

## Use of Cadastral Databases in Land Consolidation in Poland

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**Abstract.** Land consolidation in the European Union is not only a tool used to improve the economy of rural areas. When setting goals for land consolidation, one should take into account the social and environmental aspects. The socio-cultural needs related to use of natural resources of rural landscape, cultural heritage, agritourism or technical infrastructure are as important as the profit earned by farms; they also help to maintain the harmony with the natural environment. For land consolidation to play a significant role in developing a strategy of multifunctional and sustainable development of rural areas, those who carry it out must have free access to up-to-date and properly selected databases; a cadaster of real property could be one of the sources of such data. A real estate cadaster is a public register, which provides credible identification of plots in a specific space. It is possible because when gathering information about land, buildings, apartments as well about their owners and holders, the system ensures its topicality, which is a priority despite the ever-changing space around us. The aim of the study is to present the significant role of cadastral databases in land consolidation as they help to develop the optimum relations between the economy, rural areas, communities and environmental protection.

**Keywords:** cadastral database, land consolidation.

**Conference topic:** Technologies of geodesy and cadastre.

### Introduction

Agriculture plays an essential role in restructuring and country planning. However, the agricultural world undergoes economic pressures that act on the efficiency of landowners. To insure a good productivity, the farmer needs a space spatially organized and well fitted (Semlali 2001). Until recently, the countryside was associated mostly with the production of food and agricultural raw materials, and its complementary function was rural crafts providing goods and services necessary for agricultural production. Currently, the share of agricultural production in the set of functions performed by rural areas is decreasing and being replaced by non-agricultural production and consumption functions, such as: providing natural resources (tourist and recreational services), and new places of residence (municipal housing and increasingly more popular summerhouses) (Kłodziński 2010).

Land consolidation in the European Union is not only a tool used to improve the economy of rural areas. When setting goals for land consolidation, one should take into account the social and environmental aspects. The socio-cultural needs related to use of natural resources of rural landscape, cultural heritage, agritourism or technical infrastructure are as important as the profit earned by farms, they also help to maintain the harmony with the natural environment. For land consolidation to play a significant role in developing a strategy of multifunctional and sustainable development of rural areas, those who carry it out must have free access to up-to-date and properly selected databases, a cadaster of real property could be one of the sources of such data. A real estate cadaster is a public register, which provides credible identification of plots in a specific space. It is possible because when gathering information about land, buildings, apartments as well about their owners and holders, the system ensures its topicality, which is a priority despite the ever-changing space around us.

The access to reliable information is in many cases the main handicap which conditions the operation of the land markets. The cadastre and the legal register system are the two main information sources about the real estates concerning their registry, their description and their property situation. The quantity and quality of the data of these two sources, but also their accessibility to the general public, are key factors which influence the achievement of land exchanges (Dudzińska *et al.* 2014).

The aim of the study is to present the significant role of cadastral databases in land consolidation as they help to develop the optimum relations between the economy, rural areas, communities and environmental protection.

## **Characteristics of cadastral databases in Poland**

Efficient and effective cadastral systems in Europe and in the world are important for sustainability of economic development, for environmental management and for stability of society. They are considered to be a part of a broader system of land administration referring to information infrastructure of the state, including the legal framework and relevant training initiatives concerning international standards that are designed to facilitate property market development and that will have significant relations with various cadastre users, particularly with the financial and banking sectors (Resolution of the Third... 2011).

According to Art 2(8) of the Geodetic and Cartographic Law Act of 17 May 1989, Cadastre, which bears the official name of the Land and Property Register in Poland, is defined as “a uniform collection for the whole country of systematized, updated data on land, buildings and premises, their owners and other natural persons and corporate bodies holding these lands, buildings and premises. Maintaining the cadastre as a government administration task has been entrusted to starosts and mayors of cities with poviat rights. The cadastre includes:

- the numerical and descriptive data on land, buildings and premises;
- the data on property owners and their respective shares in the property right, as well as the dates of acquisition and loss of that right.

The basic object of the cadastral database is the parcel, defined as a land area situated within a cadastral sub-district, legally homogeneous and separated from the environment using boundary lines. In addition to a parcel, cadastral objects include buildings and premises. The information sets contained in the cadastre are used in various areas of the economy. The provisions of the Geodetic and Cartographic Law Act oblige entities operating in the State to use cadastral sets for the following purposes: economic planning, spatial planning, tax and fees assessment, denotations in land and mortgage registers, national statistics, land management and farm registry.

Regardless of the above-mentioned objectives, cadastral information sets enhanced with additional data from other sources serve an important role in shaping and maintaining the spatial order, managing problem areas, in situations involving natural disasters, and in supporting works carried out in rural areas, such as a land consolidation process. The cadastre contains a set of information on each separated parcel, including:

- the name of the cadastral district (municipality) and sub-district where the parcel is situated;
- the ordinal number of the parcel;
- the numerical description of the boundaries of the plot and its surface area;
- the boundaries and surface areas of the contours of usable land and soil valuation classes within the parcel;
- the value of the land if it has been determined, and the date of the determination of that value;
- the designation of the land register or other documents specifying the ownership, e.g. a notarial act.;
- the designation of the documents specifying rights to the parcel other than the rights of ownership and perpetual usufruct;
- the identifier of the register of objects of cultural heritage maintained under the regulation on the protection of cultural heritage;
- the identifier of the statistical area that the parcel belongs to;
- in relation to parcels that are public roads, the numbers of these roads assigned on the basis of the regulation on public roads and the name of the street where the public road performs this function;
- for parcels that are physiographic objects, such as streams, water reservoirs, parks, forest ranges – the names of these objects.

The cadastral database of buildings includes:

- information on the location: the name of the cadastral district (municipality) and sub-district;
- the ordinal number designating the building in accordance with the regulations on numbering properties,
- a numerical description of the contours of the building;
- the numbers of the parcels where the building is situated;
- the status of the building specifying that the construction of the building has been completed or its actual use has been initiated, the building is under construction, the building is to be demolished, or the building has a building permit or notification but its construction has not yet started;
- the type and class of the building;
- the main function of the building and other functions;
- the value of the building if it has been established;
- the date of completing the construction of the building, or the date of reconstruction if the building has been reconstructed;
- information on the material used to construct the outer walls of the building;
- the number of building floors above and under the ground;
- the footprint area of the building;
- the number of independent premises disclosed in the register;

- the floor space area of the premises forming separate properties, non-separated premises, and auxiliary rooms belonging to the premises;
- the number of dwellings in a residential building according to the construction design documentation;
- the total number of rooms in a residential building;
- the identifier of the register of objects of cultural heritage if the building has the status of a historic object.

If the building is not a component of the parcel and is under separate ownership, the system will generate:

- data on the owner of the building;
- the designation of the land register or other documents specifying the ownership of the building;
- the designation of the documents specifying rights to the building other than ownership.

The cadastral system will also provide a set of information on the premises located in buildings, including:

- the ordinal number of the premises within the building;
- the reference number of the building where the premises are located;
- the type of premises, including the specification of residential and non-residential premises;
- the number of rooms within the premises;
- the number and types of auxiliary rooms belonging to the unit;
- the floor number where the main entrance to the premises is located;
- the floor space area of the premises;
- the surface area of the auxiliary rooms belonging to the premises;
- the address of the premises.

If the premises are not a component of the building and constitute a separate property in the building, in addition to the data mentioned above, the system will generate:

- the designation of the land register;
- the value of the premises if it has been determined, and the date of the determination of that value.

The cadastral database also includes data on:

- the property owners, and in the absence of documents on the basis of which the owner can be determined, the persons and other entities using the land on the basis of autonomous possession, and the place of permanent residence or the address of the registered head office of the entity;
- perpetual usufruct holders;
- the organisational entities in charge of the administration or permanent administration of the properties;
- the state legal persons to whom the State Treasury entrusted the exercise of the ownership right or other property rights in relation to its property;
- public administration bodies which administer properties that belong to the State Treasury and municipal, district and provincial property resources;
- state and local government land users;
- land that is subject to lease agreements, and the lessees of this land reported in the register;
- information on whether the land area specified in the Land and Property Register is covered – in whole or in part – by a form of nature conservation.

The cadastral data on the plot, building and premises are included in the land register survey, which consists of Land and Property Register databases maintained by means of an ICT system which provides, in particular, adequate data security, storage and updates, and data visualization in the form of records, files and lists, and gives stakeholders access to extracts from these records, files and lists.

An integral part of the cadastral survey is the digital cadastral map containing spatial information on cadastral objects. Depending on the degree of urbanisation of the area and the structure of the possession of land, it is developed in the scales: 1:500, 1:1000, 1:2000, 1:5000. Contents of cadastral map: boundaries, designations of boundary points, contours of land uses and their designations, contours of soil valuation classes and their designations, contours of buildings, numbers of cadastral parcels. Its edition is formed by sub-district maps. While developing a cadastral map, technical standards appropriate for the base map are used.

The cadastral information, characterised by a high degree of detail, including entity data (data on the owners, perpetual usufruct holders, administrators and permanent administrators) and data on parcels, buildings and premises, is used in all the spatial administration and management processes. Effective administration depends on fast access to reliable and current information collected, e.g. in public reference registers, which allow for a clear definition of individual objects and spatial phenomena in space.

### **Stages of land consolidation works in Poland**

Land consolidation is one of the most important elements for helping to solve the structural problems in agriculture and agricultural production. International advisors and consultants recommend land consolidation procedures as a “secret weapon” for economic growth and shared wealth. Many people are surprised, however, if after finishing the initial projects the touted or expected gains have not materialised. Land consolidation procedures can be successfully carried

out only if the decision to take such measures is the outcome of attentive diagnosis and comprehensive analysis, with precisely-defined goals, the use of special instruments and with careful attention paid to specific structural conditions (Thomas 2006). Land consolidation plays an important role in the consolidation of farmlands and in the improvement of spatial structure of Polish agriculture (Leń, Król 2016).

The collectivization process in Poland after the Second World War, when the communist government took power, largely failed and as much as 75 percent of the agricultural land remained in private ownership as well as in private use in individual family farms (Hartvigsen 2013). The level of fragmentation, both of landownership and land use, is rated as medium to high and is especially high in the southern and eastern provinces of the country. However, the origin of land fragmentation is not so much with the recent land reform but rather with the historical ownership structure, including that created by the land reform following the Second World War (Hartvigsen 2014).

Poland is among the European countries with a land consolidation tradition that dates back to the beginning of the 20th century. The first law establishing land consolidation procedures was passed by the Polish Parliament in 1923. In that time the estimated needs for improvement of the agrarian structure amounted to 13 million hectares (ha) i.e. 50% of total area of agricultural land. Up to 1939 land consolidation works covered 5.4 million hectares (ha). After Second World War the land consolidation and exchange works were continued on the basis of laws adopted in 1923, 1968 and 1982. During the period 1945–1998 the land consolidation and exchange works were executed on the area of 10 million ha of land (that was about 2/3 of total area of agricultural land). At present the agricultural area in Poland is nearly 16.0 million ha from which 96% is utilized by the private sector in a majority by family farms (89%). The characteristic feature of Polish agriculture is a big number of farms. According to the result of survey conducted in 2005 by Central Statistical Office in Poland there were 2,733,000 farms, in which 947,000 do not exceeding 1 ha of agricultural land (Kozłowski, Zadura 2007).

Land consolidation in Poland may be defined as agricultural engineering operations, aiming at transformation of the spatial configuration of lands located in rural areas in such a way that more favourable conditions of farming are created, as a result of improvements of the spatial structure of farms, rational setting of extension of farms and adaptation of real estate borders to the system of water melioration installations, roads and to the terrain relief. The legal basis for these operations is the Act of 26 March 1982 on land consolidation and exchange of lands (Journal of Laws 2013, item. 1157) (Dudzińska *et al.* 2014).

Despite numerous economic, social, historical, cultural, natural and legislative differences, land consolidation processes in individual European countries follow similar rules and procedures. Land consolidation is more than the outcome of normal land market transactions agreed between a few private landowners. Land consolidation is carried out through a project and connected with a certain geographical area (i.e. the project area) in which the project is conducted. The outcome of land consolidation is the result of a planning process facilitated by land professionals and with the active involvement of the landowners and other stakeholders in the project area. The outcome of the planning process is the re-allotment plan displaying the new layout of land parcels and connected ownership after the land consolidation project. In the literature, this understanding of the term “land consolidation” is sometimes also described as “formal land consolidation”, as opposed to “informal land consolidation” which describes arrangements from the coordination of the use of contiguous parcels either through informal leasing or exchange agreements or through formal voluntary land transactions between a small group of landowners (Van Dijk 2003).

Procedures for land consolidation projects generally involve:

1. Initiation of the land consolidation project:
  - request for initiation of a project;
  - analysis of the situation and identification of what is needed and wanted;
  - preparation of an initial concept plan that states the aims of the proposed project and approximate estimates of costs and sources of financing;
  - approval of the request by participants and the state;
  - formation of a local management team with representation from the community.
2. Design of the project:
  - selection of consultants to design the project;
  - precise definition of the area and scope of the project;
  - preparation of cost-estimate and schedule for the project;
  - evaluation of projected costs and benefits;
  - preparation of cost-sharing formula.
3. Inventory of the existing situation:
  - identification or adjudication of boundaries and the legal status of parcels;
  - including lease rights, mortgages, and easements or servitudes;
  - delimitation of important environmental areas;
  - determination of the value of parcels;
  - handling of objections related to boundaries, ownership and valuations.
4. Elaboration of the detailed land consolidation plan:

- preparation of the draft consolidation plan showing the new parcel layout, location of new roads and other public facilities, and identifying those roads and facilities which will be removed;
  - presentation of several plan alternatives with cost-benefit and environmental impact assessments;
  - review of the options for consolidation by participants;
  - preparation of the final detailed consolidation plan to accommodate comments of participants;
  - handling of objections;
  - approval of the detailed consolidation plan.
5. Implementation of the detailed consolidation plan:
- selection of contractors for construction works, etc;
  - construction of public works (agricultural improvements, levelling, drainage, new roads with bridges and culverts, etc.);
  - survey of new boundaries on the ground.
6. Concluding phase:
- working out compensation and apportionment of costs;
  - final updating of the cadastral map;
  - issuing and registration of new titles (Vitikainen 2004).

Agricultural development through the reduction of landownership fragmentation and the improvement of rural infrastructure has always been the main objective of land consolidation in Poland. Land consolidation often led to loss in biodiversity and landscape degradation, especially before 1990 (Kupidura 2010).

Land consolidation is sometimes applied in connection with large infrastructure projects, such as the construction of new highways, but it is not yet used as an instrument to actively restore nature, environment and landscapes. Land consolidation in the future could provide an opportunity to create diverse landscapes with conditions for the multi-purpose development of rural areas (Kupidura *et al.* 2014).

### **The use of cadastral data in selected stages of consolidation works – results and discussion**

The main aim of research was to present the significant role of cadastral databases in selected stages of land consolidation work. The research applied the following methods: analysis and synthesis of the literature and land consolidation documentations, survey research.

The individual actions performed as part of consolidation works require fast and easy access to a range of current and reliable spatial data, without which it would be impossible to effectively perform them. In Poland, there are approx. 280 different public registers, which are given different purposes, e.g. the registration of the actual state of properties is assigned to Land and Property Registers, and the registration of the legal status of properties falls within the scope of Land Registers.

The development of the assumptions for a consolidation project requires carrying out a number of studies and analyses on the characteristics of the consolidation object in the areas, such as its legal status, the state of development and investment, as well as economic, transport, environmental, cultural, historical and landscape conditions. The cadastre is one of many sources of information about the area covered by a land consolidation procedure. According to the Act of 1982 on land consolidation and exchange, the state of land ownership and possession, the surface area of the usable land and the soil classes are determined based on the data included in the cadastre. This makes it possible to analyse the structure of possession in a selected consolidation area, on the basis of which a particular group of surface objects (parcels) meeting certain descriptive conditions is identified and the characteristics of farms associated with their spatial and surface structure are obtained, including in particular:

- the analysis of the legal status of the property;
- the analysis of the structure of the land use by type of users in total, and in the private and public sectors;
- the analysis of farms by area groups of surfaces in area groups of usable agricultural lands in total and in the private and public sectors;
- the elaboration of the boundaries of the consolidation object;
- the elaboration of the boundaries of the areas excluded from the land consolidation.
- The source of data necessary for the possession status analyses includes:
  - the spatial layer of parcels (source: cadastral map);
  - the spatial layer of usable land contours (source: cadastral map);
  - the spatial layer of pedological class contours (source: cadastral map);
  - the cadastral attribute database on parcels.

Another analysis of the local conditions prepared based only on cadastral data is the study of the state of development of the consolidation object, which is prepared in order to:

- determine the share of arable land, orchards, pastures and permanent meadows, agricultural built-up land, land under ponds, land under ditches, forest land, wooded land and land covered with thicket, built-up and urbanised land, ecological land and idle land in the specified consolidation area

- analyse farms by area groups of the surface of the arable land, forest land, fallows, orchards, pastures and permanent meadows in the area groups of usable agricultural lands in total, and in the private and public sectors.

These activities are developed based on the following source materials related to:

- parcels (source: cadastral map);
- contours of usable land (source: cadastral map);
- contours of pedological classes (source: cadastral map).

For the results of studies and analyses of the local environmental, economic, cultural and historical conditions to perform a significant role in the realisation of the objectives resulting from the directions of the economic and social development of the consolidation object, they should be developed on the basis of data with a different thematic scope. The cadastre has a rich informational potential for detailed characteristics of lands, buildings and premises, which will allow for the full spatial reconnaissance, including the development of the analyses of transport accessibility, population density, technical infrastructure, functions of the area, and environmental conditions for the specified parcels, when combined with other data sources, such as the geodesic registry of infrastructure networks (GESUT) (data on the technical development of the area), the local zoning plan (data on the functions of the land), a digital forest map (data on forestry separations), the Central Statistical Office (data on economic conditions), a road cadastre (data on public roads and bridges), a zoological map, and the register of forms of nature conservation (data on the natural environment). Below are presented selected studies and analyses developed based on thematically different land data with a particular emphasis on cadastral data.

There is a need for the analysis of the investment of the area and its services, such as technical infrastructure, i.e. agricultural transport roads, reservoirs, and the main and field drainage systems based on, e.g. the existing planning documentation setting the directions of spatial development. The analysis of the existing state of investment of cadastral parcels of the land covered by the land consolidation aims to:

- determine the extent of the occurrence of the areas of technical infrastructure, residential and services development, and infrastructural and production development, the areas used for agricultural purposes, transportation, environmental protection and greenery entered in the Register of Objects of Cultural Heritage and declared to be historical monuments;
- determine the occurrence of water resources, and main and field drainage system facilities;
- determine the extent of the occurrence of the areas where there are archaeological sites entered in the Register of Objects of Cultural Heritage;
- the characteristics of hydraulic facilities;
- the characteristics of historic buildings (name, date of entry into the register of objects of cultural heritage);
- the characteristics of the service infrastructure network.

The state of investment of cadastral parcels covered by the land consolidation works is determined on the basis of the following thematic spatial layers regarding:

- parcels (source: cadastral map);
- service infrastructure network (source: network of public utility lines);
- the state of ownership and possession (source: cadastral map, the cadastral attribute database on parcels);
- the function of the area (source: land use plan).

The direction of development of the road system in the consolidation area used for the agricultural field operation and transport accessibility of cadastral parcels to roads is determined on the basis of detailed analyses of the existing road network which cannot be carried out without the relevant data, whose sources include:

- the road cadastre;
- municipal databases on agricultural transport roads;
- topographic maps including information on, e.g. the road network;
- the cadastral map, the cadastral attribute database on parcels.

The results of the studies of transport conditions for cadastral parcels can contribute to the rational targeting of activities related to the development and improvement of, e.g. the agricultural transport road network, e.g. by selecting the areas preferred for its development.

The analysis of the consolidation object in terms of the forest conditions apply, in particular, to the following aspects:

- environmental aspects (the ability to enlarge forest complexes – the indication of the cadastral parcels for afforestation, together with an analysis of their legal status, the creation of ecological corridors and paths in cadastral parcels);
- physiographic aspects of the land (soil quality for afforestation, agricultural land use, water conditions, downslopes, areas threatened by water erosion);
- economic aspects (existing rural buildings – utility functions, built-up area, usable area, technical data, planned construction areas as well as industrial and services areas, planned and existing recreational areas).  
The data used in this type of analysis come from:

- digital forest maps;
- the register of the forms of nature conservation;
- cadastral map and the cadastral attribute database on parcels.

The knowledge of the topography of the consolidation object is an extremely important element to be taken into account while organising the agricultural space, shaping the agricultural transport road network and selecting potential areas for afforestation or areas at risk of flooding. Surface analyses allow for the determination of the downslopes which form a basis for many analyses regarding the designation of cadastral parcels potentially at risk of flooding or soil erosion. Also, the selection of the optimal intersection of the land by projects, such as highways or power lines, requires the knowledge of downslopes and slope exposure. The results of the analyses of the structure of distribution of surface run-off in the area form the basis for the designation of the location of flood risk zones for cadastral parcels. This is very important and significant information, especially at the stage of the development of conceptual solutions (the assumptions for the land consolidation project) relating to the designation of, e.g. residential zones or areas to be used in flood protection projects. Slope visibility analyses make it possible to specify the general spatial vision of the consolidation area, places with attractive viewing exposure, places worth seeing, and pedestrian and cycling paths. A slope exposure map can be used for the designation of areas reached fastest by thaw water, places with unfavourable exposure for plant vegetation but attractive for ski slopes, hiking trails and direct sunlight, and the best locations for planned housing estates or individual habitats (Trystuła 2013). The source of the data used in these topography analyses for cadastral parcels is a digital 2D or 3D terrain model.

The environmental conditions of the area covered by the land consolidation procedure also include soil conditions, which – like topography – affect:

- the organisation of the agricultural space;
- the selection of areas for future development;
- the selection of areas for recreation and relaxation.

The sources of data necessary to carry out the analyses of soil conditions for cadastral parcels include:

- soil and agricultural maps (data on agricultural arable complexes and types of soil);
- the cadastral map (the boundaries of cadastral parcels).

The aim of the development of the study of water conditions for the area where the consolidation procedure is taking place is to provide the necessary data to support the process of making the decisions related to the improvement of water conditions, mainly the projects in the area of the main and field drainage water systems and the construction of water reservoirs, which contribute to favourable changes in moisture in the soil. Water conditions are characterised for the purpose of water management in agriculture and environmental protection, and this applies, in particular, to the description of surface water, groundwater and the areas at risk of flooding or drought. The sources of data used for this kind of study include the hydrological map and the cadastral map. The juxtaposition of this kind of data makes it possible to indicate, among other things, periodically flooded cadastral parcels or land that could be used in flood protection projects.

## **Conclusions**

Cadastral systems are used by society in various domains, from calculating taxes, through supporting activities in the property market, to broadly understood land management (Wilkowski 2002). Technological progress, motivated by social and economic needs that grow with each day, brings new solutions that provide a chance for dynamic development of the property cadastre as one of the most important public registers, gathering data on land, buildings and apartment units, as well as on entities with specific legal status in relation to the above-mentioned objects (Trystuła 2014).

Comprehensive land consolidation, also known as full land consolidation, is a measure that most effectively promotes the development of non-urbanized areas. It involves the exchange of land plots as well as other activities that contribute to rural development, including land zoning for public utility projects, construction and surfacing of rural roads, construction of drainage systems and erosion control systems and environmental protection. Consolidation significantly influences space and often leads to dramatic changes in spatial patterns. The process has both positive and negative implications for the natural environment. In recent years, greater emphasis has been placed on nonproductive, including ecological, functions of rural areas (Dudzińska, Kocur – Bera 2014).

Directions of changes and development of property cadastre result mainly from the needs of the society for solving newly emerging problems related, among others, to globalisation, sustainable development and development of spatial information technology. Development and evolution of contemporary cadastral systems depends on many important factors, related e.g. to economic policy and possibilities of implementing activities supporting innovation and transfer of new technologies. A modern cadastre should satisfy not only its current leading functions, for instance, fiscal, information, legal or record functions. It should also be oriented towards new challenges, such as 3D geovisualisation, which will enable multidimensional visualisation of cadastral objects along with recording of related rights. New solutions will contribute to extending the existing functions of cadastral systems and to the emergence of new

functions, e.g. related to ensuring public safety as one of the elements of sustainable development (Konieczna, Trystuła 2013).

The process of land consolidation is a multi-step project taking into account a number of social, legal, economic and environmental aspects which require access to a huge database. The cadastre provides more than 30% of all the land data necessary for the performance of land consolidation works. The discussed examples of the activities carried out as part of the consolidation works support the notion of the significant usefulness of the cadastral data in the studies of local conditions which determine the feasibility of solutions in the consolidation project. Regardless of the objectives mentioned above, cadastral information sets enhanced with additional data from other sources serve an important role in the performance of consolidation projects.

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