

INTEGRITY OF LAND RELATIONS AND TERRESTRIAL MEASUREMENTS WITHIN THE MULTIFUNCTIONALITY OF CADASTRE

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Abstract: The need to develop land relations and the emergence of property relations highlighted some of their peculiarities and namely the spatial aspect of land relations. As part of cadastre, terrestrial measurements have been applied under the influence of law as a social category of land relations. Land rights have their peculiarities and namely: location, formation, development and protection. Any land right is obligatorily accompanied by its spatial aspect. The issue related to the land right connection to space is still current nowadays. The form and content of the land rights is in a permanent evolution as well as their location in space. Historically, the land right evolved from a simple spatial layout in a horizontal plane to the formation of the 3D and 4D property right. The object of our study relates to the interaction of land rights as a social category and the measurement process within the multifunctional cadastral system. Also the author mentions that, in the study, the land rights are examined through the prism of land ownership and land measurements as a need to identify physically the property right on the ground. In the cadastral field, land measurements have been developed including at the request of such processes as: land valuation, land use, protection of limited natural resources, etc.

Key words: land relations, land measurements, cadastre, land litigation, registration of rights, protection of rights.

1. Introduction

1.1 Topic and object of the study

The initial stage of the statehood of the Republic of Moldova, over the period 1991-1995, is characterized by an intensive development of land relations, especially in the field of agriculture. The more we move away from the events that took place at that time, the more we need to have thorough studies concerning the impact of implemented actions both on the present and on the future.

The experience, perhaps too modest, of the Republic of Moldova in the development of land relations but viewed in relation to the world practice convinces us of the major importance of land relations in the cadastre process, of the conceptual role of cadastre in the development of country's economy.

Land relations have emerged as a product of society development at a certain stage of its evolution. This assertion reveals two important conclusions: land relations have a social context and land relations incur an everlasting and permanent development.

Current cadastre is also characterized as an integral and at the same time multifunctional process. [3] The multifunctionality of cadastre stems from the multitude of its applications and such internal processes as: registration and protection of rights; valuation, management planning and sustainable use of limited natural resources; etc.

The Republic of Moldova is at an important stage in the development of land relations. Correctly selecting the cadastre model, land relations, depending on the stated economic policies, represent a current problem. Obviously, the ecological aspect of cadastre, the adjustment of land relations to the new conditions, including the expectations of the future, even if it is less obvious compared to the economic aspect, requires to be recognized and the most current activities in this field should be undertaken. Society considers the issue of protection of rights, interests, taxes, etc. in present land relations as a problem of the 21st century. [4]

1.2 Emergence and development of land relations.

Cadastre 2034 represents a continuation of *Cadastre 2014*, which laid the foundations for a universal cadastre and determined the prospects for a period until 2034. Cadastre 2034 content gives a priority position to the land rights. Thus, an essential volume of directions in the development of cadastre 2034 is determined by the requirements and needs of law, especially in the field of measurement.

At the same time, the requirements of land rights related to the future development of cadastre are influenced by the „economic sustainability”. The system of land relations (legal framework) within cadastre defines and records the position and extension of property rights, restrictions, responsibilities and interests. These requests will be met by the geometrical description of the limits of rights to land and constructions related to other records that describe the nature of interests, ownership or control over those interests, and often the value of the land parcel and its improvements.

According to Cadastre 2034, there will be a significant increase in the volume of legal and environmental information and the community will require easy access to this information and to be fully informed of the associated interests.

The role of the social factor. The role of society in the development of land relations is particularly important. Only under conditions of society development, the social and economic relations emerge and develop. Land relations include both social and economic aspects in their content. The role of the social factor in the development of land relations could be identified both in the history and in the social reforms carried out including in the Republic of Moldova since the 1990s. Based on the modest information regarding the distant past we can mention the role and importance of state in the development of land relations, in the formation and protection of land law.

Land relations represent the ownership relationships between two and more persons regarding the limits of land use.

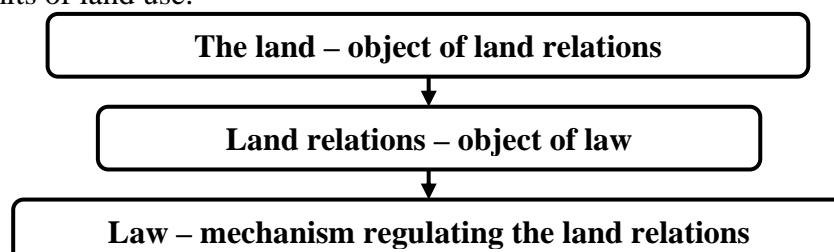


Fig. 1. The objectivity of law and land relations

Source: elaborated by the author

The emergence of land relations as property relations between subjects, concerning the use of agricultural land on the ground, is a result of the development of the agricultural sector as a whole. The development of agriculture in different civilizations (countries) has given rise to a diversity of land relations. Thus, the right to agricultural land has emerged as a derivation of agriculture development. The right to property is not intended to regulate all land relations, but only those required by the company (Figure 1).

Integrity of law and land relations. The multifunctional content of land relations also creates a diversity of relationships: between individuals, between individuals and land, between workers and owners, etc. Land relations and law are two forms of expression - at first glance contradictory - of society. Land relations have a tendency and content of objective free manifestation. The right to land ownership has the purpose of regulating relationships for the benefit of society.

Formation of land rights has an important role both for the purpose of forming new land relations and for regulating the existing land relations. New land relations are formed concomitantly with the formation of the new object of law.

The newly-formed *object of law* represents a sector of land detached from the body of another existing object of law.

When examining through the prism of the content of law, we determined that the formation of rights concerns equally the textual and the graphic (spatial) part. Any right to land inevitably passes through the stage of its formation. The process of land right formation determines us to focus on such important issues as the purpose and subject of formation. Obviously, the purpose of forming the right is formulated by the subject (owner, holder, etc.).

Once the right to land is formed, it undergoes a constant development, modification. The development of the right to immovable property (land) inevitably leads to the modification (specification) of its boundaries, etc. In all countries, the process of land right modification is regulated by law.

In the legal document, spatial information will not have the necessary level of credibility if this information does not emerge from the established landmarks and boundary lines physically identified on the ground. This is based on the fact that the link between the boundary and the legal document was neglected in the Republic of Moldova.

The limits of land right or thereafter - the boundary between two properties, between two rights to two land parcels, becomes an important element in the process of rights' protection.

The role and necessity of the legal document, the characteristics of the legal document compared to other rights including property rights require a thorough analysis through the prism of historical development of land relations.

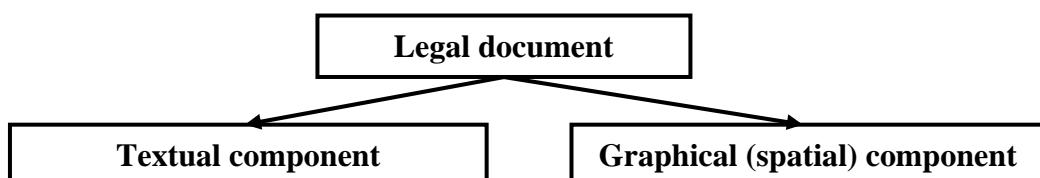


Fig. 2. The structure of legal document

Source: elaborated by the author

The legal document, at its first stage, had a textual content of description. The textual form of the legal document, more precisely the textual part (the textual component) has been

preserved till nowadays. At the same time, it is necessary to mention that the right to land, already at its initial stage, has demonstrated the need for the spatial component of the law.

Thus, we come to an essential conclusion regarding the content of right to land (real estate) and namely: the legal document on land includes two parts - the textual part and the graphical part (Figure 2).

The land right will not be complete unless it is demonstrated its reference to space. This peculiarity of land right caused the emergence of a new component in cadastral activities - *terrestrial measurements in the field of cadastre*.

Consecutiveness of actions in the process of land rights formation and its observance is important for the whole process of formation. Namely this aspect may lead to the decision to stop or continue the process of land rights formation.

The re-establishment of rights to land is current from the earliest times (we will once again refer to the Egyptians, to the re-establishment of rights because of the flooding of the Nile River) and till nowadays. At the initial stage of land reform in the Republic of Moldova, the ignorance of land boundaries by owners represented a frequent reality.

The correction of mistakes made in the process of land reform is a requirement for the public authorities, as the land reform represents a state policy. At the request of one or more right holders, at the initiative of the local public authority or within the mistake correction program, the cadastre specialist will prepare a report of findings, which will include the following information: *mistake description, the date of its detection, the cause of its emergence, the description of the situation in the cadastral sector and on the ground, proposals regarding the way to correct the mistakes*.

As a result of the performed mistakes, the landowners' rights do not coincide with physical location of the land parcel on the ground. These mistakes have a negative impact on the further expansion of land reform, land relations, land consolidation and other aspects of the economic reform as a whole, such as granting subsidies, etc.

2. The role and necessity of measurements in the protection of rights

Historically, terrestrial measurement process has been oriented towards guaranteeing property right to land. [2] The current stage assigns to the measurement process much more extensive functions than the historical ones.

The need to develop land relations, the emergence of property relations also highlighted some of their peculiarities, namely the spatial aspect of land relations. The right of a person, of a group of people to own land can occur and exist only by physically identifying it on the ground applying the measurement process.

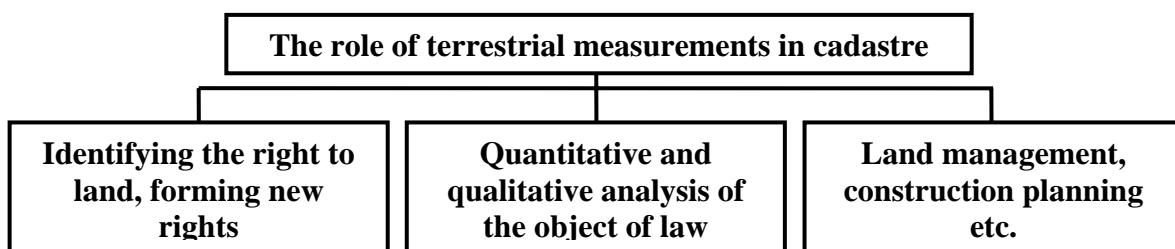


Fig. 3. Integrity of the property right and terrestrial measurements.

Source: elaborated by the author during the process of scientific analysis.

As part of cadastre, terrestrial measurements have been implemented under the influence of law as a social category of land relations. The right to land has its peculiarities:

position in space, formation, development, protection. A right to land is obligatorily accompanied by its reference to space. The issue of reference of the land rights to space is still current. The form and content of a right is in a permanent evolution and therefore its position in space. The recognition of terrestrial measurements as an objective necessity in the development of land ownership is presented in Figure 3.

During its historical evolution, the land right passed from a simple spatial positioning in a horizontal plane to the formation of right in 3D, 4 D space [5].

The object of our study concerns the interaction of the land right as a social category and the measurement process. We will also mention that in this study, the right is examined from the perspective of land ownership, and terrestrial measurements as a need to identify the right to property on the ground.

Measurements within the cadastral multifunctionality don't represent a purpose, but only a means to establish a spatial limit of the right to property and other rights, restrictions, limitations, responsibilities, etc. that have emerged in the evolutionary process of developing land ownership relations. Unlike other areas of terrestrial measurements, in our case, it is necessary to know the legal and economic aspects of land relations. If the boundary of a property corresponds to the one established by cadastre, it is assumed that the boundary signs are placed on the real boundary, and therefore cadastre proves its technical competence in these operations so important for the protection of a fundamental human right. The authority and respect of the institution in countries with an old democratic tradition is based namely on this contribution.

2.1 Spatial aspect in the content of legal documents

The boundary line and the legal document had a major positive impact on the process of identifying, protecting and developing land rights and terrestrial measurements as a whole.

The legal document is nothing more than a paper-based location of the boundary lines and landmarks.

A legal document, including its spatial information, can only be drafted based on the boundaries physically established on the ground. Once established, the boundary lines become the object of land litigation that has already existed for thousands of years. The resolution of land litigations requires a continuous implementation of the process of re-setting boundaries, obviously through measurements.

The setting, re-setting of boundaries in the content of terrestrial measurement process will exist as long as land ownership and land relations exist.

Determining the boundary lines and landmarks. An essential incentive in the development of land relations, including the emergence and development of land law, is the setting of boundary lines and landmarks, which represents one of the most important tasks of cadastre. Namely due to the boundary lines and landmarks, the objects of land relations, the objects of land rights are identified.

The need to establish and re-establish the ownership of land on the ground is also known from ancient times. It is also known the role of terrestrial measurements carried out by Egyptian chancellery after the flooding of the Nile, in order to re-establish the rights to land subject to flooding [1].

What does the integrity of these two components consist of: the property right to land and terrestrial measurement process?

The link between measurements and property right to land is also argued by the fact that a new incentive for the development of the measurement process was caused by the development (need to develop) of the property right to land.

Land litigation represents a conflict between the subjects of land relations regarding the use of the object of law (land). The boundary lines and landmarks represent the mechanisms for land litigation resolution. An important element in the resolution of land litigations is the accuracy of the location of landmarks and boundary lines in the cadastral plan.

Terrestrial measurement process within the cadastre includes: the measurement, measuring instruments and technologies.

The specialist in measurements is a person licensed in the field of cadastral measurements activating both individually and on a contractual basis within the enterprises specialized in cadastral measurements.

Measuring instruments - devices performing the whole complex of measurements required by the field of cadastre.

Measuring technologies - methods used to achieve the goal that includes measurements in space in order to obtain the required cadastral information.

3. The consequences of implementing market land relations in the Republic of Moldova

3.1 Land privatization.

The notion of privatization could be applied when the public property of the state, according to the legislation in force, is transferred to private property. Experience shows that this transfer can be both free of charge or based on a symbolic payment.

Historically, both forms of privatization took place in the Republic of Moldova. According to the reform carried out in 1918-1935 (Ferdinand's reform), the peasants received land based on a symbolic payment.

The land reform that was performed since 1992 stipulated the free of charge privatization of land.

The fragmentation (parceling) of the privatization fund of mayoralties in the Republic of Moldova was carried out as an inevitable stage in the process of assigning rights to land to peasants. The parcelling had the purpose of transferring on the ground the equivalent land shares. For these reasons, land fragmentation was inevitable.

The size of equivalent land shares was different depending on the size of the reserve fund of the mayoralties. The lowest land share equivalents were established in the Central districts (Straseni, Calarasi, Nisporeni, etc.), the largest ones - in some mayoralties of the South districts (Cahul, Cantemir, Stefan-Voda, etc.).

Generally, the average size of the equivalent land share ranged between 0.6 and 4.0 ha. There were recorded cases when the average share was less than 0.6 ha and higher than 4.0 ha.

Excessive land fragmentation occurred most of all for subjective reasons. It is well known that, even within a mayorality, soil quality of land parcels differs a lot. The spatial aspect also influenced excessive parcelling.

Respecting the democratic principles in the land fragmentation process, in most cases, at landowners' request, the area of the equivalent land share was divided depending on soil quality into good, medium and bad land parcels and by location - near the village, at an average distance and far from the village.

In many villages, excessive land fragmentation was also influenced by such specific conditions as: dry climate, hail, irrigated land, etc. At first sight, these conditions were justified and should be taken into consideration. At the same time, they ultimately had a negative impact - they led to an excessive and unjustified fragmentation of land. Thus, a land

plot was fragmented on average in 5-7 land parcels being located at a distance of 5-7 km and more.

In our Republic, about 1.1 million of landowners who owned 1.7 million ha received over 3 million of land parcels, with an average area of 0.3-0.5 ha. The shape of those land parcels, long and narrow (5-10m width and 300-500m length), is as inefficient as the total average area of 0.6-4.0 ha. As for the multiannual plantations, the parceling was carried out even more drastically taking into consideration the year of planting, the structure of plantations (cultivars, varieties, etc.). After an excessive fragmentation of agricultural land caused by land privatization, its consolidation represents a positive process oriented towards the optimization of land areas, implementation of advanced technologies and finally towards the enhancement of the living standards in the rural sector of our country.

3.2 Mistakes associated with the setting of property boundaries (physically identifying the land rights on the ground)

Another problem related to the land fragmentation process is that the execution of the required works was done with mistakes, which can't be solved even at present.

It is important that so far, due to some external financing programs, the mistakes made during the privatization process are detected and corrected. Moreover, many owners of agricultural land, for whom the land reform has been carried out, do not even know where their land parcels are located. The deficiencies related to the period when peasants became land owners have disrupted the agricultural sector and left their mark for many years to come. The mistakes that were made during the mass privatization of land may be classified as follows:

- mistakes in geodetic measurements;
- design mistakes;
- mistakes in identifying the real estate;
- mistakes in the transposition of the land use project;
- mistakes in the issuance of titles to land ownership and preparation of registration materials.

Technical mistakes. Technical mistakes have been made by the executors of the cadastral works in the process of assigning land rights to peasants. In their turn, they are of three types:

- incorrect linear and angular measurements;
- incorrect determination of the initial points' coordinates ("x" and "y");
- incorrect determination of initial azimuth.

The image obtained in the cadastral plan (Figure 4) does not correspond to physical reality on the ground.



Fig. 4. Mistakes associated with the setting of landmarks

Source: <http://geoportal.md/>

For this reason, all the land parcels that have been formed based on this polygon are incorrect. In fact, the area of all the land parcels is larger than the one written in the landowner's Title and in the real estate Register respectively.

Figure 4 represents the variant when the lines and angles determining the location of the point "A" include mistakes. As a result of those mistakes, the point "A" moved to point "A¹".

Obviously, any mistake should be rectified. Such mistakes have a crucial impact on the property rights. As a result of the performed corrections, the location of the property boundaries will change and the surface of these properties will increase.

Another example of a technical mistake is shown in Figure 5. This example includes the moving of the polygon from image to a certain distance from the real situation. One of the ways to detect those mistakes is the superposition of terrestrial measurements and of the "orthophoto" plans.

At the stage of identifying land boundaries on the ground, the specialists did not have "orthophoto". After obtaining the "orthophoto" materials, it has become possible to apply them in the mistake analysis process. Thus, in Figure 5.a, the real situation of the polygon within the cadastral plan is determined by its superposition with the orthophoto plan.

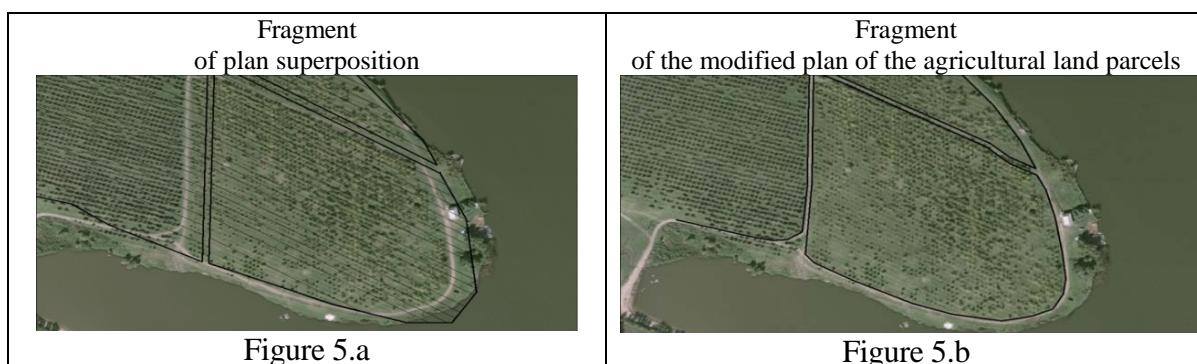


Fig. 5. Mistakes associated with the execution of terrestrial measurements

Source: <http://geoportal.md/>

The example presented in Figure 5 shows that the respective polygon in the cadastral plan is shifted approximately 40 meters in the direction "South-East". Thus, for the above-mentioned reason, a part of the cadastral plan, in the process of superposition, was located in the space of a lake. Obviously, such a cadastral plan can't be used within the Land Parcel Identification System.

Figure 5.b represents a modified variant of the Land Parcel Plan. The position of correct location of the polygon in the cadastral plan is determined based on the orthophoto plan.

A third type of technical mistakes is shown in Figure 6 "incorrect azimuth".

Taking into account the fact that such mistakes don't cause damage to landowners, their rectification is carried out in accordance with the Real Estate Cadastre Law (no.1543 - XIII) based on the Registrar's decision.

Obviously, in such cases, the initiative to modify the mistakes should belong to central public authorities interested in solving the problem. Landowners will not be interested in such corrections.

This example refers to cases when the respective polygon of the cadastral plan is shifted azimuthally (around its axis, see Figure 6). Analyzing the figure, we can see that as a result of the mistake, the cadastral parcels were located incorrectly in the space of a road, of an arable land, of a buffer strip, etc.

In such cases, the surface, the dimensions (length, width) of the land parcels have not changed. At the same time, for the purpose of implementing the agricultural cadastre (Land Parcel Identification System), such inaccuracies are unacceptable.

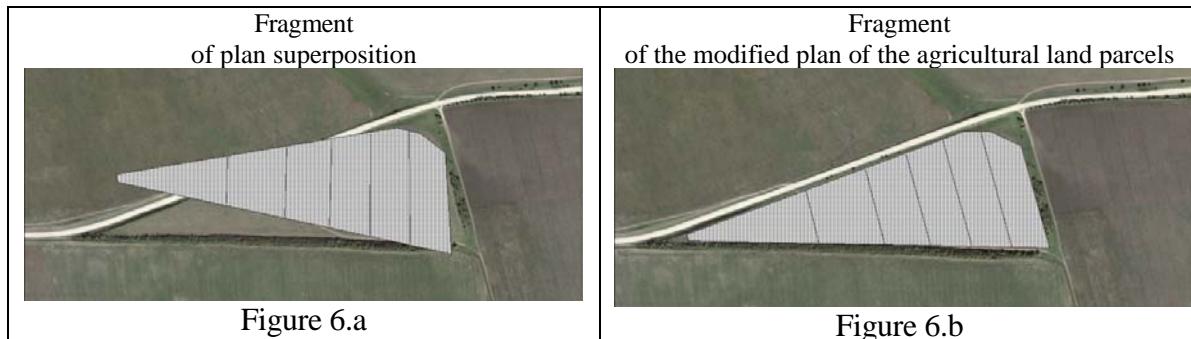


Fig. 6. Mistakes associated with correct determination of line orientation

Source: <http://geoportal.md/>

Also, due to the fact that such mistakes do not cause damage to the owners, they will not initiate the correction procedure and, therefore, this function belongs to the public authorities. Mistake correction can be done using two methods:

determining the coordinates of landmark points of the polygon on the ground using topographical measurements;

determining the location of the polygon based on the orthophoto plan.

The needs of the Land Parcel Identification System allow the successful use of the orthophoto plan in order to correct the mistakes.

Legal Mistakes. Two categories of legal mistakes are the most frequent.

The first category is caused by the fact that the landowners are not guided by the cadastral plan in the land use process. The reasons for such non-compliance are different. In many cases even the surfaces are not observed (Figure 7.a).

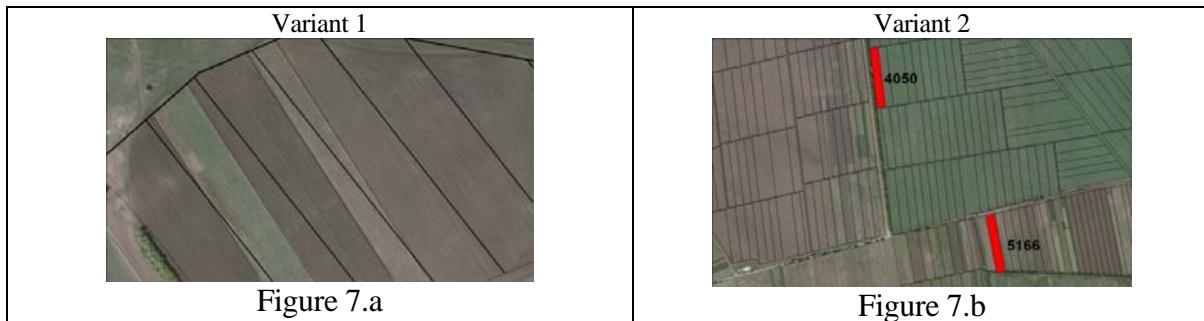


Fig. 7. Fragment of non-coincidence of the cadastral plan with the sector on the ground

Source: <http://geoportal.md/>

Whatever the reason, this is a violation of law enforcement and has to be rectified. Such mistakes are rectified by transposing the landmarks on the ground in accordance with the content of the cadastral plan. The landowners will respect these changes on the ground otherwise it will be impossible to determine the amount of subsidies they will claim.

Another category of legal mistakes is manifested by the fact that the owners having the legal document for a land sector use another remote sector (Figure 7.b). Such cases occur because of the fact that at the moment of execution of the massive cadastral works for the elaboration of legal documents on land, these persons already owned some land parcels and the

executors of the geodetic works did not take into account this situation. The problem can be solved choosing one of the following two ways:

modifying the legal documents so that each owner keeps the land parcels on which he works;

modifying the land parcel based on legal documents.

In order to correct the mistakes and remove the non-conformities in the cadastral plan drawn up in the process of mass privatization of land, special methodological indications have been developed by the Land Relations and Cadastre Agency, which regulate a spectrum of cadastral works executed on this point.

4. Conclusions

1. The process of measurements in the field of cadastre has been implemented within the peculiarities of land ownership rights as a need to identify its location and thus to enhance the level of law protection. In this context, the nature of measurements, the content and form of expression of spatial information, should be examined in the context of land rights.

2. An important element in the process of terrestrial (spatial) measurements, in order to solve the problem of identification and protection, is the “boundary” which establishes the limit of right impact on the land. The setting of land boundaries determine (formulate) the measurement methods applied for this purpose.

3. The existence of land boundaries requires an objective reality that is known as: legal boundary and real boundary. This phrase of law determines the existence of a phenomenon in the field of cadastre that can be identified as “litigations in boundary location” and the emergence of a process for their resolution. Thus, in the field of cadastre, the litigation becomes an objective reality accompanied by a solution.

4. The cadastral plan, as a space information bearer, primarily serves to protect the land right by visualizing the location of boundaries and then for other purposes of sustainable economic use.

5. Cadastre 2034 represents a continuity of the purpose of the contemporary cadastre in the context of phenomena and processes development. The concept of cadastre argues the influence of rights, restrictions, obligations, interests, etc. on the space measurement methods (methodologies) and technologies in an integrated space and for the purpose of a sustainable economy.

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