



An analysis of possibilities for the establishment of a multipurpose and multidimensional cadastre in Poland

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ABSTRACT

An efficiently operating cadastral system may provide the basis for all processes for the purposes of rational and effective property management. The cadastre existing in Poland originates from the 13th century's tradition of land management. However, the work on the construction of an IT cadastral system was only initiated with the issuance of Regulation on the Land and Property Register in 1996. The implementation of its provisions resulted in errors visible in the cadastral documentation up to the present day. Currently, the Land and Property Register *i.e.* a public register serves the function of the cadastre in Poland. Regulation of 1996 initiated the stage of transition of (both descriptive and graphic) documents from analogue forms to digital data carriers. Most often, this was done by means of scanning or digitisation of the existing resources. As demonstrated by earlier studies, the process often failed to include the updating of maps and the verification of the compliance of the descriptive part of the Register Documentation with its graphic part. Moreover, significant inconsistencies were observed between the data originating from the Land and Property Register and the Land and Mortgage Register *i.e.* a register of rights to properties. Low accuracy of the cadastral data, and the incompleteness of sets of spatial data about cadastral objects create a significant barrier to the construction of a modern cadastral system in Poland. This study constitutes the analysis for the construction of a multidimensional cadastre in Poland, and to identify the groups of problems associated with its implementation. Based on detailed analyses of regulation and conducted case studies, a possibility was indicated for a gradual evolution of cadastral data from the 2D dimension to 3D. The study considered technical and legal conditions of designing cadastral systems worldwide. The proposed solution offers an opportunity to accelerate the construction of a cadastral system which is an effective tool of property management policy in Poland.

1. Introduction

The issues relating to a multipurpose cadastre has been discussed worldwide since the early 1990's. The project of Kaufmann and Steudler (1998) is one of the most important and known scenarios of the development of cadastral systems in the world. As reported by Ting and Williamson (1999): "Throughout history, the relationship of humankind to land has been dynamic. This dynamism has had a direct impact on the creation of cadastral systems and the subsequent evolution of their function." Therefore, "A Cadastre may be established for fiscal purposes (valuation and equitable taxation), legal purposes (land transfers), to assist in the management of land and land use (e.g. for planning and other administrative purposes), and enables sustainable development and environmental protection."

In turn, Williamson (2001) notes that: "Cadastral systems are the foundation and an integral component of parcel-based land information systems (LIS) that contain a record of interests in land. These systems

are a central component of the land administration and land management systems in a state or jurisdiction". According to (Ting and Williamson, 1999) - This statement shows how far the application of cadastral systems has evolved. Moreover, the trend towards developing multipurpose cadastrals to address planning for sustainable development issues as well as fiscal and economic imperatives is evident in a range of Western nations such as: Australia (Williamson, 1996), Canada (MacLauchlan and McLaughlin, 1998), Denmark (Enemark, 1994), Germany, Austria and Switzerland (Hawerk, 1995), New Zealand (Robertson, 1996) and the USA (NRC, 1983).

The issue of a multipurpose cadastre has also been addressed in numerous, more recent international publications. Most frequently, it concerns a broader context in the field of mutual experiences of designing land administration systems. This has been addressed *inter alia* by Bennett et al. (2007), Khalaj and Lashkari (2010), Riecken and Seifert (2012), and Parsova et al. (2012). Therefore, the issue is still topical and valid.

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The recent trends in cadastre development indicate the need to construct multidimensional systems. This has been addressed *inter alia* by Oosterom et al. (2011), Rahman et al. (2012) and Döner et al. (2010). Since 2001, a clear trend towards the construction of a 3D cadastre has been observed worldwide. This involves the development of new construction technologies, and the emergence of complex architectural structures (particularly in towns and cities). This has been addressed *inter alia* by Yu et al. (2012), Ying et al. (2012), Zhang et al. (2016), and Stoter et al. (2017). In Poland, the issues have been addressed in their papers by the following authors: Karabin (2012), Góźdz and Pachelski (2014), Siejka et al. (2014), Dawidowicz et al. (2014), Bydłosz (2015), Mika et al. (2016), Bydłosz (2016), Mika, (2017c), and Dawidowicz and Żróbek (2018).

It should be stressed that Polish cadastre has a long-lasting tradition, as it originates from the 13th century's tradition of land management. However, the work on the construction of a cadastral system was only commenced with the issuance of Regulation on the Land and Property Register in 1996 (Regulation, 1996). At present, the Regulation is no longer valid but the adverse effects of its provisions can be noticed in cadastral documentation to this day (Hanus et al., 2014; Przewiężlikowska and Buško, 2014; Mika, 2016, 2017a). The Regulation initiated the stage of transition of (descriptive and graphic) documents from analogue forms to digital data carriers. Mass production has begun of digital maps created through the direct processing from the paper version into a computer image by means of scanning or digitisation. Unfortunately, this primarily resulted in the duplication of errors occurring in the Land and Property Register. The processing frequently took place without updating the maps and without verifying the compliance between the descriptive part of the Registry Documentation and its graphic part. Moreover, the actual status of cadastral objects (parcels, buildings, and premises) on the ground was not unified with the legal status disclosed in a separate register known as the Land and Mortgage Register. Here, it should be noted that Polish cadastre may be incomprehensible abroad as the cadastral information on the objects and subjects is collected in two separate databases. The basic database, legally known as the cadastre, is the Land and Property Register. Having considered the global solutions, in particular principles proposed by Kaufmann and Steudler (1998), this database fails to achieve the basic objectives of a multipurpose cadastre as it does not collect legal information on cadastral objects and subjects. It is maintained by County Offices. On the other hand, legal information is contained in a separate database maintained by Land and Property Register Divisions of District Courts.

Fig. 1 shows the succeeding steps of the transformation of the cadastre in Poland over the last 50 years, which indicates the willingness

to strive for changes leading to a multipurpose and multidimensional cadastre. These reforms result from the revision of regulations due to political transformations after 1989. A significant incentive to the commencement of the construction of a multipurpose cadastre (and, ultimately, a multidimensional cadastre) was Poland's accession to the European Union in 2004. It was connected with the need to unify regulations, and to introduce European standards. Since 2004, intensified work of the Head Office of Land Surveying and Cartography (GUGiK), aimed at the modernisation of the existing cadastral system, have been observed. An important project in this regard is the commencement of work on the construction of the Integrated System of Real Estate Information. At the moment, the system is not yet fully operational, but in the future it may serve as a multipurpose, or even a multidimensional cadastre. It contains a very extensive concept of the integration of many real estate databases, the practical implementation of which has appeared to be difficult and, as it seems, requires many more reforms. For this reason, it is reasonable to search for alternative solutions. One of them may be the original author's concept of a reduction in the number of databases, shown in Figs. 8 and 9 and discussed further on.

For comparison, a country with a similar recent history i.e. the Czech Republic has succeeded in developing a full-fledged cadastral system which integrates the register of legal and factual data on properties. As reported by Pešl and Slaboch (2002): "After the fall of the communist regime in 1989 a new governmental programme of restitution, privatisation and general economic reconstruction started. The current cadastre could not meet new demands and it was decided to come back to the time-tested principles of previous land register and land cadastre. The result is a "legal cadastre" integrating the land register (legal tool) and the land cadastre (technical tool) into the only instrument administered solely by survey authorities. This solution was accepted as the easiest one under the existing circumstances. In the years 1991 and 1992, new basic cadastral legislation was prepared and came into effect at the beginning of 1993. Thus, 1st January 1993 is a milestone in the long history of the land cadastre in the Czech Republic and the beginning of the cadastral reform."

Meanwhile, in accordance with the regulations in force, the cadastre function in Poland is still served by a single database, namely the Land and Property Register. In addition, as shown by results of both this and previous studies (Maślanka, 2016; Mika and Leń, 2016) this particular database fails to meet cadastre users' expectations about the quality and completeness of the data collected in it. Modernisation works have been going on for years (Siejka et al., 2015; Mika, 2016) but, unfortunately, they do not bring the results desired from the perspective of interests of all user groups. A major obstacle to the modernisation of the Land and

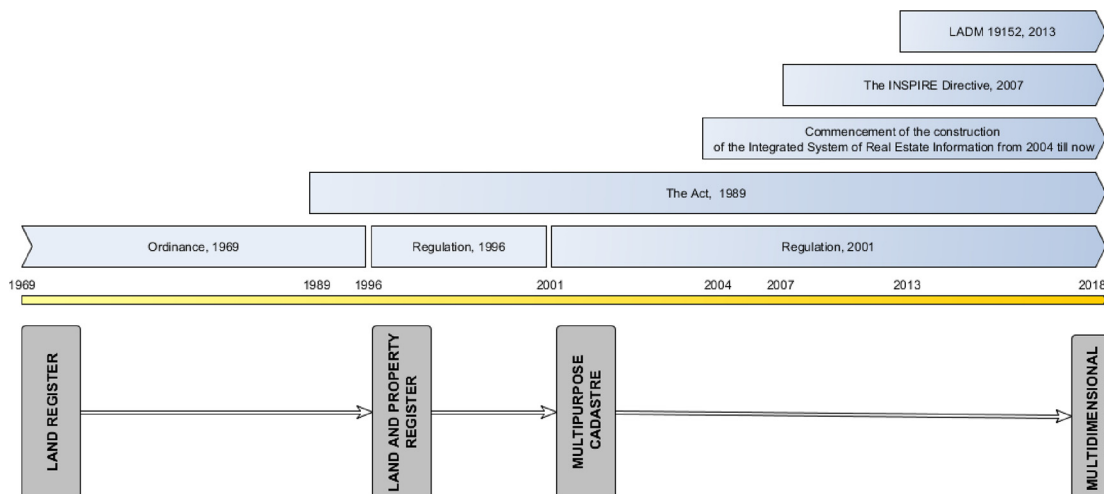


Fig. 1. Stages of the development of a multipurpose and multidimensional cadastre in Poland.

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