ABSTRACT: We are today in a new stage of development, we must create new opportunities to develop the economy; one of this can be the rehabilitation of the historical sites of mining fields. For this we must analyze, justify and suggest new solutions, to develop strategies for long term in according with the environment, population and all stockholders.

KEY WORDS: development, strategy, mining.

Chapter I - The development planning

1.1. Sustainable development

Part of the national and European history, these sites had in the past an important role in the regional economy, but by being insufficiently financed in the present within the national mine closure programs, these were transformed in almost abandoned mines, derelict railways invaded by wild flora. Because of the unclear legal status of the property, the sites were owned by large mining companies, owned by the Ministry of Economy, therefore were not returned to the local communities to be used, exploited as a new destination. In other countries from Europe, the sites were transformed into attractive areas for touristic reasons or even for industrial reasons, by changing the destination of their use. Nowadays, these sites from Romania are unproductive lands that are only polluting, while some green, virgin lands are taken in use as new developing investments.

In the attempt to erase the traces of the industrial past from the mining regions, we have to think about the rehabilitation of the landfill sites and the conservation of the mine pits.

The new development policies must include the preservation and the conservation of the industrial past’s memory, but also the transformation of the areas. Do not forget that these remnants of the past include buildings and facilities, warehouses, mines and processing and refining sites, storage facilities, power generation systems, transportation etc.

We must seek and implement successful models in the regeneration and the capitalization of the former mining sites with an important role in the local and regional economy by taking into account the human resource dynamic, the potential analysis, the financing programs through innovative and feasible methods.

We are talking about the conversion of the former industrial sites by changing their destination, we are talking about the local development creativity oriented, about the development of some local brands, of some public-private partnership systems through strategies, incubators, clusters and other attractive tools to remove the unused areas that create a major visual and economic impact.

Also, at international level “we talk about some European and U.S. cases where important areas were reused, creating urban spaces and facilities, commercial locations of high quality, modern housing schemes, and converting the industrial monuments in the cultural circuit1”.

Most of disused areas are a legacy of almost two centuries of industrial activities, of mining particularly in our area and not only. The concern for the conversion of these areas in order to reinstate them for public use began to take shape globally in the ‘70s - in our country, after the ‘90s.

The mining industry exerts a significant influence on the environment in all the phases of the technological processes of production.

„The influence on the environment begins with the prospecting and the exploration of the deposits and continues and intensifies with the development of the productive activities. In some cases, the negative influence manifests for a very long time, even after the total cessation of the productive activity in the area. The whole mining activity produces, due to its specificity, multiple and varied negative environmental impacts. 2“

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2 Prof.univ.dr.ing. Dumitru F., „Influenţa industriei miniere asupra mediului” [The Influence of the mining industry on the environment], bulenitul AGIR nr. 3/2006, iulie-septembrie.
Among these impacts, we can enumerate: relief changes; occupation of large areas for operating activities, stockpiles, storage etc.; land degradation by vertical and horizontal displacements etc.

The sustainable development requires economic development within the existing natural resources and their rational and fair use, without damaging the quality of the environment. In another words, it is needed a development that ensures the future generations needs. Schematically we find four dimensions of the sustainability: the environmental sustainability – through the ability to preserve the natural resources, to maintain the ecosystem, to preserve the biological diversity; the economical sustainability – the ability to produce jobs and incomes, the economical eco-efficiency; the social sustainability – the ability to guarantee welfare conditions and equal opportunities for the people; institutional sustainability – the ability to ensure stability conditions and democracy.

In this respect we find specific procedures that support these issues, so we can illustrate the assessment procedure of the environmental impact.

We can explicate this procedure through „the current context of economic and social development and of the administrative activity where are taken a plurality of decisions that will have an either direct or indirect effect on the environment. Therefore, all decisions taken by the authorities must take into account the effect on the environment and must be subordinated to the strategic objective of ensuring the sustainable development. 

Over time, a close competition was created, between the administrative, economic, social interests and strategically related on the exploitation of the deposits of useful minerals and the public and even private interest, that is the optimal use of resources.

„Due to changes in technology and the spread of high-tech techniques and the transfer of production to services, the economic profile of European countries appears radically. The conservation and the conversion of the historical peculiarities under the form of cultural and artistic assets are part of the new tendency of urban regeneration and part of the strategy to attract capital”; so as the decommissioned industrial lands offer new possibilities of planning, the development should be integrated into a long-term recovery and planning project, with implications from the public and the private sector.

Chapter II - The analysis of the environmental impact of the mining sites

2.1. Perspectives and the importance of the environment

Industrial lands being mostly part of a city and therefore affect the quality of the urban life, the urban regeneration is often a long, complex process, not only extremely important to achieve, but also extremely difficult to achieve due to the need of substantial financial resources and the particularities of the natural processes, of the administrative processes etc.

The recultivation and the rehabilitation of the mining areas include not only ecological and geological changes but also important social, environmental and economic factors of the area. The major aim of the area’s rehabilitation and recultivation is to create a mining surface and the related space to be used in the future, with impact on the public interest.

The financial and technical resources that are needed to achieve these changes in accordance with the legislation are very large and expensive. The areas should be recultivated so that future planning can be carried out and that the public access can be guaranteed without any risk.

The legislation regulates the ways through which one can perform the revitalization of these lands. We can find in the Mine Closure Manual the framework contents for the planning stages, the technical closing programs.

I will elaborate only a few elements from the technical documentations that can be found in the manual and that are extremely important to reflect the whole: “III.2.1. Closure of underground mining works; III.2.2. Closure of mining works in open pits; III.2.3. Disposal of surface constructions and land vacating; III.2.4. Rehabilitation of areas affected by mining; III.2.5. Providing utilities for the execution of mine closure works; III.2.6. Monitoring; III.2.7. Cost estimations of physical mine closure works.”

Also, in the specific legislation regarding the Mining Law we can find some elements that define the process of closure; the 52nd article of the Mining Law describes how to cease mining activity, namely by paragraph 1:

“The initiative of a mine or quarry closure, belongs to the title holder of an exploitation license who will submit to the Competent Authority an application for mine closure, as well as the activity cessation plan, which must include:

a) the reason of closure, based on the technical economic documentation;

b) the technical closure or conservation program of the exploitation, which will include the Post-closure Monitoring Program; in case of national companies and societies, the program will obtain prior approval from the line Ministry;”

4 Condoros A. – „Reconversia platformelor industriale-Scenariu” [Conversion of industrial platform-Scenario], http://urbanistique.ro/%E2%80%98packing -industry%2%80%99-reconversion...

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c) social protection program, through reemployment and/or professional reconversion; financial compensation and/or regional development measures by creating new work places, prepared in accordance with the law, upon consultation with affected groups of people and approved by the Competent Authority in the field of social protection; in the case of national mining companies and societies, such program shall also be approved by the line Ministry;

d) environmental and water management authorizations for mine/open pit closure;

e) decommissioning and land vacating procedure.\(^6\)

The regulatory issues may have a significant consequence on costs by setting closure mining objectives. The more it is desired a more specific variant of reintroduction of the objectives in the circuit, the more the costs can be substantially bigger.

A key factor in this analysis is to avoid wasting the land’s resources; nowadays a significant number of abandoned lands have a strategic location in urban areas, some of them occupying large areas that offer opportunities for large projects’ realization that may be used to revitalize and generate development.

In Europe, many of the decommissioned industrial areas are located in the historical center of the cities or in their neighborhood, their re-arrangement having benefic effects on the restoration and ordering of the urban texture.

The specific legislation is that of closure, but also of town-planning, containing directions and recommendations, the methodology and the framework for the elaboration of the town planning projects.

A major problem raised by the analysis of these lands, particularly in the mining industry, is the treatment of the wastewaters resulting from this industry, both during operation process and closure process.

The following aspects can be analyzed: the wastewaters from the mining industry are classified in two categories: mining water, with features depending of the nature of the rocks the groundwater is crossing and of the nature of the exploited rocks; wastewater resulting from the preparation of the useful minerals. Which are: ferrous, non-ferrous minerals. ... the reagents used in the flotation or other chemical procedures to concentrate minerals\(^7\); these pollutants, even if now they are no longer used in the mining process, they have already contaminated significantly these lands, and they are still presents in varying concentrations in these lands, even presenting danger. Because of these aspects, the closure process becomes a long-term, complex and expensive process to rehabilitate the mining sites.

The procedure for treating both surface water and groundwater against pollution by various harmful substances that are toxic to flora and fauna but also for the human body is achieved by treating the wastewater before its discharge in the emissary.

We find that the water consumption increases globally, that Romania has, among other states, water resources strongly influenced by the human activities both quantitatively and qualitatively, and we mention here especially the intense pollution - as a result of the mining activity, in Maramureş County there is pollution mainly in the rivers Lâpuş, Sâsar and Cavnic which cross significant urban and rural localities, including the county capital. „The drainage of lakes and ponds, the creation of new collecting mains for the water drainage from dewatering, the diversion and the regularization of existing watercourses on the open pits perimeter causes a major change in the river system, with effects on the ecosystem."\(^8\)

### 2.2. Mines closing process and its consequences

Thus, we come back to an important element of this concept that is mines closing plans; the basis elements of the planning process which define the vision on the final result of the process and establish the objectives to implement that vision.

It must also include aspects such as sustainable development of the area, studies about the closing options, consultative process of the community etc.

The planning process covers aspects such as: integration, costs estimation and financial regulations, risk-based approach, closing plan, closing feasibility, revision and monitoring.

The areas where there are tailings, those mine dumps represent an example of the anthropic impact on the zone where these are located and they create environment modifications, their presence causing the reduction of biodiversity and the simplification of the ecosystem structure.

The basic aim of territory planning is the harmonization of economic, social, ecological and cultural policies at the level of the entire territory, established at national and local level, to ensure a balance in the development of different areas of the country, in order to increase the cohesion and efficiency of economic and social relationships between them.

We discuss here about an equilibrated economic and social development of regions and zones, according to their specific features; improvement of the quality of people’s lives and of communities; good management of natural

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\(^6\) The Mining Law no. 85 of March 18\(^a\), 2003.


resources with environment protection and cultural landscape; rational use of land; preservation and development of cultural diversity”

These objectives can be achieved by real actions to create a territorial equilibrium, an adequate economic and ecological balance.

2.3. Baia Mare mining reservoir

In the past, in Maramureș as well as in other places of our country, communities were developed around mining activity whose activity was focused on using the underground mineral resources. “MINE worker” was a difficult job and at the same time a very important one for the country economy.

At one point, under particular economic and political conditions, mining activity became unprofitable and was considered “the black hole” of national economy and it must have been greatly supported to survive. As a result, it was decided that this activity must be stopped, although there were countries in the world that had historical development rhythms due to the increase of the prices of mining products. In Romania, in 1996, mining was “closed”.

The problems related to the closing, security and ecological rehabilitation of former mining areas are very complex, and they need a great analysis process based on national and international experience. This supposes a specific approach of all conditions “on the field”: natural, social-economic, financial of that particular country. The process needs the elaboration of certain project and execution principles that should allow the continuous adaptation to regional characteristics of real situations. In Maramureș there are 17 tailing dams – contaminated sites having an area of approximately 3,800,000 m², according to the analysis of Maramureș Agency for Environment Protection.

The number, volume and area of mine dumps built in Romania in the years when mining industry was functioning are not known exactly.

Statistics data estimate for non metalliferous ore (Pb, Cu, Zn + Au, Ag), specific for Maramureș and Apuseni Mountains:
- REMIN Baia Mare: 197 mine dumps, with more than 48 million m³ material deposited on an area of 264 ha;
- MINVEST Deva: 179 mine dumps, volume of ca. 107 million m³ material deposited on an area of 417 ha.

Mine dumps are located usually at the entrance of the gallery, at a small distance from the zone they rise from. Their building was made by gravitational deposits on the mountain side. In the long run, during precipitations periods, the soft material is driven (“washed”) to the base, influencing the stability of mine dumps by modifying the slope angle.

This type of degradation represents a real danger, a break of the deposit causing great human and material damage.

The attempts to rehabilitate from technical point of view till now consisted of: adding granular material at the surface of mine dumps to fix them; building protection fences (using a great amount of wood, without visible results of improvement); putting different species of plants with long branched root on contaminated areas, that fix the land, to avoid landfall.

In fact, for a correct action to rehabilitate the polluted zones, the first step is to define the reactivity of the material, to analyze its origin and the method of depositing it as waste material.

The most important parameter that influences the chemical behaviour is potential acidity, the content of minerals with sulphur in the mine dump. Their presence over certain limits (0.5-1% - according to ICOLD, 1989) creates acid drainage, the waters with content of heavy metals which pollute the areas where they flow (land, underground waters and surface waters).

The measures that can be taken are those of isolation and cushioning, the aim being to avoid the phenomena that take place in South America, for example where soil reactivity appears containing sulphur from mines that were functioning 400-500 years ago (G. Verraes, 1996).

The material from mine dumps contains rocks with physical-mechanical characteristics that can be used in different geotechnical works, in roads rehabilitation.

In Romania there is a standard on the quality of natural materials used in roads works (SR 667-2001), which imposes great constraints regarding resistance features of materials used in such works. The material from mine dumps is used according to this standard in forest roads works, access roads in some areas (without significant rolling), as filling material etc.

Using these former mining dumps in constructions can be a great advantage for the environment by the fact that materials from deposits with potential risk of pollution/accidents are moved totally or partially.

In the case of former tailing dams of dumps coming from preparation plants the problem is more delicate than in the case of stagnant mine dumps.

Any work in these places can be made only after its physical stability was ensured (isolation, cushioning) and the risk degree was established.

Decisions are taken after a close analysis of the content of sulphur from the mine dump, of minerals with role of cushioning, after the analysis of dump location (upstream or downstream of nearby human communities, “on the coast” or “in the valley”, etc).

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9 Law 350/2001 regarding Territory Planning and Urbanism
Geological and hydrological framework of the zone must be taken into consideration; the presence of similar mining dumps in the area, the volume of the dump, the cost of works that can allow access to the deposit, the existence of the material that allows cushioning, etc.

One of the most suitable solutions found and applied in Baia Mare was the recovery of metals found in the mine dump, that from Meda. Moreover, the land was cleaned and ecologized.

Covering and putting green vegetation represent another rehabilitation solution, an example being the old dam from Bozânta. The new dam from Bozânta, where the accident from 2000 took place by breaking the bank, is the single dam in the country which has a geo-membrane moisture-resistant, a solution that is used often in other countries in the world, including household waste deposits.

Recovery methods, conventional or not, even with costs under profitability limit, would transform the dump that today are a threat for our lives into chemically inactive dump and, in the long run, would eliminate isolation or elimination expenses that are used now.

After rehabilitation, the land can be used for different activities: they can become entertainment parks, locations for supermarkets, sport fields, to build solar panels; there are many options — on the condition that the land should be safe.

“Non ferrous ore exploitation in Baia Mare area created a negative aesthetic impact especially in the case of quarry exploitation10, and also a great economic impact; being a monoindustrial mining zone, today the localities in the county still deal with the consequences of mines closing after 2000: industrial areas still in the property of the Ministry cannot be used by local administrations, the unemployment is very high and another consequence is the massive immigration from the area.

CONCLUSIONS

The strategy must be one on medium and long term, and it must be financed accordingly because the preservation of these sites requires great costs that take from the budget of necessary investments for development.

It is necessary to clarify the legal situation of the land, because this uncertainty and lack of authority have consequences on structural funds for this domain. In planning period 2007-2013 money was allocated by Regional Operational Program for the rehabilitation of such industrial sites. Because the authorities of local public administration could not prove the property, they could not apply for these funds, so they were allocated for other development domains, although it is necessary to finance these mining sites.

Territory analysis from urban point of view and the impact on environment must be basic elements in the recovery strategy of these mine sites; for this there must be many efforts not only at administrative, legal level, but also at the level of all actors involved.

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