

Environmental Impact of Mining and Chemical Industry

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Abstract – The work is devoted to problems of environmental impact in mining and chemical industry.

The purpose of the work is to evaluate the impact of mining activities on the environment.

It is shown that mining activities have resulted in land degradation leading to limited land available for local population, the accumulation of large-tonnage wastes, the presence of contaminants in soil and water, distortion of terrain, activity of various geophysical processes.

Keywords – environmental impact, mining, mining and chemical industry, large-tonnage wastes, water pollution, soil pollution, heavy metals, liquidation, reclamation.

I. Introduction

Minerals extraction is associated with both opportunities and challenges. Historical concerns around work conditions and the competitiveness of the mining sector have been complemented by a growing number of other issues. Today, an overarching goal is to find ways by which the mining sector can promote sustainable development.

Sustainable development is often defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” Furthermore, it is commonly agreed that this must incorporate economic, environmental and social concerns.

The relationship between extractive industries and sustainable development was analyzed in the literature, but the problems of the impact of mining on the environment are not sufficiently studied, especially at the stage of their closure.

When active mining ceases, mine facilities and the site are reclaimed and closed. The goal of mine site reclamation and closure should always be to return the site to a condition that most resembles the pre-mining condition. Mines that are notorious for their immense impact on the environment often made impacts only during the closure phase, when active mining operations ceased. These impacts can persist for decades and even centuries. Therefore, the Environmental Impact Assessment for every proposed mining project must include a detailed discussion of the mine Reclamation and Closure Plan offered by the mining proponent.

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II. Materials and methods of research

The impact of mining on the natural environment begins with geological exploration. There are the following types of environment violations:

- geomechanical (changes in the natural structure of the mountain range, terrain, surface layer of ground, soils, including deforestation, deformation of the surface);
- hydrogeological (change of stocks, mode of movement, quality and level of groundwater, water regime of soils, removal of harmful substances into rivers and reservoirs from the depths of the earth);
- chemical (change in the composition and properties of the atmosphere and the hydrosphere, including acidification, salinization, water pollution, and the increase of phytotoxic elements in water and air);
- physical and mechanical (air pollution, its heating, changes of soil cover properties, etc.);
- noise pollution, vibration of soil and rock mass, emissions of rock in explosions; deterioration of the transparency of the atmosphere and other possible phenomena that accompany mining, negatively affecting the environment.

Consider the negative impact of mining and chemical activities on the environment of Rozdil state mining and chemical enterprise “Sirka”, which has been at the stage of liquidation since 2003. There is a distortion of the terrain of the quarries, tailing pits, dumps at the stage of liquidation. The soil cover is negatively affected, the fertility of soil in the territory decreases due to the activity of the mining and chemical enterprise.

The mining and chemical enterprise has left behind a large-tonnage wastes, which are difficult to apply to reduce their quantity. In these wastes and soils near them there are an excess of the maximum permissible concentration of heavy metals that migrate through soils and water objects. In place of the quarries man-made lakes were formed, which fall into the Dniester river through the channels. The maximum permissible concentration of many hydrochemical parameters is exceeded in water objects on the territory. They are: Chemical Oxygen Demand, pH, sulfates, mineralization, iron, dry residue, etc.

In addition, on the territory of the enterprise 17,195 tons of “MG” type modifiers, made from neutralized tar residues and residues boiler anhydrite maleic acid were imported from Hungary.

Complex man-made impact of mining activity leads to violations of the geological environment, which are divided into:

1. geomechanical (Fig. 1) [3];
2. hydrogeological (Fig. 2) [3];
3. violation and pollution of the airspace;
4. changes in flora and fauna.

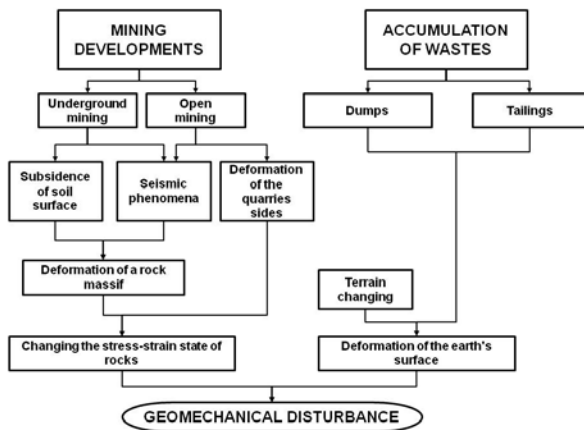


Fig.1 Causal and consequential scheme of geomechanical disturbance formation

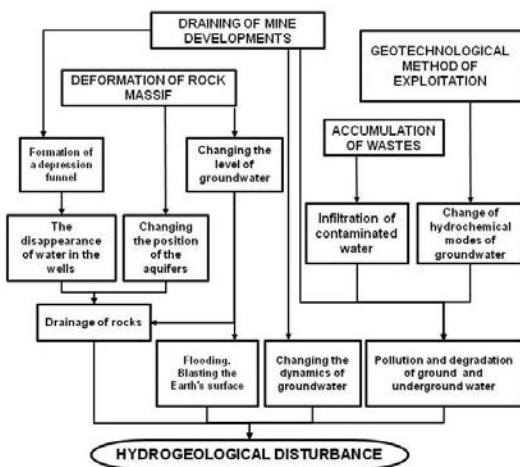


Fig.2 . Scheme of formation of hydrogeological disturbance of the mining industry

Deforestation and vegetation violations occur in open pit mining areas, during storing on the surface of overburden and dumps of mineral raw materials, laying roads and building structures for the maintenance of mining enterprises. Violation of the earth's surface occurs during the disclosure of minerals in places of quarrying, placement of shafts of mines and siege structures, underground extraction of minerals as a result deposition of surface. After removing the rocks, the surface of the soil sinks. The formed deposits are filled with water.

III. Research results and discussion

The problem of dumps, however, is so big that it can not be completely solved through their use as raw materials. None, even such material-intensive production, as construction, does not require such large volumes of raw materials. In addition, not all the overburden and rocks that are extracted intermittently, can be classified as minerals. According to estimates of geologists of Ukraine, currently 15-20% of overburden can be suitable. Areas occupied by dumps, like all the territory, affected by mining operations, are subject to reclamation. In Ukraine, the mining industry employs about 190,000 hectares of

land. Annually 7,000-8,000 hectares are allocated for this purpose, with about 40-50% of all land plots are occupied by dumps. Reclamation of land after mining operations involves preserving the land resources of the country and providing the population with normal sanitary and hygienic conditions of life.

In accordance with the requirements of the current environmental legislation, all land that is violated as a result of extraction and processing of minerals, subject to re-establishment. The restored landscape occurs as a result of the interaction of a complex of liquidation, rehabilitation and reclamation works after the completion of the exploitation of the deposit with the processes of natural self-restoration. The program of liquidation of the mining enterprise must ensure the physical and chemical stability of the affected areas, regulate the hydrogeological and hydrological relations, and offer a monitoring system that required minimum [4].

Conclusion

On the example of the territory of the Rozdil state mining and chemical enterprise "Sirka" it was established that the mining and chemical activity has a negative technogenic impact on the environment.

Exploitation of mineral resources causes significant environmental impact. The large areas of agricultural land become unfit for use, also there is the damage to soils, forests, the hydrological regime of large territories changes and their productivity decreases, even the terrain and the movement of air flows change. Extraction of mineral raw materials leads to the creation on the large areas of anthropogenic-mining industrial landscape, which is characterized by surface accumulation of mountain masses (dumps, heaps, sludges), as well as other forms of terrain – quarries, areas of subsidence of a surface above mine fields, etc.

The activity of mining enterprises should be aimed at extraction of the maximum amount of necessary minerals. It should also be aimed at preserving them in immovable condition or derived and properly constructed formations that can become useful minerals in the future and for the reclamation of disturbed territories.

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