

## STUDIES AND RESEARCHES CONCERNING THE JOINTING OF REAL ESTATE CADASTRE WITH UTILITY NETWORK

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### Abstract

The paper aims at developing a GIS model that includes information on the real estate cadastre (in the case of agricultural areas) supplemented with data from the cadastre of water supply systems. GIS models present a wide-ranging application of water supply and sewerage monitoring. The paper presents an analysis for water main transmission. It crosses its way from captation to reservoir, private property and public property. The water main pipeline requires investigative, annual repairs, rehabilitation and modernization interventions over long periods of time. In order to carry out the intervention works it is necessary to ensure the access to the site. The paper deals with the problem of the location of the conduits and there are signalized special situations on the water main transmission Timisesti - Iasi. Access to private properties may be restricted by owners. Through the GIS monitoring model and in collaboration with other analysis programs (Autocad, ArcMap), there were identified particular situations encountered on the two water main transmission pipeline. These situations can be solved through various technical and legal procedures. One process is the creation of an expropriation corridor.

**Key words:** water main transmission, agricultural areas, expropriation corridor, public property, private property

The cadastre is a unitary and compulsory system of technical, economic and legal evidences of all the real estate on the whole territory of the country, through which the registration, identification, representation on topographical and cadastral maps and land and real estate on the territory country, irrespective of their owner or destination (Law 7/1996).

The cadastre has several branches that work together to create a database of graphical and numerical alphanumeric information. Among the most important branches of the cadastre we can list: the agricultural cadastre, the real estate cadastre, the cadastre of the forest fund, the water cadastre, etc.

The cadastre in agricultural areas is a subsystem of the general cadastre that studies, inventories the plots, plots, buildings, cadastral parties, constructions and owners regardless of the title of ownership (Tămăioagă Ghe., Tămăioagă D., 2005, Vorovenicii I, Forest I., 2010).

The role of the agricultural cadastre is to provide real data on agricultural land, depending on the categories of use for the purpose of planning agricultural produce, protection and improvement works, fair tax setting, expansion of the village or city, and the development of efficient GIS (Tamaioaga Ghe., Tamaioaga D., 2005).

The categories of agricultural use are: arable lands, pastures, meadows, vineyards and orchards.

Similar to the agricultural cadastre, the hydro-cadastral cadastre deals with the study of the location of the public networks and of the special constructions afferent to them. Their location is characterized by land, plot, locality, coordinates, owners, etc.

Specialist cadastrals work together and are interdependent. Such a case is the conduction pipes that pass over the agricultural areas, the forest areas, the inhabited areas, the water-covered areas. The water main network and special constructions are subject to maintenance, repairs, rehabilitation / upgrading works, so that the expropriation color is required to carry out the related works.

### MATERIAL AND METHOD

In order to carry out rehabilitation or repair works on certain sections of the water main transmission, gas pipelines, street networks, electrical networks, expropriation corridors are needed.

Expropriation corridors are made for different community networks for proper exploitation and operation. In the literature there are presented both national and international situations in which these types of corridors are made.

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In Bosnia and Herzegovina, an expropriation corridor for the highway linking Podvlije and Rudanka was proposed. The project is quite tedious, as in the case of highway pipelines and through agricultural areas. Thus, the motorway route passes over cropland crops (corn, oats, barley, rye) and different areas, marshland, rivers, forests and non-productive areas. Also along the route there are farms or factories that make the route a problem (PC, 2017).

Expropriation corridors were built in Romania for:

- gas pipelines, for example in the case of the "Biharia - Alsed gas pipeline", where the corridor had a 12 m and 6 m aperture on the left and right side of the pipe axis.

- highways such as Galda de Jos, Alba County where the expropriation corridor sections were established in accordance with the law, 255/2010 and the feasibility study and / or the urban planning and regional planning (Bîrlea I.C. et al, 2017).

- water main transmission through the rehabilitation project of the water supply pipeline of the localities Hațeg, Călan, Simeria and Deva, where the process of registration of the water main transmission corridor was carried out and the landowners were identified. As mentioned in the Decision no. 168/2014, the procedure is a tedious process requiring the production of a large number of documents (HC no.168, 2016).

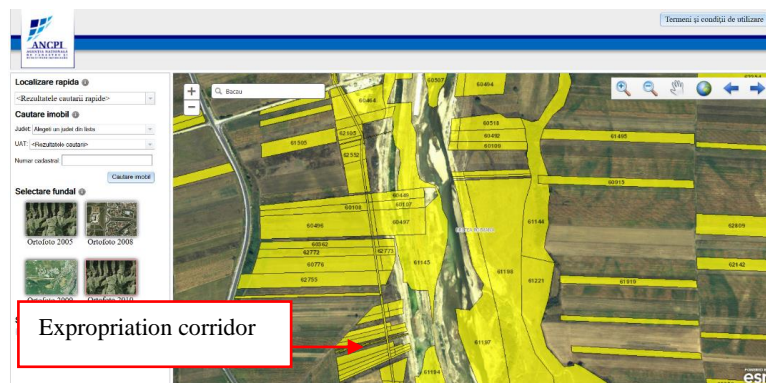


Figure 1 View of the expropriation corridor of the Bretea Română area, county Hunedoara ([www.geoportal.ancpi.ro](http://www.geoportal.ancpi.ro))

## RESULTS AND DISCUSSION

The Timisesti- Iasi water main transmission crosses two counties and a number of administrative territorial units. It starts its route in the outskirts of Timisesti village and crosses both villages in Neamt County and in Iasi County, rivers, reliefs, roads, railways.

The study area considered in the research is water supply I Timisesti - Iasi, as well as the water main transmission II Timisesti - Iasi (figure 1). The water main transmission I was put into operation in 1911 and is also known as the "King Carol I" water main transmission, the length of the water main transmission pipeline is 104 km. Water main transmission II was commissioned in 1970 and is 102 km long (Luca M. et al., 2015).

In order to achieve the special situations on the route it is necessary to know the route as well as the buildings that it crosses. Thus, in the case of private property, owners are required to be compensated in case of damage, and in case of rehabilitation, an expropriation corridor is to be carried out. This can be done easily by working together with the cadastre of the real estate. In Romania, there is no legislation regulating the cooperation between the two, but with a view to

the realization of an expropriation corridor or compensation, law 255/2010 is taken into account.

In the case of the expropriation corridors, different situations are dealt with:

- the pipeline passes through land or uninhabited land from the rural area and the urban area represented by agricultural land, pastures, forests, orchards, near inhabited areas, communal roads;

- pipelines requiring technical inspection intervention (investigations, annual repairs, rehabilitation and upgrading to large-scale interventions);

- access to the private domain where it can be limited by the owners, for example on the water main transmission route in the area of A. I. Cuza, in the sector 86, plot CC 573/1 the conduit I is located under a cemetery;

- access to the public domain where the conduit passes parallel to the road and does not have access problems;

- the problems of intervention in the case of damage to the undertraversing or overcoming the natural and artificial obstacles.

In order to carry out the case study for the Timișești-Iași pipeline, the following steps were taken (Lateș I, 2018):

Stage I: Schematic analysis model based on data collected and processed primary.

Stage II: Acquisition of data and identification of the study area. The data are collected from cadastral documentation (OCPI Iasi and Neamt) and hydro-hydraulic (SC APAVITAL Iasi).

Stage III: Drawing up or improving the model by correlating the real estate cadastre (measurements made, identifying private and public properties, delimiting areas with access to interventions) with the hydro-cadastral cadastre.

The data collected from the two sources is merged and processed in Excel and Autocad programs. Verification of the model of analysis is done by means of cadastral plans, orthophotomaps and field research.

Stage IV: Elaboration or improvement of hydro-cadastral cadastral elements by updating pipeline location data, pipeline material, current structural condition, access conditions, time interventions for repairs, etc. The data is processed and entered into the GIS monitoring model.

Stage V: Signaling problems encountered on the sections studied and analysis of the different cases encountered in the study area.

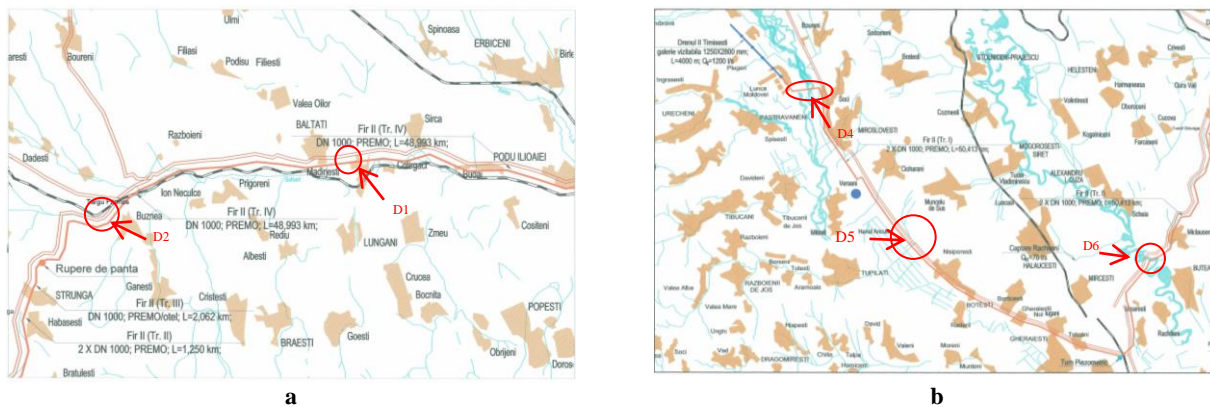


Figure 2 The general water supply scheme of the Iasi county area with highlighting the problem areas property: a - Ad I route details; b - Ad II route details (Apavital, 2016)

Analysis conducted in rural areas of agricultural type dealing with intervention problems in the pipeline on private or public property. In order to achieve this scenario, the location of the Timișești - Iași water supply and the buildings that are registered in the county, in collaboration with the cadastral plans, orthophotomaps, proprietary documents existing in the OCPI database, were taken into consideration. Thus, the overlapping of the built-up buildings over the water main transmission route was done (figure 2, figure 3), and a follow-up of the analysis was as follows:

- at the level of Iași County, there are predominantly buildings that are not yet listed; the

route of water main transmission passes through several territorial administrative units;

- the water main transmission has a route along the communal, county or national roads, but it can be seen that there is a case when they cross the nesting buildings;

- the Timișești - Iași railway line crosses various forms of relief, rivers and streams, townships, street networks and private properties along the route.

In this case, it is recommended to make some access corridor to the duct and to define the pipeline and fireplace location areas.



Figure 3 Outline of the expropriation corridor

Following the analysis of the constructive structure of the Timișești - Iași pipeline are exemplified the following cases, considered as details in *figure 4*:

a) Private sector, owner is the Research and Fruit Production Resort, named Nursery Sârca, the buildings with the cadastral numbers 60468, 60569, 61320, 60976, 60977, 60978, 60317, 60518, 61383, 6182, 60381 situated in the outside of Bălțiți village, and 71, the parcels L 777, L 791 along the former DE 776, DE 792. The Ad II

pipeline runs parallel to DN 28 and the Ad I line aligns to the duct II on the building surface with cadastral number 60569. A particular situation encountered in this case is represented by the land use category, namely orchards. Thus, in the reported area, most of the buildings are stamped and the conduits pass under the plantation of trees. In order to achieve an expropriation corridor it is necessary to provide access in case of damage, so at least 2,5 m on the right or left side should be left with the pipe axis.



a



b

Figure 4. View D1 of the Pomicole Sârca area: a - general view; b - orthophotomal view of Sârca area

b) Private area, in the area of Târgu Frumos town, near the purification station, sector 109, plot A 2900. The identified area has both built-in properties and buildings without cadastral number. A case study in this area presents a particular problem because the pipeline has its way very close to the constructions raised in the area or even pass under them. For example, in the case of the building with cadastral number 60617, the axis of the pipeline passes at a distance of 3.56

m from the western corner of the building. In the case of the neighboring building located in the north it can be seen how the conduit passes through the construction itself.

If we consider that an opening of at least 5 m, in some cases 12 m, is necessary for the expropriation corridor, the expropriation corridor would pass through the construction located on that land.



Figure 5 View D2 location location of the private ownership city Târgu Frumos

c) Public domain, in the case of the building with cadastral number 62857, located in the outside of A. I. Cuza village, sector 86, plot CC 573/1 with an area of 2910 sqm of land in the property of Butea commune. The water main transmission pipeline is located underground in the right of the national road DN 28 at a distance of about 4 m. If we consider that an opening of at least 5 m of the total area of 2910 m<sup>2</sup> is required for an expropriation corridor dismantled an area

of 800 m<sup>2</sup>, the surface of the building would be reduced to 2110 m<sup>2</sup>. In this respect, from the cadastral point of view, it is necessary to draw up a documentation of the detachment and compensation of the owner.

A special situation in this building is that there are graves from the Second World War on the ground, as well as the Cemetery of the Butea heroes, and the route of water main transmission passes even under some of the tombs (*figure 7*).

However, the expropriation corridor may require a width of more than 5 m because it must be in line with the size of the intervention means.

For example, an excavator has a width of more than 8 m, which would require a 10 m corridor.



Figure 6. View of aduction location area: a - orthofotoplan; b - general building view with the water main transmission pipe II site ([www.googlemaps.ro](http://www.googlemaps.ro))

d) Analysis of detail D4 indicates the problems of interventions in damages on the pipeline that subtraverses the river Moldova. The undercrossing area is located in the Northwest part of the Miroslovesti commune, in an area outside the area, sector 49, the HC 478 plot, at the Moțca UAT limit near the European road E85.

Thus, the conduit I undercross the river Moldova, as can be seen in *figure 8*. The riverbed is continuously morphologically modified by annual floods and ballast operations. Intervention in case of damage to the conduit can be made difficult by these changes of the riverbed.

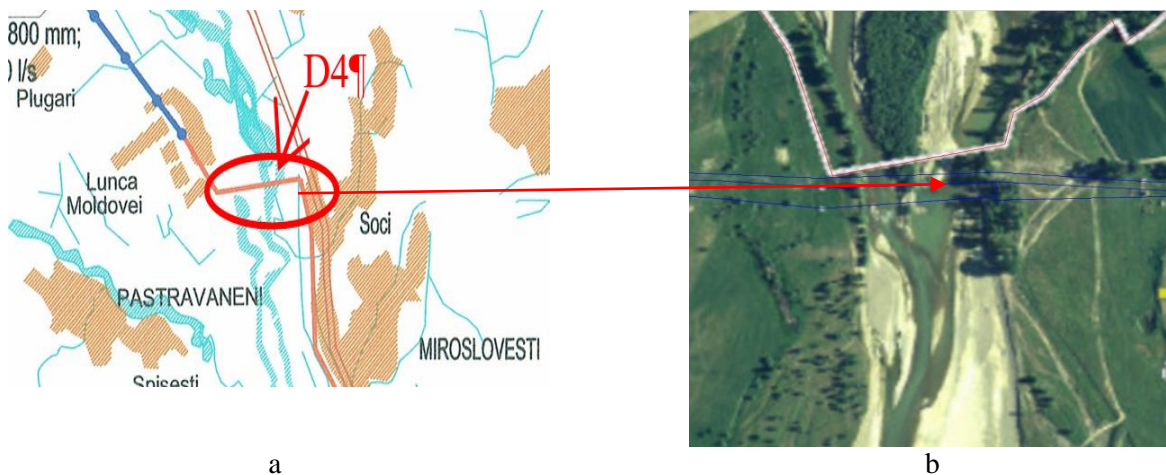


Figure 7 D4 view of the undertraversal area: a - plan with the flow diagram; b – orthotommap;

e) The analysis represented by D5 indicates the problems of interventions in damages on the conduit that subtracts the boundary between Iasi County and Neamt County. The undertraversing area is at the boundary between two counties, making the area of the expropriation corridor problematic. Considering that the corridor would pass to two localities in order to be registered in the land book it is necessary to rectify the border between the two counties. The procedure is long and difficult. Border correction implies the involvement of several authorities for this purpose. The procedure is also hampered by the fact that in Ad I it overlaps the real estate registered in the land book and over the county road DJ 208.

f) Analysis of D6 indicates the problems of intervention in case of overloading. As a result of the field research, it can be noticed that the water main transmission overpasses the river Moldova in the area of Butea - Răchiteni. In the case of a damage to the direct induction pipeline is the water - canal channel SC APAVITAL, ABA Siret, UAT Butea and UAT Răchiteni. The studied section is located at the boundary between the two administrative territorial units Butea and Răchiteni, in the parcels HC 465 and HC 933 according to the cadastral plans of outside of village drawn at 1: 10000 scale. It is positioned parallel to the national road DN 28 crossing the Siret River.

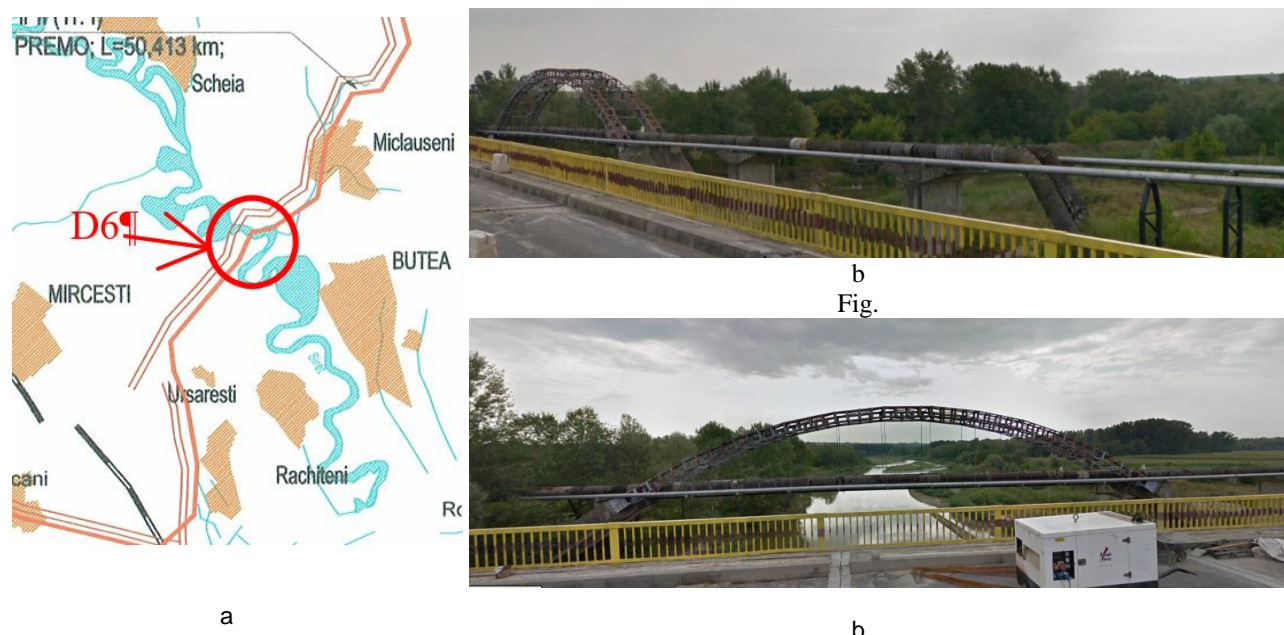


Figure 8 **Overflow of the water main transmission II over the Siret river in the Scheia area: a - visualization D6; b - lateral and general view**

## CONCLUSION

Analysis models facilitate the inspection, maintenance and monitoring of water supply systems.

The monitoring of the pipes is useful for the rehabilitation and refurbishment processes.

The route of water main transmission is of a long length, making the issues of positioning issues topical.

The cooperation of the real estate and land registry makes the problems of property ownership in the case of expropriations easy to solve.

Early identification of issues of access to interventions on pipelines shortens the type of intervention crew analysis.

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