ANTHROPIC IMPACTS ON THE ENVIRONMENTAL FACTORS AND ITS REDUCTION MEASURES WITHIN THE OLTET MINING PERIMETER

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ABSTRACT: *The Oltet mining perimeter is part of the Amaradia-Taraia mining field, being attributed to Horezu Mining Enterprise. On the basis of geological and hydrological research, of exploration and exploitation works executed by 2013, respectively of the documentation prepared and approved, it has been established the medium-term strategy for further exploitation of primary energy resource reserves (lignite) from the mining perimeter in the conditions of market economy.*

Environmental impact produced by coal exploitation is significant, unavoidable and irreversible, affecting the aquatic systems, air, natural mineral resources, ecosystems, climate, geomorphology and landscape, land use and human community.

Key words: anthropic impact, environment, coal exploitation, Oltet mining perimeter.

1. INTRODUCTION

Oltet mining perimeter, which is part of the Amaradia-Taraia mining field, was established by order of the Ministry of Geology No. 276/30.05.1985 and was awarded to Horezu mining Enterprise. Oltet open pit started in 1980, having as main activity the exploitation of lignite by open mining works at a projected production capacity of 1300 thousand t/year, which was reached in 1985, on the basis of the technical documentation execution.

Further, on the basis of geological and hydro-geological, engineering structures exploration and exploitation, carried out by the year 2013, respectively of the documentation prepared and approved, was established that:

- medium-term strategy for further exploitation of primary energy resource reserves (lignite) from Alunu mining perimeter in conditions of market economy;
- have been valued resources and reserves of lignite in Alunu mining perimeter, which can be exploited by open pit mining works;
- production capacity at the coal pit.

At present, the mining works within the Oltet coal pit develop on the four steps of the excavation,being used 4 rotor excavator. The excavated mining mass in the working fronts is spilled on the front, depending on the organization of sterile/coal transport system. The main waste product of the work of the coal pit, the sterile, does not suffer from any significant transformation chemical or biological physics, does not react in any way physically or chemically, is not biodegradable and does not affect the materials that come into contact in a way that can lead to pollution of the environment or harmful to human health.

On site there is no question of a biological pollution which might arise as a result of carrying out the work. Coal contains radio-nuclides primary existing, naturally, such as 40 k, 238U, 232Th and their degradation products of disintegration. Through the utilization of lignite natural radioactive isotopes in the Earth's crust are brought to the surface. Here, they can get into the chemical elements of the biosphere or station in the form of materials, raising the level of radioactivity in the area. In these areas the risk of radiation is negligible, and there is no an abundance of radioactive elements [1].

2. THE POTENTIAL IMPACT ON THE ENVIRONMENTAL FACTORS

2.1. Anthropic impacts on the water

Activities within the Oltet open pit generates the following types of wastewater:

- domestic waste water;
- water coming in from rainfall and leaks on the coal pit slopes.

The domestic sewage from administrative headquarters, social group, draw PSI, heating power plant, cafeteria and is collected in a network of sewer concrete pipes with DN = 250 mm, L = 350 mm.

Wastewater treatment plants:

- fat separator pool with dimensions 1, 2 x 2, 0 m, 4.0 meters (V = 2.4 cm) set on the collector channel;
- sinker with grill;
- IMHOFF type aerator with two compartments with the 2x500 loc. capacity, located on the left bank of the Oltet river.

After purging, purified sewage are discharged into the Oltet river.

In the year of 2011 provided sewerage network of the administrative was designed to be fasten to the village network.

Since before the beginning of lignite exploitation in the Oltet mining perimeter it has been performed geological research papers for the detection of possible under pressure aquifers horizons in order to apply appropriate methods of dewatering and stress-relieved them, so to eliminate the risk of flooding: the work of possible landslides, embankment the loss of stability of the dump.

Domestic waste water are discharged into the Oltet river [1].

Table 1 Quality indicators of wastewater in the discharge point

Crt No	Paramete	Uni	Result LCA	Values accordi to HG 352/2005	Testing method (standar
1	pH		6,82	6,5-8,5	SR ISO10523/2009
2	Slurry	mg/	2	35 (60)	STAS 6953/1981
3	Grounds	mg/	326	2000	STAS 9187/1984
4	Retrievab	mg/	-	20	SR 7587/96
5	CBO_5	mgO	8,9	25	SR EN 1899-1/2003
6	CCO - C	mgO	28,8	125	SR ISO 6060/96
7	Total Nitrogen	mg/	0,160	10 (15)	SR EN 12260/2004

2.2. Anthropic impacts on the air

Having regard to the specific activities of the main sources of air pollution that can be taken into consideration are:

- lignite exploitation;
- fuel combustion for heating living spaces and food production (generating sources of carbon dioxide, carbon monoxide, nitrogen oxides and sulphur oxides.);
- mobile sources (cars, transport) which produces oxides of carbon, oxides of sulphur, oxides of nitrogen, lead, benzene.

Air quality assessment was made on the basis of the 349/2007 Order concerning the classification of localities within the Region 4, under the provisions of the order of the Ministry of Waters and Environmental Protection no. 745/2002 on the establishment of built-up areas and classification of built-up areas and areas for the assessment of air quality in Romania through modeling. The effects of changes in air quality, caused by the works of Oltet coal pit, will materialize through the possible increase in certain points of the mining perimeter of the concentration of total dust, gases and fumes resulting from the development of technology into the coal pit.

The most important manifestation points are:

- in the excavation area;
- in the area of sterile dump;
- in the discharge points of the front bands to the joint bands;
- the distribution nodes;
- to the deposit of coal into the deposit and its expedition;
- access roads.

Another potential source of deterioration of air quality is the coal self-ignition in warehouses or in the coal pit layers. Due to incomplete, burnt offerings in the air to emit carbon oxide and small amounts of sulfur dioxide, hydrocarbons light-toxic substances whose concentrations do not exceed the allowed usual limits .[3]

Dust and gas emissions of the specific machinery are appreciate after the fuel consumption and range that runs these activities (pollutant particles in suspension and the sediment materials).

We appreciate that the air pollution in the fuel supply activities, maintenance and repair of means of transport is reduced and can be neglected. Engaged in the activity of mobile equipment deployed in the perimeter will generate emissions in the form of dust and combustion gases (NOx, SO2, CO, CO2, CH4, NMVOC, Table No. 2).

Table no. 2 Emission factors for the main components of fuel gas

Crt. No.	Pollutant	MU	Emission factor
1	NOx	g/kg of diesel	48,8
2	NM-VOC		7,08
3	CH_4		0,17
4	CO		15,8
5	NH_3		0,007
6	N_2O		1,3
7	PM		5,73
8	Cadmium	µg/Kg diesel	0,01
9	Copper		1,7
10	Chrome		0,05
11	Nickel		0,07
12	Selenium		0,01
13	Zinc		1
14	Benz-a-anthracene*		80
15	Benzo(b)-fluoranthene*		50
16	Dibenzo(a,h)anthracene *		10
17	Benzo(a)pyrene*		30
18	Chrysene*		200
19	Fluoranthene*		450
20	Phenanthene*		2500

The machinery, regardless of their type, operating with Diesel engines, the exhaust gases discharged into the atmosphere containing the whole complex of specific pollutants in diesel internal combustion: nitrogen oxides (NOx), volatile organic compounds (VOC), methane (CH4), carbon oxides (CO, CO2), ammonia (NH3), particles of heavy metals (Cd, Cu, Cr, Ni, Se, Zn), polycyclic aromatic hydrocarbons (PAHs), sulphur dioxide (SO2).[2]

The complex of inorganic and organic pollutants emitted into the atmosphere through the exhaust gases contain substances with varying degrees of toxicity. So this stands out, besides common pollutants (NOx, SO2, CO, particle), of substances with carcinogenic potential highlighted by epidemiological studies carried out under the auspices of the World Health Organization, namely: cadmium, chromium, nickel and polycyclic aromatic hydrocarbons (PAHs). It is noticed also the presence of protoxide (N2O)- an inculpative substance in the depletion of stratospheric ozone and methane, which, along with CO2 have global-scale effects on the environment, being greenhouse gases.

2.3. Anthropic impacts on the soil

Influence of coal exploitation on the soil from the mining perimeters is manifested in destroying the soil (in case that no recovery action is taken) mixing and storage together with the sterile result from surface excavations in the early stage of preparatory work.

In the area of mining perimeters, as a result of the stripping works, natural vegetation was completely destroyed on the working surfaces. Sometimes, especially on the outside dump, there can be seen a tendency of the grassy vegetation restoration with

As potential sources of soil pollution in the stage of mining geological extract may mention the following:

- landslides;
- outdoor dumping activity can produce changes in soil quality through the generation of local landsliding across the natural ground.
- mechanical removal of the stripping, activity which affects the structure and soil texture;
- activities of open diggings for construction of any kind;
- arranging conveyor routes;
- works, drainage, drains;
- risk of accidents relating to the complementary works of coal exploitation, from which:
- activities of technological waste storage, spare parts, machinery, coal;
- storage of combustibles and lubricant use for operation equipment;
- dust results from auto traffic and transport of excavated material.

Mechanical work on the ground is achieved when the soil is stripped from the surface of the coal pit.

Besides the structure and soil texture will be affected the bio activity, while activity of exploitation will act on the subsoil through excavation activities, realization of benches and slopes of the working front.

2.4. Anthropic impacts on the bio-diversity

common species, botanical worthless, but with an important process of enriching the soil with organic material.

The process of restoration of grassy vegetation places devoid of mining tasks is fast, but it no longer

retains the existing species before starting work. Generally occur annual plants that contribute to soil fixation and his preparation for restoring the characteristic vegetation of the area.

In the area of mining, terrestrial fauna have suffered significant quantitative changes. The works in the area, men present in large numbers, the bustle, the noise of machinery, on the one hand, the dismantling of the deforestation, grasslands, pickling, scraping, etc. on the other hand, have led to the migration of vertebrate fauna from the site and in the vicinity thereof.

Fauna is currently represented in particular by invertebrates, of which we can mention: lumbricide species, enchytreids, springtails, mites, nematodes, annelide, arthopods. These except for nematodes and mites have a extreme low density in the dumps and poor soil conditions due to lack of food.

3. MEASURES TO REDUCE HUMAN IMPACT ON THE ENVIRONMENT FACTORS

3.1. Measures to reduce human impact on water

By mining technology in the period of exploitation in the coal pit, are provided for the following protection measures:

- the application, in case of need, of all measures to prevent and control accidental pollution under the provisions;
- maintenance of the sewage systems of classification for administrative discharge waters within acceptable limits and compliance with technical norms of equipment exploitation;
- prohibition of any kind of waste disposal in surface waters;
- revisions and repairs to machinery will be done periodically according to the charts and technical specifications, and the fuel supply shall be done only in zones specially designed for this purpose;
- fuel handling is done so as to avoid their dispersal and have always liked on the ground;
- implementation and maintenance of ditches that collects rainwater, in behalf of the rhythm of the opening works, operation and training.

It will be necessary for the entire duration of exploitation to ensure verification measures of water discharged and to identify solutions to pollution prevention and remediation in the event of accidental overflows of dangerous substances.

After the cessation of mining activity in time, naturally it will restore the underground water in the area, to levels that have no relation to the situation existing before.

3.2. Measures to reduce human impact on air

Safeguards provide:

- mobile sources sprinkle access and maneuvering areas during summer which increases the concentration of dust in the atmosphere;
- dust extraction at source by dust generating equipment enclosures;
- movement of coal stocks to prevent self-ignition of coal during very hot;
- compaction of coal during the formation of the stack;
- using overlays for protection; for preventing air access inside the stack of coal; surface and slopes are covered with powdered charcoal, powdered clay layer 10-15 cm, compacted, anthracite (0-3mm) drizzled with oil and compacted. It is also possible to use bituminous slurry of clay (45% bitumen, 25% water, 30% clay), which is applied in liquid form on the surface of the stack, a layer of 2-3 mm. Use as coating bitumen paste clay is possible only when the ambient temperature is above 0 ° C.
- in order to prevent auto-ignition of the coal layers outcropping, stripping not completely, leaving a layer of sterile of approx. 10-15 cm;
- avoid if possible abandonment of coal pillars in the exploited area;
- to isolate a fire or an abandoned coal pillar, will make backfill areas totally;
- avoid introducing foreign material into coal, especially wood;
- monitoring of temperature probes steel pipes to the bottom of the stack, which lowers thermometers, measuring temperature from 2 to 2 m depth; the temperature exceeded 40 ° C, control is made every 12 h, and if the temperature exceeds 60 ° C, coal is consumed immediately;
- playback into the circuit of the remaining productive land to limit the expansion dust in the atmosphere;
- to minimize air emissions through proper design and maintenance of mining facilities through appropriate operational procedures and procedures for emission control.
- using inhibitors in order to reduce loss of quality of coal:

a) *mechanic inhibitors* creates stack surface film that prevents the oxygen in the air and its interaction with coal. Mechanics inhibitors have wide application like lacquers, paints, macromolecular organic substances, combinations oxidative polymerization properties and heating the unsaturated hydrocarbons (bitumen), their halogenated derivatives (polyvinyl chloride) polymerized aldehydes and ketones.

b) *chemical inhibitors* can be grouped into:

- saturated suspension of lime with carbon dioxide, calcium bicarbonate $(HCO_3)_2$;
- chloride ($CaCl_2$) by adding pure clay and lime dust;
- ammonia, ammonia salts;
- mixtures of phenol-formaldehyde resins, polyacrylamide, shale, slag, etc.

After closing the coal pit these sources will disappear.

3.3. Measures to reduce human impact on soil

Impact on soils and their use is to establish a closure plan to maximize the recovery of appropriate uses for

soils affected by soil conservation area. As part of the closing of soil resources in the affected areas will be removed prior to commencement of mining operation and stored separately to be used as material recovery during progressive and final closure. Storage issues are detail addressed in preliminary final closure planning and reclamation of mining activities.

- saving the fertile part of the soil that will be occupied by the technologic flow. In this situation surfaces that can be mechanically harvested and have a fertile soil thickness greater than 30 cm are *arable areas*. [5]

In order not to lose the quality of the topsoil, the stripped soil must be exploited immediately by filing as a fertilizer material on surfaces or other dump areas, even natural land, to increase their fertility (law 18/1991-article 79 and 80).

In view of the decreasing quality of soils due to restrictions caused by natural factors (climate, relief, accented drought) or anthropogenic factors (seasonal cultivation) it is recommended that the soil and agriculture studies to determine what qualitatively and economically area can be stripped of topsoil to be made with one-two years before their occupation.

According to the "Technical project of environmental remediation", surfaces that can be harvest mechanized and having fertile soil thickness greater than 30 cm are arable areas. [5]

- restoration in productive circuit of the remaining lands free from technological tasks;
- avoiding advanced deforestation than those for uncovering land for regressive erosion has uncovered land and limiting the action of rainfall and winds;
- storage of combustibles, lubricants, waste, residues, which would lead to the pollution of soil, only in areas and perimeters specially intended for that purpose outside the perimeter of exploration and observing strict regulations in force concerning environmental protection;
- elaboration of waste evidence still unused and whose uncontrolled clearance may affect the quality of soil or other components of the environment;

To prevent pollution of soil and groundwater with petroleum products it will be implemented the following measures:

-fuel supply of transportation and machinery will be made from petroleum products workstations and in case of impossibility of technique fueling from coal pit, it will be made with the utmost attention only on the concrete surface;

- verification of the integrity of the fuels and lubricants and if it is noticed a malfunction, it has to be fixed in the shortest time;
- verification of the integrity of concrete platforms on which are stored petroleum products and/or technological waste.

3.4. Measures to reduce human impact on bio-diversity

To protect flora, must be considered:

- avoid losses of disordered materials (lubricants, fuels);
- measures to limit emissions of dust in the air;
- development and improvement of technological tasks freeing up land for them to be planted.

In the early years lands will be cultivated with species and then with technical plants, for testing. After a period of about 4-5 years the land can be restorable to productive agricultural or forest circuit.

The problem of local fauna is linked to the reconstitution of the existing bio-type before the degradation of the area, which is partly made possible by rearranging the mining perimeter but only by closing of the operation of the coal pit.

Once reinstalled, the flora, fauna and other works of protection and restoration of the environment the climate conditions recover. For the impact to be reduced one it is recommended carrying deforestation outside periods of reproduction of the species.

It is recommended to be done between October-March, so besides the vegetation period of plants and breeding of animal species. It will not be done in loss periods as it is not allowed any form of disruption for bird species.

4.CONCLUSIONS

Oltet mining perimeter, which is part of the Amaradia-Taraia mining field, was awarded to Horezu mining Enterprise. On the basis of geological and hydro-geological, engineering structures exploration and exploitation, carried out by the year 2013, respectively of the documentation prepared and approved, it has been developed the medium-term strategy for further exploitation of primary energy resource reserves (lignite) mining perimeter in the conditions of market economy.

The environmental impact caused by coal mining, is significant, unavoidable and irreversible, affecting water systems, air, natural mineral resources, ecosystems, climate, geomorphology and land use, landscape and human collectivity.

The inclusion of environmental protection actions and ecological restoration of degraded areas in the works carried out in the mining perimeter have the role to control and limit the negative effects of coal exploitation and to ensure the recovery of the affected areas, the natural conditions prevailing before the start of the operation, both during the mining activity and its closure.

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