

RESEARCHES ON MINING CADASTRE: PAST, PRESENT AND FUTURE PERSPECTIVES. THE CASE OF A FORMER MINING TOWN: BORȘA, MARAMUREȘ COUNTY

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DOI: 10.2478/minrv-2022-0022

Abstract: *After the cessation of mining activities, concerns for mining cadastre research are only sporadic. The present study aims at bringing up to date the evolution of the mining cadastre in the Romanian provinces with a mining book regime, territories that were until 1918 within the structure of the former Habsburg Empire. (Austro-Hungary since 1867). Several stages can be distinguished in the evolution of the mining cadastre in the areas shown. From the 16th century until 1854 the principles and methods of the mining cadastre were set up. Between 1854 and 1924 the provisions of the Austrian General Mining Law of 1854 were followed. From 1924 to 1948, the mining cadastre provisions provided for in the mining law of 1924 and other specific regulations are applicable. After 1948, under the conditions of a statist regime, the mining record did not respect the principles of the mining cadastre previously assessed. After 1990, the new mining cadastre only partially takes over the classical principles and methods of the mining cadastre. The way of applying the mining cadastre was focused upon in the town of Borșa, a mountainous place where farmers had not formed cooperatives and where intensive mining was carried out until 2007. With the cessation of mining in Baia Borșa, the mining cadastre was reduced to inventories of some mining assets and sporadic cadastre registrations of some premises and settling ponds. The study analyzes the current situation and proposes some integrated solutions, mediated by GIS technology, aiming the introduction of the mining cadastre in correlation with the introduction of the general cadastre. In this context, GIS technology offers modeling tools that, for example, can assess the degree of suitability of the land for construction.*

Keywords: *mining, stable cadastre, concretual cadastre, Baia Borșa mining area*

1. Introduction

Historical legal background of mining cadastre within the Romanian provinces of the former Habsburg Empire

The mining cadastre is the oldest technical or specialized cadastre created to regulate the relations between the different public and private entities involved in mining activities and also to secure mining possessions and activities. Securing starts from the exploration stage, as the right of preference is only applied to those mining possessions registered and described in the records of the mining cadastre. Legal and technical prescriptions specific to the mining cadastre were gradually established within the historical Romanian provinces of the former Habsburg Empire. They were included within the mining legislation applicable in the mentioned provinces, consisting of ordinary and special mining laws. Until 1850 the mining legislation in Transylvania was made up of ordinances, imperial rescripts, constitutions, regulations and imperial patents of historical and practical interest. For Galicia, of which Bucovina was a part, the imperial patents are of interest.

Within the Habsburg Empire the mining evolution preceded the development of mining law and the mining cadastre. The main principles, methods and techniques, derived from German-inspired mining law, were already established by the beginning of the 19th century. Their codification began as early as the 16th

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century. It introduced the concept of investiture which involves the granting on behalf of the sovereign by the mining authorities of the right of concession to explore and exploit mineral substances in a fief - an area of land that actually belonged to allodial property. A variety of mineral resources were the object of the concession.

The right to exploit mineral resources definitely determined through exploration works was granted to the first discoverer following a petition by the mining authority. The petitioner should have previously applied for and obtained an exploration permit registered within the exploration register. The petition had to contain information regarding the identification of the petitioner and the location of exploration area with the assigned name and the mention of the type of mineral resource. The petition had to include information about the petitioner, the location and the assigned name of the perimeter and the type of mineral resource. Registration in the mining book confers a special legal regime according to the prescriptions of both mining and civil law. Only those evaluated as exploitable under profitable conditions were granted, thus becoming reserved minerals. Next came the surveying of a ground size reduced area of an three-dimensionally featured earth's crust, with standardized length, width and depth. There were also granted the lands for ore processing facilities, as well as the main gallery right. With the investiture and the transcription of this record within the mining cadastre registers of the Mining Court, the granting decision was sent to the petitioner. [1]

The specific provisions of mining law of the various provinces of the Habsburg Empire were unified and systematized by the Austrian General Mining Law of 1854, the legislator still allowing the existence of particular rules established by statutes and regulations. Unlike the previous legal provisions, it distinguishes two stages in exploration work: prospecting and exploration. According to the provisions of the law, the mining cadastre works, especially those concerning the mining book, are to be preceded by mineral resource discovery works based on exploration permits. The mining authority of first instance issued two types of permits at the entrepreneur's request: general and exclusive. An exploration permit had to be obtained for each type of activity. For the first type of work, a permit was requested for a "general research area" whose boundaries were determined at the discretion of the petitioner. For the second type, an exclusive exploration area is requested related to an exclusive exploration sign. This was a landmark, which becomes the center of a circular perimeter with a radius of 424.812 m (224 Viennese fathoms). Confirmation of fixing the landmark was made by the mining local authority. It gave the right to request a concession for a rectangular area of 45,116.4 square meters (12,544 square fathoms). This was called a mining precinct, with an orientation that generally had to take into account the spatial arrangement of mineral ores. Private mining statutes may bend the pre-established surface rule.

The license of exploitation works is done by the concession of a mining precinct where exploration works have been carried out. By granting the concession, the surface property is separated from the underground property, being considered as new possession. A translation of the subsurface property to the ground surface by assignation of visible boundary marks is also carried out. By concession, the ownership was granted following an inspection by the mining authority. This one ascertains the existence and exploitability of mineral resources. Another stage in granting the right of concession is the surveying and laying out the boundaries on the surface or even inside the mine. It is executed by the mining authority for the mining boundaries, relative to the opening point. A parallelepiped with unlimited height and depth is delimited, with the previously specified base area whose width cannot be less than 106 m. The mining statutes grant other types of mining boundaries. All surface constructions, workshops and installations that are used for the exercise of rights deriving from the concession deed belong to mining properties.

The main role in the management of the mining cadastre and implicitly the mining book was adjudicated to the mining authority of first instance, in this case the mining captaincies or their branch offices and also mining courts. They had the obligation to register all granted concessions in a standardized public register. Each type of concession or investiture is recorded, respectively precincts or sub surfaces, the intermediate spaces mining fields. Three pages were reserved for each concession. The actual mining book represented, in the view of the mining legislation, an instrument of record of the mining cadastre under the administration of the mining court, as an authority that registers and verifies the legality of registrations of mining possessions. The registrations were ordered by the executive mining authority represented mainly by the mining captaincies. Once the investiture was granted and transcribed within the mining cadastre registers of the Mining Court, the granting decision was sent to the petitioner. The concession once obtained, the entrepreneurial shareholder must assume some obligations. The mining activities were permanently supervised by the mining authorities.

The Austrian General Mining Law only partially solves the problem of interoperability between the stable cadastre introduced after 1850 and the mining cadastre by impelling the preparation of topographic survey plans at the cadastral scale 1:2880. It does not mention the compulsoriness to frame the topographic surveying

works into the local or higher-order geodetic network. The phrase “stable” means that the tax remains stable even if the owner changes. [2]

The provisions of the Austrian General Mining Law regarding the mining cadastre were maintained in force after the Great Union, from 1918 until the promulgation of the Mining Law of 1924. It was based on the provisions of the Constitution of March 28th, 1923. According to the fundamental law, underground resources belong to the state, thus amending the existing legislation by nationalizing the underground, admitting, however, that the rights won in the past will be maintained. The new Mining Law, as amended in 1929 and 1937, took over in part the mining cadastre principles of the Austrian Mining Law. It was due to the fact that part of the mining leaseholds in interwar Romania were located within the Romanian provinces derived from the former Austro-Hungarian Empire with a mining book regime. Thus, the duality of the institutions that manage the entries in the mining book is kept up.

The attainment of the mining property was done by granting the concession. It gives the right to mine on the basis of a license for a certain type of minerals, within a bounded perimeter on the ground and underground for certain period of time. The granting of the concession is done after the prospecting and exploration works in order to discover exploitable ores. They were to be executed based on a license by the Geological Institute or private entrepreneurs. Following these steps, the state chooses an explorer, to whom it grants an exclusive exploration permit that gives him the right to carry out mining works, excluding other entrepreneurs. Bounding the mining area was assimilated to mining cadastre works. It was necessary to precisely bind the mining area and represent it on topographical plans or map it. The geometric shape of the leaseholds had to have square or rectangular geometries. Their sides had to be oriented to the N-S and E-W directions according to the site astronomical meridian. They had to have the geometric proportions of dimensions similar to those established by law for different types of minerals. The location of the leaseholds was conditioned by the existence of a number of definite exploration points attesting the existence of an ore that can be profitably mined. The property right of the mine and its specified by the law annexes is acquired after the publication of the license deed in a journal of the Council of Ministers. It was accompanied by a specification detailing the main types of mining activities to be developed within the mining area. By granting the concession, the mining rights are separated from the surface right, without excluding the land owners. They had the right to participate as shareholders. The mine and its annexes are considered immovable property that cannot be merged or subdivided without the prior authorization of the mining authorities.

The possession is secured by registering the properties in the mining book, a tool for advertising mining rights and duties. They were established at territorial courts and the regional mining authority. The law included provisions and procedures regarding the recognition and validation of so-called earned rights. It regulated the relations between the State, having the capacity of grantor and the assignees prior to the new law, as well as of previously acquired exploration rights. It had significance for the Romanian provinces of the former Habsburg Empire which provided for a deadline that was extended several times.

Although there was the question of achieving a correlation between the works of the general cadastre and that of the mining cadastre, i.e. all the cadastre works to be coordinated by a single institution, this remained a desideratum in the interwar period. The mining cadastre works were drawn up by mining engineers and other licensed personnel, but without a unitary common methodology with the specific works of the general cadastre. [3]

This system of granting leaseholds for exploration and mining works and the procedures of registration within the mining book was maintained until 1948, with the nationalization of mining enterprises.

During the communist regime, one cannot speak of a proper mining cadastre, as it was applied until 1948. Statism is also reflected in the new Mining Survey Regulation, according to which the mining surveying activity is carried out in the mining areas where the mining was carried out by state mining enterprises.

After 1990, the new socio-economic reality led to the resumption of enactment in the parliamentary regime of the exploitation of mineral resources. The concession and the granting for managing for a limited period, with the possibility of extension, remain the main ways of exploiting mineral resources by the state. It is not explicitly stated that the concession bound the rights over the underground mineral resources compared to those of the surface. Only the ways of acquiring the use and access to the lands on which mining is carried out is set forth. According to Law 85 of 2003, the mining book is a constituent of the extractive cadastre. The data to be entered into the mining book refer to the land surfaces associated with the leasehold, the topographical situation of the mining works, the state of the mineral resources or reserves and those of production.

The mining book is open for each area of exploration or mining based on a license. The purpose of its institution is to ensure the rights publicity and charges of any kind encumbering the mining properties, which thus become opposable to third parties. In the new legislation, the bipartite system of the mining book held by

both the mining authority and the judicial authority was abandoned. It is exclusively in charge of the executive authority: National Agency of Mineral Resources with its territorial structures. They are made up of cadastral inspectorates, subordinated to the General Directorate for territorial inspection and supervision of mining activities and oil operations. The mining book is drawn up for each mining area and mainly includes the general record book and the mining book, which includes a series of registers and the entered records.

2. Material and methods

2.1 Study area

Borșa is a town located in a mountainous area at the south-eastern end of the county including, as a result of the administrative reform of 1968, the village of Baia Borșa, which became Băile Borșa neighborhood. The town area is 419.13 km². It was a non-cooperative area with an important mining activity and primary processing of some non-ferrous ores. Until 2007, the year the mines were closed, the country's 8th largest mining state company operated here. The area of mining interest is located especially on the right side of Țâșla River.

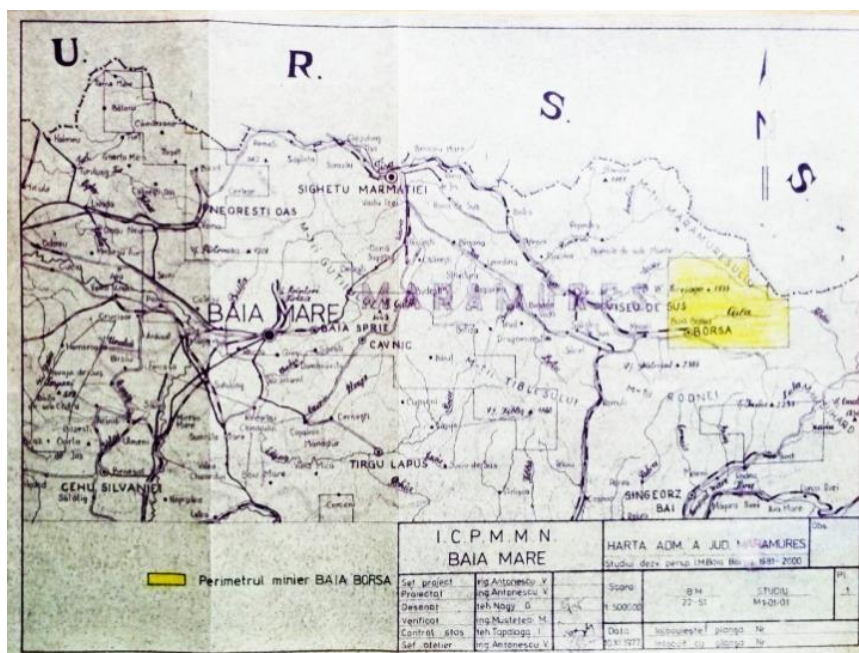


Figure 1. Map of Maramureș county from 1980 with the demarcation of Baia Borșa mining area.
(Source: National Archives, Maramureș County Service, NA, AMMS) It is also valid today

2.2 Historical data on background of mining within Băile Borșa.

The beginning of mining in Baia Borșa is not known but it appears to have its origins in the Bronze Age. Written evidence of the existence of mining comes from a 1780 copy of a report drawn up in 1551 on two field visits by an official of the Montanist Court Chancellery. At the end of the 18th century, mining activities were resumed, the main investor being the Ministry of Finance or the Treasury and some private investors. In the absolutist decade, Manz Ritter von Mariensee became the main investor in Baia Borșa mining, who acquired the main mining assets in 1859. Mining went into decline for ten years with bankruptcy proceedings after Manz's death. The mining properties were purchased by Hubert Franz Franzbender, the owner director of the Chemical Products Factory from Bocicoiul Mare. Since 1893, part of the mines from Baia Borșa was purchased by the Hungarian-Swiss joint company, "Klotid". Before the World War I, beginning with 1905, a mixed Hungarian and Anglo-Austrian company started sporadic mining exploration works. During the war, mining was controlled by the army. Mining continued intermittently until 1927 when the *Pyrít* Company called for their cessation. The properties and mining rights at Baia Borșa were purchased in 1928 by *Minopirit* but without carrying out important mining activities within the area. [4] After nationalization, the new communist regime established in 1948 initiated an ambitious investment program within Borșa and Baia Borșa that led to an unprecedented development of mining in the area. In 1952, Baia Borșa Mining Enterprise was founded, which continued its activity under different names until 2007.

2.3 The evolution of mining cadastre works in Baia Borşa mining interest area

Some documents from the years 1852-1859 of the Baia Borşa mining court, which became the Mining Sub-Captaincy, refer to mining cadastre works. They were made based on the prescriptions of the mining law of the time. Among the records are the petitions for granting or renewing the mining concessions of some local investors or mining associations, sale-purchase or lease deeds of some mines. Between 1856 and 1867, cadastral works were carried out to introduce the stable cadastre, in parallel with that of the *concretual* cadastre. They also provide information on the mining cadastre. Within the framework of the stable cadastre, permanent constructions, some hydro-technical facilities, roads were mapped. They were located in the area of Burloaia stream, in the major bed of Tâşla River as well as in Baia Borşa. After 1859, mining cadastre activities were carried out according to the provisions of the Austrian General Mining Law under the control and supervision of Baia Mare Mining Captaincy. Mining ceased for various reasons by the end of the 19th century. The resumption of mining activities is reflected in the entries in the mining cadastre records. In particular, circular exploration areas will be recorded in the mining book. In the interwar period, the control of mining cadastre activities was entrusted to the VII Mining Inspectorate, Baia Mare. During the World War II, the Hungarian administration set up in 1942 a Mining Captaincy in Baia Mare that would control the mining within Maramureş area. Until the enactment of the Mining Act of 1924 *Pyrit* applied for annual extensions of the validity of exploration permits. It was only in 1927 that they requested and obtained, in 1929, the validation in principle of the mining rights of exploration and mining by a specialized panel of judges from the Maramureş Court. *Minopirit* wanted to secure its mining rights after having acquired the mining properties from *Pyrit* Company. Thus, in 1931, it requested the renewal of exploration rights for 80 circular perimeters out of the 86 that the former company had obtained. It requested the granting of new exploration permits within the limits of 27 rectangular perimeters with an area of 2070.55 ha within Baia Borşa area. In 1936, the Ministry of Industry and Commerce approves the renewal of exploration rights only for some circular perimeters included within seven rectangular perimeters. The Ministry appreciated the request as it was formulated as a tendency to grab areas with exclusive exploration rights. Thus, it approved only those perimeters that can constitute a reserve for the existing exploitation perimeters. During the period 1948-1989, the most intense mining activity was carried out. Mine topography works were carried out on the surface and underground. Given the conditions of a statist regime of soil and subsoil ownership, one cannot speak of a proper mining cadastre. The mining activities had consequences on the mining cadastre after 1990. [5]

2.4 The current cadastre in the area of mining interest Baia Borşa

The setting up of the mining heritage of Baia Borşa Mining Company after 1948 was done in several ways:

- Nationalizations: the inventory of the assets of the former *Minopirit* Company transferred, beginning with 1952, to the Mining Company Baia Borşa. It consisted of plots within built-up area of Baia Borşa (the mining colony), buildings and facilities as well as the Borşa train station area (land, constructions, preparation facilities, and funicular).

- Another source was the transfer to the administration of Baia Borşa Mining Company of some forest areas managed by the Forestry Offices of the area. Most of the forests in Baia Borşa came from the expropriation of compossessoral forests, of the commune and of private owners.

- Expropriations by the communist authorities of private lands for the future industrial or mining sites and for the construction of settling ponds and tailings dumps within Baia Borşa area. A correlation was made between the historical cadastre, the “concretual” cadastre and the topographic surveys for the lands proposed for expropriation. The “concretual” cadastre is a form of fiscal cadastre introduced after 1850 based on expeditious fields surveys including parcels with the same land use. The expropriation documentation was drawn up by the topographical service of Baia Borşa Mining Company.

Surface constructions, development works and underground mining works were supported by an ambitious program of investments within Baia Borşa mining enterprise.

Until now, the mining cadastre works for the mining interest area had as their object the registration in the general cadastre records of the main mining premises. Sometimes the sporadic cadastre and several technical cadastrals compete for the same surface. In Borşa town, no systematic cadastre works have been carried out so far. Thus, through the sporadic cadastre, certain mining areas were occupied, areas that maintain their importance even if the mining activity has ceased.

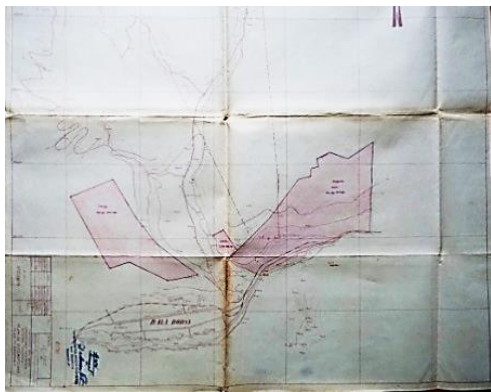


Figure 2. Topographical plan with the location of some plots proposed for expropriation in 1952 for the location of the industrial premises, (Source NA, AMMS)

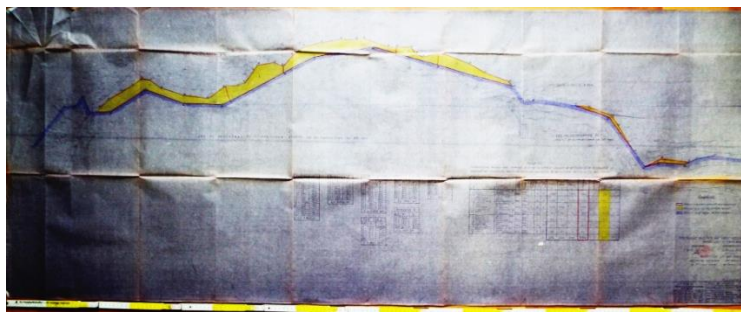


Figure 3. Topographical plan with the location of some land proposed for expropriation in 1982 for the expansion of the settling pond D3 (Source NA, AMMS)

Carrying out works for the introduction of the general or systematic cadastre is a necessity in the area of mining interest in Baia Borșa. According to the methodology for introducing the systematic cadastre for Borșa, 56 cadastral sections were designed by the National Agency for Cadastre and Real Estate Advertising. The design of the cadastral sectors was done relatively arbitrarily without taking into account the physical-geographical realities of the area and the existing cadastral works.

To facilitate the introduction of the mining cadastre in correlation with that of the systematic cadastre, the following aspects must be taken into account:

1. In the town of Borșa, the “concretual” cadastre is in use, which was introduced simultaneously or shortly after the completion of the stable cadastre works. The stable cadastre works were carried out between 1856 and 1867. An important cadastral material consisting of maps made on a scale of 1:2880 and records of parcels and owners was created. The connection between the two types of cadastre is made through correspondence registers between cadastral and topographical numbers. [6]

2. Part of the lands located in the area of mining interest was subject to the reconstitution of property rights through the agrarian reform laws after 1991. Most of these lands are forests that were nationalized by the communist regime. By retrocession, the forestry regime achieved through the forest cadastre is maintained.

3. Mining cadastre works were carried out mainly through sporadic cadastre works for some of the mining premises and settling ponds. For example the roads and access areas to manholes of some closed mine galleries were included within the reverted forest property.

3. Results and discussions

By means of the systematic cadastre it will be possible to clarify ownership relationships and ownership structures of the area. In support of the complete introduction of the mining cadastre correlated with the systematic cadastre, several solutions can be proposed:

1. The analysis and processing in GIS or CAD environments of the cadastral material resulting from the stable cadastre offers the possibility to make the connection between the “concretual” cadastre and the layout of the plots in the field. Processing in ArcGIS Pro involved scanning the cadastral plans, geo-referencing and mosaicking them. To facilitate geo-referencing, a grid was created with the use of control points through which the correspondence between stable points in the field and those on the map is made.

The digital map of Borșa resulting from the mosaicking of 192 map sections can be used for:

- the restoration of the border limits of Borșa town since the current ones were set arbitrarily;
- the design of cadastral sectors based on the toponymy criterion, since the toponymy coverage of the territory is more stable and easy to use;
- reconstitution of parcel boundaries in uncertain and litigious situations;
- predictions for the possible number of parcels within a cadastral sector based on the ownership structure identified on the stable cadastral maps.

2. Making correlations mediated by ArcGIS Pro between the competing cadastral: the historical cadastre, the sporadic cadastre, the forest cadastre and other technical cadastral in support of the introduction or continuation of mining cadastre works. These correlations can be made through a database in ArcGIS Pro. [7] Raster or spatial data from different sources can be integrated into the database. They allow the realization of different analyses or modelling.

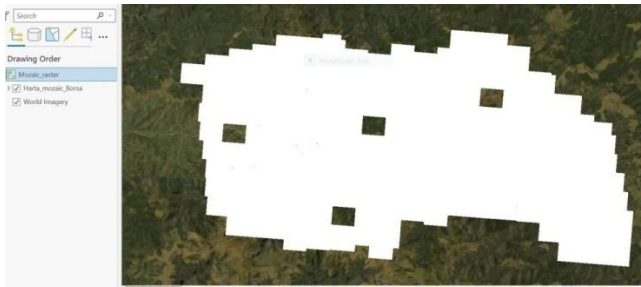


Figure 4. Mosaic digital map of the stable cadaster of Borșa town.

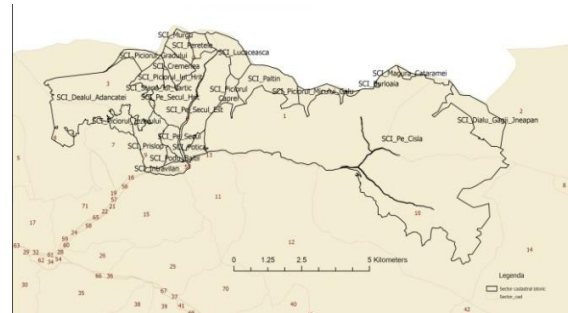


Figure 5. Historical cadastral sectors in relation to the sectors proposed by NACREA within Baia Borșa area

Analysis and modeling in the GIS environment provides the possibility for potential investors to make predictions in the evaluation of land according to their suitability for building. A classification of land in Borșa town according to favorability and readiness for construction can be achieved through modeling in a GIS environment.

The analysis involves making spatial correlations between the component layers of the created database. The resulting model respects the statistical and scientific rigors, while also allowing an adequate evaluation of the cost of land suitable for construction and mining developments. Land use, geo-morphometric factors, accessibility and restrictive factors such as watercourses were taken into account in the creation of the model. The first stage of the analysis consisted in the acquisition of the data, followed by their symbolization within some thematic layers.

The vector data were transformed into raster-type structures, necessary for spatial modeling. The resolution of all grids that were included in the model was 10 m. In the next step, the initial raster data were reclassified, thus the raster values were ordered according to the favorability for construction. With the help of "Weighted Overlay" tool, spatial modeling could be done to obtain a thematic layer. This thematic layer reflects the suitability and favorability of land for construction and implicitly for mining developments. Each raster is assigned a weight in the model according to the importance that the favorable conditions have reported, respectively favorable or unfavorable. To these are added any restrictions regarding the arrangement of industrial and mining buildings.

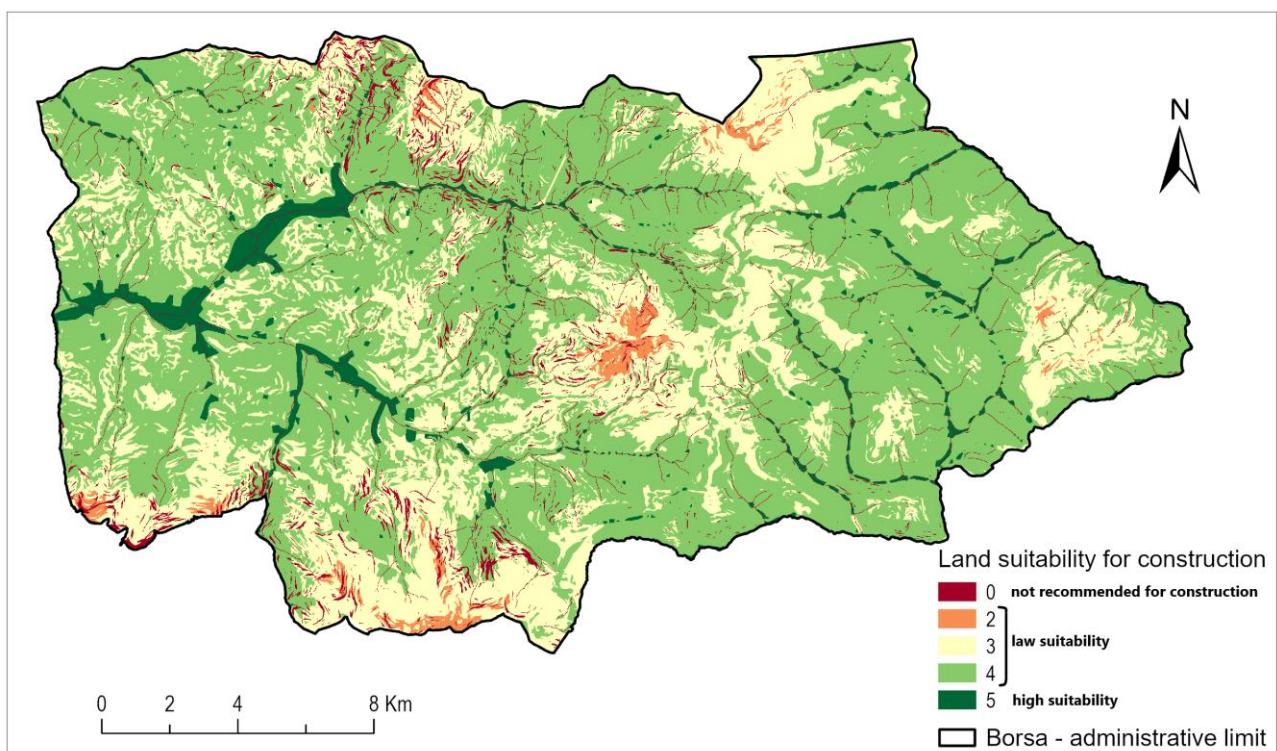


Figure 6. Map of Borșa town with the zoning of the suitability for construction works

4. Conclusions

The extensive study of the material resulting from the mining cadastre and extractive activities, in particular the one concerning the mining interest area in Borșa, can bring both theoretical and practical benefits. The mining cadastre is the oldest technical cadastre and the first three-dimensional one. The classical principles and methods of the mining cadastre were observed until the imposition of the communist regime. In this new situation, under the conditions of a statist regime, mining cadastre works were partially assimilated with mining topography works. However, the connection with the historical cadastre was not ignored, especially in the case of expropriations. Unlike the historical cadastre, in the case of the mining cadastre after 1990, the principles of the classic mining cadastre were only partially adopted. Given that most mining activities have been stopped in nowadays Romania, concerns for theoretical or technical aspects have become peripheral. In the mining project, the extractive cadastre works are important in all its phases. The present research focuses on the necessary mining cadastre works for the mining resumption. At this stage, the identification of legal mining lands, their inventory and registration in the cadastral records is mandatory. To the same extent, the problems of property relations in the areas that can be affected by the activities of the mining project must be solved, so an integrated solution of the cadastral problems in the areas of mining interest is needed. Equally, the problems of property relations within the areas potentially affected by the activities of the mining project must be solved, so an integrated solution of the cadastral problems in the areas of mining interest is needed. GIS technology provides technical support and also for scientific analysis in introducing and continuation of mining cadastre work. The conclusions of this research are limited by the material accessible to the research. The opening for scientific research of the documents resulting from the mining activities, in the present case the documents created by Baia Borșa Mining Enterprise, will allow the realization in a GIS or CAD environment of some three-dimensional modeling of the mineral deposits. It will be possible to evaluate the ore reserves as well as the virtual reconstruction of the underground mining works. Such modeling will facilitate the exploration and opening works in case of the resumption of mining works in the studied area. Complex analyzes in GIS environment of mining fields will be able to be performed for reserve evaluation and optimization of mining operations.

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