission easements established pursuant to a notarial deed are subject to entry in section III of the land and

mortgage register. In order to establish the scope of the easement, it is also necessary to prepare a map for legal purposes, on which the scope of the encumbrance will be marked along with a description. However, the report accepted into the resource does not result in the introduction of the scope of easement in the registration database due to the lack of such a possibility in the currently applicable land and building registration model. Therefore, the target model proposes to take into account the registration of rights also from a vertical perspective.

Regardless of the adopted model of operation of the register as a register of land and buildings or a full-fledged real estate cadastre, the results of the conducted research constitute valuable advice regarding the direction of changes undertaken. According to the author of the article, institutional changes are less important, i.e. keeping records by starostas and land and mortgage registers by courts, but the integration of both registers and its consolidation in the form of reference databases is crucial. Thanks to the integration of registers, the real estate cadastre, as an official public register, should ensure unambiguous identification of spatial plots together with the institution of land and mortgage registers, protect property and ensure a sense of security in the area of rights. This is extremely important information that is of great importance in real estate business transactions, in which the systemic legal institution of the cadastre guarantees a clear scope of rights of the owner/controller defined by the scope of boundaries on the land. Such a register should guarantee certainty of the indicated area of plots, buildings, premises, as well as the method of use. The proposed change therefore concerns the creation of a register whose warranty will guarantee the above.

The dominant view in the manuscript is that introducing the concept of spatial real estate into Polish jurisdiction, thus enabling the establishment of separate ownership of objects above or below the ground surface. It will not only contribute to the correct registration of existing facilities, but above all it may constitute an investment impulse for development. It should also be noted that the possibility of creating spatial air plots may be associated with an already existing facility or constitute an "empty" area subject to economic turnover. The right to separate a spatial plot in formal terms should be exercised in civil procedure, in the form of a notarial agreement, and in strictly defined cases under special acts, in administrative mode. An effective legal action should be confirmed by an entry in the land and mortgage register. This structure of the newly functioning law also ensures the possibility of financing future investments by establishing a mortgage in section IV of the land and mortgage register. The analyzes carried out include the view that changes should be of an evolutionary nature over the life of the register, which is why the concepts of strata ownership registration and real estate cadastre are used interchangeably. In the authors' opinion, a modern real estate cadastre should also create the possibility of registering objects established on someone else's property in a limited time, which is why, in terms of terminology, it is more appropriate to use the term multidimensional cadaster. Registration of objects of a spatio-temporal nature is another dimension of a separate legal entity and a registration object, which determines its clear identification.

The full proposal of changes should correspond to the achievements that have already been achieved and have the attributes resulting from the regulation of the Minister of Interior and Administration of April 26, 2017 on changing the register of spatial data sets and services covered by the spatial information infrastructure (IIP). Therefore, a spatial plot should, like two-dimensional objects, have the identifier: PL.PZGIK.EGB.ODzP_XXX, where:

1. PL – RP code,
2. PZGiK – type of resource, i.e. state geodetic and cartographic resource,
3. ODzP_XXX – local identifier, i.e. designation of the object registration unit (Fig. 4).

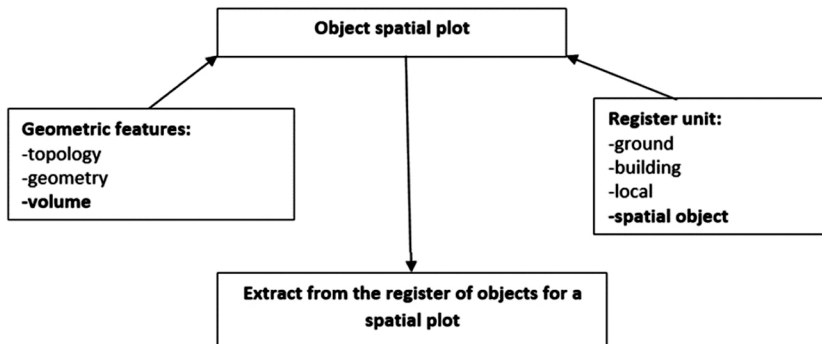


Fig. 4. Scheme of description of the object spatial plot;
source: own study based on [Budkowski, Litwin, Gniadek, 2022]

The proposal to introduce strata ownership is closely related to the land administration model (LADM), which is a hierarchical, international standard that can stimulate application development and accelerate the implementation of land management systems that support sustainable development goals. The Land Administration Domain Model [9] contains basic information components relating to: entities, objects, administrative units, as well as taking into account the geometry, topology and attributes of objects.

In this context, we cannot forget about the specificity of the Polish conceptual model of land and building registry data, which, as the UML application schema of registry data, should be the basis for creating a new schema (Fig. 5).

In accordance with the previously stated assumptions, the new scheme of the conceptual model of cadastral data should be expanded to include the ability to record time, including the beginning and end of the existence of an object, as well as the ability to demonstrate the volume of a spatial artifact. The model has also been enriched with a spatial register unit that includes, apart from geometry and topology, also volume. This method of model construction is the proposed step towards creating a cadastre system that is not only multi-dimensional, but also multi-purpose.

The proposed reform, apart from the obvious advantages, may also be associated with many barriers, ranging from formal and legal barriers to financial and social ones. The introduction of strata ownership into the legal system would involve the need to change many acts that have a key impact on the functioning of real estate management, such as: Civil Code [31], Real Estate Management Act [37], Water Law [38], Geological Law and Mining [39], the Geodetic and Cartographic Law Act [30], the Spatial Planning Act [40] along with executive acts. Changing so many important legal acts would undoubtedly require great diligence and commitment of the legal teams introducing the new terminology. The allocation of air spatial plots for bridges, viaducts, tunnels, etc. would also guarantee a sense of legal and economic certainty in the investor's disposal of the facility. In the case of these objects, it would be necessary to abandon the principle of superficies solo cedit. This change would be fundamental for the real estate operating system.

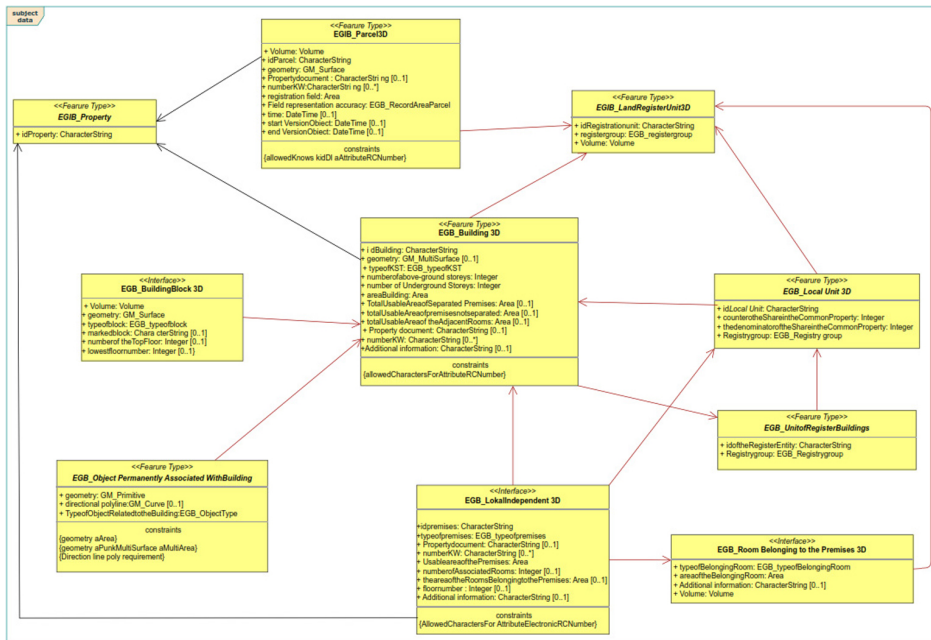


Fig. 5. Conceptual model of subject data; source: own study

The possibility of separating spatial plots is often associated with an investment impulse, the idea of which is not only to use the space of an attractive vertical urban fabric, but also the opportunity to finance the investment by establishing a mortgage on a spatial plot. This approach, although very interesting from the point of view of potential investors, also entails the need for new legal regulations regarding real estate valuation, including the method of valuation of an “empty” spatial plot. The existence of a vertical legal entity that may be the subject of economic transactions would also require the regulation of ownership relations between neighboring properties. The division of such properties also remains an open issue, including how this procedure would take place and what documents would be necessary to carry out this activity. An undoubted financial barrier may also be the cost of the project, which, in addition to the cost of the legislation itself, will also involve modifying the software and improving the quality of the hardware resulting from the need to store larger amounts of data and improving the functionality of the system. A significant problem may also be caused by society, which, without conducting an appropriate information campaign, may have problems understanding the idea of the changes being introduced, or identify these changes with the need to introduce new taxes. The reluctance to introduce changes may be based on fears about the introduction of new taxes, which is a phenomenon typical of all types of tax reforms.

The need to identify complex ownership relations in legal space may result in the need for precise identification and better visualization details, for example inside buildings. In order to treat the cadastre as a complete and exhaustive source of information, it is necessary to manage not only legal information, but also physical space within existing solutions, such as BIM. Building Information Modeling is currently a comprehensive process of creating and

managing information about building resources. Technology based on a model integrating multi-disciplinary data indicating precisely their physical representation, i.e. buildings, rooms, wall thickness, elements of technical infrastructure, utilities, technological channels, may in the future be helpful in determining the scope of rights constituting a burden on real estate, such as transmission easements, despite the fact that the IFC standard currently used in modeling does not allow for the management of legal information. The next step to building a digital space description model is the integration of the IFC (Industrial Foundation Classes) and LADM standards into the CityGML standard. Taking into account that both the IFC standard and CityGML contain a lot of redundant and useless information from the point of view of LADM, integration based on a reference resource capable of selective treatment of registers would be necessary (Fig. 6–7).

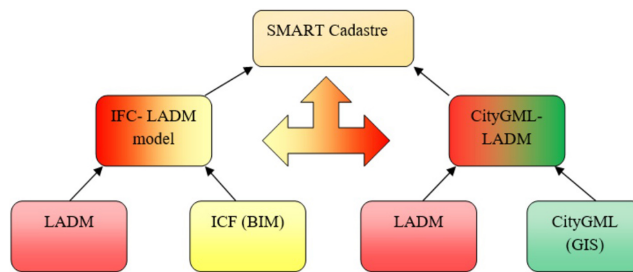


Fig. 6. Proposed steps for integrating LADM, ICF, CityGML standards, source: own study

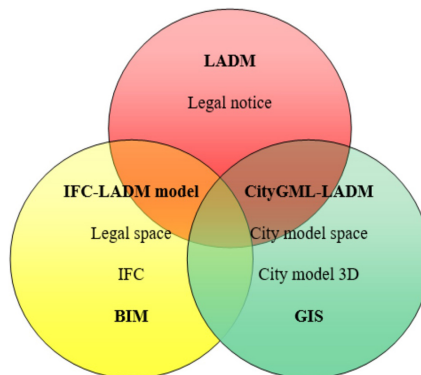


Fig. 7. General scheme of integration of LADM, BIM and GIS systems, source: modified based on [61]

The modification of the IFC standard also assumes the need to create spatial zones (IfcSpatialZone) within which it would be possible to assign rights. In addition, it is proposed to introduce changes in the attribute scope by assigning the IfcSpatialZoneTypeEnum attribute, with the possibility of selecting the type of law, and introducing the IfcRelSpaceBoundary relation allowing the boundary to be defined directly on the edge of the object or regardless of the edge’s course. The extension of the current functioning of the standard as well as further systems integration processes constitute the potential for continued research (Fig. 8).

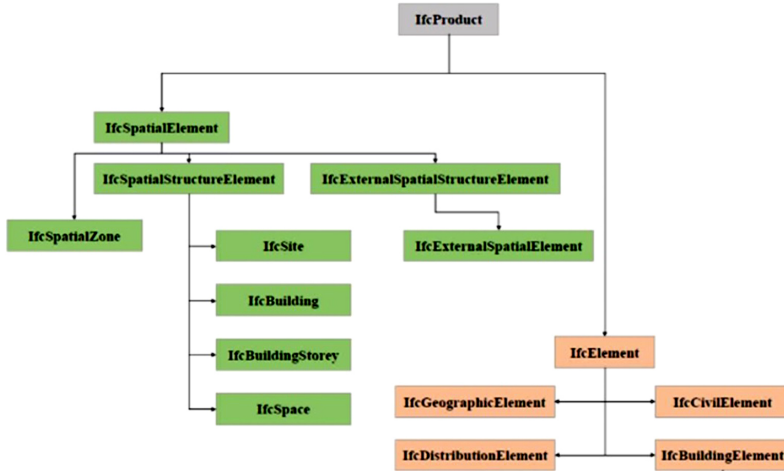


Fig. 8. General scheme of integration of LADM, BIM and GIS systems, source: modified based on [61]

The proposals regarding the visualization of cadastral information in complex urban space, in the author opinion, will allow the concept of cadaster synergy to be met, which is the excess of benefits accruing to a single action. For the construction of a multi-dimensional, multi-task, relational and synergistic legal system with integration capabilities with other systems, it is proposed to introduce the term SMART Cadastre. The introduced modifications will gain new functions over time, especially in terms of the availability and universality of visualization. Therefore, it seems a matter of time to use augmented reality not only for visualization itself, but also for conducting spatial analyzes that are not yet available or difficult to implement today.

The presentation of the results registered in real estate is shown in Figure 9.

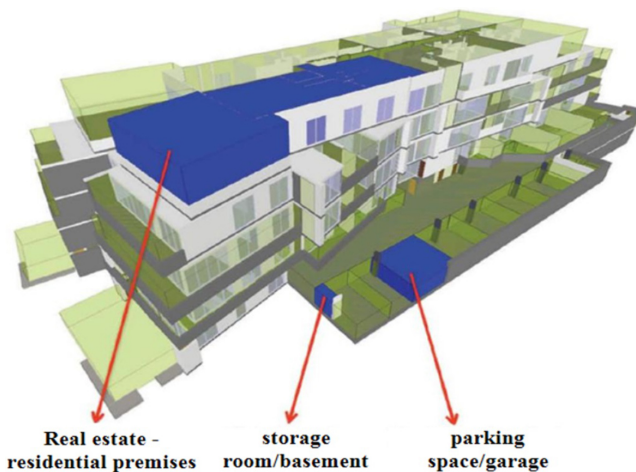


Fig. 9. Proposed registration of real estate, source: own based on Bujňáková B., 2021 [61]

4. Discussion of the results

The existing demand for qualitative, reliable and up-to-date real estate databases is an impulse to modify the currently applicable regulations, which do not seem to meet the socio-economic requirements. This optics is confirmed by research conducted around the world [7, 41–44]. The need for changes is also established in the way modern records operate in other countries in Europe and the world [45–51]. The development of legal space in a vertical approach, as in this article, is very often ultimately associated not only with the evolution of changes in the context of introducing them in the cadastre itself, but with greater integration with modern city models such as CityGML [52–58].

Within the analyzed literature from Poland, all researchers dealing with the subject of multidimensional cadastre [10–17, 59–61] believe that it is justified to modify the Polish legal system so that it meets the requirements set for it. Despite differences between individual scientists, there is agreement on the necessity/possibility of using the LADM reference model. It enables land administration information from various sources to be combined in a coherent manner, while ensuring the use of terminology based on national systems and existing procedures of various jurisdictions.

The solutions proposed in the manuscript, although based on the specificity of the Polish legal system, are universal and can be implemented, contributing to the improvement of real estate management on a global scale. LADM is a solution used around the world, just like CityGML or BIM diagrams, which makes using them to create the concept of a smart cadastre tailored to the conditions of individual countries, often having different specific legislative solutions, a universal proposition. Therefore, the greatest achievement of the manuscript should be considered the methodological solutions, presented point by point, constituting a kind of milestones, actions towards the construction of a modern cadastral system of a universal nature. The example of making changes based on the application language model has the potential to be relatively quickly modified and adapted to the specifics imposed by another legal system. Despite the undoubted legislative differences between various cadastral systems, as well as between individual countries, the methodological and technical activities developed can constitute the basis for building a modern register. In this context, there is no doubt about the need to continue research.

5. Summary and conclusions

The analyzes presented in the manuscript covering the current legal status, new legislative proposals and milestones aimed at creating a modern cadastral system include the possibility of implementing changes of a practical, theoretical, legal, dogmatic and functional nature to the institution of the real estate cadastre in the context of its usefulness in the implementation of tasks arising from socio-economic needs.

The adopted assumptions of the target real estate cadastre model assume, in the long run, the elimination of dualism in the functioning of the subject registers within the subject data. According to the author, functional and systemic unification could be an alternative to costly

institutional changes. Legal, organizational and technological integrity can be achieved based on common information standards and interoperability of databases, as well as harmonization of files kept by existing authorities (land and mortgage register courts, county offices). The introduction of new changes cannot be achieved without taking into account aspects that have been diagnosed as technical and legal barriers, without which the introduction of a register containing “added value” will not be possible.

The manuscript contains a proposal for milestones aimed at replacing the two-dimensional cadastre with solutions enabling the unambiguous identification of separate cadastral objects in space and time (multiple dimensions). This proposal is defined in terms of an important achievement of the publication not only thanks to modernist attempts to specify the scope of strata property rights in a vertical perspective, but primarily thanks to its applied nature. The existing application model enables not only efficient implementation, but also active modification if necessary. The proposed solutions are therefore evolutionary in nature, consisting in successive supplementation of data sets with information guaranteeing clear identification and visualization of the space above and below the ground. The idea of creating a model separating spatial plots, buildings, premises, as well as land infrastructure networks constituting an object of ownership separate from the land, supplemented with time and space data (volume), with the ability to integrate with other standards, fits into the concept of creating a cadastre of the future – **SMART Cadastre 'u**. This system should be understood as going beyond the state of current knowledge, relational and synergistic, which, due to the information it possesses, will have the potential to be used for other purposes, even unknown today and currently difficult to define, which may indicate added value not resulting directly from the nature of registry.

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Techniczne i prawne aspekty wprowadzenia własności warstwowej w Polsce

Słowa kluczowe: CityGML, działka przestrzenna, ewidencja gruntów i budynków, kataster 3D, SMART Cadastre, własność

Streszczenie:

Kataster nieruchomości uznaje się obecnie za rdzeń systemu zarządzania gruntami. Mapy katastralne powinny zatem przedstawiać pełne i wyczerpujące informacje przestrzenne celem zaprezentowania zasięgu praw i ograniczeń przysługujących ich właścicielom i władającym. Z przeprowadzonych w tym zakresie badań, zarówno w Polsce jak i za granicą, wynika, że zrealizowana projekcja praw na mapach dwuwymiarowych nie może uwzględniać złożonych, nakładających się na siebie nieruchomości, dlatego powinna zostać rozszerzona na przestrzeń trójwymiarową. Celem niniejszej publikacji jest przeprowadzenie analizy technicznych i prawnych aspektów związanych z potencjalnym wprowadzeniem własności warstwowej w Polsce. Główne cele badań obejmują: zrozumienie koncepcji własności warstwowej w tym zdefiniowania czym jest własność warstwowa oraz zdiagnozowania zakresu zmian w ramach istniejących przepisów prawnych; badania istniejących przepisów prawnych oraz określenie potencjalnych rekomendacji dotyczących ewentualnych zmian w prawie oraz procedurach technicznych. Metodyka badań opiera się na podejściu holistycznym łączącym aspekty prawne i techniczne zakładające przegląd literatury przedmiotu, analizę przepisów prawnych oraz studium przypadku. Za osiągnięcie manuskryptu należy uznać przeprowadzoną analizę technicznych i prawnych w kontekście możliwości implementacji katastru wielowymiarowego w polskim systemie prawnym. Na uwagę zasługują także autorska propozycja modelu pojęciowego przestrzennych danych przedmiotowych, wprowadzenie przestrzennej jednostki rejestrowej, rozszerzenie rękojmi obejmującej powierzchnię działek o ustalonych granicach, a także wyznaczenie kroków milowych integracji standardów Ladm, Ifc oraz CityGml. Dla konstrukcji wielowymiarowego, wielozadaniowego, relacyjnego i synergicznego systemu prawnego, wykazującego zdolności integracyjne z innymi standardami wprowadzono nowy termin: Smart Cadastre.

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