A methodological evaluation of the Polish cadastral system based on the global cadastral model

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**ABSTRACT**

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In an era when information is the main strategic resource, there is a growing need for comprehensive spatial information, including cadastral information, which necessitates the continuous modernization of cadastral systems. Standardization requirements are imposed by international agreements on the development of Global Spatial Data Infrastructure (GSDI). These efforts gave rise to new concepts and systems in the international arena, including Cadastre 2014, the Land Administration System (LAS), CCDM/LADM, Cadastre 2012, Cadastre 2034, Cadastre’Inspired, Cadastre 2.0, Cadastre 3D and Fit-for-Purpose Land Administration. These concepts have led to the development of new functional solutions for cadastral systems.

The aim of this article was to analyse and to evaluate the Polish cadastral system based on the proposed universal method for evaluating cadastral systems. A global cadastral model has been proposed, and the Polish cadastral system has been evaluated in the context of the developed model. The results were used to identify the system's strengths and weaknesses.

**1. Introduction**

The cadastral system is a highly valuable tool and a source of comprehensive data in the land management process, which is why it should be regarded as the cornerstone for the efficient operations of any state. Similar observations have been made by numerous organizations and researchers, including the International Federation of Surveyors (FIG 1995, 1999, 2002, 2010, 2014), Henssen (1995), Gaździcki (1995), Larsson (1996), Bennett et al. (2007, 2010), Enemark (2004, 2010a, 2010b), Enemark et al. (2005, 2014), and Williamson et al. (2010). The cadastral system should respond to public demand and contribute to sustainable land development (Enemark et al., 2014). Sustainable land development promotes real estate management practices that guarantee social justice, economic growth and environmental protection. These goals cannot be achieved without free access to the cadastral system which should cater to social needs. The extent to which the cadastral system fulfills modern needs is directly influenced by the increase in rationality on the property market and the improvements in land management efficiency (Dawidowicz and Żróbek, 2012a). These demands call for the development of cadastral systems that promote the resolution of local and regional problems in land management, including rational land management at the national level.

In a globalizing world, cadastres should support the achievement of sustainable land development goals delineated by the Millennium Development Goals (MDG) (UN, 2000) and the new Sustainable Development Goals (SDG) (UN, 2015), (Dawidowicz and Żróbek, 2017).

For this reason, the modernization of cadastral systems should support the development of Global Spatial Data Infrastructure (GSDI). Global Spatial Data Infrastructure encompasses integrated land information systems that are based on and referenced to the cadastral system. This approach guarantees the usefulness of cadastres at the global level (Dawidowicz and Żróbek, 2014). The global cadastral model should define the general directions for the evolution of every cadastral system. The references attributes should be identified in a series of logical steps which will be used to update these attributes in the future (Dawidowicz and Żróbek, 2012b).

The aim of this article was to analyse the Polish cadastral system with the use of the proposed universal method for evaluating cadastral systems. The method has been developed based on the global cadastral model (GCM) concept proposed by the authors. The development of the GCM concept proved to be a challenging undertaking due to the large number of cadastral system concepts that have been developed in the last 20 years. The proposed solutions had to be systematised to describe growth trends, and significant and non-mutually exclusive attributes that account for the proposed solutions and support the development of a comprehensive global cadastral model had to be identified. The proposed method supported a detailed analysis of the Polish cadastral system, which is an essential step in the modernisation process.
2. Materials and methods

This study analysed various cadastral system development concepts that have been proposed over the last 20 years. The research was performed in several logically related stages (Fig. 1).

The presented study relied on a multi-criteria approach based on qualitative methods, in particular analytical, logical and identification techniques. Comparative analyses were also carried out based on similarity model concept where the key attributes of selected models were compared in a given area (Kaufmann and Kaul, 2004). This method is used to identify attributes (parameters of similarity) that can be transferred to a real-world system. The similarity attributes of components were calculated, and the similarity of models was determined. An attribute of a cadastral system is a criterion based on which model rules for cadastre operation are defined. According to the Polish Language Dictionary (PLD, 2017), an attribute is a quality or a characteristic that describes something or someone. For the needs of this study, an attribute will be defined as a characteristic feature of a system.

In the first stage of the study, cadastral issues and the relevant problems were discussed in the national and international context. The core indicators of the global cadastre should account for global demand trends, whereas local indicators should guarantee that the land management model accounts for local needs. The factors that influence the development of cadastral systems were identified, including the key actors (organizations), key technologies, development trends and key initiatives. The main determinants, concepts and approaches to cadastral system development were identified at the national and international level.

In the second stage of the study, the key concepts and guidelines for the development of cadastral systems were selected for further analysis. They included Cadastre 2014 (Kaufmann and Steudler, 1998), an innovative report in the field of cadastral systems which was used as the main reference document for scientific publications relating to cadastral systems.
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