### The Impact of Environmental Degradation on the Existing Built Stock

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*Abstract* – Human actions over time have led to the degradation of the environment, of natural resources with major implications in urban centers. Destructive factors can affect urban communities, land, the environment as a whole – water and air. The European Union recognizes the strategic importance of urban regeneration whose dimension is increasingly relevant. The authors develop a subject of maximum economic but also social importance through an in-depth analysis of the effects of land degradation through mining operations on the existing built stock, respectively on buildings, underground networks, drinking water, etc.

An eloquent example is provided by urban communities in mining areas located at short distances from dangerous pollutants such as tailings dumps or underground galleries.

Even if the geotechnical research over time did not highlight areas with a natural risk of landslides, however, the exploitation of lignite deposits, as a whole, the mining works in the Motrulu valley - the areas where the analyzed constructions were inspected, led to landslides with adverse effects on the existing built environment.

Keywords -degradation, environmental, impact

#### **1. INTRODUCTION**

In recent years, the built-up areas of Valea Jiului have been subjected to deformations caused by land movement through landslides. Under these conditions, evolutionary structural deformations were identified in the residential buildings that affected the resistance and stability of some, and partially of those located at greater distances.





Fig. 1 Deformations with land movement and failure of building elements

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The analysis of the causes of the degradations produced in the last 20 years highlighted the fact that the disruptive factors of the extraction activity with all the collateral effects led to their occurrence and at the same time to the increase of the risk in the area.





Fig. 2 Inclined cracks in structural walls

Fig. 3 Inclined cracks in the bathroom walls

### 2. SITE STUDY IN THE CONTEXT OF MINING

From the geological surveys, it can be noted that in 2017, in accordance with the Risk Analysis and Coverage Plan developed by the Ministry of Internal Affairs, the Department for Emergency Situations of Gorj County can also find the villages of Lupoaia, within the 186 areas with landslides, Valea Mănăstirii și Steic - locality where the property of the plaintiff in this file is located.

In this document it is recorded that the nature of natural landslides cannot be differentiated from anthropogenic ones, but what is relevant in the opinion of the expert is the fact that the entire area is subject to the geodynamic effects influenced on the foundation lands and the built sites.

The presented study highlights the fact that the area can be cataloged as periodically deformable and the increase in the frequency of deformations can be attributed to favorable factors, triggers, and anthropic activity is one of the main favorable factors. Also in this studio, the presence of clays with large swellings and contracts is indicated, which in the presence of, I quote: "underground and surface water leads to the modification of the physical and mechanical parameters of the earth". This element in the analyzed study is still in the context of changes caused by anthropogenic phenomena. Thus, the study refers to the fact that the subterranean exploitations led to tectonic movements, changes in the hydrographic network that adapted to the inclination of the layers. Important are the data provided regarding the depth of groundwater that varies between 0.50 m and 2 m, a fact that can influence the geotechnical parameters.

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Another aspect recorded with the degree of danger of the extracted barren areas that was deposited in two Dumps: respectively Valea Lupoita and Valea Mănăstirii. Motivated by these deposits, the Motru river was diverted, and a guard channel was built on which the experts from Petroşani University warn of the possibility of the existence of clogged areas. In fact, they also identified for a building in the village of Steic (the same as that of the plaintiff in the case file) at no. 40. Also, from this work we learn that in 2017 the guard canal was blocked in many significant portions and the connection between the guard canal and the river Motru was interrupted. In these conditions, in the opinion of the technical expert, it is easy to understand that in this area the surface water stagnates, that it can be confused with the water table and that there are imminent risks of vulnerability of these contractile lands. Therefore, not the contractual lands invoked by the defendant in the objects with reference to NP126/2010 the causality of the deformation of the sites on representative areas, but the collateral actors that contribute to the triggering of the deformability of these lands and those related to the humidity induced by the extraction activity.

Soils with large swellings and contractions can be found in the specialized literature under the name of contractile soils or expansive soils. These are clay soils active in relation to water, which have the property of significantly changing their volume as a result of the variation in humidity. But to place these sites in the category of contractile soils, specialized laboratory study is necessary. Furthermore, active deformability is generated by excessive humidity produced by anthropogenic systems as explained above.

The research carried out by the Faculty of Mines of the University of Petroşani also highlights the fact that the mining works in the area led to the appearance of underground voids, possibly to their collapse underground with the disturbance of the geological layers, the appearance of sinkholes on the surface of the land favoring the infiltration of water rainwater in the soil. The underground mining activity had the effect on the expertized perimeter with reference to the village of Steic of the following damages, some certified and others of a possible nature:

- changing the maturity balance of the rock massif,

- disturbance of the natural courses of surface and underground waters,

- infiltration of water into the exploited underground spaces after the closure of the mines,

- the phenomenon of local, regional subsidence,

- modification of the physical and mechanical characteristics of the rocks due to high humidity.

These aspects are also supported by the authors Anghel Titu and Virgil Surdeanu, who in the work "Functional reintegration of geomorphological systems degraded as a result of coal mining" published in the Geomorphology Magazine vol 9, 2007 page 61-72 and recorded in the bibliography of the technical expertise report. The changes induced to the geomorphological layers due to human activity are recorded in this work. Mining involves the dislocation, storage of material and including the reallocation of aspects that generate the production of underground voids - anthropogenic structures. These structures assume inversions of the relief, modeling of the slope profiles, the appearance of tensions between the anthropic and natural systems.

Another important aspect, and this paper notices it, is the effects of waste storage in cumulative anthropogenic structures that substantially influence the topography of the area, the natural drainage systems of underground water. An eloquent example presented in the paper is the destruction of the upper and middle basin of Cervena Valley as well as the one located between Cervernei Valley and Ploştina Valley. The destruction of aquifer layers,

changes in local lithology, the appearance of voids on the surface or underground are just some of the repercussions of mining operations.

With reference to the landfill in Valea Mănăstirii, the authors express themselves on its chaotic, asymmetric aspect, which they record as a negative factor that led to the appearance of phenomena such as: rain denudation, flooding or raving. And in this work is recorded the serious effect of the changes in the hydrogeological channels, namely the moving of the Motru riverbed, the surface runoff, the filtering of meteoric waters that has changed, the appearance of swamping of the waste dump due to the deficient drainage system.

The information taken by the authors on the date of the finding and inspection of the affected homes, with reference to the fact that:

- The Territorial Administrative Unit did not carry out a specialized hydrogeological or geotechnical study on the built-up area and for comparable periods depending on the exploitation of the deposits.

- The water-sewage networks are installed in the hamlets area.

Corroborated with the records of the expert report drawn up by the University of Petroşani, the Faculty of Mines in the respective area, "the exploitation of the lignite strata in the former Lupoaia V-VI micro quarry and the dumping of the excavated waste material in the mined area... have led to the modification of the land's morphology with direct influence on the flow of surface water"... "the underground voids generated by the exploitation of the lignite layers through underground mining works which later determined the collapse and disturbance of the geological formations in the roof and the appearance of sinking areas on the surface of the land favor the infiltration of rainwater into the soil and their accumulation in the exploited space from where they migrate along the aquifer formations to lower elevations", and with the article "Slides of tailings dumps - risk factor for lignite quarries in Oltenia" authors: Prof. Univ. Dr. Eng. Ilie Rotunjanu, Prof. Univ. dr. eng. Maria Lazar – University of Petrosani, Faculty of Mines, Department of Management, Environmental Engineering and Geology published in Construction Journal no 95/2013 page 54 where it is recorded that the deposit of tailings in the area of the valleys without drainage works presents a high degree of vulnerability, I quote:

"Over time, there have been many tailings slippage phenomena, with more or less serious consequences on the environment, on the objectives in the area of influence or on the production activity."

With reference to the Rogoaselor dump in the above-mentioned article, it is recorded: "The landslide was caused by the reduction of the geotechnical characteristics of the dumped rocks, under the influence of water".

In such situations, the destructive effects on the existing built stock can be limited by adopting a land regeneration program. Monitoring plays an important role in land regeneration.

#### **3.** CONCLUSIONS

The complexity of the activity and the similar existing situation lead, in fact, to the assessment that a risk assessment with a major environmental impact must be the subject of specialized studies. Such areas are also subject to local risk factors that can be triggered by fires and damages in mining activity, with effects on the environment.

However, there is also a risk, mainly determined by:

- self-ignition of coal;

- the loss of land stability and the generation of landslides, affecting the dumps or the slopes of the quarry;

- water floods and floods (mainly because of the overflowing of guard channels,

- seismic risk;

- the risk of accidents, fires and breakdowns, with important effects on the environment and the population.

This fact develops new directions of research to reduce these risks. The European Union recognizes the strategic importance of urban regeneration whose dimension is increasingly relevant. The results of the carried-out research highlight the effects of land degradation through mining operations on the existing built stock, respectively on buildings whose construction belongs especially to the 1950-1970 period, underground networks, drinking water, etc.

#### 4. References

[1] Ana Maria Grămescu, Judicial technical expertise regarding the technical condition of some buildings around the Motru Valley

[2] Judicial geological expertise - expertise drawn up by the Faculty of Mines of the University of Petrosani on 07/29/2020

[3] Anghel Titu, Virgil Surdeanu - Functional reintegration of degraded geomorphological systems because of coal mining - Case study of Valea Mănăstirii dump - Motru Mining Basin - Geomorphology Journal vol 9/2007 page 61-72

[4] Ilie Rotunjanu, Maria Lazar ,"*Slides of waste dumps - risk factor for lignite quarries in Oltenia*" - University of Petrosani, Faculty of Mines, Department of Management, Environmental Engineering and Geology published in Revista Construcțiilor no 95/2013 page 54

[5] Nicolae Anastasiu, "Mineral resources - a forgotten potential!"

[6] Ana Maria Grămescu, Georgeta Stoian, Anca Gemănaru(Simion), *The impact of environmental degradation on the existing built stock - "Dezvoltarea expertizei judiciare ecologice – obiectiv esențial în protecția mediului*" din 30 septembrie 2022 – volumul conferinței ed special Law and Life ISSN 2587-4365 Chișinău 2022

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