Revista Minelor – Mining Revue
ISSN-L 1220-2053 / ISSN 2247-8590
vol. 30, selected papers from the 11th edition of
UNIVERSITARIA SIMPRO / 2024, pp. 123-128

# SOLUTIONS FOR THE REUSE OF AREAS AFFECTED BY COAL EXTRACTION AT LUPENI MINE

*Andreea Cristina TATARU* [1*], *Dorin TATARU* [2]

[1, 2] University of Petrosani, Faculty of Mechanical and Electrical Engineering, Department of Mechanical, Industrial and Transport Engineering, 335600, Petrosani, Romania

DOI: 10.2478/minrv-2024-0049

**Abstract:** *Coal extraction in Valea Jiului leaves behind large areas of affected land. Once the mining units in Valea Jiului are closed, they can be given a different destination than the original one. Both surface and underground constructions can be used for other purposes, both economic and environmental protection. One of the mining operations that is currently in the process of closure and greening is the Lupeni Mining. In this paper we will present some solutions for the reuse of the areas affected by coal extraction at the Lupeni Mine.*
**Keywords:** *reuse, areas, coal, exploitation*

## 1. Introduction

Coal mining in the Jiu Valley began in the 19th century, with the first systematic coal mining being carried out between 1850 and 1970. During this period, mines were opened in Vulcan and Petrosani, then in Petrila and Lonea. In 1890 they continued in Aninoasa, and in 1892 in Lupeni.[1], [2]

The first owner of the mines in Valea Jiului, which started the first exploitations, was until 1870 the "Brasovean Society for Mines and Furnaces". Since 1870, the mines have been owned by the most powerful Hungarian mining company "Salgö Tarjan Company".

Since 1919, the mines in Valea Jiului pass from the property of the Hungarian state to the property of the Romanian state, forming the company Petrosani S.A.R. Since 1948, the mines in Valea Jiului, owned by the Romanian state, have been grouped into the Valea Jiului Mining Central.

In the last 50 years or so, important investments have been directed to the Jiu Valley both in the field of coal extraction and surface processing, in complementary economic activities, infrastructure and housing.

After 1989, finding that some mining objectives were not profitable, they were abandoned as economic objectives. All mining enterprises reduced their activity, the mining activity entering a phase of decline. [3], [4], [5]

The entire mining activity produces, due to its specificity, multiple and varied negative effects on the environment, exemplified by:

- changes in the relief, manifested by the degradation of the landscape and displacement of households and industrial facilities from the exploitation areas;
- the occupation of large areas of land for the activity of exploitation, dumping, storage of useful mineral substances, industrial installations, access roads, etc., areas that thus become totally unusable for other purposes, for a long period of time;
- degradation of the land, through vertical and horizontal displacements of the surface and the sliding of dumps, causing serious accidents;
- impurity of surface water and ground water;
- the hydrodynamic imbalance of underground waters;
- negative influences on the atmosphere, flora and fauna in the area;
- chemical pollution of the soil, which can affect its fertile properties for many years;
- noises, vibrations and radiation spread in the environment, with a strong adverse effect.

[*] Corresponding author: University of Petrosani, Faculty of Mechanical and Electrical Engineering, Department of Mechanical, Industrial and Transport Engineering, 335600, Petrosani, Romania, andreeatataru@upet.ro; Tel.: +40-721-04-47-67

With the completion of the mining process, the mining units enter a mine closure program. Under this program, mining units can be permanently closed or found another destination. The future destination of the mining units must not have negative effects on the environment and remedy the current problems. [6], [7], [8]

*Fig. 1 Valea de Brazi green mining*

**2. Soluțions of reuse of areas affected by coal Extraction at Lupeni Mine**

The redevelopment of a coal mine involves transforming it into a useful and safe space for other economic, social or environmental activities. This process requires detailed planning, risk assessment and investment in appropriate infrastructure and technologies.

One of the mining operations that entered the process of closure is the Lupeni Mining Operation

The Lupeni Mine is located in the town of Lupeni, which is in Hunedoara County, Romania. The town of Lupeni is part of the Jiului Valley, a region known for its coal mining activities. The Jiu Valley is located in the southern part of the Southern Carpathians, being crossed by the Jiu River.

The town of Lupeni is located at an altitude of approximately 650 meters and is surrounded by the mountains Vâlcan and Parâng, part of the Southern Carpathians.

Lupeni is accessible via the national road DN66A, which connects Valea Jiului with the rest of the country. The municipality of Lupeni is located approximately 20 kilometers west of Petroșani, the administrative and economic center of the Jiu Valley.

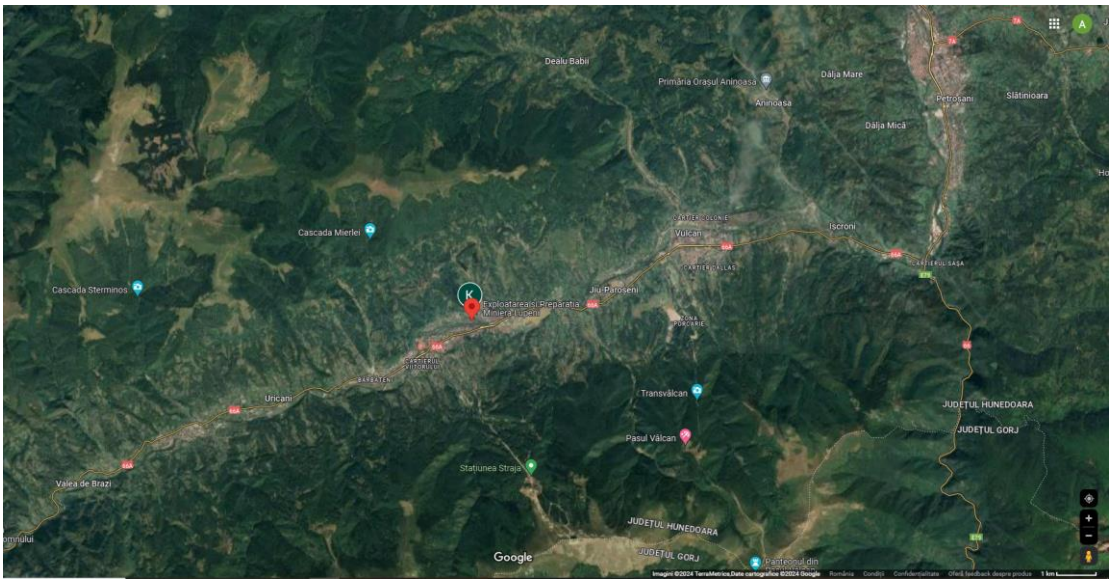


*Fig. 2 Location Extraction at Lupeni Mine*

### *2.1. Solutions for reuse of tailings dumps*

The tailings dumps of the Lupeni mining operation are located in the vicinity of the mining operation. Currently, Lupeni Mining no longer uses tailings dumps, they must enter the greening process.


*Fig. 3 The location of the tailings dumps from the Lupeni Mining Exploitation*

Tailings dumps negatively influence the environment in terms of surface and underground water quality, air quality, vegetation and the general aspect of the area and comfort.

*Fig. 4 The tailings dump from the Lupeni Mining Exploitation*

For the protection of the environmental factors in the areas affected by the presence of dumps, a series of measures must be taken, including:

a) Measures to prevent the pollution of underground and surface water with harmful substances.

b) Measures to avoid entrainment of the dumped material by running water.

c) Canceling the trenches and ensuring some slopes of the piling platforms would ensure a good management of surface waters.

d) Measures to avoid entrainment of dust particles by prevailing winds.

e) Ensuring a good stability of tailings dumps. [9] [10], [11]

After completing the processes regarding stability and environmental issues they can be found another destination.

The surfaces of tailings heaps can be reused for planting trees of different varieties that lend themselves to the soil conditions - a solution still used today (This solution also ensures an additional increase in the stability of tailings heaps by developing the root system of the trees). [12], [13], [14]

Due to the environment in which vines can grow, this can be another solution for reusing tailings dumps.

Also, their surface can be leveled, covered with a layer of topsoil and turned into a camping area, and the lake formed in the vicinity of the tailings dumps can be populated and turned into a fishing area. [15], [16]

Another solution for the reuse of tailings dumps can be their transformation into grazing areas for animals. [17]

The method to be chosen in order to reuse the land surfaces affected by the tailings dumps from the Lupeni Mine depends on the financial resources to be allocated in this regard., [18], [19]

### *2.2. Solutions for reusing the underground spaces of the Lupeni Mining Exploitation*

The underground spaces resulting from the exploitation of coal at the Lupeni Mine represent an important problem from an environmental point of view. In the closing process, we must make sure that these spaces will not cause problems in the next period. [20]

Being a coal mine, where the presence of methane in the underground tunnels is a significant problem that can cause mine fires, these areas are not suitable for reuse of the remaining voids. It is necessary to close the access inside them with protective walls.

A solution for the reuse of these underground areas is to backfill them with ash from Thermal Power Plants (fireproof material). By using ash to fill underground voids, important areas of land that were to be converted into tailings ponds for slag and ash storage are protected.

Access areas in mining galleries and safe underground areas of mining can be turned into museums. Creating an underground museum to showcase the history of mining, the equipment used and the stories of the miners.

Areas can also be set up where guided tours can be organized to educate visitors about mining processes and their impact on the community and environment.

Safe zones can also be used to transform them into research and practice area in partnership with universities and research centers in the field. Here, underground practical and research laboratories for geological, ecological and technological research can be built.

## 3. Conclusions

The Lupeni Mining operation, like any mining operation, led to the change of destination and the damage of large areas of land.

After the completion of the mining process, the mining units must be closed or possibly found another destination.

Both surface areas, tailings dumps and underground areas must be subjected to the greening process

Tailings dumps can be turned into recreational, agricultural or pasture areas depending on the financial resources allocated over time and underground voids can be used as waste deposits from the mining and energy industries.

Access areas in mining galleries and safe underground areas of mining can be turned into museums.

Another possible solution for the reuse of a certain safe exploitation area is to transform them into research and practice laboratories in partnership with Universities and research centers in the field.

## References

[1] **Arad V., Arad S., Samoilă L., Teseleanu G.,** 2019
*The coal exploitation in the Jiu Valley between the strategic resource and social impact,* Journal of Engineering Sciences and Innovation Volume 4, Issue 1 / 2019, pp. 99 – 114

[2] **Baron M., Dobre-Baron O.**, 2009
*The emergence of the Jiu Valley coal basin (Romania) - a consequence of the industrial revolution,* Annals of the University of Petroşani, Economics, 9(3), 2009, 53-80

[3] **Baron M., Dobre-Baron O**, 2015
*The Concentration of the Capital in The Coal Mining Industry from Jiu Valley in The 30s of the Xx Century,* Annals of the University of Petroşani, Economics, 15(1), 2015, 5-20

[4] **Fodor D.**, 2006
*Influenţa industriei miniere asupra mediului,* Buletinul AGIR nr. 3/2006, iulie-septembrie

[5] *Institutul Naţional de Cercetare Dezvoltare pentru Urbanism şi Amenajarea Teritoriului – URBANPROIECT Bucureşti, Plan de amenajare a teritoriului zonal Valea Jiului.*

[6] **Tataru D., Tataru A.C., Stanci A.**, 2018
*Management of affected areas by the pollution of the slag and ash deposits,* ICoM 2018 8th International Conference on Management "Leadership, Innovativeness and Entrepreneurship in a Sustainable Economy", Czestochowa University of Technology Faculty of Management, Czestochowa, Conference Proceedings, pg 620-624, 2018

[7] **Radu V.M., Vîjdea A.M., Ivanov A.A., Alexe V.E., Dincă G., Cetean V.M., Filiuță A.E.,** 2023
*Research on the Closure and Remediation Processes of Mining Areas in Romania and Approaches to the Strategy for Heavy Metal Pollution Remediation,* Sustainability 2023, 15(21), 15293; https://doi.org/10.3390/su152115293

[8] **Tataru D., Tataru A.C., Stanci A.**, 2017
*Study on development of vine plant in slag and ash resulting from the burning of coal in thermal power plants,* 17th International Multidisciplinary Scientific GeoConference SGEM 2017, www.sgem.org, SGEM2017 Conference Proceedings, ISBN 978-619-7408-09-6 / ISSN 1314-2704, Vol. 17, Issue 52, 875-882 pp, DOI: 10.5593/sgem2017/52/S20.112, 2017.

[9] **Tataru D., Tataru A.C., Stanci A.**, 2017
*The use of herbaceous plants to stabilize tailing ponds of thermal power plants,* International Multidisciplinary Scientific Conference, University of Miskolc, Hungary, ISBN 978-963-358-061-5

[10] **Vaverková M.D., Maxianová A., Winkler J., Adamcová D., Podlasek A.,** 2019
*Environmental consequences and the role of illegal waste dumps and their impact on land degradation,* Land Use Policy Volume 89, December 2019, 104234

[11] **Abdel-Shafy H.I., Mansour M.S.M.**, 2018
*Solid waste issue: Sources, composition, disposal, recycling, and valorization*, Egyptian Journal of Petroleum, Volume 27, Issue 4, December 2018, Pages 1275-1290

[12] **Kharbouche M, El Khalidi K., Aajjane A.**, 2024
*Using Mine Tailings as a Soil Improver to Reduce Micronutrient Deficiencies in Wheat Crops, Western Morocco,* Journal of Ecological Engineering 2024, 25(9), 44–59 https://doi.org/10.12911/22998993/190287 ISSN 2299–8993, License CC-BY 4.0

[13] **Pollmann O., Van Rensburg L., Lange C.A.**, 2009
*Reforestation and landscaping on mine tailings – a step forward in mine closure*, Conference: International Mine Water Conference, hosted and organized by Water Institute of Southern Africa's Mine Water Division together with the International Mine Water Association,

[14] **Pollmann O., Van Rensburg L., Lange C.**, 2009
*Reforestation and landscaping on mine tailings – a step forward in mine closure*, Abstracts of the International Mine Water Conference Proceedings ISBN Number: 978-0-9802623-5-3 Produced by: Document Transformation Technologies cc

[15] **ERM**. 2018.
*Casino Mine Project: BAT Study for Tailings and Waste Rock Management*. Prepared for Casino Mining Corporation by ERM Consultants Canada Ltd.: Vancouver, British Columbia.

[16] **Chernaik M.**, ELAW Staff Scientists, 2010
*Guidebook for Evaluating Mining Project EIAs*, ISBN# 978-0-9821214-36

[17] **Araujo F.S.M., Taborda-Llano I., Nunes E.B., Santos R.M.**, 2022
Recycling and Reuse of Mine Tailings: A Review of Advancements and Their Implications. Geosciences; 12(9):319. https://doi.org/10.3390/geosciences12090319

[18] **Tataru A.C., Stanci A.**, 2019
*Research concerning the vegetation development on the ash and slag deposits of Thermal Power Plant Paroseni*, Journal of Physics: Conf. Series 1297 (2019) 012016, Online ISSN: 1742-6596, doi:10.1088/1742-6596/1297/1/012016, https://iopscience.iop.org/article/10.1088/1742-6596/1297/1/012016/meta

[19] **Petrilean D.C.; Irimie S.I**., 2015
*Solutions for the capitalisation of the energetic potential of sludge collected in Danutoni wastewater treatment plant*, Journal of Environmental Protection and Ecology, Vol.16 No.3 pp.1203-1211

[20] **Georgescu M.**, 2012
*Utilizarea spaţiilor subterane,* Editura Universitas, Petroşani