

## THE IMPACT OF MINING INDUSTRY ON THE LANDSCAPE OF MARAMUREȘ COUNTY

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**Abstract.** Having been mentioned for centuries, the mining industry and its activities have been at the same time an important means of economical development in the region and a major source of pollution for the environment. Moreover, it has altered the features of the natural habitat in Maramureș. This study aims to highlight the impact that mining industry has on the environment of the county and to present the main aesthetical consequences of carrying out such activities.

### Introduction

The rapid development of mining industry in Maramureș caused the spread of ore extraction sites, out of which the best known are Baia Mare, Baia Sprie, Cavnic, Borșa, Ilba, Nistru, Băiuț and Răzoare.

In Maramures county there were two major mining companies - Intreprinderea de Prospectiuni și Explorări Geologice Maramureș and Centrala Minereurilor Baia Mare. Both companies ceased their activity in the field of non-ferrous and precious metal extraction in 2006 as a direct consequence of drastic subsidy reduction after the nineties. Since 1999 several mine closure and rehabilitation activities have been carried out in order to return the disturbed land in the vicinity of mining sites to its natural landscape. However, the planning and implementation of this process has not succeeded in restoring the original native ecosystem of such sites.

Serious environmental problems caused by extraction activities have not been promptly and efficiently solved and accordingly, environmental accidents due to

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technical malfunction occurred while handling dumps at Aurul Baia Mare (Jan 30th 2000), Novăț - Borșa (March 10th 2000), Colbu- Borsa (July 2008).

These accidents had a considerable media impact on public perception, highlighting once more that special meteorological phenomena accompanied by errors in the planning and extraction process may cause accidental pollution with major regional or international impact.

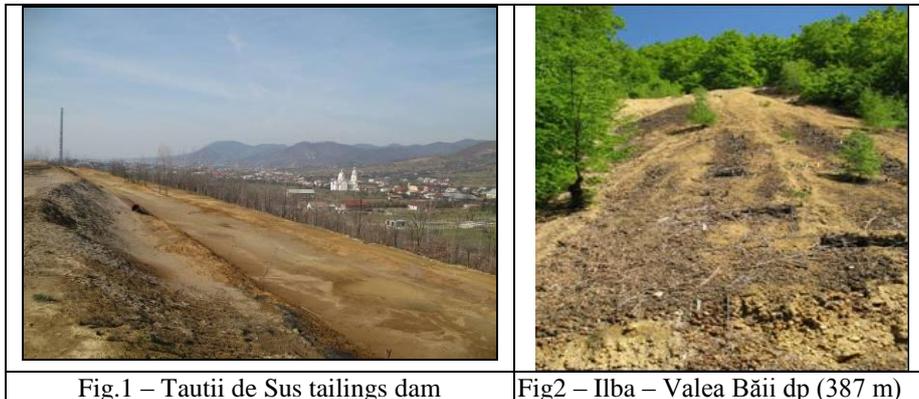
### 1. The impact on geography and landscape

In Maramures county prospecting, exploring, extraction and processing of non-ferrous and precious metals generated unwanted aspects that led to difficulty in maintaining the balance of the natural terrestrial ecosystems.

The main categories of polluting and disturbing factors that affect the geographical and landscape are:

#### 1.1. Mine spoil dumps and acid mine drainage

The activities in mining industry have generated huge amounts of waste material, more precisely, mine spoil (over 100 million tones) which was deposited in the following 18 dumps: Bozânta, Săsar, Aurul, Nistru, Tăuții de Sus, Flotația Centrală, Vrăncioara, Mălăini, Plopiș-Răchițele, Bloaja, Bloaja Vechi, Leorda, Novăț, Colbu I, Colbu II, D1, D2, D3 (Figure 1). In our opinion all these dumps can cause international impact with serious consequences on the environment and on the safety of the population in case of hydrologic accidents.



In Maramures there are over 500 mine spoil dumps, out of which only 300 dumps that deposit 4 mil tones are registered in the documents of mine operators. We consider that these dumps present mechanical instability due to the wide angles of the huge piles, due to ditches, spoil washouts, as well as due to the downward

migration of pollutants (heavy metals) caused by exfiltration and alkalinisation (Fig 2).

A very critical situation is represented by the over half million tone of arsenic pyrite that is directly deposited on the soil. The strong acidification of the flotation waste which contains high level of pyrite led to the acidification of the surrounding soils and to the drying out of the vegetation on the southern side of the dumps in Bozânta, Plopiş, Bloaja, Corbu and D3.

A relevant example is the old dump at Bloaja – Baiut where the concentration of deposited pyrite (over 50.000 tones) caused the acidification of a wide surface of surrounding land and led to the corrosion of the evacuation system built for pluvial water on the dump platform (the reverse pumps), causing 4 holes in the dump.

On the other hand, the deflation phenomena that affect the flotation waste on the surface of the dump have major negative impact on the surrounding places such as Bozânta, Săsar, Tăuţii de Sus, Baia Mare and Borşa (Fig. 3).

At the same time mine waste flows and ditches occurring at such dumps and dams have disastrous effect on the vegetation and on the environment

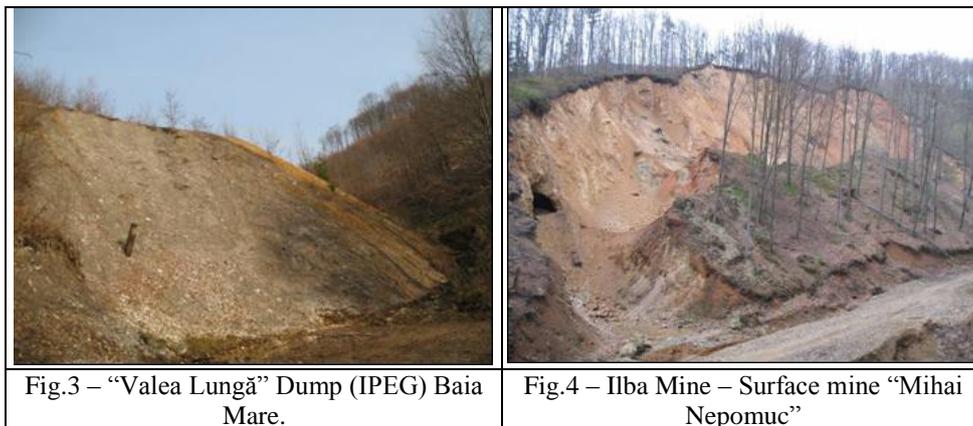


Fig.3 – “Valea Lungă” Dump (IPEG) Baia Mare.

Fig.4 – Ilba Mine – Surface mine “Mihai Nepomuc”

### 1.1.Surface and underground mining

Surface minings at Hanău –Ilba, Mihai Nepomuc – Ilba, 11 Iunie – Nistru, Baia Sprie, Şuior, Măgura – Borşa, Răzoare, are mainly responsible for the appearance and evolution of soil erosion, acidification and migration of harmful elements into the surface receptors (Figure 4).

Underground mining – that consist of over 1000 km galleries in the mines of Ilba, Nistru, Săsar, Herja, Baia Sprie, Şuior, Cavnic, Băiuţ, Băiţa, Borşa and IPEG galleries in all Maramureş county cause underground sinkholes that - under the influence of the interior pressure led to landslide, uncontrolled mine water

accumulation as well as its acidification due to the contamination of surface and underground water with minerals (Figure 5).



Fig. 5 – Sfântul Gheorghe Mine – Băița; Gallery (left), Old stope (right)

### 1.3. Sinkholes

Drilling in the underground caused numerous sinkholes on the mine surfaces at: Purcăreț, Firizan, Nucuț – Ilba; Jidovia, 9 May, Lăpușna – Nistru; Borzaș, Sofia, Aurum, Valea Roșie, Dealul Crucii – Săsar Baia Mare; Herja Superior; Limpedea, Crăpătura Zorilor - Baia Sprie; Cariera Șuilor; Breiner, Petru and Pavel – Băiuț; Gura Băii – Borșa) (Fig. 6).

Through these holes pluvial water infiltrates, it acidifies due to contamination with metals in the deposits and, combined with heavy rain it creates huge amounts of water in the underground, as well as violent phenomena such as heavy floods.

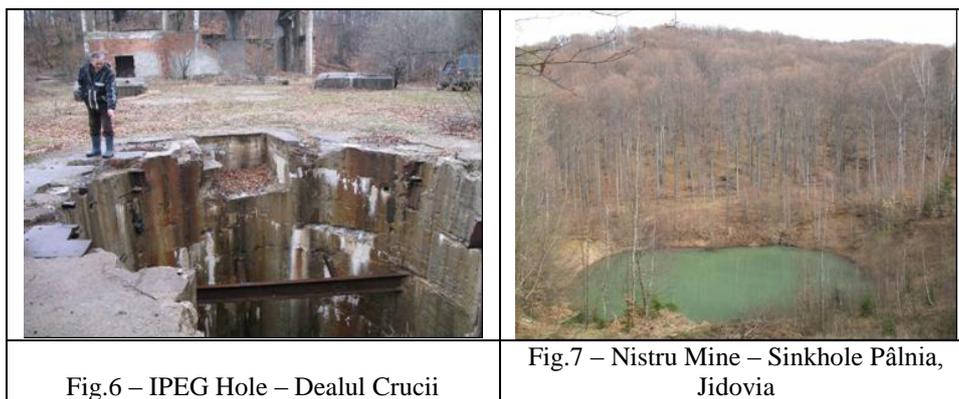


Fig.6 – IPEG Hole – Dealul Crucii

Fig.7 – Nistru Mine – Sinkhole Pâlnia, Jidovia

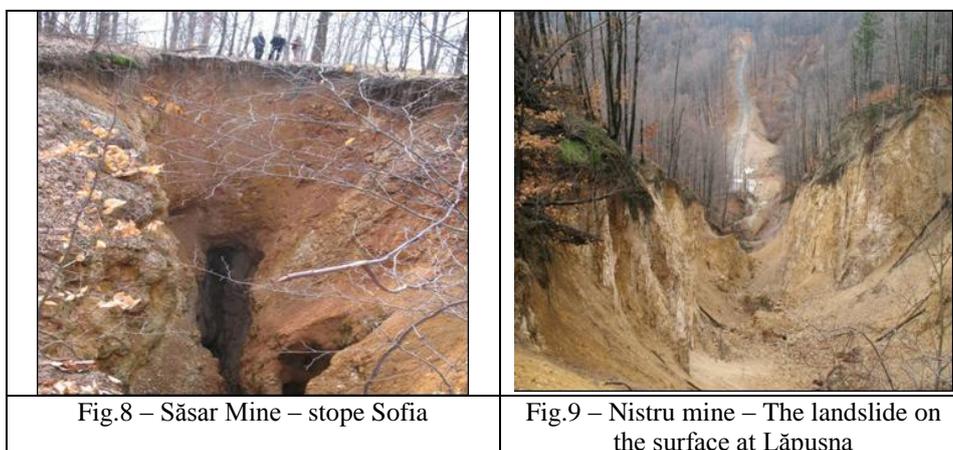


Fig.10 – “Dealul Crucii” mine - Landslide

Also, infiltration of surface water in the underground can occur through karsts and crevices formed above some mines where the mining activities are run near the surface (Jidovia – Nistru, Băiţa, Valea Roşie – Baia Mare, Conci stream – Băiuţ) (Fig.7, Fig. 8, Fig. 9, Fig. 10).

#### **1.4.Mining related constructions and water transportation pipes.**

Huge surfaces (hundreds of hectares) on which abandoned constructions and equipment connected to mining industry were left derelict (at present most of them being devastated) will represent a major environmental problem due to the corrosive process they undergo.

Such dangerous factors are: buildings, flotation plants, storehouses for mining materials and concentrates, mine access roads, large quantities of scrap iron (rails,

tubes, pipes, cables, metallic structures, anchors); electric cables, electric equipment, tools and installations (trolleys, engines, mining pumps, extraction machine, loading machines, electrical engines) that were not removed because their removal was not profitable. They will be a major environmental issue for a very long time (Fig. 11).



Fig.11 Ilba mine – mining site

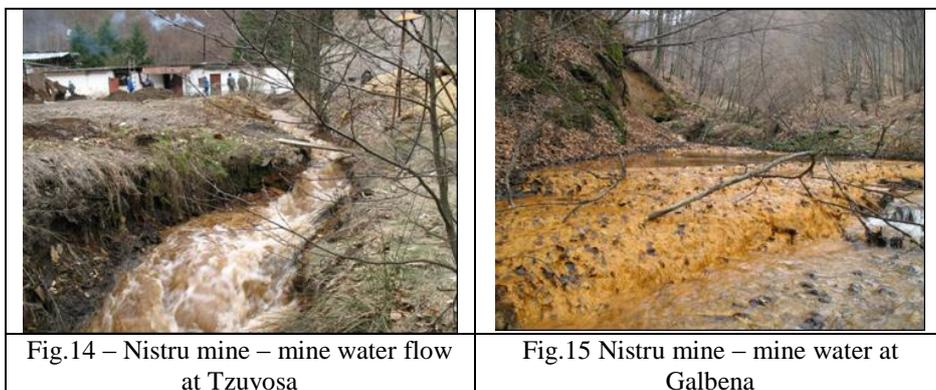
Similarly, a negative effect on the environment can be caused by evacuating mining water directly into nature or by the insufficiently purified mine waste waters in the 5 water treatment plants at Toroioaga- Borșa, Tyuzosa – Băița, Câmpurele – Nistru, Valea Colbului – Ilba and Herja – Baia Mare (Fig. 12, Fig. 13, Fig. 14, Fig. 15).



Fig.12 – Săsar mine – mine water evacuation plant



Fig.13 – Nistru mine – water treatment plant at Câmpurele



Other potential causes of negative impact on the environment are represented by purified water evacuation systems in the waste dams (reverse water pumps) that undergo severe corrosion phenomenon that lead to ecological accidents (relevant examples are the collapse of reverse water pumps at the dams in Tăuții de Sus, Bozânta, Bloaja vechi, Leorda ).

Also, there is the permanent danger of blocking the water transportation galleries under dams situated in the valleys of Novăț, Colbu (Borșa) and Bloaja (Băiuț) in the case of heavy floods that can carry branches, logs, garbage from the slopes.

At present closure and safeguarding processes are run on such dams built in valleys at Novat, Colbu (Borsa) and Bloaja Baiut, but it requires important financial resources to close and clean all the mining vicinities.

### Conclusions

Unfortunately for the environmental health and safety, only a regional perspective - and not a global view - was considered in the process of closing the mining perimeters. As for the technical projects of mine closures, the interest of the company involved in this business (REMIN) was prior to other activities such as prospection, geological explorations, mine opening activities executed by IPEG Maramures or by other mine operators.

As well, it is obvious that all there is no prioritization from the perspective of assuring a minimal safety when it comes to mining activities and environment and also, it is evident that there are no designing solutions that could lead to the possibility of holding back the pollutants at the source.

The present situation in the post-closure process of the mining perimeters reveals the fact that there are many unsolved problems due to lack of regulations when it comes to environment protection. The major problems consist of hundreds

of galleries and vertical mining activities, as well as waste dumps and many surface mines.

Vertical mining causes the most dangerous situations as they lead to the formation of sinkholes or landslides that represent a real threat for the animals and especially for the tourists who, too often, get too near, risking falling. The water quality is also a major issue as it acidifies due to the flooding process.

In order to solve all these problems, it is necessary to implement the legislation concerning the safety of post-closure process in the case of mining perimeters so as to provide protection both for the environment and for the people and animals that live or happen to go near such areas.

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