

## DEVELOPMENT OF MODERN CADASTRE AND CADASTRAL MAPPING: CADASTRE AS MAJOR INFORMATION SOURCE OF LUCC RESEARCH IN CZECHIA

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**Abstract:** The article deals with the history of cadastre and cadastral mapping as one of the most important and by capacity of information most extensive databases used in the so-called historical land use research in Czechia from the late 18<sup>th</sup> century up to present days. It is naturally used by geography and historical geography of agriculture, history of cartography, economic history etc. It also offers some information on development of cadastral mapping in some parts of Austria-Hungary, especially in its western part, i.e. Austria and Slovenia. The article topic is characterised in accordance with main periods of the history of Czechia and with main milestones of cadastre development, mostly corresponding with political changes. The changing quality of data and content of the cadastre are to a certain extent evaluated from the point of view of land use research by a team headed by I. Bičík at the Faculty of Science, Charles University. The first chapter gives also a very brief overview of cadastre history from antiquity until now.

**Key words:** cadastre, cadastral mapping, history, LUCC research, Czechia

### 1. INTRODUCTION

The research into long-term land use changes in the territory of Czechia in the period of 1845 – 2000, carried on at Charles University, Faculty of Science, Department of Social Geography and Regional Development, by the team headed by I. Bičík, the member of which I am, uses the so-called evidential statistic method. This method is based on using partly archival and recent written and cartographic cadastre files, partly the computer database data kept by the Czech Office for Surveying, Mapping and Cadastre in Prague. From the point of view of comparability in time and space, the cadastre of realties is not only in Czechia, but similarly also in Austria and Slovenia and partially in Slovakia and Hungary, a unique and large exact source of very detailed information on land use in different time sections. In case of agricultural (mainly arable) land and forests, it provides also information on their productivity and quality.

This method is primarily based on cartographical and statistical analysis of data, mainly of written cadastre files. For research on micro-regional or local level, i.e. into land use structure changes inside cadastral units (abbr. CU) or into test areas, cadastral maps or other cartographic sources are used. The contemporary picture of land use inside of both cadastral units and test areas (of an area of about 5 000 ha) is obtained by field mapping of land use in maps of large scales (most often 1 : 5000). For more information on this research and its results, see for instance Bičík et al. (2001), Bičík, Kupková (2002), Bičík, Jeleček, Štěpánek (2001), Bičík, Jeleček (2005), Jeleček (2002), Štych, Mareš (2005), etc.

However, the main purpose of this article is to give basic information on cadastral mapping and cadastre in the territory of Czechia during the last two centuries which is the major information source of our research into LUCC carried on with the support of the Grant Agency of the Czech Republic and also in the activity framework of the IGU-LUCC Commission.

## **2. THE ORIGIN AND A BRIEF HISTORY OF CADASTRAL MAPPING**

In general, the term "cadastre" is defined as a list of persons or real estates made usually by state primarily for tax purposes. The term is derived from Latin and means inventory (caput = head, capitastrum = inventory per head, later per any unit). In a narrower sense of word, this term means a comprehensive and systematic written and cartographic description and inventory of individual plots of land elaborated in order to determine their acreage, land use and property evidence and to register and chart how their land use changes. The cadastre contains herewith data on pricing of individual plots of land, which as a rule express their natural fertility. These data serve as a basis for land tax assessment of each plot of land and also for fixing the so-called official prices of land (which are generally lower than market prices). Written and cartographic data must be identical (Kain, Baigent, 1992).

Cadastral maps (abbr. CMs) are therefore maps of properties, which identify the property of owners as they are registered in written documents, with some additional data like name of owner, area of plot, its fertility, tax class, etc. A cadastre is therefore an important source of exact numerical and cartographic information on the state of land use to the date, on which it has been counted or surveyed. As the modern cadastre has existed in various forms for about 200 years, it represents an inestimable database for studying long-term land-use/cover changes especially in small territorial units. These units can be joined together according to different administrative or geographical units (e.g. historical lands, provinces, districts, counties or catchments basins, mountains ranges etc. (Jeleček, 2006, I, 83-84).

The research into land use change at higher regional level uses generally archival written cadastral data, on micro-regional level rather old or new cadastral maps or large scale maps compiled after field surveying of the current land use. Cadastral parishes or units, and territories, which usually surround each settlement (village, township, territorial parts of cities) serve as basic territorial units of a cadastre. They are characterized by data on land use categories, but at the same time they represent a sort of

a "black box" inside of which it is impossible to observe the land use structure and its changes. For studying land use changes in detail it is necessary to use old and new cadastral maps or maps of smaller scale.

Cadastral maps are based on exact trigonometric survey that has been under permanent control. They are very detailed in terms of topography (they include also place names and mainly names of different parts of cadastral units – many of them expressing the way of their use or character in the past: compare -crest, -grove, (Holly)-wood. Cadastres, which were and are organized or sponsored by the state, usually cover and contain data on smaller territories (districts, counties, parishes) and then data according to higher administrative units (provinces, lands, states). As to the private sector, its cadastre covered only property of manors, great estates of landlords and is considered to be forerunner of the state cadastre.

The technique of land property mapping was known and used to a limited extent already in ancient Mesopotamia and Egypt from about the end of the 3<sup>rd</sup> millennium B.C. Antic Greece and mainly the Roman Empire used cadastral maps (e.g. incised in bronze) and registers of state land from the 2<sup>nd</sup> century B.C. as well (Kain, Baigent 1992).

The nobility in Europe began to secure their private rights to land property (in early feudalism usually gained by purchase or rather as feud from state, represented by king or emperor, for the services rendered) around 1000 A.C. by recording them into official registers (land books), such as the Domesday Book in England in the 11<sup>th</sup> century. The hereditary tenures of land (or farms) by serfs and their incumbencies (pledges) to the feudal lords were registered in special books called in Czechia *urbars*. The land farmed by serfs was called "rustical", the land of feudal landlords "dominical" and was registered in special files called "Land Boards" (*Desky zemské*). The land of nobility was not burdened by any land tax until about the early 19<sup>th</sup> century (e.g. in Austria). Many medium-scale maps of manors drawn in the 16<sup>th</sup> and especially in the 17<sup>th</sup> and the 18<sup>th</sup> centuries show the field patterns and some gross data on their land use. They also served as inventories of land property. These maps have limited possibilities of use in comparison with later cadastral maps because of their relatively small scale, but they are used after their GIS processing for studying the generalized land use state as it was some three hundred years ago.

The idea of cadastral mapping sponsored or organized by the state was born in Europe in the era of Enlightenment in the 18<sup>th</sup> century. It was influenced by the struggle between the gradually centralized state and landlords, i.e. nobility and church, wanting to preserve the old no-tax character of their land property. The birth and development of capitalism urgently required all land to be converted into a free commodity on free markets. Such commodity had to be liberated from feudal survivals (like serfdom with its tributaries), at least exactly priced and then taxed and for that reason exactly mapped and measured.

The centralized state – centralization was generally a progressive historical process – needed more bureaucracy and a permanent army which required a much higher state budget, i. e. higher tax income. Direct taxes, such those from farmed land, offered the most rapid way to its increase. This approach corresponded with the economic philosophy of physiocracy, leading economic theory at that time. It meant a shift in elaboration and use of cadastre and cadastral maps by the state, i.e. by the government, as one of the tools of land management and consolidation of the nation-state and of the upcoming new societal capitalist system.

Cadastral maps were elaborated for each cadastral unit with delineated boundaries of all plots. As a model for all surveying and mapping of enclosures and tithes in England, for the very early cadastral mapping in the Netherlands and later for the so-called "ancient cadastre" in France, for plats together with the notes of the United States Federal Land Survey, for the Austrian Stabile Cadastre and for the Bavaria, Tuscany, Spain, etc. ones, was used the so-called "Milano Cadaster" (Censimento milanese) elaborated between 1718 – 1780 for the Italian province of Lombardy (Kain, Baigent, 181-186, Mašek, 1948, 16). All of them are typical for their long duration; therefore they constitute valuable historical sources for historical studying of land use and landscapes changes.

### **3. BIRTH OF A MODERN CADASTRE IN CZECHIA AS A PART OF HABSBURG MONARCHY**

#### **3.1. The Joseph's Cadastre**

All attempts to map out the extent and quality of land for tax assessments till the Joseph's Cadastre (this was the 3<sup>rd</sup> one, 1785), i.e. "Catastrum rollare" (1654), First (1748) and Second (1757) Theresia's Cadastre and exequastorium dominicale (the first inventory of land owned by nobility), were based on unreliable and often purposely distorted tax confessions of landowners or tenants (compare Kain, Baigent, 1992, Mašek, 1948, Pekař, 1932). Land plots were not surveyed and taxations made by suzerain clerks were influenced by interests of owners, which were not under a satisfactory control by the state administrative. Before the Joseph's Cadastre, all previous ones used farm (homestead) as "taxation unit", i.e. its whole territory.

A crucial cadastral reform based on surveying land plots instead of farms of both farmers under serfdom and nobility and suzerains, which was the basic idea of this cadastre, was started by the Emperor Joseph II in 1785. As a new unit, subordinate to the state and not to suzerains, cadastral parish was established (and its each farm or dwelling house was numbered), it was set down without reference to border of estate. In addition, data on acreage and tax yields of fields, meadows, vineyards and forests and on yields from water bodies and streams were measured. Individual plot surveyed in the field was established as the basic tax unit. The Joseph's Cadastre was the first one based on direct measuring of the real state in the field.

Joseph II intended "...to tax the gross income from each plot of land divided into nine land use types and the holder of each piece of was to declare the income received from it over the past ten years" (Kain, Baigent, 1992, 193). Very remarkable is that the geographical position of the field (plot of land) to the market was taken into consideration. But after the death of Joseph II, the Joseph's Cadastre was declared void because of a strong opposition of nobility and other great estate owners, and the old Maria Theresia tax list was used again. Anyway, the Joseph's Cadastre is a significant source of information on economic and social conditions in Czechia at the end of 18<sup>th</sup> century, i.e. just before the beginning of the Industrial Revolution. Unfortunately, it does not contain big scale maps with surveyed land plots.

## 3.2. The Stabile/Franciscan Cadastre

### 3.2.1. The 1817 – 1869 period

Foundations of the contemporary modern cadastre of land, (real estates) were laid by the patent of the Austrian emperor Francis I of December 23, 1817. So the first cadastre providing detailed and exact maps of cadastral units could be created and it can be used even now. It was the so-called Stabile (Franciscan) Cadastre founded in the 1<sup>st</sup> half of 19<sup>th</sup> century.

The more and more centralized state with increasing bureaucracy and permanent army needed a much higher state budget. In the historical context, the centralization of state was at that time a progressive process. Direct taxes, e.g. from land, were the fastest way to its increase. In that period, industry, better said manufactures, were still underdeveloped and therefore (like during the whole era of feudalism) the major resource of wealth (capital) was agriculture and then, in a much smaller extent, crafts and trade. It corresponded to at that time leading economic philosophy of physiocratism. Therefore it was necessary in the early 19<sup>th</sup> century to gather data that would serve as a base for exact land taxation. For the purpose of exact surveying, a precise triangulation network was finished in 1816 and on its basis cadastral maps at a scale of 1 : 2 880 were drawn. The exact plot areas were calculated from these cadastral maps and all further maps of medium scales (e.g. Second Military Surveying, 1836 – 1852) were derived from them (see Kain, Baigent, 1992, 156-202; Mašek, 1948). Unlike the Joseph's Cadastre, the Stabile one did not contain only written files with numerical data, but also an immense set of exact cadastral maps.

Preparatory works started after the Emperor Francis I of Austria had issued the edict on the "Stabile Cadastre and Land Tax" on December 23, 1817. Tax assessment was based on land plots and the net income from each plot in CU was defined. Each plot obtained its cadastral number (valid until now), boundaries of cadastral units were derived from the Joseph's Cadastre. For each CU a cadastral map was elaborated, where all plots and CU boundaries were delineated.

The main part of work started in 1817 in Lower Austria and in 1824 in Czechia. The survey in the Austrian part of monarchy was completed in 1861 (Tyrol) and a total of 30,556 CUs with an area of 300,082 km<sup>2</sup> divided into almost 50 million land plots (parcels) were surveyed (Kain, Baigent, 1992, 198). The detailed surveying was being carried out in whole Czechia in 1824 – 1843, in Bohemia in the period 1826 – 1843 and in Moravia in 1824 – 1836 (for more details compare Katastrální mapování 1 : 2 880. In: Atlas ČSSR, map 4/4). Exactly 12,696 cadastral units with 15,359,513 plots of land of an area of about 79,000 km<sup>2</sup> were surveyed in historical lands of Bohemia, Moravia and in the Czech part of Silesia. The elaborated maps covered 49,967 maps sheets. After the maps were finished, plot areas were calculated from them and plots were evaluated according to their land-use, land cover and fertility. Each plot was given, with the help of a complicated method of pricing (netto income), a number expressing its soil value (Mašek, 1948) according which land tax was calculated. Each defined (e.g. village) settlement unit had its CU. Where a settlement died out, the frontiers of the CU were preserved in maps and the area was joint to the CU of an existing settlement.

As regards the eastern part of the monarchy, i.e. Hungary (including the territory of Slovakia, Croatia and Transylvania), the taxation of individual land plots instead of homesteads was introduced in 1849 by emperor's edict of October 1849. But a detailed surveying and mapping began later, in 1856, in the western part of Hungary, now

Austrian Burgenland, according modified instructions from 1824 (edited in 1865) and was finished in Slovakia in 1918 (Katastrální mapování 1 : 2 880. In: Atlas ČSSR, map 4/4). Pricing and evaluating of plots fertility was carried out similarly as in the western part of the monarchy (Mašek, 1948, p. 24-25). After the so-called dualism in 1867, when the Austrian empire became "confederation", i.e. the Austro-Hungarian monarchy, its Hungarian part was being mapped by the Hungarian administration.

Apart from maps, the cadastre provides also written sources with exact numerical data on the area and land-use of individual plots of land.

The methodology of cadastral mapping distinguished at the beginning 45 categories of land use: e.g. land category typical by its lowest biodiversity, "arable land" (AL) was divided into six sub-categories (for details see Table 1). The cadastral maps were continually updated to display the land use state till the end of 19<sup>th</sup> century. Currently, the old cadastral maps are in deposit in the archive of the Czech Office for Mapping, Surveying and Cadastre in Prague.

The cadastre written and cartographic files contain more elements. In terms of land use research, the most important are "katastrální mapy" (cadastral maps) usually of a scale of 1 : 2 880 (in some territories with very fertile soils maps were drawn at a scale of 1 : 1 440 or 1 : 1720). The first maps were called "original maps" (originální mapy) and used as "evidentiary maps" (evidenční mapy, later called as "katastrální"). For the field probing of changes to plot they on maps have been printed also coloured so-called "Indication sketches" ("indikacní skici"). In 1833 a central archive was established in Vienna to store the coloured copies of all maps called "Kaiserpflichtexemplare", Emperor's mandatory copies (císařské povinné výtisky), which were not used in cadastral service practice but which greatly document the state of land use and landscape at the time they were made. The majority of still valid cadastral maps created on the basis of the Stabile Cadaster surveying data (usually at a scale of 1:2 880) are still used in about 80 % of the territory of the Czech Republic (Mašek, 1948).

Each cadastral map was from the beginning accompanied by "Grundparzellenprotokoll", i.e. register of plots (in Czech "parcelní protokol"), which embraces for each land parcel its reference number, the name of its owner, its land use (it can be used as another way how to elaborate coloured maps printed only in black and white) and its area in Lower Austrian "Morgen" or "Joch" ("jitro"), i.e. 0,5756 ha, and "Quadratklafter" (čtvereční sáh). This list of the "Protokoll" contains columns enabling to record changes. The "Protokoll" includes also a list of all owners in the locality (in alphabetic order) and data about the area they own.

Table 1 show that the most detailed land categories structure dates from the 1<sup>st</sup> half of the 19<sup>th</sup> century when the cadastre was created. Land categories were divided into so-called "pricing categories/classes" (e.g. arable land into 4 – 6 classes) and according to them plots were taxed. This division has been constantly simplified as documented in Table 1, so nowadays the database of the Czech for Office Surveying, Mapping, and Cadastre offers data for 12 individual categories, and 2 aggregated ones (see Table). The number of land use categories in written cadastral data from the last years was reduced and the LUCC database is adapted according to the current number of 11 individual and 3 aggregated categories.

Cadastral maps provide also information on spot objects in the landscape such as castles and mansions, vicarages and parish churches, schools, town halls, pubs, distilleries and breweries, glass-manufactures, etc. From cadastre data on deserted settlements or their parts we can observe changes in extent of settlements and in population density.

**Table 1** Titles of Land Use categories used in the Czech cadastre maps and registers

1845	1948	1964	2000	Database LUCC 2001
Arable Land (AL)	Arable Land (AL)	Arable Land (AL)	Arable Land (AL)	Arable Land (AL)
Arable Land				
o With fruit trees				
o With vineyards				
o Alternate Me				
o Alternate Pa or fallow				
o With wood				
Gardens	Gardens	Gardens	Gardens	Permanent (PC) Cultures
o Vegetable				
o Fruit -orchards				
o Flower				
o Hop fields				
X	X	Fruit orchards	Fruit orchards	
X	X	Hop fields	Hop fields	
Vineyards	Vineyards	Vineyards	Vineyards	
Meadows (Me)	Meadows (Me)	Meadows (Me)	Meadows (Me)	Meadows (Me)
o With fruit trees				
o With lumber				
Pastures (Pa)	Pastures (Pa)	Pastures (Pa)	Pastures (Pa)	Pastures (Pa)
o With fruit trees				
o With lumber				
o Alpine Pastures				
X	X	X	X	Permanent Grassland (PGL)
Agricultural Land (AGL)	Agricultural Land (AGL)	Agricultural Land (AGL)	Agricultural Land (AGL)	Agricultural Land (AGL)
o Forests	Forests	Forests	Forest Plots	Forest Areas
o Deciduous high stand forest		o Forests including clearings		
o Coniferous high stand forests		o No-forested plots used for forestry		
o Mixed forest		o Plots laying above upper forest frontier covered by shrub		
o Low stand forests				
o Clearings				
o Shrubs				
o English gardens				
o Forest fire places				

Table 1 – continue

1845	1948	1964	2000	Database LUCC 2001
Swamps, lakes and ponds o Ponds and lakes with reed o Lakes without reed o Lakes without reed o Swamps and peat bogs	Swamps, lakes and ponds	Other Water Areas	Ponds Other Water Areas	Water Areas (WA)
Built-up Areas and Courtyards  Unproductive Land o Naked rocks o Stone quarries o Sand, gravel and clay pits	Built-up Areas and Courtyards  Unproductive Land (RA)	Built-up Areas and Courtyards  Remained Areas o Plots for depots, manufacturing, and constructions, o Roads and railways o Plots for recreation o Protected areas o Parklands o Quarries o Cemeteries o Other plots non-suitable for farming	Built-up Areas (BuA)  Remained Areas (RA)	Built-up Areas (BuA)  Remained Areas (RA)
Other areas o Rivers and brooks o Roads and trails o Railways	X	X	X	
X	Other areas	Other areas	Other areas	Other areas (OA) - Built-up Areas - Water Areas - Remaining Areas
<b>X</b>	<b>Total</b>	<b>Total</b>	<b>Total</b>	<b>Total</b>



### 3.2.2. The 1869 – 1918 period

The notion "Stabile Cadastre" did not respect reality, because already in the first decades after mapping it was clear, that it would be necessary to permanently review the cadastral data and maps as well as pricing of land plots and mainly the assigned taxes (the taxation lasted to the 1860's.). The idea of Emperor's patent of 1817 expressed by the name of "Stabile Cadastre" did not take into consideration the economic and technological progress in the society development. In fact, the neutral name "Franciscan cadastre" used in Austria more corresponds with reality.

Varied discrepancies in ranking of plots into different land categories, their fertility classes, yields of harvests were not eliminated in the so-called "Reambulierung" cadastre, (reambulace = specification) which was introduced in 1869 and remained in place till 1882.

An act on establishing new ground books approved in 1874 set down the duty to inscribe in those books all realties including all rights and duties connected with them. That act also set up the public character of ground books. The rights recorded in the books became lawful by the so-called "intabulation".

The "Reambulierung" of cadastral maps indicated that the quality of cadastre content could be degraded. The situation called for a better method of cadastral database improvements and therefore the new act "On evidence of cadastre land tax" of 1883 prescribed its permanent completing and maintenance. It enabled to proceed to constant revisions using modern surveying techniques and methods. The metric system was introduced into the cadastre in 1893. The first complex results were completed in 1896 and published e.g. in the Lexicons from the 1900 population census. These data are very important because they document the state of land use after the climax of agricultural revolution accomplished in the whole Czechia in the 1880s and until the end of 19<sup>th</sup> century followed by minimal land use changes noted in all partial periods from 1845 to 2000 (see diagram in Jeleček, 2002, 51, or 2006, I, 191). For instance, whereas the acreage of arable land was extended by 7.1 % in the period of 1845 – 1882, it decreased by 1.8 % in the next period of 1882 – 1897 (Jeleček, 1995).

Agricultural revolution (for its definition see Jeleček, 2006, vol. I, 25-27) put an end to the former permanent intensive growth of agricultural land area, especially of arable land. The changes in land use structure were very small until the end of the 19<sup>th</sup> century. Feeding of the rapidly growing non-agricultural population required improvements in the efficiency of agriculture rather than a further expansion of arable land. The solution was in intensive forms of farming, i.e. also an intensive exploitation of the historically influenced land use structure. This was carried out through capital investment into the most fertile plots by mechanisation, use of chemicals; crop rotation, etc. (compare also Bičík, Jeleček, Štěpánek, 2001, Jeleček, 2002).

The situation shown in Emperor's Imprints could be compared with the situation documented in cadastral maps chosen for a part of the Czech territory around the year 1900, then in maps published later, especially at the end of the 20<sup>th</sup> century. The current state of land use can be seen from field surveying drawn into 1 : 5,000 maps produced by Ivan Bičík's research team since the turn of the 20<sup>th</sup> and 21<sup>st</sup> century for selected model areas.

To conclude, E. Kain R. and Baigent argue that "Austria's role in the development of topographical mapping benefits of its position as a major European power". But concerning the contribution of Austria in the field of technological innovations they note,

that "By contrast, Austria's role in the development of cadastral mapping is slight...and although it covered a remarkably large area and was carried out efficiently and with great determination in widely varying terrains, it was not innovative in technique and innovation" (Kain, Baigent 1992, 203-205). I would assume that such evaluation corresponds rather with the cartographical approach than with the geographical one. From the point of view of historical/dynamic land use, the highest value of the Stabile Cadastre lies in its content, i. e. in data on the area and value of land categories.

### **3.2.3. Period 1918 – 1948**

The Emperor's imprints of cadastral maps which were in Vienna archives and covered the territory of the new independent state of Czechoslovakia were passed on to the Czechoslovak authorities after the fall of Austria-Hungary. They are now stored in the Central Archive of Surveying and Cadastre in Prague and therefore we are now able to process them in GIS and print them at different scales, use other colours etc.

The new act on ground (land) cadastre and its administrating approved in 1927 was newly called "Cadastre act". The cadastre's former only tax function was changed and the cadastre got general economic, technological and legal purpose. From this point of view characterized the function of older cadastres of Bohemia from 1654 until 1798 (i.e. until the Joseph's cadastre) an outstanding Czech historian J. Pekař (1932). It is obvious, that such change was useful also for geographical and mainly historic-geographical research. The public character of cadastre was preserved.

### **3.2.4. The 1948 – 1989 period**

We may insist on the fact, that the cadastre was very exact and reliable until 1938, i.e. until the German occupation of Czechia (western part of Czechoslovakia) in March 1939. Later its maintenance was losing its quality, particularly during the post-war period, when due to confiscations of lands owned by transferred Czech Germans and their distribution to new Czech holders the cadastral data became more and more different from the reality in landscape. Notably after 1956 its maintaining came to an end. But the cadastral act of 1927 was completely abrogated only in 1971 by the "Act on geodesy and cartography".

The in 1948 established communist regime considerably negatively changed the function and administration of cadastre in consequence of the communist regime's opposition to private property of means of production, including also land under cultivation, specific by its globally limited area and practically not renewable natural source.

Farmers and landowners in communist countries, where agriculture was more or less collectivized or nationalized, had to put gratis their land in co-operatives and to cultivate it collectively. The cadastre was then degraded into records and maps of land users. Ongoing updates of land property changes became obsolete; they did not correspond to the reality any longer. The restoration of private property rights followed by restitution of land properties, i.e. the former landowners or their descendants obtained their land back, was therefore complicated and tedious in these countries after 1989.

So at the beginning of 1950s the constitutionality of records into land books was abolished. Property rights to land plots changed only through purchase/sale contracts. Records into land books (intabulations) were not obligatory anymore. Only organizations

(legal persons) had such obligation. Changes were introduced by extensive integrating of plots, by expropriation of big farmers and by allocating of their land to small farmers.

The basic reason of this practice was the centrally and directly controlled economy, i.e. including the almost fully collectivized agriculture, as the former private farmers had to, mostly by means of political constrain, put their land into co-operatives to have it cultivated in common. In such a system the state needed to know only who farms the land and not who owns it. This ought to be assured by the so-called "United Land Plots Evidence" (Jednotná evidence půdy) introduced in 1956. Only the current state of land use, i.e. category of land (arable land, meadow etc.), and their users were registered, not their owners and their changes. Written records (entries) into land books were interrupted at that time and land books were moved from cadastral offices to state notary's offices. It meant that the principle of cadastre as list of land property was abandoned and its maintaining interrupted. About one third of the Czechia's territory was affected by these extraordinary large changes (History of the Cadastre...<http://www.cuzk.cz/Dokument...>).

The yield tariffs fixed by the 1896 revision of land cadastre were replaced in the 1970s by the so-called "BPEJ" (soil ecological bonity units), calculated by objective methods of long-term research, which are still the basis for fixing official price of agricultural land. This very detailed and carefully formulated system has maintained a relatively high level, even when compared with other countries. A considerably different development and conditions in agriculture after 1989, especially due to the competition of much more subsidized agriculture in EU countries, (a great decrease of fertilization intensity and of cattle population, both under the critical level under which arable land lies fallow) render the informative value of these units rather obsolete.

### **3.2.5. The period after 1989**

After the fall of the communist regime and the renewal of democracy and capitalism in Czechia in 1990, the above mentioned United Land Plots Evidence became completely inadequate to this new situation, not to speak about impossibility to maintain its defective methods.

To the new societal conditions corresponds a series of acts approved in 1992 and in force from January 1, 1993. The by these laws established "Cadastre of Real Estates of the Czech Republic" (in short "Cadastre of Realities", "Katastr nemovitostí") integrates into one operative tool the functions of the former Land books and the former Land Cadastre. The state administration of the Cadastre of Realities is done by state cadastral offices, both central and regional, which were transformed from the former District Geodesy Centres. The major merit of this reform lies in the re-introduction of the 40 years ago abolished "constitutive" principle, according to which the legal effects of all changes in property relations and also in character of realty (i.e. also changes in land category, e.g. from arable land into meadow) come up only after being recorded (intabulation) in the Cadastre of Realities.

All owners are now obliged to notify to the Cadastre offices all land use (land category) changes in term of two years at the latest, whereas in the past this term was only one year. In any case it means that in some years cadastral data on land use are a bit delayed in relation to the given year land use structure, I would estimate this delay to be two or three years. This delay is clearly apparent when comparing the land use state (data) we got by field mapping with the cadastral ones. This "mistake" does not play any important role, because the research into long-term land use changes is looking for major

trends of these changes and for their natural and especial societal driving forces (Bičík, Jeleček, 2005).

The restoration of private property rights to land enabled to all former owner or their ancestors ask for given back their land. Not all eligible did so, but in certain sense the economically inconvenient structure of land tenures by their area, typical for pre-war period has been restored. For instance, the land tenures of acreage until 10 ha represented 85 % of all land tenures in Czechia in 1930. Only some land owners decided to farm their land, but majority of them rented out their plots of land to big farmers, transformed co-operatives, or state estates, because of under the current economic conditions such small farms could not survive. These big farms which use this land have been paying the land tax instead of land owners. To simplify such splintered tenure of land the Czech government decided, that not users but owners of land will pay the land tax.

At the beginning, the Cadastre of Realities completely took over the data of the previous evidence of realities, i.e. the set of geodetic information including cadastral maps and related descriptive information (data on the cadastral territory, plots, buildings, owners and other authorized persons and on legal relations. These data include also summary surveys of land resources, the most important source of information for land use research, and results of enquiries and measurements and a collection of documents. In 1994 – 1998, the set of descriptive information was digitalized. Then in the years 1997 – 1998 the "Cadastre of Realities" was completed by data on relations of soil ecological bonity units to pots. In 1998, digitalization of the set of geodetic information, i.e. cadastral maps, has begun.

Since 2001, the "Cadastre of Realities" has been simultaneously maintained in the computerized "Information System of Cadastre Realities" (Informační systém katastru nemovitostí – abbr. ISKN). This system enables each citizen to obtain, against payment and under determined legal measures, the needed data via Internet.

#### **4. CONCLUSION**

The modern cadastre birth and notably its development in Czechia were influenced above all by political changes, the most important of them being the fall of feudalism in 1848/9, the transition to capitalism and the progress of the Industrial and Agricultural Revolution; the end of the Habsburg monarchy and the establishment of the independent democratic Czechoslovakia in 1918, forty years of communist regime (1948 – 1989) and finally its fall followed by a come back of capitalism and market economy. It was also the economic development of the society, technological progress and finally progress in techniques and technologies of surveying and mapping, later in computer technologies. The former almost only tax function of cadastre was gradually changing to a general economic, technological and legal one. For the LUCC research using the evidential-statistic method, cadastre written files have less importance because they enable LUCC observation only according to territorial units (i.e. not the changes going on inside these units which appear as "black boxes"), from which the smallest ones are cadastral units and the largest ones provinces, state or territory of several states. To the contrary, cadastre surveying of (cartographic) files has enabled a relatively very exact LUCC research and landscape reconstruction based on analysing of large scale cadastral

maps already from the 1st half of the 18<sup>th</sup> century. GIS using enables to compare the old state with the recent one, documented by new cadastral maps or by field surveying chartered into maps of larger scales (about 1 : 5 000 or 1 : 10 000). Because of its quite logical laboriousness and financial costs, this method can be used only on local or micro-regional levels, i.e. in selected test areas. In comparison with the LUCC research using remote sensing methods, satellite mapping or old and new maps of smaller scales (approximately from 1 : 25,000 to 1 : 50,000), the evidential statistic method enables observation of LUCC during a much longer time span of about two centuries in minimum.

Considering the fact that the modern cadastre was established in Czechia when it used to be a part of the former Habsburg monarchy, it is possible to create in time and space comparable databases of land use also for the territories of today's Austria and Slovenia and to compare long term LUCC in these countries of different natural conditions and political and economic development from 1918 up to now nowadays. As cadastral mapping began a bit later in the territories of Slovakia and Hungary, their LUCC can be compared with that of Czechia for instance only since the last decades of 19th century.

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## **Vývoj moderního katastru a katastrálního mapování: Katastr jako hlavní informační zdroj výzkumu LUCC v Česku**

### **Resume**

Článek pojednává o dlouhodobém vývoji katastru nemovitostí a katastrálního mapování jako o jedné z nejvýznamnějších a kapacitou dat nejobsáhlejších databází, která je využívána v historickém/dynamickém výzkumu využití ploch v Česku. Jde o tzv. evidenčně-statistickou metodu aplikovanou týmem I. Bičíka z katedry sociální geografie a regionálního rozvoje PpF UK v Praze. Tým zkoumá vývoj využití ploch v Česku od poloviny 19. století do současnosti od výchozí úrovně katastrálních území. Zdrojem dat jsou písemné operáty tzv. stabilního katastru uložené pro každé katastrální území spolu s kolorovanými tzv. císařskými otisky originálních map v Ústředním archivu zeměměřictví a katastru Zeměměřického úřadu v Praze. Tam byly v 50. letech 20. stol. přepočítány do metrické soustavy a nové tabulky za každé katastrální území byly doplněny o již méně podrobné údaje za r. 1948. Katastrální data jsou ovšem využívána také v historické geografii zemědělství, průmyslu, v hospodářských dějinách atd. Nejméně je využit písemný operát, včetně geografických charakteristik např. celých Čech, tehdejších krajů apod. Článek rovněž charakterizuje vývoj katastru v bývalých zemích Habsburské monarchie, zejména Předlitavska, ve kterém proběhlo mapování podle stejné metodiky jako v Česku (Rakousko, Slovinsko). Všimá si částečně i Slovenska a Maďarska, kde bylo zahájen později a již podle poněkud jiných pravidel.

První část obsahuje stručný popis vývoje katastru od antiky do 18. stol. Pak následuje charakteristika počátků moderního katastru, tedy počínaje tzv. Josefským katastrem, jako nástroje pro přesné změření každého pozemku, určení jeho půdní kategorie (orná půda, louka etc.) a ohodnocení jeho úrodnosti (tzv. vcenění pozemku). To mělo zajistit určení odpovídající pozemkové daně, k čemuž došlo až v 60. letech 19. století, avšak musela být téměř stále revidována. V té době byla hlavním zdrojem příjmu státního rozpočtu. Písemný operát katastru týkající se podkladů pro výpočet pozemkové daně ztrácel svou hodnotu na rozdíl od měřického (mapového operátu), který slouží dodnes pro téměř celé území Česka. Vývoj moderního katastru, zpočátku zvaného jako „stabilní katastr“, je pak charakterizován podle období, jejichž periodizace odpovídá hlavním mezníkům politických dějin, které vždy ovlivnily i vlastní vedení katastru a pořizování katastrálních map. Mění se kvalita katastrálních dat je v menším rozsahu hodnocena z hlediska potřeb metody užívané týmem I. Bičíka. Jsou uvedeny hlavní

zákony, které počínaje 20. lety 20. století postupně měnily původní výhradně daňový účel katastru na účel právní a všeobecně hospodářský. Jsou charakterizovány příčiny úpadku a značného znehodnocení písemného operátu katastru v 50. a 60. letech 20. století, kdy téměř ztratil nejen svou právní, ale i informační hodnotu, protože přestaly být sledovány vlastnické vztahy k pozemkům a katastr evidoval pouze jejich uživatele. Závěrečná část článku se věnuje obnově katastru a všech jeho funkcí po roce 1989.