MGIS (MINING GEOGRAPHICAL INFORMATION SYSTEM) A NEW CONCEPT FOR THE INFORMATIZATION MANAGEMENT ON MINING COMPANIES. INTRODUCING MINING DATA IN GIS AND ITS TRANSFORMATION IN MGIS

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ABSTRACT
Geo-coding and geo-referencing all information entered in the system is one of the most important aspects to successfully creating MGIS. The creation of MGIS should be regarded as starting from a pre-configured GIS for the location of the mine. The existence of an Urban GIS, Environment GIS, Geology GIS would create an ideal support on which to build the MGIS. However in the earlier phasing, it can be seen that it is preferable to build an Urban GIS, then to implement MGIS. We think the first benefits of MGIS is the possibility of viewing virtually any information in a graphically digital manner, and then the possibility of simulation and study of the alleged situation’s effects. Another huge advantage is the actuality of data, if the system is working properly, because information can be analyzed after a few moments from running it. But, by currently using MGIS, we do not have to reach such events as the system provides sufficient data to prevent them.

Keywords: MGIS (Mining Geographical Information System), mining database combined with a GIS platform

INTRODUCTION
The degree of computerization of mining companies is extremely varied from mine to mine, but the before mentioned transnational nature of the extractive industry paradoxically makes some mines in Africa, Senegal, Ghana, South Africa, Botswana or Latin America, Chile, Peru to have a higher rate of computerization compared to mining organizations in countries with a centuries old mining activity like the ones in Europe.

The informatisation ways are different, with some companies opting for mining software, others developing GIS platforms [1]. Others, very rare, have combined the two methods and most have developed custom general software, tailored for the field.

MATERIALS AND METHODS
1. Introducing mining data in GIS, it’s convert in MGIS

As in any field of activity, in mining data has to be the most important resource, which must be very well managed to serve effectively in organizational management in making sound, timely and efficient decisions [3].

GIS has the ability to graphically display a lot of the information, grouped in issues, going around in mining, and MGIS will become a very useful tool in managing the industry’s activity [2].

Geo-coding and geo-referencing all information entered in the system is one of the most important aspects to successfully creating MGIS and then MBD GIS [4]. The 1:1000 scale will be only representation scale for the entire system. There may be documents surveyed, such as the base map at a scale of 1:25000 or smaller scale maps; they are externalized to MGIS, have an advisory nature, and can be analyzed in parts which are surfaces from the perimeter or proximity of the mine. The creation of MGIS should be regarded as starting from a pre-configured GIS for the location of the mine.
The existence of an Urban GIS, Environment GIS, Geology GIS (or a system such as Geological Information Register, from the Republic of Moldova [7]) would create an ideal support on which to build the MGIS. However, in the earlier phasing, it can be seen that it is preferable to build an Urban GIS, then to implement MGIS. The steps to achieving MGIS in its final operational version need to be seen like so [4]:

1. MGIS can be built, following the steps suggested in Figure 1:

   a. The graphical topographical-mapping-cadastral data are introduced into the GIS, together with plans and digital maps, or digitized analytical ones, then urban data, starting from PUG, encoded through CAD (cadastral informations) and URB (urban informations) shall transform GIS in **URBAN GIS**; it is appropriate to use the origin layer as support, a larger topographic plan, at a scale of 1:1000, which also should include the situation plan of the mining enclosure, which becomes LTOP010 in MGIS. The work is obviously carried out in STEREO70, RMN75, thus ensuring compatibility of the system.

   b. The reporting origin supports are reconfigured by adding origin layers LTOP012 horizontally and LVER001, LVER002 vertically. It is obvious that both the horizontal and vertical layers can be extended, in fact they are reference layers, not perimeters, and at the same time they are still when it comes to position, but not content. **BASIC MGIS** is obtained.

   c. The graphic data most in use are introduced, generally in the analog version, mining surveying data, coded TOP, geological, coded GEO and the ones from the underground mine structure and the current exploitation activity, data encoded by MIN. We obtain a new version of MGIS, which we called **EXPLOITATION MGIS**.

   d. Introduction of economic-financial supply and sales data and human resources data, information coded FIN, and MRU, can be done only as attribute data, databases, and then they enter
the training Chapter MBD GIS; or, the data can be introduced by geo-encoding directly in a graphical format, in the STEREO70 system. At least initially, a mixed solution might be used. In any format, a new GIS will be reached, called **COMPANY MGIS**, as it contains all the data that the mining, company and agency management needs to efficiently lead and manage the organization’s activity.

Considering that one of the biggest problems a mining company faces (see the case of Roșia Montană) is the impact of activity on the environment, the introduction in the system, probably from the beginning, divided thematically not chronologically, is essential for proper functioning, and even for the survival of the company. The data in this category, even in digital format, are most easily obtained, since the authorities and civil society ensure that the data, encoded in MED system, are complete and current. Data on climate conditions, meteorological, hydrological, coded CLI, are equally important and equally easy to obtain from the authorities.

A final remark: the offer of GIS configuration and administration software is relatively small, but each potential MGIS user will choose that software that best suits the actual conditions in which it must operate, the amount of data, the needs to interface with other software, etc.

2. **Defining the advantages of MGIS, conclusions on the context**

We believe that from the foregoing analysis and presentations results much of the benefits of MGIS and of the management process that may rely on it as a leading provider of information, compared with traditional management methods based largely on the analysis of written reports [6].

We think the biggest advantage offered is the possibility of viewing virtually any information in a graphically digital manner, and then the possibility of simulation and study of the alleged situation’s effects. Another huge advantage is the actuality of data, if the system is working properly, because information can be analyzed after a few moments from running it. In case of underground accidents, knowledge of the effects, if the MGIS system is doubled by a sensory system monitoring the processes and activities underground, can be made spontaneously, and the system will provide the most current and complete information on the organization and coordination of the emergency situation. But, by currently using MGIS, we do not have to reach such events as the system provides sufficient data to prevent them [5]. The biggest gain will be for the daily activity of all those using the information in the current activity, from sector heads to the unit manager, not to mention the managers of upper structures who will be able to oversee the entire activity of all subordinate institutions from their offices.

Another big advantage is the possibility of having synchronous data for important information regarding: state of underground railway, air, gases, dust, water infiltration, situation of perforations and directed explosions, operation of machinery, mining machine, and many other events, obviously depending on the equipment and specific of each mine, but also in relation to the possibilities and willingness to invest in monitoring the underground mining environment. The global crisis did not affect the overall software market and much less the GIS expansion, but in mining, if mining software and the ones with mining applications expand, GIS remains, inexplicably, an untapped opportunity [4]. There are positive signs: some producers of mining software have gone to configuring GIS interfaces, general software manufacturers have created interfaces with mining software and two or three producers of GIS software have created interfaces with software from different categories, all isolated actions, not a trend or a recipe for success. Large multinational mining corporations have operations worldwide, so the implementation of GIS or of efficient software in the field, cited in the paper, has an explanation that is not necessarily related to a local initiative, and here I mean the countries of Latin America or India, Indonesia or even some African countries. The companies being transnational, the system is implicitly applied to
mines belonging to them, so we find GIS applications in mines in Botswana, Sierra Leone, Indonesia, Malaysia. We believe that at present four countries can be considered promoters (mining companies in these countries) of computerization in mining using (also) GIS technologies: Australia, Canada, China and India. The first two countries were champions in promoting GIS worldwide, since the launch of this important management tool. Understandably, I was refused details on the practical aspects of GIS implementation in business activities in the above category. Public information is that GIS applies to Mine X, but the rest is information that companies consider classified. In environmental monitoring, GIS has become the main operator, mining involving strong environmental influences whose effects must be known;

CONCLUSIONS
The application of Geographical Information Systems (GIS) in mining still remains low, and although the mining industry’s share in the global economy is significant, reaching up to 70% in some countries, the sale of GIS licenses is less than 1% of all licenses sold by the largest manufacturers, ESRI and Intergraph. Then, at the suggestion of the scientific leader we went to a more extensive analysis of the process of computerization in mining, further observing that the computerization of mining, especially in large companies, is well established, but through specialized mining software with punctual applications. The concept of Mining GIS was defined several years ago, there are several applications, very different, and it was concluded that a concept was not defined, only the idea that MGIS label mining can be applied to GIS applications.

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