IMPLEMENTING TECHNICAL PRINCIPLES IN SYSTEMATIC BUILDING REGISTERING, COMMUNE OF SÂNANDREI, TIMIȘ COUNTY, ROMANIA

C.A. POPESCU*, A. ŞMULEAC*, Gabriela POPESCU*

Banat University of Agricultural Science and Veterinary Medicine Timisoara, Faculty of Agriculture
adrian_smuleac@yahoo.com

Abstract: *Because of the need for clear legal and economic registering of buildings in Romania, we need to pay proper attention to systematic registering works. The goal of this study was to develop a clear database relying on systematic registering works that cover economic technical and legal information on each building within an administrative-territorial unit. Another goal was to develop a reference system for a sporadic reference framework; a third goal was to leave for future generations a clear report on property. The importance of systematic registering is of national interest and concerns us all particularly because it involves each of us and will continue to do so because such works are increasing in frequency. Systematic registering works are an opportunity particularly for challenged people whose financial state does not allow improving the buildings they own. Land survey for the systematic registering of buildings was done with two total stations. Leica TCR 805 and Leica TC 407, three GPS equipments with double frequency Leica GPS 1200. Within the systematic registering work, we also used three graphic stations for data processing. Topographic measurements at Sânandrei, Timiş County, Romania, were made on an area of 9,240 ha, of which 492 ha are lands within the localities Sânandrei, Covaci and Carani: they have 6,342 inhabitants and about 1,588 owned buildings of the total 10,230 ones. After analysing the information on the communal administrative limits (file in the Dxf format) overlapped with an orthophotoplan, we could see that is was inconclusive and problematic (it does not totally follow natural, identifiable limits in the field). Inner limits for component localities also are unclear and problematic: they do not correspond to the real situation and sometimes they overlap buildings and constructions in the field. Information regarding the zonal urban plans of Sânandrei, we see that they are only informative urbanistically.*

Key words**:** *systematic registering, land surveys, Leica TCR802, Leica TC 407, Leica GPS 1200, dxf*

INTRODUCTION

The origin of the word ***cadastre*** lies in the Greek prefix ***kata-*** 'downwards' and the Modern Greek word ***stikon*** 'tax log, notebook, trade book'. Other authors claim it comes from the medieval word ***capitastrum*** 'per capita tax' – a word related to ***capitions registrum*** or ***capitum registrum***. The word ***cadastre*** was first recorded in a Venetian document from 1185 as ***catastico***. It became common in the 17th century and, from Italy, it went to France (***cadastre***) and Germany (***Kataster***). In Romania, it appeared at the beginning of the 19th century, as ***cadastru***. It continued to designate an inventorying of land resources for the calculus of taxes.

The notion of "cadastre" nowadays has several meanings of which we present below the most common:

- The totality of works different from speciality cadastre for special economic sectors (agricultural land cadastre, forest land cadastre, water cadastre, etc.) for which they usually use the word ***cadastre***;
- A public institution represented by A.N.C.P.I. and charged with the organisation and operation of cadastre works directly or through territorial units such as Office of Cadastre and Real Estate Publicity and the Institute for Geodesy, Photogrammetry, Mapping and Cadastre;

- The discipline of land measurements, together with geodesy, topography, photogrammetry, mapping, gravimetry, etc., included in the curricula of technical schools and faculties.

The systematic registering in an administrative unit provides real, complete data regarding ownership of buildings and all their attributes such as limits, area, destination, usage category and transfers recorded in the real estate register.

The Commune of Sânandrei is located in south-east Pannonia Plain, more exactly in the south of the Western Plain also known as the Tisa Plain, at the intersection of the parallel of 45°55' northern latitude with the meridian 21°10' eastern longitude, and at an altitude of 95 m from the Black Sea; mathematically, it is in the northern hemisphere, almost equally from the North Pole, and in the eastern hemisphere, in Central Europe hour time (Figure 1).

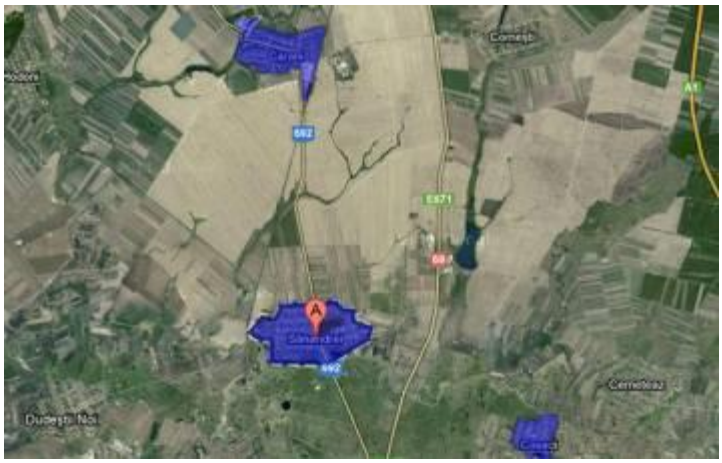


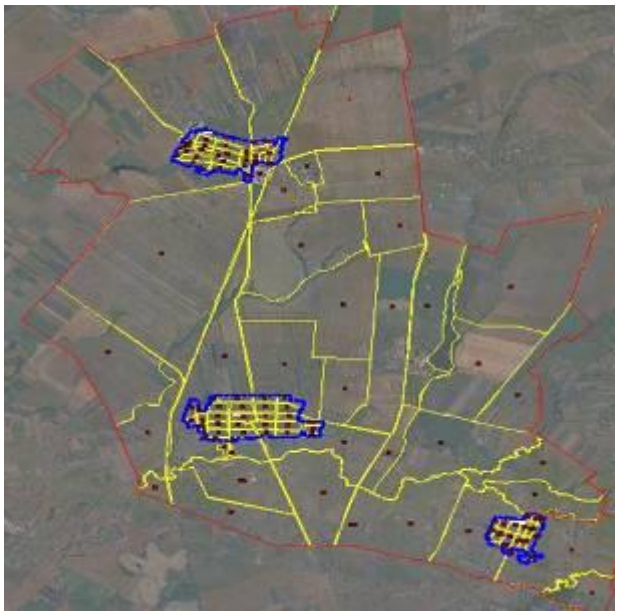
Figure 1 - The Commune of Sânandrei and its component localities

MATERIAL AND METHODS

Necessary Work Methods and Steps in Systematic Registering

1. Preliminary Report

A Preliminary Report is the document in which a contractor presents technical solutions and details of each operation, the work volume per stages and type of operations, human resources needed and any other information relevant for the evaluation of the technical solution proposed. A Preliminary Report describes the methodology that a joint venture will use to achieve the project and the project management plan to be followed during implementation. It is the first deliverable part of a project and it contains the strategies of the joint venture regarding the work plan and the technical solution to apply during the works.



The graph of the cadastral sections are an annexe to the Preliminary Report (Figure 2) for each Territorial Administrative Unit at a scale of 1:10,000 and it includes the limits of the unit, the limits of urban components, the limits and numbers of cadastral sectors, and the orthophotoplan.

Figure 2 - Graph of the cadastral sectors of the Commune of Sânandrei

2. Objectives

The goal of this Preliminary Report is to investigate the area of each commune and village, of clarifying the situations of technical data in the Office of Cadastre and Real Estate Publicity, of determining the logistic needs of the Office of Cadastre and Real Estate Publicity and, within town halls, of identifying the state of ownership restitutions, of identifying the parties involved, their needs, and their archives, of identifying protected areas, tourism areas, and commune infrastructure, of evaluating the economic profile of the commune based on the inhabitants trades, of identifying potential issues in the communication with the population, of identifying minority-related social conflicts, of identifying project risks, and of establishing connexions between state authorities and work teams.

The cadastral sector is the area unit delimited by stable linear elements in time – highways, watercourses, canals, dikes, railways, etc. In establishing cadastral sectors, the Contractor will use the limits of the territorial administrative unit supplied by the Office of Cadastre and Real Estate Publicity, the orthophotoplan, the cadastral plans at a scale of 1:2,000, 1:5,000 or 1:10,000, the overall cadastral plan at a scale of 1:10,000, etc. Possible corrections of these limits will be made only upon previous approval by Office of Cadastre and Real Estate Publicity. The limits defining cadastral sectors will not cross building limits. The Contractor will establish the limits of cadastral sectors and number cadastral sectors. Infrastructure elements defining cadastral sectors will be grouped in the cadastral sector "0".

The preliminary report is the first delivery and it should be approved by A.N.C.P.I. before the works start.

3. Analysis of digital and analogical documents

a. General data – The Territorial Administrative Unit of the Commune of Sânandrei, Timiş County, covers 9,240 ha of which about 492 ha are urban lands: the Commune of Sânandrei has three villages, Sânandrei, Covaci and Carani.

b. Limit of the Territorial Administrative Unit and of components urban elements – The administrative limit of the Commune of Sânandrei, Timiș County, is limited by the territorial administrative units of Orțișoara (North), Pișchia and Giarmata (East), Dumbrăvița and Timișoara (South), and Dudeștii Noi and Satchinez (West).

c. General cadastre plan at a scale of 1:10,000 with plot representation – After overlapping the cadastral plan at the scale 1:5,000 over the orthophotoplan, we saw that it covers about 90% of the current land, with a few differences in certain areas. Therefore, in these areas, we shall have to take into account the current configuration of the lands and the ownership documents.

d. Orthophotoplan – The orthophotoplans from the Office of Cadastre and Real Estate Publicity Timiş in electronic format of the type Ecw, scale 1:5,000 covers completely the urban areas of the Territorial Administrative Unit of the Commune of Sânandrei and the extravilan area between the urban limits and the limits of the Territorial Administrative Unit (Figure 3).

Figure 3 - Orthophotoplan of the Commune of Sânandrei

e. Cadastral/Topografic plan

Fig. 4 - Plan 1:5,000 Territorial Administrative

Fig. 5 - Plan 1:2,880 Covaci

Unit of Sânandrei

The territorial Administrative Unit of the Commune of Sânandrei is covered by cadastral and land survey plans:

- Cadastral plans at a scale of 1: 5,000 - 30 plan sections (Figure 4);
- Land registry plans at a scale of 1: 2,880 (Figure 5) – 70% covered;
- Cadastral plans at a scale of 1:2,000 and 1:4,000, respectively – 100% covered.

f. Plot plans

g. Ownership titles

- There are 1,901 Ownership Titles;
- These Ownership Titles represent 75% of the extravilan area;
- The rest of 25% is represented by lands such as roads, canals, and pastures.

h. Active P.A.D. from sporadic registering

We have overtaken information regarding topographic and cadastral works on the administrative territory of the Commune of Sânandrei as digital jpg file (4131) containing the geography of the buildings.

i. Land survey records

j. Documents according to HG834/1991

k. CGXML files

l. Other types of data

4. Identifying the Land: Estimating the Volume of Measurements and their Implementing

After the visit in situ and based on the data from the Office of Cadastre and Real Estate Publicity, after the talks with the representatives of the town hall of the Commune of Sânandrei, we could make decisions regarding the areas that need topographic survey and how to do that.

a. Relief of the area

b. Identifying the areas that need topographic survey

c. Identifying the areas where building limits and topographic survey need to be done in the presence of owners

d. Identifying areas with potential difficulties

e. ***Estimating the volume of measurements and the way to make them***

5. Describing the Technical Solution: Designing Cadastral Sectors at the Level of the Territorial Administrative Unit of the Commune of Sânandrei

a. Method – scanning, geo-referencing, integrating information, and topographic measurements

- *Scanning topographic/cadastral maps;*
- *Geo-referencing cadastral/topographic maps;*
- *Integrating information.*

b. Digitising the limits of the plots/sectors

- *Determining plots and sectors;*
- *Determining the limits of real estate properties in urban and extravilan.*

c. Correlating land registry maps and land registries

After determining the link between topographic numbers identifying the buildings on the land registry map and the updated building numbers in the land registry textually and following the history of the buildings, the joint venture operators will continue correlating information thus mentioned in the pre-filled interview sheets by confronting them with the information from the in situ interviews. Later, each building in the commune will be allotted a unique electronic identifier through automatic numbering. When interviewing in situ, the joint venture teams will need, besides the technical equipment, the following documents:

- The pre-filled interview sheet that will also contain the topographic number;
- The orthophotoplan or the cadastral/topographic plan for the urban;
- The plan containing the cadastral sectors and plots for primary identification of buildings in extravilan.

Thus, after the interviews, the joint venture operators will also correlate topographic numbers and unique electronic identifiers in each Territorial Administrative Units depending on the real situation in situ (PROCA GABRIELA, 2001).

6. Ordering and Scheduling the Activities

To programme and establish the order of the activities to be carried out in each production flow, we took into account that the area in urban to be measured is 492 ha, that the number of buildings in urban is 1,588, and that the area in extravilan to be measured is 8,748 ha.

The order of the activities to be carried out is:

- *Implementing the publicity campaign;*
- *Collecting and integrating data;*
- *Interviewing in situ;*
- *Developing the support and survey network: In situ*
- *Conducting topographic measurements in urban: Measurements with a total station*
- *Conducting topographic measurements in extravilan: Measurements with GPS receivers*
- *Conducting topographic measurements in urban;*
- *Collecting ownership documents;*
- *Integrating field data and generating cgxml files;*
- *Publishing technical documents and the solutions for rectification requests;*
- *Updating technical documents.*

RESULTS AND DISCUSSIONS

Analysing and optimising the work process covers a set of steps or measures within work steps aiming at improving them both technically and economically.

1. Organigramme of the Work Team (Figure 6)

2. Publicity Campaign

The goal of a publicity campaign is to plan and implement informative actions for the citizens regarding the need for carrying out this work (Figure 7).

As for the need to carry out the topography and land survey works within this project, we did our best to inform the population as correctly as possible. The information methods were applied by the staff involved in this local information campaign with the support of local

authorities and of the institutions involved in the project. As far as the information points are concerned, we adjusted some areas in town hall buildings.

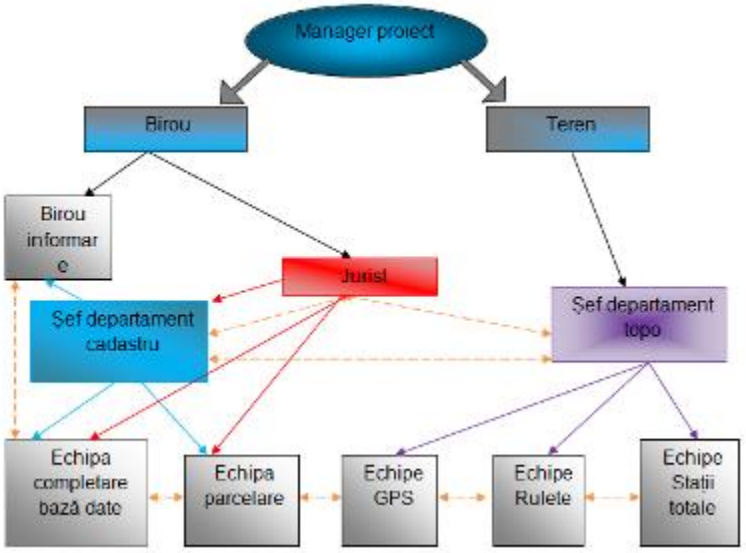


Figure 6 - The work team

Fig. 7 - Flyer – publicity campaign

The distribution of the information materials was done in such public places as town hall, police precincts, dispensary, church, culture club, and shops. We also distributed all households flyers (Figure 7) containing information about the project.

Phase I of the publicity campaign

The first stage of the publicity campaign took place together with cadastre special works. Two weeks after approval of the preliminary report, we carried out the first local publicity campaign. This involved printing and distributing information materials in all villages (Table 1).

Table 1

Printing and distribution of flyers and posters

County	Territorial Administrative Unit	Villages (N)	Flyers (psc)	Posters Phase 1 (pcs)
Timiș	Sânandrei	3	3,200	60
Total			3,200	60

Phase II of the publicity campaign

The second phase of the information campaign took place while preparing the publication of technical cadastre documents and during actual publication.

3. Optimising Works through Apparatuses and Measurement Methods

Measurements are one of the most important steps in systematic registering works; therefore, the best it is done, the greatest the chances of observing deadlines are. This was aimed at during systematic registering works at Sânandrei when we:

A) Started measurements to position buildings in relation to building limits: we started by doing this because it takes a long time to achieve.

B) We checked the points of the existing geodesic network (Table 2) to check the current state and whether they have been moved or not. To optimise the measurements, the team checking geodesic points started the activity together with the measurement teams. This was possible because the two teams do not depend one another.

Table 2

Geodesic points

Name of the point	Order	Trapeze	State of the point	Location
At the canton	II	L-34-79-A-c	destroyed	-
Sânandrei West	V	L-34-79-A-d	destroyed	-
Orchards	V	L-34-79-A-d	unidentified	-
In the Cornet	II	L-34-79-A-d	unidentified	-
Surduc Hill	V	L-34-79-A-d	unidentified	-
Sânandrei Church	V	L-34-79-A-d	good	The church is urban Sânandrei
Carani Church	V	L-34-79-A-d	good	The church is urban Carani
Covaci Church	V	L-34-79-A-d	good	The church is urban Covaci

C) After the studies were carried out, we decided to establish a new support network and, to optimise this procedure, we appealed to GPS technology (static method) taking into account the following geodesic points in the national GPS network class A (Table 3):

Table 3

Class A geodesical points

Name	Class	B[m]	L[m]	He[m]
Station Faget	A	45°51'16.42753"N	22°10'37.78289"E	216,4898
Station Arad	A	46°10'23.51004"N	21°20'40.51052"E	167,684
Station Timisoara	A	45°46'47.65271"N	21°13'51.46281"E	154,7278

To implement the support geodesic network, we used the GPS Leica 1200 because it is a GPS with double frequency and it shortens point stationing compared to single frequency GPSs.

C.1. During the first phase, we set concrete landmarks in strategic points so that radio frequency of the GPS to cover the entire Territorial Administrative Unit of the Commune of Sânandrei. To find the landmarks easier, they were set in relation to time stable elements.

C.2. The second phase was determining the coordinates of the points of the geodesic support network through the static method by stationing on each point for about 140 minutes. To download the GPS coordinates, we used the application Leica Geo Office Combined.

C.3. The last phase was to increase the density of the support network with the kinematic method through radio frequencies. In this method, we use minimum two GPSs: one of them is set on one concrete landmark as reference and the other one serves at determining the coordinates of the network density points. These points materialised in situ as phenol landmarks, metal bolts and iron stakes. Once the network finished, we could start optimising the work process, satellite measurements with GPS through the kinematic method based on radio frequencies and topographic measurements with total stations.

D) Topographic measurements were made with total stations Leica TCR 802, with excellent results (fiability and performance). An important element in topographic measurements is the possibility of measuring elements in situ with a laser without needing a prism, particularly where no prism is needed.

Removing points of interest was done by stationing on support and survey network points.

Figure 8 shows the type of measurement of two buildings in the cadastral sector no. 55 of the Commune of Sânandrei.

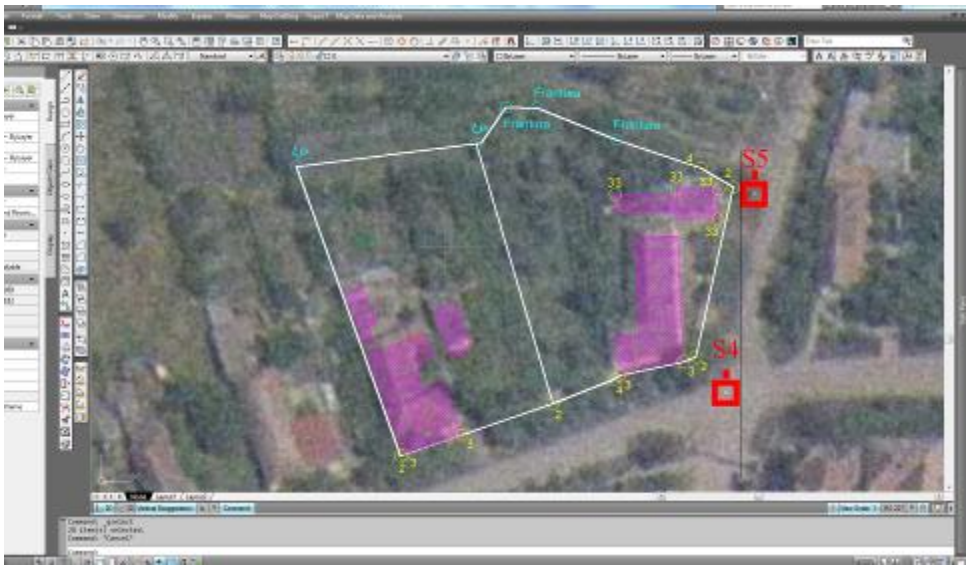


Figure 8 - Building after Measurements

4. Periodical Work Meetings with B.C.P.I. to Optimise the Registering

The cadastre and real estate publicity office plays an important role in systematic registering works both as a monitor of the entire work and as councillor in problem solving.

5. Specialty Software Applications and Their Role

Figure 9 - NetSetCad Application

Software applications were essential in optimising work time and type in systematic registering at Sânandrei, particularly due to their ability of optimising certain technical procedures. The main software application used in the systematic registering work at Sânandrei was ***NetSetCad*** (Figure 9).

Besides the ***NetSetCad*** application, we also sued to ease and optimise work the ***AutoCad*** application, the ***TopoLT*** application, the applications in the ***Microsoft office*** package and the ***Webcadgen*** application (Figure 10). ***NetSetCad*** is a GIS application with which we developed a database regarding each building within the territorial administrative unit of Sânandrei.

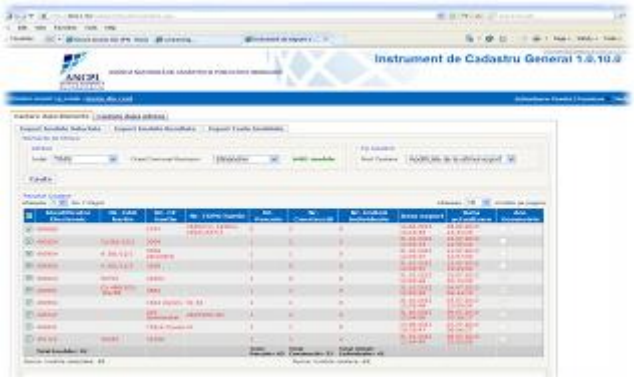


Figure 10 - WebCadGen Application

From the first download of ***CGXML*** files with a Webcadgen application, we needed to periodically download updates from sporadic cadastre because of the ongoing processes on the real estate market.

With these ***CGXML*** files, data were uploaded in the database through the ***NetSET Map Professional*** application using the ***CGXML*** import command and making sure that each ***CGXML*** be associated with the corresponding graph.

This graph part was done with an ***AutoCad*** application that allows building cadastral sectors and buildings with corresponding layers to introduce them into ***NetSET Map Professional***.

5. Preparation of cadastral technical documentation

Technical documents made as a result of systematic registration are intended to illustrate the real situation on the ground. These technical documents of the cadastre corresponded to the smallest detail requirements of the specification datasheets.

In Figure 11, it exemplified the cadastral number 55 of the territorial administrative unit Sinandrei prepared in terms of graphics to be inserted into **NetSET Map Professional**. An innovation for this program was automatic association of each building in the corresponding **CGXML**, this is possible if the graphics inside the building is found a point of text with cadastral number, card number or number of land surveying.

Figure 11 - Cadastral sector no. 55

6. Final Works of Handing In, Publishing, and Updating Data

a. Reception of cadastre documents

Reception of cadastre documents was done by the reception board of the Office of Cadastre and Real Estate Publicity appointed by Order of the General Manager of the National Agency and it aimed at checking the observance of technical specifications in the contract. Reception of cadastral documents supposes a both quantitative and qualitative reception of the work.

b. Publishing technical documents and solving contestations

Publishing technical documents – In this phase, the Office of Cadastre and Real Estate Publicity, together with representatives of the town hall of Sânandrei, organized the publication of technical documents and carried the technical documents to the town hall (or to the posting point) ensuring the necessary equipment for the publication and posting of the plans. In this phase, they also informed the owners about the beginning of publishing the results of systematic registering.

Solving contestations – After posting the technical documents of the cadastre, owners of buildings within the territorial administrative unit of Sânandrei could litigate within 30 days if they identified an error: the correction could be done based on documents.

c. Opening land registries

The Office of Cadastre and Real Estate Publicity opened Land registries based on final technical documents of systematic registering and on corresponding annexed documents.

7. Finalising the Systematic Registering Process

Starting with opening formal land registries, transcription and inscription registries, land registries and any other cadastre and real estate publicity proofs were replaced for the territorial administrative unit of Sânandrei by a new cadastre plan and new cadastral land registries which ended the work; the old proofs are kept in the archives of the territorial office and can be seen for historical documenting.

CONCLUSIONS

According to the technical standards for the introduction of cadastre modified through the Order no. 534/2001 of the Minister of Public Administration and approved by the General Manager of the National Agency of Cadastre and Real Estate Publicity through the Order no. 601/2008 regarding the financing, contracting, execution, noticing, and reception of technical works of identification, inventorying and building up of databases regarding buildings, the process of systematic registering is to be implemented all over Romania.

Systematic registering works will grow in importance in the future and we expect clearer results in a short time though at present the number of territorial administrative units where it is being implemented is still small. We tend to believe it will grow because of the auctions within the National Agency and of the increase of the number of providers – the future of cadastre.

Given the experience acquired as a representative of a cadastre company carrying out systematic registry in several communes, among which Sânandrei, we could see that most population in the rural area is not willing to cooperate. Under such conditions, we have all the reasons to believe that the work will not be done no matter the efforts of the provider and of the contractor because, in order to identify the legal situation of a building we need all owners to participate.

A particularly important aspect here is the seriousness in doing it because, if not done properly, it can have serious consequences on everybody involved. Therefore, such a work should be done responsibly by the providers, by the Office of Cadastre and Real Estate Publicity, by the town halls involved and by the rest of institutions participating directly in the systematic registering process.

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