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A BRIEF STUDY TO ASSESS THE ENVIRONMENTAL IMPACT GENERATED BY JILȚ NORTH OPEN PIT

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Abstract: *As the extension of the valid periods for lignite exploitation licenses in the current perimeters in the Oltenia basin is considered (except for those perimeters that will deplete the exploitable resource) until the horizon of the year 2030 (possibly even 2035), it is crucial to ensure that extractive activities take place under safe conditions, and, above all, under legal conditions regarding environmental protection. Despite the significant and undeniable negative effects of current lignite mining, this industrial sector has multiple possibilities at its disposal to minimize the negative impact on the environment and, moreover, to restore affected areas. In this context, within this paper, our goal is to identify, describe, and evaluate the environmental impact produced by lignite mining activities in the Jilț North open pit. To achieve this, well-known and recommended techniques and procedures from the specialized literature are used, taking into account the legislative provisions stipulated by Emergency Ordinance no. 195/2005 on environmental protection (approved by Law no. 265/2006) and the Mines Law no. 85/2003, as well as the guidelines outlined for anthropogenic impact assessment by Law no. 292/2018.*
Keywords: *environment, impact assessment, open pit, Jilț North, lignite, mining*

1. Introduction

Open pit mining affects the environment in two main ways: on one hand, through the alteration of the landscape, and on the other hand, through the brutal intervention of open pits in the natural processes and rhythms of ecosystems. All these effects have led to the emergence of a conflict of interests between the necessity of extracting raw materials and the requirements for environmental protection to such an extent that mining enterprises have begun to be perceived as "environmental destroyers" [1].

For a long period, up until about 30 years ago, priority was given to economic growth, excluding environmental protection issues. The more and more severe manifestations of environmental degradation have necessitated a change in this mindset [2].

The mining activity carried out in the open pit is characterized by a significant impact on environmental components. Current open pit mining operations occupy and alter the geomorphological structure, rendering the use and recultivation of the land impossible for an extended period. Additionally, the waste dumps cover significant agricultural and forested areas, influencing adjacent lands through morphological and hydrographic changes [3].

Removing the overburden, preparation of the deposit and lignite extraction constitutes destructive activities with significantly negative impacts. Approximately 25% of the occupied areas are permanently

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removed from agricultural circuit, being taken up by social-edilitarian constructions, communication routes, or watercourses. The remaining 75% is temporarily removed from agricultural or forestry uses for periods ranging from 2-3 years to 15-20 years. This leads to the destruction of fertile soil and vegetation, with repercussions on the local habitat and fauna [4].

Efforts to protect the environment, through the development of non-polluting technologies in the coal extraction sector, are hindered by the considerable financial efforts they entail. However, at the current stage of development of the open pits in the Jilț mining basin, depending on the extraction methods and technologies applied, solutions must be found to improve the affected environmental components, including a proactive approach in addressing the negative environmental impacts related to the potential closure of certain mining perimeters.

The intervention to remove the impact generated by lignite extraction activity involves restoration of the affected surfaces at the end of exploitation. This includes interventions for an optimal reuse destination of the area, aiming to achieve maximum biological and morphological diversity, the ultimate goal being the optimal integration into the territorial context [5].

2. Description of the influence area

In order to identify, describe, and assess the environmental impact on adjacent areas generated by the extractive activity in the Jilț mining basin, it is necessary to provide a description of the soil, surface and groundwater, climate, vegetation, fauna, landscape, as well as human communities.

From an administrative point of view, the Jilţ mining basin (consisting of two open pits: Jilţ North and South) is located in the southwestern part of Gorj county, on the territory of Matăsari, Dragoteşti, Slivileşti and Negomir communes (fig. 1) [6].

Fig. 1. Location of Jilț North open pit [6]

The exploitation perimeter of the Jilț North open pit occupies the north-western part of the Jilț mining basin, within the territories of the localities Runcurelu, Brădeţel and Mătăsari.

From a morphological perspective, the relief in the Jilț North perimeter is typically hilly, belonging to the Subcarpathian region between the Jiu and Danube rivers. It exhibits a strongly rugged appearance, with elevation differences of +170 m between the maximum and minimum levels of the terrain. Among the peaks that dominate the relief of the perimeter, notable ones include Runcurelu Hill (+390 m), Brădetului Hill (+395 m) and Cerchezului Hill (+353 m) [7].

The hydrographic network in this area is tributary to the rivers Jiu, Tismana, Jilţ and Motru.

The hydrographic network of the Jilț mining basin is formed by the Jilțul Mare stream and its main tributaries. The Jilțul Mare stream originates to the west of the locality of Brădițel, from the Bujorăscu Hill area. It flows from west to east for approximately 3.5 km, after which it changes its course in the northwest-southeast direction and flows into the Jiu River north of Turceni town.

From a hydrogeological perspective, the groundwaters in the Oltenia mining basins are divided into [5]:

- Free-flowing groundwater (phreatic waters);
- Pressurized groundwater, with an ascending or artesian level.

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The aquifers recharge conditions have led to the formation of contact zones between aquifer horizons at various depths.

The mining basin of Oltenia is characterized climatically by the specific conditions of the Getic Subcarpathians and the Getic Piedmont (temperate continental climate with mediterranean influences). The climate is relatively humid, with average annual temperatures around 10ºC and average annual precipitation of approximately 753 mm [7].

The soils in the studied area are mostly of alluvial nature, formed from coarse material deposited over a layer of gravel.

Pedogenetic factors in the studied area are represented by the fertile soil and its characteristics, as well as by the rocks in which the lignite deposit is located (which may be used as a soil substitute in rehabilitation works), climate (temperature, precipitation, winds), biological factors (vegetation, microorganisms and fauna), air, groundwater, stagnant water, time (age of soils and rocks), and anthropogenic activities. The soil forming rocks are generally marls, marly clays, gravels, and sands [4, 5].

The characteristic pedogenetic processes involve significant alteration of silicates and migration of altered secondary products under the conditions of a relatively humid climate and forest vegetation.

Under the influence of these combined processes, inevitably interacting with the pedogenetic factors, including climate, vegetation, rock, hydrogeological and hydrographic conditions, the following types of soil have formed [8]:

- Pseudogleyed clay-loam brown soil - encountered on extensive surfaces;
- Pseudogleyed loamy brown soil - found on plateaus, slopes, and terraces throughout the Oltenia mining basin;
- Pseudogleyed albic luvisoil - found in the Rovinari basin on slopes and plateaus;
- Typical brown eumezobasic soil - rarely encountered;
- Typical vertisoil - found on plateaus and slopes;
- Alluvial protosoil - found in strongly narrowed basins in the Oltenia mining basin;
- Typical alluvial soil - found in lowland areas in the Rovinari and Motru basins;
- Soil complexes and associations - resulting from the association of distinct soils with unevolved soils, encountered on slopes.

In the Oltenia region, approximately 28 potential species (existing before lignite exploitation commenced) are reported, some of which are rare and significant.

The presence of elements that make up xero-mesophilic arboreal structures is specific to the territory. The coal-bearing region of Oltenia is located, in terms of vegetation levels, in the lower level of the sessile oak forest, where beech infiltrates at the northern limit, and xero-thermophilic oak at the southern limit, along with characteristic herbaceous plants [8].

The fauna in the Jilț mining perimeter area is characterized by a great variety and diversity due to different conditions: hills and depressions, slopes and terraces with brown soils in various degrees of podzolization. The composition and distribution of the fauna reflect the climatic and vegetative characteristics of the area, influenced by its geographical position and topography. Depending on the living environment, terrestrial and aquatic fauna can be distinguished [7].

The region where mining activities take place is situated in the landscape of hills and plateaus under the influence of an oceanic climate with a sub-mediterranean nuance, as defined by [8]:

- Middle and high hills landscapes covered with beech forests and small agricultural areas;
- Low hills and hilly plateaus landscapes;
- Depressive landscape with meadow-like appearance - the domain of oak, hornbeam, and beech forests, predominantly featuring southern elements and cultivated agricultural lands;
- Landscape with wide floodplains with willow and poplar groves, sometimes oak, alternating with meadows and cultivated lands. It is noteworthy that in the last 30-40 years, all these landscapes have experienced increasingly strong anthropogenic pressure, with some being in advanced stages of degradation.

The studied region is characterized by a negative demographic trend at the community level. Corresponding to this trend, migration of young people is observed and an increase in the proportion of elderly individuals, with a pronounced decline in the school-age population.

In the short and medium-term perspective, the resident population in the studied area may consider diversifying activities in parallel with lignite exploitation. The main directions to be followed can be summarized as follows [9]:

- Extractive industry, represented by mining (lignite extraction) until the perspective of 2030-2035;

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- Manufacturing industry (promotion of small and medium-sized enterprises, development of partnerships between the private and public sectors, utilization of production capacities through sales, etc.);
- Forest exploitation – constitutes an important element in the region's economy;
- Agriculture – the main challenges in the agricultural sector include poor quality, low fertility, and the long recovery period of soils resulting from industrial exploitation and significant acid rainfalls;
- Food industry.

3. Description of the main activities carried out in the Jilț North open pit

Extraction of lignite in the Jilț North perimeter began in 1980, through two micro-open pits located in the Cerchez I and II hills, and excavations with bucketwheel excavators (BWEs) began in 1984 (when the E07 BWE, type SRs 1400 – 30/7, was put into operation). Currently, the Jilț North open pit (fig. 2), with a licensed capacity of 4.5 million t/year, supplies lignite for the Turceni Central Power Plant, a component unit of the Oltenia Energy Complex [6].

Fig. 2. Working fronts of Jilț North open pit (left) and the internal waste dump (right)

The specific technological flux existing in Jilț North open pit (throughout 2023) is presented in fig. 3, with the specification that the A02 spreader, which deposits sterile rocks in an exterior waste dump, is used only in emergency situations (if failure occurs to the conveyor system or the spreaders operating in the internal waste dump).

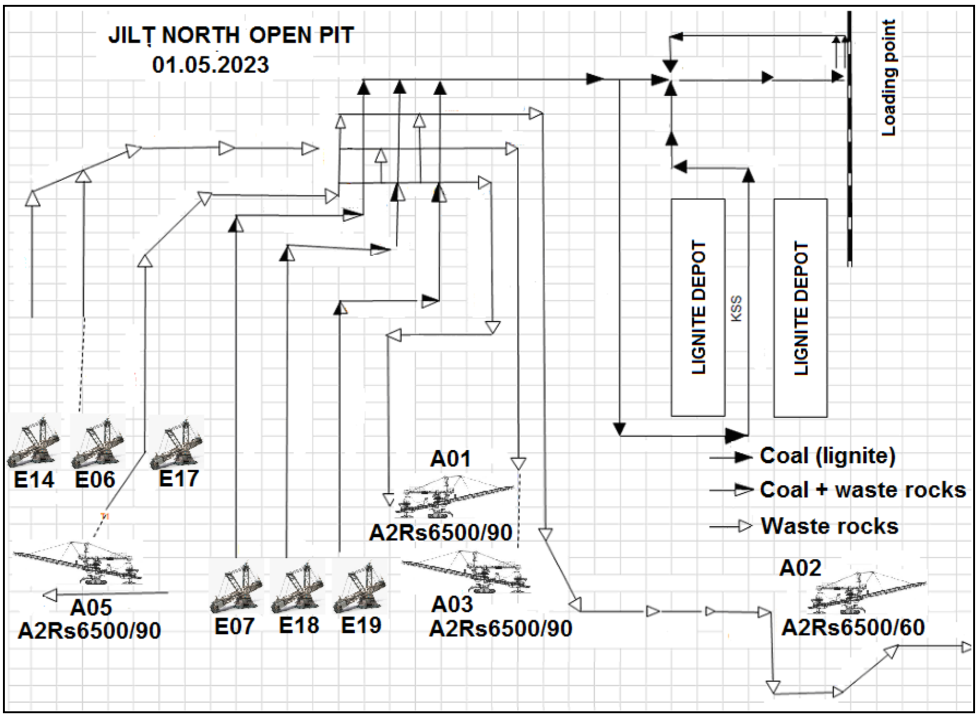

Fig. 3. Technological flux existing in Jilț North open pit [6]

Excavation is carried out exclusively with high-capacity BWEs, type SRs 1400 – 30.

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The transport of both the waste rocks and the lignite resulting from the excavations is carried out on conveyor belts. The waste rocks are transported to the internal dump (occasionally to the external one), and the lignite to the Jilţ coal depot and from here to the Turceni Central Power Plant.

The waste rocks and coal are separated by means of the distribution lanes located in the nodes.

Dumping of the waste rocks from the excavation fronts is carried out by means of spreaders (dumping machines).

Coal storage is carried out in the Jilţ depot by means of combined (depositing – extraction) and stacking machines.

Currently, the Jilţ North open pit is equipped with the following high-capacity technological equipments [6]:

BWEs: 6 x SRs 1400 – 30/7 (E06; E07; E14; E17; E18; E19);

BWEs: 3 x SRs 470 – 15/3.5 (E09; E11; E16) – removed from the technological flux (in conservation, near the premises of the administrative building and the coal depot);

High capacity conveyor belts, types: B1400; B1600; B1800; B2000; B2250, over 30 km;

Belt wagons;

Spreaders: 3 x A2RsB 6500.90 (A01, A03, A05) and one A2RsB 6500.60 (A02);

Depositing machines: combined machine type KsS 5600×40 and stacking machine type ASG 6000.

Added to these are a variable number (being used jointly with the Jilț South open pit) of classic excavators (with wheels and tracks), dumping trucks and bulldozers, used for related activities (profiling, access roads, leveling, etc.) [6].

In Jilţ North open pit, the exploitation method used is the one with the transshipment of a part and the transport of another part of the sterile rocks to internal dumps (fig. 4) and the technology of excavation, transport and dumping in continuous flux, through the use of excavation, transport and dumping/deposition complexes. The material deposited in the waste dump is leveled with the help of different types of bulldozers [10].

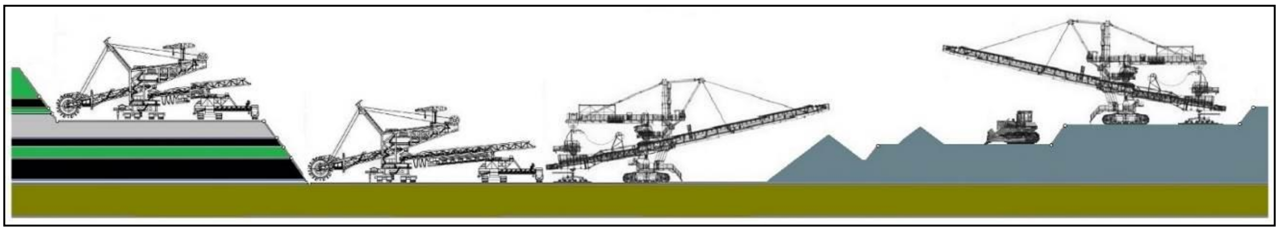

Fig. 4. Exploitation method applied in Jilț North open pit [6]

It is expected that the current exploitation method and technological flux will be maintained until the cessation of productive activities (2028 according to the current license, or, by its extension, 2035 at most) [6].

4. Legal and theoretical aspects regarding the procedure for environmental impact assessment

4.1. The purpose and requirements of the environmental impact assessment study

The Environmental Impact Assessment (and in some cases, the risk assessment) study must be part of the mandatory documentation that an economic entity submits for analysis within the procedure of initial application or renewal of the Integrated Environmental Authorization. This report provides competent environmental protection authorities with information and data regarding the site's condition, including pollution status, before the facilities are put into operation. It serves as a reference point for comparison when applying for future Integrated Environmental Authorizations or at the time of activity cessation [11].

The highly important activity of environmental impact assessment is currently regulated in Romania, in general by Emergency Ordinance no. 195 of 2005 on environmental protection [12], and specifically by Law no. 292 of 2018 (with subsequent amendments and additions), which establishes the framework procedure for environmental impact assessment [13].

The purpose of a general methodology is to guide the project initiator, the competent authority, and stakeholders through a series of clear and defined steps, while allowing certain degrees of freedom based on the proposed methodology. Thus, the environmental impact assessment procedure is not merely a formal compliance requirement for authorization conditions; instead, it allows for the framing of these degrees of freedom within a logical and sufficiently precise structure [14].

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Regarding the environmental impact study, it is important to emphasize that it includes not only strictly environmental aspects (those that could be called ecological-naturalistic) but also economic and social aspects. This means that a broader significance must be accepted for the term "environment."

In an impact assessment study, various competencies are involved since such a study raises a series of issues related to coordinating analyses and intermediate results from extremely different disciplinary sectors.

The environmental impact assessment is intended to forecast the consequences that the implementation and operation of development projects (road traffic, railway, navigation, energy production, mining, hydrotechnical constructions, waste management, etc.) can have on the surrounding environment.

The purpose of the impact assessment study is to identify and locate the potential disturbances generated by the project, from the first stage of its planning and design.

The environmental impact assessment is a crucial stage in the decision-making process regarding the final form of a particular project, serving as a guide for decision-makers.

Typically, an impact study needs to clarify several aspects, including [15]:

- The feasibility of the safe operation of the project, without the risk of major accidents or long-term health effects;
- The ability of the natural environment to cope with the pollutant emissions and waste generated by the project's operation;
- Location conflicts with the surrounding environment (for example, if the project site overlaps with an area under special protection, such as national parks, Natura 2000 sites, etc.);
- The consequences of implementing the project on existing infrastructure;
- How the project affects natural and anthropic components of the environment;
- The required natural resources for the project and their management;
- The human resources needed for the project's implementation and operation;
- Damage to the natural landscape and the impact on national and local values (forests, wetlands, tourist areas, historical, urban, cultural, architectural, or religious sites);
- Actions to mitigate these changes;
- Measures to limit in time and space and minimize the modifications generated by the project;
- Legislative, regulatory, or decision-making norms that need to be adopted for the project's acceptance and proper functioning.

Principles to be followed in conducting an impact study are the following [14, 15]:

- Focusing on the main issues;
- Involving the most suitable individuals and teams in conducting the study;
- Correlating information for decision-making;
- Clearly and thoroughly presenting solutions to minimize impact;
- Assembling the obtained results in a form suitable for decision-making.

The stages that an impact assessment study must go through are as follows [14, 15]:

- Orientation phase (preliminary operations and assessments);
- Description of the surrounding environment phase,
- Description of the project phase,
- Impact highlighting phase,
- Impact assessment phase;
- Implementation of the intervention (integrative actions) phase;
- Communication and publicizing of results,
- Finalization and transmission to decision-makers.

4.2. Tools for identification, description, and assessment of the environmental impact

The procedural schema of an impact assessment represents a general framework applied in drafting environmental impact studies, which is not specific to a particular project. It follows the same path through analytical and evaluative techniques that can be adapted to any category of projects, even if they were designed for certain types of specific projects. Thus, checklists, matrices, impact networks, impact estimation models, and various evaluation criteria are tools applicable in the context of impact assessment studies for any project [15].

The impact identification stage involves a few operations to identify certain or probable interactions between the basic causal actions of the project and the environmental components characteristic for the reference area. The description stage summary presents how the causal actions of the project interact with environmental components, while the evaluation stage quantifies these effects [14].

5. Identification, description and assessment of the environmental impact generated by the mining activity in the Jilţ North open pit

5.1. Identification of environmental impact through the impact network method

They consist of flow diagrams or chains of multiple relationships that interconnect project actions with environmental components susceptible to change. Impact networks systematically highlight secondary and indirect effects, the existence of multiple or concomitant cause-and-effect relationships, and the accumulation of effects, taking into account the temporal dimension [14].

The impact network for lignite mining activities carried out in the open pit is illustrated in fig. 5. This network is specific to the Jilț North open pit but can be extrapolated to other open pits in Oltenia.

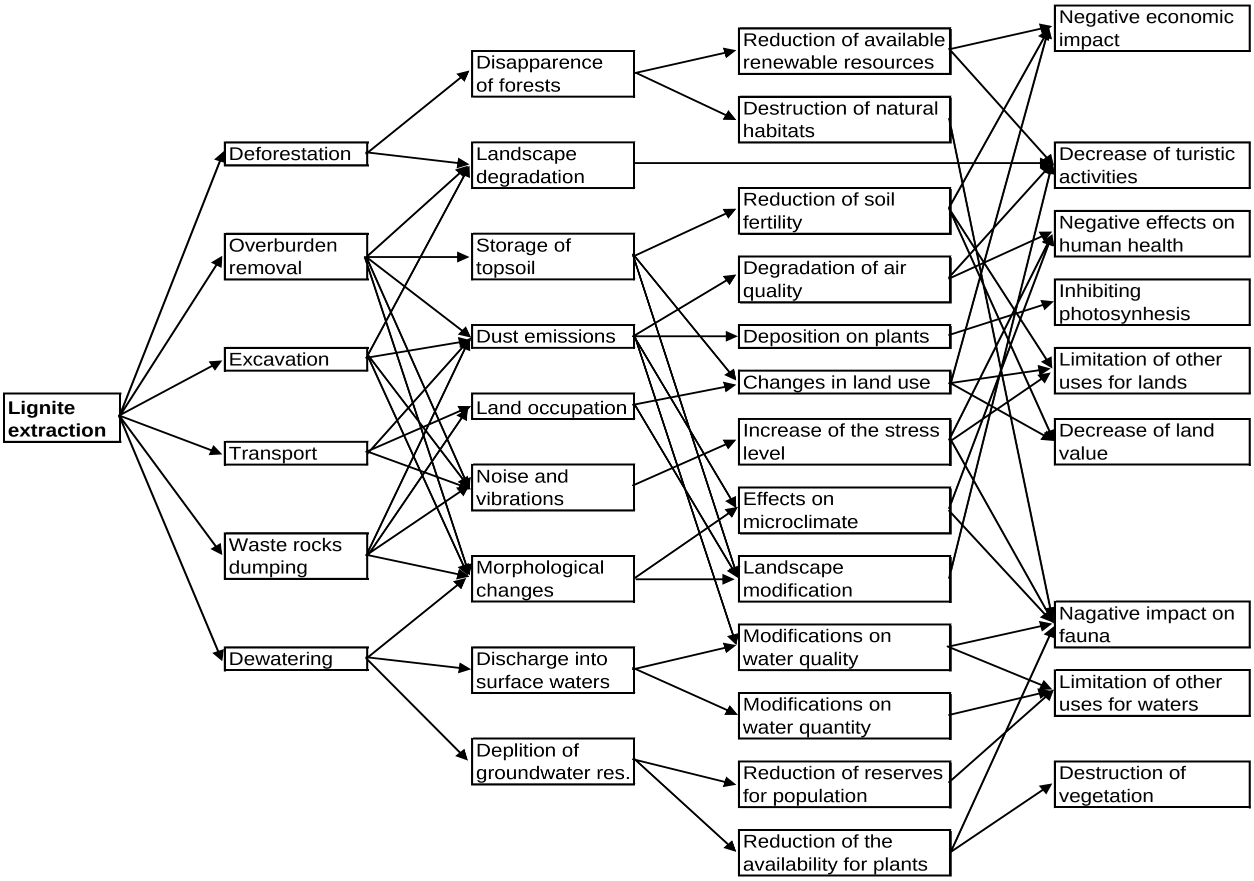

Fig. 5. Impact network for lignite mining activity in the open pit

The impact network method does not allow for an evaluation of the activities that generate the greatest impact or the environmental components that are most affected. It only permits the identification of impacts and connections between specific activities in the open pit on one hand, and on the other hand, it identifies how various primary impacts interact, generating secondary impacts.

5.2. Description of the environmental impact through the checklist method

These are lists of parameters related to environmental components and factors, project actions, and/or impact factors. They can be considered the simplest tools for identifying and describing impacts. Among the five types of checklists described in the literature [14], within this paper, a descriptive checklist (lists that provide, for each considered component, the guide and methodological criteria necessary for evaluating their quality and forecasting impacts), is presented in table 1.

Some of the negative impacts identified in the checklist presented in table 1 are inherent to open pit-mining activities and therefore cannot be eliminated (impacts related to land clearing, overburden removal and mining the deposit, dewatering works, etc.). Measures can be taken to mitigate the impact during the active period of the open pit, such as reducing sedimentable and suspended dust emissions by moistening the land during cutting operations (especially during periods of low precipitation). However, the most effective actions are typically carried out after the cessation of activities (although concurrently is preferable) through comprehensive ecological reconstruction efforts in the affected areas.

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Table 1. Checklist for mining activities in open pits

Specific activities	Affected environmental component / factor	Description
Deforestation/removal of land from the agricultural circuit	Flora and fauna	The disappearance of naturally installed trees from hilly areas, varied in species and age, and their replacement with monocultures that cannot restore the initial ecosystems; Reduction of available renewable resources; The initial crop plants often struggle to adapt to the new conditions provided by anthropogenic soils, and many times it is necessary to choose other non-native species in the process of returning the lands to agricultural circuit. The characteristic fauna species of the area migrate to other zones due to the destruction of natural habitats.
	Landscape	Landscape degradation and limitation of recreational uses.
Removing the overburden	Soil/subsoil	Destruction of the natural balance of fertile soil (the balance between organic matter, water and air); Loss of fertile soil especially from forest areas where selective excavation is difficult; Destruction of the natural lithological structure; Removal from the productive circuit of significant land areas. Alteration of the land morphology and hydrogeology.
	Atmosphere	Emissions of suspended particles leading to additional local haziness.
	Vegetation	The emissions of sedimentable dust that, by depositing on the leaves of plants in adjacent areas, hinder the process of photosynthesis.
	Landscape	Landscape degradation and limitation of recreational uses.
Lignite mining	Subsoil	Reduction of reserves of non-renewable resources (energy); Destruction of the natural lithological structure; Modifying the land morphology and hydrogeology. The occurrence of surface erosion on the slopes of the open pit.
	Atmosphere	Particulate matter emissions leading to additional local haze.
	Vegetation	The emissions of sedimentable dust that, by depositing on the leaves of plants in adjacent areas, hinder the process of photosynthesis.
	Landscape	Landscape degradation and limitation of recreational uses.
Transport of lignite/waste rocks and car traffic	Soil	Occupying land surfaces with circuits of conveyors and access roads.
	Atmosphere	Entrainment of suspended and sedimentable particles; Noxious emissions from motor vehicles.
	Vegetation	Deposition of sedimentable dusts and inhibition of photosynthesis.
Sterile dumping Waste rocks dumping	Soil	Land occupation, especially by external dumps, which remove important areas from the productive circuit; The occurrence of negative geomining phenomena (erosions, subsidence, backflows and landslides); Changing the morphology through the appearance of positive relief forms.
	Air	Entrainment of suspended and sedimentable particles;
	Vegetation	Deposition of sedimentable dusts and inhibition of photosynthesis.
Redirecting watercourses	Surface waters	Modification of natural riverbeds with effects on flow regime and sediment transport. Reducing the availability of water supply for the population in the area from surface sources by increasing the distance from them.
Dewatering works	Groundwater	Changes in the configuration of aquifer horizons, and their hydrogeological parameters. Decrease in underground water reserves and its availability for the population.
	Surface waters	The discharge of waters from dewatering works into natural rivers can lead to an overall qualitative improvement, but not necessarily in terms of turbidity.
	Vegetation	By lowering the hydrostatic level, plants in the vicinity of open pits no longer have access to water, leading to the disappearance of vegetation in the drilling area of influence.
	Soil	Also, due to the lowering of the hydrostatic level, an imbalance occurs between water, air, and organic matter in the drilling influence zones, leading to a decrease in their fertility. Inherent surface soil compaction.

5.3. Impact assessment through matrices

Impact assessment is the phase in which a transitions is made from an estimation of the anticipated impacts on various environmental components to an evaluation of the importance that the forecasted value for that environmental component or factor holds in a specific context [14].

The question arises as to whether the forecasted value for various indicators used in the description and forecast phases and for different alternatives will result in significant variations in environmental quality. To the extent possible, an indication of magnitude compared to a conventional scale (e.g., 1-3) is provided, allowing for the comparison of the magnitudes of different impacts and the establishment of a series of operations for the assessment of the complex impact [15].

Matrices are composed of tables with double entries, where environmental components and factors involved are listed and divided into categories along the rows, and elementary project activities are listed in the columns. Each intersection in the matrix represents a potential impact relationship between project factors and environmental factors [16].

Generally, more commonly used are quantitative matrices designed for evaluation through a numerical scoring system. They assess both individual impacts for elementary actions and the overall impact generated by the project. These matrices are constructed by assigning a numerical coefficient to each intersection point, expressing the importance of that interaction compared to others. In this case, matrices become operational tools in the analysis and impact assessment phase [14].

The most well-known example for this methodology is the Leopold matrix, which cross-references 88 environmental components with 100 elementary actions, resulting in a total of 8,800 potential impact cells. The forecasted impact is marked in the respective cell by entering data related to the intensity and importance of the impact, based on uniformly scaled numerical ratings [16].

To evaluate the environmental impact generated by mining activity in the Jilț North open pit, we proposed the matrix presented in table 2.

Table 2. Impact matrix for lignite mining activity in the Jilț North open pit

Environmental components	**Specific actions related to lignite mining**							
	Deforestation	Overburden removal	Lignite mining	Transport	Waste rocks dumping	Dewatering	Redirecting watercourses	**Cumulative impact on environmental components**
Soil	-	-3	-	-1	-3	-1	-	**-8**
Subsoil	-	-3	-3	-	-	-	-	**-6**
Surface waters	-	-	-	-	-	-2	-2	**-4**
Groundwater	-	-	-	-	-	-3	-	**-3**
Vegetation	-3	-1	-1	-1	-2	-2	-	**-10**
Fauna	-3	-	-	-2	-2	-	-1	**-8**
Ecosystems	-3	-2	-1	-1	-2	-1	-2	**-14**
Noise level	-1	-1	-1	-2	-1	-	-	**-6**
Morphology	-	-3	-2	-	-3	-	-1	**-9**
Landscape	-3	-3	-1	-1	-3	-	-1	**-12**
Socio-economic environment	-2/+1	-	+3	-	-	-	+1	**-2/+5**
Microclimate	-2	-1	-1	-1	-1	-1	-	**-7**
Air quality	-2	-1	-1	-1	-1	-	-	**-6**
Availability of resources	-3	-2	-3	-	-	-	-2	**-10**
Risks	-	-1	-1	-1	-3	-1	-	**-7**
Cumulative impact of activities on the environment	**-22/+1**	**-21**	**-15/+3**	**-11**	**-21**	**-11**	**-9/+1**	**-110/+5**

The majority of impacts generated by mining activities are negative, with many of them being irreversible or reversible in the long term.

In terms of specific actions, those that generate the greatest impact are represented by: deforestation, removing the overburden, waste rocks dumping, and the actual excavation. In terms of environmental components that are most affected, the situation is as follows: ecosystems, landscape, vegetation, and resource availability.

Positive impacts relate to the stimulation of the socio-economic environment as long as mining activity supports the majority of the local population and reduces the risk of flooding through watercourse regularization and redirection.

As can be observed in the case of deforestation, we can approach a dual interpretation:

- On one hand, once forests are cleared, they no longer serve as a source of income (of medium importance) for the population, and their restoration is a long-term process.
- On the other hand, the utilization of the available timber during the expansion of the open pits is a short-term source of income.

In other words, deforestation is not a sustainable forest management practice. The reversibility of impacts depends on how these lands are managed (by this, understanding the management of soils, how the arable or forestland is monitored and exploited, etc.) after the cessation of mining activities and the initiation of the ecological reconstruction process.

It is obvious that if, for example, forests (newly created through ecological reconstruction efforts) are deforested, beyond the direct impact on vegetation and the availability of renewable resources, it will also negatively affect fauna. There will be effects on the microclimate and air quality, and if we consider this chain of events, in the end, the negative effects will ripple through the ecosystems as a whole.

In the case of areas returned to agricultural use, practicing unsustainable agriculture can lead to a rapid degradation of soil fertility, which will affect productivity. The negative impact will be felt at the level of the local economy.

6. Conclusions

The purpose of this study was to identify, describe, and evaluate the environmental impact of lignite mining activity in the Jilț North open pit. In this regard, methods recommended by the specialized literature were employed, namely the network method, checklists, and the impact matrix method.

Following the application of these methods, the following conclusions can be drawn:

- The environmental impact manifests itself in the Jilț North open pit at the level of all environmental components: water, air, soil, subsoil, and implicitly vegetation, fauna, human settlements, and the population;
- The impact on surface waters has a local extent and a moderate intensity, affecting particularly the watercourses with seasonal flows;
- The impact on groundwater is generated by dewatering works within the open pit perimeter, and it has a limited temporal character, ceasing to exist upon the end of productive activity;
- The impact on the air within the studied mining area is generated by stationary and mobile sources involved in lignite and overburden extraction, transportation, and storage activities;
- The impact on the soil, as a result of removing the overburden and excavation of lignite layers, both the fertile soil layer and the layers beneath it, undergo and will continue to undergo a strong impact. This is manifested through the total transformation of profiles, a phenomenon that will be evident across the entire area affected by the open pit;
- The impact on vegetation and fauna - concerning mining areas, no inventory of species, both plants and animals, has been conducted. Evidently, open pit mining leads to the removal, at least during the exploitation period, of the majority of plant and animal species. Thus, we can say that the impact of mining activities on flora is determined by the ratio between the number of floristic species existing before exploitation and the present, with a local extent;
- The impact on the socio-economic environment, human settlements, and the population – concerning the health of the population, the effects of extractive activities are strictly negative. However, in terms of human settlements and the economic environment, both positive impacts (infrastructure development, modernization of residential areas, public institutions, food security, energy etc.) and negative impacts (relocation of the resident population, relocation of heritage monuments and buildings, immobilization of significant land areas in the medium and long term, depletion of non-renewable resources, etc.) can be identified.

Overall, even though within this paper we did not use an impact analysis method leading to classification, based on the experience accumulated over time by the authors, we can assert that the environment within the Jilț North open pit and neighboring areas is subjected to anthropogenic activities to an extent that causes discomfort to living organisms. In the absence of necessary measures to mitigate the impact (including ecological reconstruction of areas released from technological works), this discomfort can transform into various forms of disturbances, sometimes irreversible.

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