

MEANS OF ACHIEVING A BASIC CADASTRAL PLAN

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Abstract: *Introduction of the cadastre in Romania involves preparation of cadastral plans based on all the 3200 territorial administrative units, the option of using existing plans and ortophotoplans. Because of the low amount of referees to this subject, that are incomplete, incoherent and with some lacks, a complete methodology must be discussed, a methodology that has to be completed with means of control and confine on surfaces with the purpose of growing the trust in cadastral plans.*

Keywords: *cadastre, cadastral plan, administrative territorial units (ATU)*

1. Introduction

1.1 General

Introducing the cadastre in Romania means achieving a system that has to be unitar and with a technical, economical and juridical evidence of mobiles on the whole surface of the country; along with the real estate publicity, that refers to rights, acts and juridical acts connected to these, is the cadastral evidence system. Our country does not own a clear and up to date evidence and as a result it has to be introduced according to the 7/96 Law and some Technical Norms (2007 edition). The importance of this action, the necessity of a modern, informatised cadastre, doubled by a real estate publicity in the funcial book system, is unanimus recognised as a base of the law state, a real democracy and a conquest market economy.

The actions means that for each administrative-territorial unity (UAT), town, county, a cadastral documentation, with a complex of juridical, economical and techincal content, that aftel the verification and avisation has to be introduced into the funcial book in order to register the rights and juridical facts linked to the buildings. The main part of this documentation is the main cadastral plan that includes the positioning of the parcels and/or properties. According to them, the surfaces are determined and the cadastral registers are made.

The main conditions that a parcelar plan has to achieve, in order to be a modern cadastre are:

- *Digital presentation* at a general scale of 1/5000, higher in populated centers (1/2000-1/1000) and lower in the mountain areas and delta (1/10000);
 - *Content specific to the cadastre*, that allow the forming of an image of the terrain and the identification of the estates;
 - *A good precision*, defined by the positioning tolerances;
 - *Compulsory introduction* in the national referance system *Stereografic '70*
 - *High economical efficiency*, it has to be obtained in the most shorter and cheap way.
- Each particular condition is important for the future use of the cadastral plan.

The real situation in our country, the starting situation in introducing the cadastre, can be characterised, briefly:

- *The total lack of old plans*, on the whole U.T.A., the existent ones being mainly overcome, deteriorised or with lack of actuality;
- *The extension of the work* on the whole national territory of 288000 km², the equivalent of 3200 U.A.T. (towns, counties);
- *Incomplete national geodetic network*, that is in the process of definitivation;
- *The existance of a competent number of qualified people* and a technical up to date dotation;
- *Insufficient funds*, in acordance to the volume of the work, even if they are made separatly;
- *High pressure*, from some internal, national requirements, doubled by the comunity obligations.

As a result the delay that we are in can be, mainly, motivated, but there are still a lot of insatisfaction, lack of fulfilment, that can not be justified.

1.2. The oficial conception regarding the achievement of the cadastral plan

The conditions of our country, mentioned before, that clearly show the absence of some good plans, but also the costs of the work and the urgent neccesity of solving the problem, is in contrast woth the lack of preoccupation and strategy for getting over the crises. The only mentions are given in Technical norms (2007) but they are evasive and lacking in clarity: „cadastral work (and not the land plan) can be done by using old plans and updating them, or on ortophotoplans. Cadastral index plans in turn, launched over a decade as a cost effective solution is obtained by proper vectorization on limits digital and contains digital graphic representation of all elements of the general cadastre.

These official remarks are the only official information on obtaining basic cadastral plans at the national level. Even a cursory examination prove them to be too general, vague and sometimes inaccurate, including examples of the table, without appropriate controls such a large operation. A clear methodology, or work instructions, including technical solutions, on stages, we have no knowledge to be done or is known only to a small circle. Yet such piece should be known to run at least in terms of teaching students to be presented as future specialists performers..

In that spirit, allow us to submit a proposal for discussions, in order to achieve the cadastral plan depicted schematically in three distinct phases, each with specific tasks (Figure 1).

2. Means of achieving the basic cadastral plan

2.1. The cadatral plan frame

The basic plan, in the past achieved on trapezes at the country level to scale 1/5000, by photogrammetric restitution by analogue methodc, is the starting point. The National Center for Cadastre, Geodesy, Photogrammetry and Remote Sensing (CNCGFT) by derivation, simplified the content by reducing contours and retaining only the important details, important to the specific cadastre: orographic terrain (valleys, ridges), the network transport facilities (roads classified, railways), the main constructions (institutions, roads, platforms), some UAT borders.

By conversion, calling the well known techniques of digitizing, scanning and vectorization, based on known coordinate points (corners of trapezes and other related points), have the result of a digital reference plane, available throughout the country at CNCGFT.

The integration, in this plan drawn up by ATU, of content items, and parcels of property that bodies require there cadastrale the known senior units and safe area. To this end we think it requires the identification, marking the precise position measurements and their terrestrial components are safe, that one control surface support. There would be bounded:

- in administrative territorial units (ATU), the steps in the technical standards are followed, which include surveying work while having a prominent legal character;
- the land that belongs to the city perimetre and that are components of ATU, also provided by the technical standards, are reminded by works like those above and they are accomplished in accordance with the urban plans (GUP) approved by the council;
- forest found than the agricultural one or other use;
- some land areas as individual or / and in groups of 2-3, which are clearly evidenced by water boundaries, roads, railways, canals, etc.

Framework Plan would result in duplication of ATU on the reference plane of these units, bounded by land, in the national geodetic datum. Inside their bodies would be located property and plots taken from ortofotoplans or existing plans. This plan becomes an instrument of control and of making a decision, that is absolutely necesar regarding the placement and dimensions of the land that were deducted by not very secure methods. Besides the first two distinctions, mentioned above, there are also intentions to be carried by ground measurements by the Law 7 / 96, but their technical rules for obtaining the ortofotoplans do not provide the precision needed for a basic land plan.

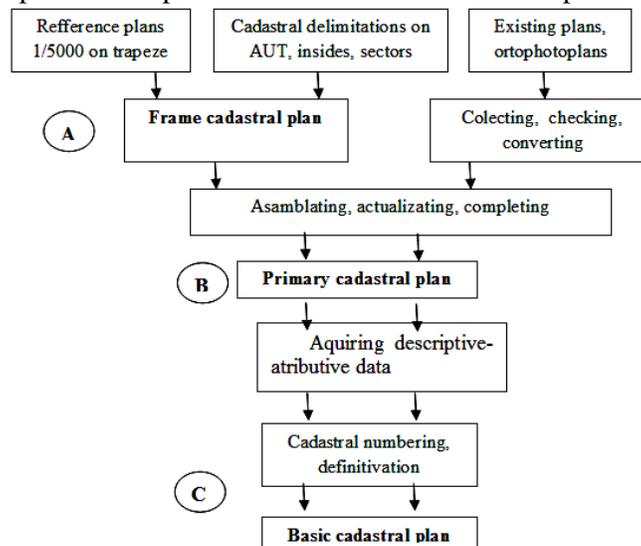


Fig. 1 Steps of a cadastral plan

2.2. Available plans. Checking and converting them

2.2.1. The existing cartografic base

Existing plans, not the „old” ones, which could be used to prepare the basic cadastral plan are numerous, some more useful, some with doubtful quality, as shown by their passage brief overview.

- Basic topographic plan of the country, described above, in the accuracy and content conditions in the years 1970-1993, including 90% of national territory being played on trapezes scale 1 / 5000 (75% of area), population centers even 1 / 2000 and 1 / 1000, and the mountains and the delta 1 / 10000 (3%).

- Land Plan, prepared by the derivation of basic plane through better technology devised at scale 1 / 5000 in terrain and 1 / 1000 in the built pieces, are rigorous but not containing all the parcels that were merged on CAPs and IASs.
- 834/91 HGR plans of documentation for the delineation and assessment of land belonging to state-owned companies, valuable pieces are relatively recent and reliable digital technical standards being developed by unitary technics and better placed.
- Parceling plans for implementation of Law 18/91, of course, deserves attention as approved by county offices, but some of them, the land „sporadic”; or „route”; achieved by simple measures (in roulette) should be viewed with reservation.
- Any other plans of cadastral documentation, approved by county offices, for land restitution under the laws of property, or made public upon request, be taken into account because, after 2005 at least, were obtained by appropriate topographic measurements and placed in Stereo 70 .

Ortofotoplans serve with excellence, preparation of cadastral plans since May to identify the most part the bodies of property and plots a ATU. The program recognizes plot, respectively LPIS system between the 2003-2005 data were acquired by nine foreign companies, which were obtained by processing ortofotoplanuri on 99% of the land, accredited by the pixel size 1m and a positioning accuracy of $\pm 1m$. Since this value can reach up to $\pm 5m$ in some cases is not satisfactory and as such can not be converted ortofotoplans, unqualified basic cadastral plans.

Aerial images, taken with digital cameras, georeferenced and orthorectified, can be used for numerical data acquisition, quantitative, through their study of individual, couples and especially stereoscopic digital terrain model (MTD). Satellite records, and they passed a primary processing could help to cadastral plans, if taken with high resolution sensors, respectively pixel size of 1.0 m.

2.2.2. Control and transformation of the plans

Checking available plans, operating plan required for their integration into the land, is to review its basic characteristics and the extent to which land plan that satisfies the conditions:

- precision of the representations, determined by comparing the position errors of detail in relation to the tolerances specified by instructions. Elements required partial (angles and distances) and / or directly coordinates of points of detail, are obtained by land, according to technical norms;
- contents of the plan are expressed as percentage changes, calculated as the ratio of empty areas, while filled with some details on how and where they have disappeared, reported that amount to the total area;
- the quality of existing plans, time of presentation, (analog or digital), the nature and support legibility representation. Counts and accessibility that the purchase of such items.

Details regarding surveys in order to determine the accuracy and content of existing schemes, the choice areas, the amount of checks and differences, are included in the technical standards of work data.

Conversion of existing plans, which proved that after proper verification accuracy and content requirements of the plan involves bringing them to land, that is in digital format and placed in 70 stereograph projection scale drawing. By converting old plans, action at national level, representations, passed the checks mentioned, were brought to a common denominator to be updated, as needed, and integrated into the Land of the ATU plan. Techniques are currently known, this is the reason why they are treated briefly.

- Digitisation involves transforming a graphic level, analog, one digital numeric. The operation, carried out step by step or continuously, leads to coordinates of points defining the details of topographical and is based on the existence of a digitizer, with appropriate software, analog and plan at least four points of known coordinates in both systems, located in the work. The assembly allows the collection, display and automatic recording of coordinates defining characteristic points that define topographical details.
- Scanning, as a process of high efficiency, makes graphics or digital photo, raster, as accessible information technology. Scanned image quality, by decomposing the pixel resolution depends on scanner and monitor, in number of distinguished points per unit area (approximately 500 points/mm²).
- Vectorization involves transforming raster images data into a vector system using appropriate software and generating vector data lines, surfaces or polygons. Vector representation of contours and shapes rendered topographical details - in this case the linear nearest reality.
- Georeferential consists of positioning, in a reference system, a certain locks. The operation, which involves knowing the position of at least four points in both systems, allowing passage of all the details, positioned in arbitrary coordinates, the national reference stereograph projection 70.

2.3. The actualisation of plans

Update the specific operation of the process adopted to obtain the cadastral plan requires any photogrammetric topographic surveys for:

- completing plans to possibly old images showing air gaps content;
- vacant areas coverage such as assembly representation;

Solutions are chosen for each of the surface tracking, equipment and technical requirements established by rules, all seen through the prism of economic efficiency. Under these rules in force elements specific to completing the plans that are specific for the components units of ATU.

Thus, the corps built property measurements aimed at positioning the total station and parcels with roulette, and the terrain of those matters where mountain villages or only the latest in lowland villages. In all cases the schedule is drawn up and body ownership. In the case of lifting again a compact area, topographic or photogrammetric works placed after the classic known scenario.

3. Assemblation and definitivation of cadastral plans

Framework Plan, described in previous paragraphs, to be supplemented with information extracted from content:

- plans existence, coming through checks and passed through conversion, possibly supplemented by updated;
- ortfotoplans, digital data directly, almost all existing country and sometimes - the plain - all of which limits buildings are often visible, lifting
- new works, the representative areas.

Translating these parts, properly prepared, the framework plan, follows a logical sequence (Fig. 1):

- Integration of basic land units (rolling property, plots) within the limits of the framework plan (land areas, the built ATU) overlaid high level;
- verify whether their position and size that can occur when certainly some surprises;

- surface offset mismatches, if accepted, by adjusting the internal borders and the land component units, by making them agree with the amount of frame area (district, built, ATUs)

This provides a imperative control, early on, by reference to a reliable reference that eliminates the final surprises. Huge discrepancies can not be accepted by improvisation, and will be affected and need new controls, we finally lifting topografice.În resulting primary land a plane with all pacelele and corresponding numerical data.

ATU final form results from expanding the nature and quantity, expressed graphically, with some textual data, descriptive, qualitative aspects that cover:

- cadastral numbers, by assigning each body of property (parcel) an unique ATU identification number;
- establish categories of land use and construction clasificarea elements defined by symbols that are part of the plan;
- identify the owners, based on Land documents presented to the operator, right holders will be enrolled in CF after checks by force;
- completing the cadastral plan with all the necessary elements of a cartographic representation of specific areas
- calculation of the coordinates, repeated for verification units amounts to the higher order components to control the ATU

All these works are presented in detail in the technical rules for the introduction prepared (2007) and is routine operations whose resume is less important.

4. Conclusions

1. Introduction cadastre in Romania requires the preparation of cadastral documentation on ATUs, whose main part is the basic land plan 1/5000-1/1000.
2. The implementation of this plan, the whole country (3200 ATU), representing a operating complex, lengthy and expensive path to be so well thought out and justified.
3. Existing technical rules (2007), which governs these works, however, are confusing, sometimes inappropriate, and a methodology, with all the necessary steps, we know not to be made.
4. Respecting the principled option, to use existing plans, presented a working version described steps to achieve national cadastral plan.
5. The proposed work involves the demarcation of land by large land units (sectors, in town and ATU), which correspond to the reference plane.
6. In this framework integrates parceling basic units (body and property parcels), taken from existing plans, and topographic survey ortofotoplanuri update-ons.
7. The process allows such as a constraint on control sites including surfaces, used time, not only the final time.

5. Bibliography

1. Boş, N., 2009, *Cadastru and funcional found*, C.H. Beck, Bucharest
2. Boş, N., 2007, *Modern Topography*, C.H. Beck, Bucharest
3. Onose, D., 2004, *Topography*, Matrix ROM Bucharest
4. Dragomir, P.I., Rus, T., Dumitru, P., 2005, *Modernisation of the Romanian GPS network,, Geodesic, Geodesic and cartographic paper nr. 1-2 Bucharest*
5. *Law nr. 7/1996 of Cadastre and real estate*
6. *Technical norms for introducing the cadastre in Romania (2007)*