

Using Geographical Information System for Implementing Resettlement Strategies in Mining Areas in Kosovo

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Abstract: - In this paper is presented a modern approach for developing and implementing resettlement strategy in mining areas in Kosovo using Geographic Information System. The main aim of such Geographic Information System is to digitally represent various geographical collected data linked to location. The geological map of Kosovo was analogous until year 2000. The lack of a modern information system about mining and settlement areas was deemed as one of the obstacles or difficulties faced by investment decision-makers. The property issues are considered to be directly related with expropriation. Properties registered in the register of rights over immovable property may not be deregistered for any purpose except for public needs. The developed information system will support the calculation of social impacts on the settlements in mining areas and will provide data visualization that will help when creating perceptions regarding mineral source utilization. The full local development benefits of mining can only effectively be realized if local settlement members support and understand mining activities. The most affected area is Kosovo coal basin, which has a surface about 270 km² and about 44.021 inhabitants with many public, cult, business and industrial buildings. The final graphical and textual data is prepared in shape file stored in data base, which offers the possibility of usage by many geographic information systems. This software application is developed using latest ASP.NET platform, C# as programming language and Microsoft SQL as database server. It shall server as unique tool for governmental decision makers and to contribute inputs to future policy and management decision-making in the mining and spatial sector.

Key-Words: - Database, Expropriations, Property, Geographic Information Systems, Minerals

1 Introduction

Development of Geographic Information System (GIS) of settlements in mining areas will provide an overview of the realistic situation in the field on the economic analysis of mining sources. The GIS will provide for definition of various relations and factors, approximate cost of expropriation for mineral use, time necessary for eventual displacement of the settlement. Expropriations and social effects have a special impact on time and cost factors. The developed database is a combination of field research and research undertaken by the Kosovo Cadastral Land Information System (KCLIS). Data on settlements is also gathered in Microsoft Excel, which may be used in the future to

calculate data according to various models in conformity with user needs.

Upon presentation of an economic analysis on the feasibility of utilization of a mining source, the detailed project to define legal-property relations and initiate further expropriation procedures shall be compiled.

2 Geological Data and Expropriation Process in Kosovo

2.1 Geo Description of Kosovo

The global geographical position of Kosovo lays approximately between parallels 420 and 440 of the northern hemisphere of the globe and between

meridians 200 and 220 of the eastern geographic longitude. Kosovo lays in the central part of the Balkans Peninsula – in Southeast Europe. The surface of Kosovo is 10 908 km², and a population of over 2 million inhabitants. Over 40% of its inhabitants are in age between 0-15 years. The population is multiethnic and consists of: 92% Albanians and 8% other communities (Serbian, Turkish, Bosnian, Roma, Ashkali). Merely the Albanian population has three religious confessions (muslim, catholic and orthodox) [1].

Kosovo has a various geological content as well with various mineral qualities and quantities. Only a number of minerals are researched and few of them were utilized, others are being utilized, whereas some will only be used in a longer perspective. Because of such indications and content of minerals in Kosovo, and because of their occurrence in Kosovo, the Independent Commission on Mines and Minerals (ICMM) has conducted a geo-physical relief in 2006 to assess the occurrence and sorts of minerals available [2]. Ministry of Energy and Mines (MEM) has prepared a plan that delineates perspective mineral areas in Kosovo. The delineation was performed to provide for clearer vision for mineral utilization in the future and will serve various studies that may be carried out to conduct certain economic and strategic assessments. The extent and delineation of perspective mineral zones is presented in the Figure 1.

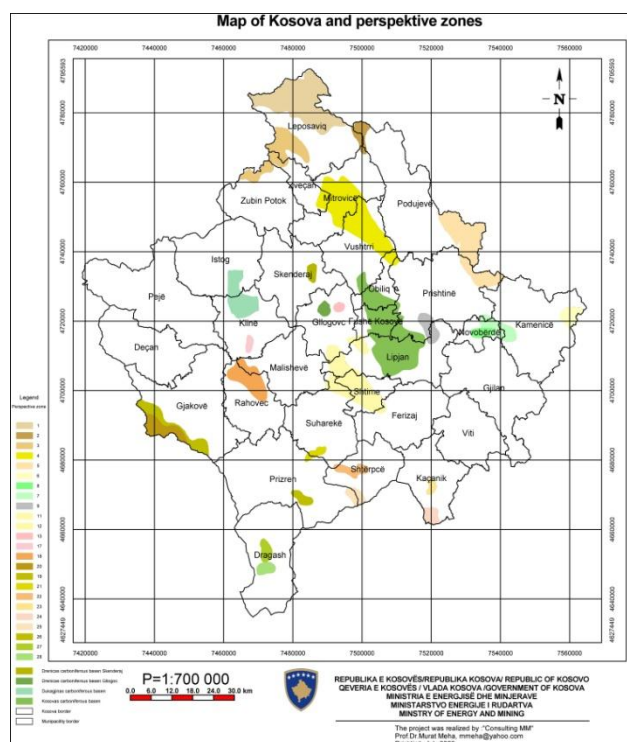


Fig. 1: Perspective zones in Kosovo

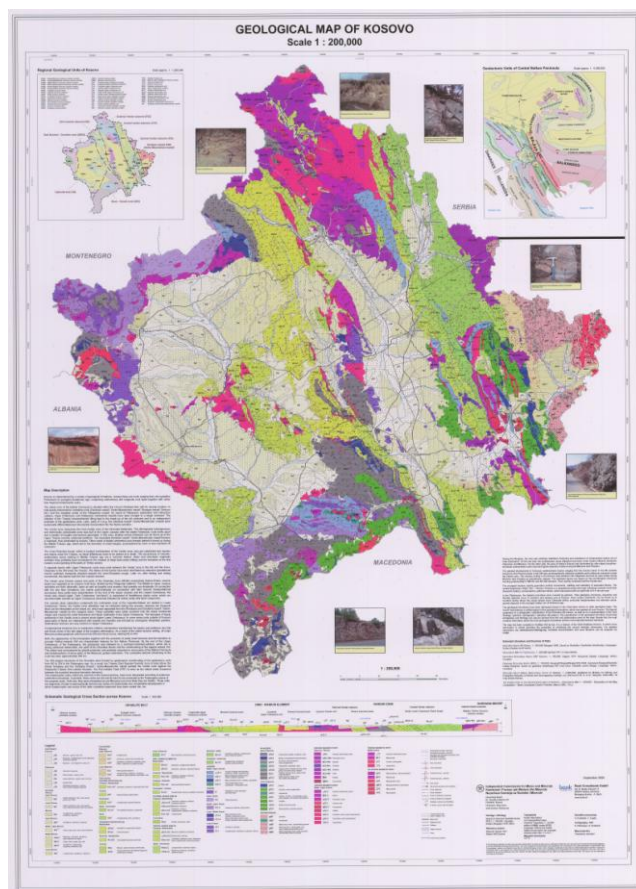


Fig. 2: Geological map of Kosovo [3]

The most significant minerals in these perspective zones are: coal minerals, lead minerals, zinc minerals, copper minerals, nickel minerals, chrome minerals, aluminum minerals, iron minerals, silver minerals [4], as presented in Figure 2. Furthermore these minerals are regulated by Law on Mines and Minerals, recently approved by the Parliament of Kosovo [5].

2.2 Property expropriation and legal foundation

Mining and mineral processing played a significant role in Kosovo's economic development, business activities, education, infrastructure and growth of income per capita. Expropriations are necessary for further development of mineral utilization. "Expropriation" means all actions of an expropriating body which include:

- Withdrawal of a legitimate right or interest over a property that belongs to one person and transforming that property into a public immovable property, or

- Compulsory transformation of servitude or another right of use into public immovable property.

Expropriation is a necessary tool used by all democratic authorities in obtaining access to properties and using the property for common interest. The expropriation procedure is an essential state instrument and provides for legal deprivation of individuals from property possession when the property represents a common economic interest. In Kosovo expropriation is regulated by the Law on Expropriations [6]. This law determines the procedures, including legal remedies, for the protection of individuals from non-proportional interventions on the right to property. These procedures consist of preparatory activities, determination of a common interest, expropriation decision and compensation decision. The Law on Expropriation determines: rules and conditions, in accordance with which the Government or Municipality may expropriate property rights and other rights over the immovable property of a person which is further transferred to public property; it also determines authorizations on limitation and temporary use of immovable property; it defines rules and procedures to be followed in determining the amount and payment method for expropriation or limitation of property rights, as well as other provisions that regulate various issues pertaining to expropriation or limitation of property rights. When expropriation is performed by the Government in achieving wider economic interests of the society, in line with this law, they supersede all current plans of municipal authorities or other public and individual plans.

2.2.1 Expropriation process methodology and management

Expropriation process management is carried out according to the Law on Expropriations [6], and includes the following:

- Mapping of the certain surface zones, to the general and strategic general interest, as vision to the decision-making authority,
- Preparation of the required documentation, for the area proposed as a common public interest,
- Publication of the area outlined as a common interest, in line with the Law on Expropriation,
- Decision on preventing new construction investments in this area,
- Development of the technical property-legal documentation for expropriation,
- Determination of the criteria for assessing real estate property,
- Price proposal for the property and the assets in the delineated area,
- Study and collection of the requests of the residents for the mining area,
- Deadlines and responsibilities for the implementation of expropriation in certain phases,
- Development of the budgetary plan for expropriation of the area announced as a common interest,
- The strategy drafted for emergency and permanent expropriation,
- Development of the budgetary plan for partial or full expropriation of the area declared as a common interest.

2.2.2 Expropriation through KCLIS

The role of land in the country's economy is very significant. Cadastral information for the lands are multidimensional and are used for many purposes, both for the public and the private sector. KCLIS has been developed as unified system, including cadastral data of the lands, the rights to immovable property; land use, addresses; and it will eventually include other data, such as: environmental conditions, buildings and facilities, land value, etc, for many purposes. Expropriation always depends on the KCLIS documentation. This documentation can be divided into two groups: textual and graphical documentation.

2.2.3 Spatial Data Infrastructure

Spatial Data Infrastructure (SDI) as an organizational approach to increase spatial information availability as well as to increase number of applications using spatial data will offer easy approach to perspective zones of minerals. In this case, if we have mineral spatial data available widely for many, we will have more profit on local and national level. This is based on definition of NSDI. National Spatial Data Infrastructure encompasses the policies, standards and institutional arrangements involved in delivering spatially-related information from many different sources to the widest possible group of potential users [7]. SDI is a mixture of information technologies, databases, services, organizational approaches, legislation, projects etc. Kosovo governmental sector already starts and is expecting to play leading role establishing NSDI, including also minerals data,

which is going to deal with policy giving answer on following questions:

- What is the price of spatial data sets from public sector for other users?
- Should public sector data be payable or not, if it is payable?
- Which information should be available for free?
- Which rules are dominating: rules of personal data protection or rules of free public data access?

Public administration is the largest spatial information producer as well as the largest data user. The information from public administration is essential for every spatial related decision. Therefore public information must be easy accessible within public administration as well as for other users.

2.2.4 Database from the cadastral information system

Based on the projecting task of expropriation and on the project's technical description, a database with the following content shall be created [8]:

- Coordinate register (Y, X, H,) from: (i) the referent/trigonometric network, (ii) polygonal network, (iii) separate cadastral plot limits which undergo expropriation, and (iv) expropriation lines
- Register of submissions,
- Recapitulation of surfaces,
- Possession lists (certificates of rights over immovable property),
- Orto-photos with cadastral maps in vector shapes above,
- Cadastral maps with the old cadastral situation, at scales 1: 2 500; 1:1000, 1: 500 pending availability,
- Cadastral maps with the new existing situation from the field, at scales 1: 2 500; 1:1000; 1: 500, pending availability.

These data on expropriation areas comprise the general foundation, while additional data may also be added. Cadastral documentation assessment clearly delineates which parts of the perspective are belonging to rural, urban or urban areas. In certain occasions, there are urban areas or entire towns included in a perspective area. Inclusion of a town or lake in perspective areas is unjustifiable;

therefore those areas of specific character are removed from perspective areas.

Cadastral data listed in the upper section may include:

- a) The updated cadastral data in the territory of expropriated area, and if they are in correlation with exploitation of minerals, will be an advantage for the project. In this case the expropriation process is shorter and we have reducing costs, each owner directly will be informed about the process, get information criteria provided by the future user and achieve the agreement.
- b) The cadastral data in Kosovo are not homogeneous and this varies from municipality to municipality. Lack of cadastral data creates challenges for implementing the project of expropriation in correlation with using of minerals. Such case in Kosovo was deployment of village Hade which was located in the coal mining of KEC. Discrepancy of cadastral data with real situation is presented in fig. 2. At parcel 100/2 now is a building but in the documentation presented on by cadastre there is no building. Updating of the cadastral documentation is necessary for fair and transparent for compensation of the owners whose land expropriation was made. This process requires special commitment to the commission of expropriation, new cadastral surveys, certificate of property rights in RDPP, time and financial resources. Another challenge is the process of heritage and eventually mortgages early parcels that are now in the process of expropriation. Collection of missing data in the cadastral documents must be processed, edited and archived to the cadastral base before getting compensation for the expropriated property owners. In solving these challenges have to be involved cadastre experts, owners, users the new beneficiary and local courts.

Land Information System (LIS) in Kosovo is achieved in the register of the immovable property (IPRR) [9] and in the graphical (GIS) that can be called as Kosovo cadastral land information system (KCLIS). This system provides advantages for the expropriation process offering the possibility of controlling the information about real estate, adding information and increasing reliability on the quality of service. This support gives opportunity to the expropriation process, starting from the recipient of request for services. Quickness of delivery services for data and transparency to the client for information that is important to achieve processing where demand for the service requested by fulfilling his legal responsibilities. Expropriations bear in them the long term timeframe, which increases the cost by creating opportunities for intervention with or without end, which may change the data on real estate. Through this graphical data can be achieved better control and gives opportunity to make a right decision in terms of their improvement. Creation of new responsibilities and use of integrated Kosovo WebGIS's as presented in [9] or through the NSDI, and setting the information online which will be available for other interested Agencies.

Therefore the preliminary tests for certain expropriation should namely started by the updating the cadastral documentation of the perspective mineral areas, various types of objects, cultural

objects, industrial facilities, cemeteries in order to avoid mismatching with field information, as presented in Figure 3.



Fig. 3: The difference of data in the cadastral documentation and field

In Table 1 is presented a part of the area number 25 with mineral perspective of Copper (Cu).

Table 1: Perspective zones of Minerals

Perspective zone: 25		Mineral's type: Cu					Coordinates of the origin of the area Y / X
Municipality	Zone	Surface (ha)	Land				
	Cadastral	(ha)	Agricultural (ha)	Mountain (ha)	Wasteland (ha)	Dwelling (ha)	
Prizren	Gornjesellë	955.2	0	472.6	482.5	0	7497539.49 4669117.91
Shtërpce	Sevc	71.2	0	71.2	0	0	7497503.39 4671608.73
Shtërpce	Jzhincë	810.8	0	810.8	0	0	7500896.67 4668215.45
Shtërpce	Vërbeshicë	38.4	0	38.4	0	0	7500896.67 4668215.45

3. Real estate market

To give a professional opinion about the situation and possibilities for the land market and taxes at Kosovo's system is difficult. Kosovo started to create a new system of land market but it is in principle probably difficult to choose between the American systems and European system. The country with the short tradition the longest market

economy and the most developed real estate market in the world is not easy to compare to economies in early development.

Based on the acquired information it may be ascertained that the area of real estate market value assessment in the Republic of Kosovo is defined by law, i.e. the communities are required to assess real estate tax based on market value. The law defines very categorically that in order to assess market

value of real estate's as well as to define the taxable base, the three established valuation principles shall be used, i.e. the principle of comparable sales, the purchase-value principle and the principle of real estate profitability. The criteria and measures as well as qualities and standards of real estate valuation are not regulated in detail, i.e. this area is left to statutory instruments.

The Real estate tax act in the Republic of Kosovo defines that communities are responsible for defining taxable base, from the aspect of providing data as well as from the methodological-organisational aspect of performing the real estate market value assessment. The Ministry of Finance and Economic Relations of the Republic of Kosovo has no part in the contents or procedures, their responsibility and duty is merely to provide IT support to all communities, based on central information systems.

4 The description of minerals in perspective zone Kosovo's coal basin

Mining sector in Kosovo has played an important role in economic development throughout the second half of last century. However, after the 1999 war, the mining sector has declined and is reduced only in the coal mines and to a lesser extent the exploitation of lead, zinc and minerals Ferronickel. Coal as a useful energetic mineral in Kosova has started to be used in 1922 by underground exertions in Hade's Mining and later also in Babush – Lipjan[4].

Now days in the Republic of Kosova, still exist a considerable amount of coal's deposits, lignite type. Lignite is the most important resource in the Republic of Kosova which supplies about 97 % of the total production of electric energy. Kosova's coal is lignite type; it has a dark color and a high partaking of wetness. It submits very easy to self-starting processes under the influence of conditions and nature's erosive processes. According to some thoughts, the main cause of the self-starting of coals is the participation of pyrite as an inorganic component. The attributive characteristics of coal are gained from number of analyses done in different periods of time of the research. Coals will remain for a very long period of time one of the most important source for producing electric energy in Kosova. The most important coal basins in Kosova's territory are: Kosova's Coal Basin, Dukagjini's Coal Basin and Drenica's Coal Basin.

Kosova's Coal Basin is situated in Kosova's basin and it is one of the biggest coal basins that were discovered until today in the region and in Europe.

The longitude of the basin is about 30 km, and the latitude is about 9 km. Kosovo coal basin has a surface about 270 km². Kosova's basin presents a long basin and relatively narrowed with extension on the North-West – South-East. It extends from Mitrovica on the North, to Kaçanik on the South. The basin is restricted by a high configuration of relief, with Kopaonik's Massif on the North-East side, on the East side with Llapi's Valley, on the South side with Kacaniku's Defile and Shari's Mountains, on the West side with Çyçavica's Mountains [4].

The morphologic border and the round mountains of the basin are very hard to cross from fields to high mountains. Different Geologic researches are almost finished in Kosova's coal basin but with a different intensity and quantity. Kosova's Basin is built of Paleozoic's, Mesozoic's and Cainozoic's formations, also involving the peripheral areas.

In geologic term Kosova's coal basin consist rough series of Pliocene's deposits which is known with a big petrography and litofacial variety. This series fatness moves to a wide diapason and it's a result of paleo-relief's morphology and sediment's conditions.

Pliocene's productive series, in lithostratigraphic aspect is separated in three lithologic parts [10]:

Coal's floor sheet (PI¹₁)

Coal's sheet (PI¹₂)

Coal's ceiling sheet (PI¹₂)

Coal's floor sheet (PI¹₁) - is represented by different colors of argils like: green, blue, copper, grey etc; sometimes it consists carbonated sand and gravel. These deposit's maximal fatness is about 300m.

Coal's sheet (PI¹₂) has a heterogeneous coal sheet, followed with a sterile under sheet consisted of argil and carbonates. Coal's sheet contact over floor deposits is unclear and with gradual crosses. Coal's sheet fatness moves on wide diapason from 5-100m and at the whole basin it has a medium fatness of 50m. Coal's sheet deepness moves from the outer sides about 310m from the North-West parts of the basin, going to the South-West parts of Henc's basin.

Coal's ceiling sheet (PI¹₂) is concordant over coal's sheet and has a split contact with it.

Mostly it's composed of argil but in special positions they displace from alluvial deposits and from baked argil which presents a product of baked argil from coal's self-starter processes. In morphotectonic aspect, Kosova's coal basin presents

a dynamic hollow situated in the geotectonic area of Vardar. Basin's formation was done from hard Pliocene tectonic radials, and as a result there are

number of tectonic separations with different rate and intensity. On Table 2 and Figure 4 are presented collected data for Kosovo coal basin.

Table 2: Perspective zones- Kosovo's Coal Basin

Perspective Zone	Cadastral Zone	Surface (ha)	Inhabitants	Objects							Land			
				Homes	Public	Industrial	Cult	Business	Others	Cemeteries	Agricultural (ha)	Mountain (ha)	Wasteland (ha)	Dwelling (ha)
				1	2	3	4	6	7	8	9	10	11	12
Kosova's Coal Basin	81	27085.0	44021	8129	66	22	19	105	5384	39	19620.6	116.5	1612.1	2697.1

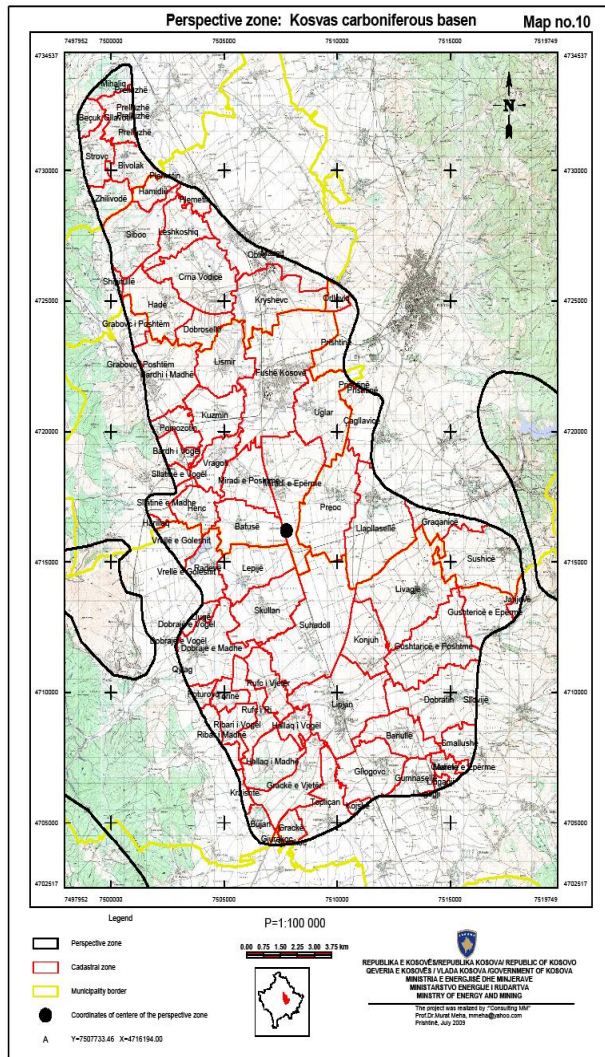


Fig. 4: Coal basin of Kosovo

5 Resettlement Strategy and GIS

Resettlement strategy is preceded with the systemized database for the location of the residential area. The resettlement process, with the aim to create appropriate conditions for the exploitation of the underground minerals, is a difficult process, which includes different challenges and is a very long process.

The resettlement should, certainly, follow an expropriation process, as described in the chapter above. There are two types of resettlements:

- Emergency resettlement,
- Normal resettlement,

An important component of the resettlement strategy is the provision of accommodation for the residents. Accommodation can be:

- Individual temporary accommodation, rented by the residents,
- Organized collective temporary accommodation,
- Permanent solution to accommodation and resettlement of the dwelling,

A normal resettlement for the needs of the Kosovo Energy Corporate (KEC) mine was carried out in the case of Hade village, Municipality of Kastriot. The Governmental group developed the resettlement criteria, always in consultation with the criteria and experience of the World Bank [11]. In addition, it also made reference to the criteria of the Department for Repatriation of the German Ministry of Mining, and their resettlement experience. The experience of

other countries has indicated that resettlement duration can be from 4-10 years.

5.1 Social impact assessment in the mining area settlements

Expropriation and resettlement of residences has a direct or indirect impact to the community living in that area. For this purpose, the project addressed the perspective area for the community, social impacts to the residents, and different age groups. This project presents the social impact for the expropriation of Hade village, Municipality of Kastriot.

5.2 Demography in the perspective mining zones

The number of Kosovo population is still unconfirmed. The last general census in Kosovo was done in 1981. When also taking into consideration other facts such as, internal migrations, and emigrations, the uncertainties are larger, and the probability to find an exact number of the population is lower. Field data gathering for the project "Creation of the database of settlements in mining areas" was carried out through the assessment method and communication with the residents of the settlements in mining areas.

Demography and other related elements are divided into two groups:

- Perspective areas with a possibility of opencast mining,
- Perspective areas with a possibility for underground mining,

Depending on the mining possibilities, a questionnaire was developed for the residents of the respective settlements. The following questions were often addressed by the landlords:

- When will the project start?
- How many of us can be employed?
- Do we resettle soon from our homes?
- Can I choose another settlement?
- Who is responsible and who funds the project, etc?

Based on the offers for the landlords, the model for the data collection and their accuracy is developed. The increased interest for the resettlement has a direct effect to the increase of the community needs. An important position, which the residents see in cases of resettlements, is the creation of new households, and allocation of lands for construction,

by registering new land plots for the new households. This is also done with the aim to define the legal ownership relation, so that the benefits from the land are realized by every household. Presentation of the database to the community clarifies their orientation. The newest such example in Kosovo is the resettlement of the Hade village, Municipality of Kastriot, a process that started in 2004. In 2004, the database for the cadastral area of Hade showed 225 registered owners. However, by the end of the process in 2006, there were 653 owners (households) with a total 1448 residents. After receiving the residents' requests, and the process development, the number of households, respectively owners had increased to 653. It results that the number of family members in the beginning of the process was 6.4, and at the end of the process, 2.2. This example indicates the rapid increase of the number of households, with the aim to acquire more benefits from the expropriation and new resettlements

5.3 GIS

The GIS application was developed using Microsoft Developer Studio 2008 and recently ported to 2010 version and C# and Active Server Pages (ASP) as programming language. Furthermore AJAX (Asynchronous JavaScript and XML) is used as ASP.NET extension to make the GIS user interface more interactive and dynamic. In the Fig. 5 is presented the general architecture of the GIS software solution.

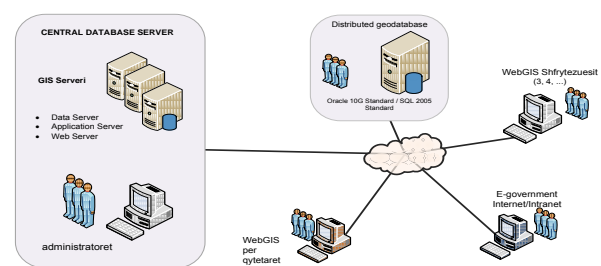


Fig. 5: Architecture for GIS system

Application architecture used is the same as presented in [12]. Presentation of the database was done in two separate groupings: a) general overview of all perspective areas b) detailed presentation of the data for every area. The data include the registration of living standards of the population, their age-groups according to respective territory. Various industrial buildings, commercial facilities, religious sites, and graveyards in perspective areas

are accounted for, and listed in a unique coordination system. General living standard assessment for the residents of the perspective mining areas is rather complex due to different types of settlements, distinguished according to their:

- geographical position,
- economic facilities in their surroundings,
- development of the current various businesses,
- development of a new infrastructure for the provision of products, etc.

Difficulties in data collection appear due to the absence of residents in mountainous areas and because migrations to the Western Europe. The following tables provide an overview of the population according to age-groups for each coal basin in the Republic of Kosovo.

The database was developed from all required elements for the settlements in mining areas, including number of residents, age-groups, employees, social situation of employees, schoolchildren, economy of territories in perspective areas. Table 3 shows only the division of age-groups and number of residents based on [13].

Table 3: Residents age groups

Kosovo coal basin	Age-group	Nr. of residents	%
Kosovo	07-15	12.406	28.2
	15-18	6.651	15.1
	Other	24.964	56.7
Total		44.021	100
Drenas	07-15	647	23.2
	15-18	290	10.4
	Other	1.853	66.4
Total		2.790	100
Skenderaj	07-15	548	11.1
	15-18	262	5.3
	Other	4.132	83.6
Total		4.942	100
Dukagjin	07-15	1.897	36.5
	15-18	871	16.7
	Other	2.432	46.8
Total		5.200	100

The Table 3 indicates that the age-groups 7-18 comprise around 30% of the residents. These data facilitates the assessment, population’s education in the region, and provide a possibility to analyze the

project development for the required expropriation and resettlement. In Figure 6 and Figure 7 are presented the view of GIS application and the view of developed perspective zones. Information data of the perspective zones and other data on the type of property, types of plants of the property and those generally used for the cadastral information system are archived in the MEM.

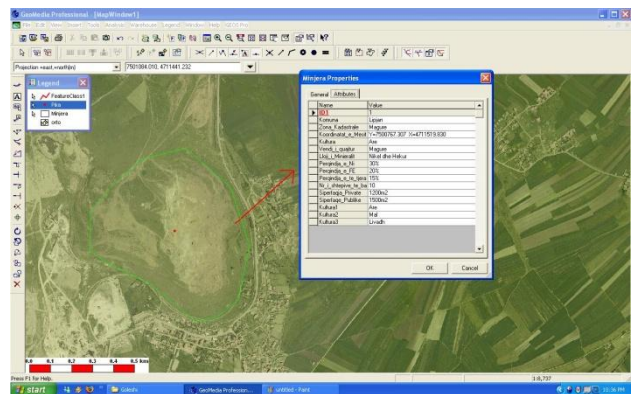


Fig. 6: View of GIS application

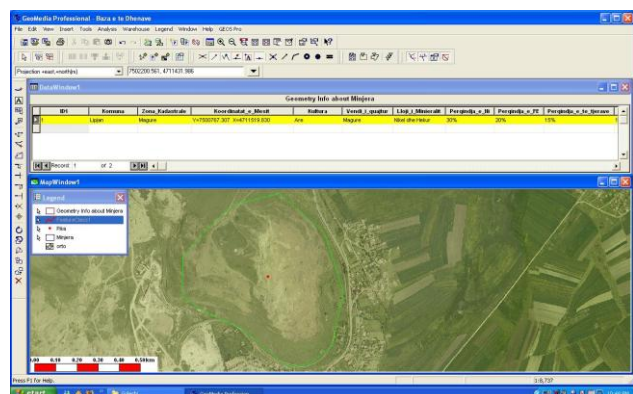


Fig. 7: View of perspective zones

6 Conclusion

Collection, systemization and processing of the existing documentation, as well as the data collection from the ground for each perspective area, made possible for the development of a new database in the model described above. The database was developed with the features and the required detailed attributes of the dwellings in the mining area. According to the Kosovo integrated WebGIS [9], the graphical database was prepared in shape file. The created model facilitates the future steps in updating the mining data. With the use of these data, and the investors’ interests for the perspective mining zones, national institutions increase the probability of the results for decision-making, as it facilitates:

- Economic analysis of the mining source,
- Determination of types of lands, communities, residents' age-groups, etc.
- Calculation of costs for the expropriation for mining purposes,
- Calculation of costs for the required expropriation and eventual resettlement of the dwellings,

Indeed, several other analysis and studies have to be developed based on this GIS model, taking into consideration the timing and economic requirements.

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