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IMPACT OF WASTES FROM THE EXTRACTION AND PROCESSING OF NON-NATURAL MINERALS THE ENVIRONMENTAL SITUATION IN THE REGION

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Influence of waste of extraction and production of a construction stone, rock salt and oil on biosphere components is considered.

At present, stocks with poor content of useful components are increasingly being used, resulting in increased energy consumption for their extraction and processing, increased waste and pollution. Modern ecosystems of mining, metallurgical enterprises and fuel and energy complexes are very dangerous to human life. This is due to the enormous emissions of gases and dust into the atmosphere; the formation of hazardous runoff that degrades water and soil resources; with the disruption of the balanced state of ecosystems; with a fundamental change in historical landscapes with their biocenosis.

Waste remaining after mining or processing of minerals is usually stored in special storage facilities. Solid mineral waste stores have a negative impact on the environment. Their placement causes pollution of the atmosphere, soil, surface and underground water bodies. Pollutants often have toxic or radioactive properties. Reaching 100 meters high, waste storage facilities affect the wind regime and thus change the climatic conditions of the area in which they are located. They have considerable mass, and their placement causes changes in mountain pressure in the subsoil and hydrogeological regime [1].

Solid wastes from mining occupy large areas, thus preventing the use of potentially beneficial lands that could provide additional material benefits to the society. And for waste-generating enterprises, this results in payments for land.

The volume of accumulated waste at storage facilities (in departmental storage areas and on the territory of enterprises) increased by 4 % in 2015 and amounted to about 1094.2 million tons at the end of the year (Table 1). The largest accumulation volumes are typical for halite wastes and clay-salt slimes, the amount of which in saltwater and sludge storage facilities is given in Table 1.

The problem of mining wastes is considered in various aspects. From an environmental point of view, gas wastes, such as sulphur gas and other sulphur compounds, carbon oxides and nitrogen oxides, amounting to more than 1 billion tons per year, are the most alarming. Emissions of dust containing metal compounds are tens of times higher than emissions of natural sources (volcanoes, forest fires, dust carried by wind, etc.). Consumption and pollution of water by mining industries is about 10 m^3 per 1 tons of extracted minerals. On average, 0,1 hectares of land for every 1000 tonnes of raw material is allocated to rock dumps, and they occupy hundreds of millions of hectares, most often uncomfortable and in some cases quite fertile land. Nature's recreational ability is no longer coping with increasing amounts of mining-produced waste, leading to irreversible habitat pollution [2].

The extraction of construction stone and the production of products of its crushing and grinding are very important in Belarus. In Brest region RUE Granit is developing a field of construction stone Mikashevichi (Luninecki district). It refers to the Zhitkovichsky-Mikashevichsky ledge of the Poleskaya saddle, represented by diorites, granodiorites and granites, which lie at depths from 7.3 m to 41.2 m. The volume of production of construction stone is 15-16 million m^3 annually.

In the process of granite production, there are a number of problems affected on the environment. In its extraction, processing and use, agricultural land and forest land are seized; the habitat of some living organisms is destroyed; soil erosion occurs; this natural resource is exhausted and not renewed; the composition of explosives used in the open development of quarries has a negative impact on the environment; a significant amount of water is consumed (granite polishing); waste water is contaminated; the working area is contaminated with dust. Granite also includes uranium, which, as a result of radioactive decay, is the source of radon formation [3].

Stone salt is one of the most important minerals in Belarus. Its resources, timed to the Devonian salt thicknesses of Pripyat deflection, are almost inexhaustible.

Currently, three largest fields have been explored: Mosyrskoe, Starobinsky and Davydovsky. The two first ones are operated. Total reserves - about 22 billion tons. During the decades of operation of the potash deposit in Soligorsk, more than half a million tons of waste have accumulated on the surface on the area of more than a thousand hectares (for the sake of clarity, it is about ten territories of the Minsk botanical garden, which is one of the largest in Europe).

Potash waste cannot be isolated from the area around it. They consist of water-soluble salts that easily penetrate groundwater and negatively affect the health of local residents. When exposed to atmospheric precipitation, wind and water erosion, terricons are sources of environmental pollution. Huge amounts of gases and dust aerosols are released into it. The deposition capacity of salt particles per year is approximately 600 tons. The total area of salted soils - about 900 hectares, of which the share of dust and gas pollution accounts for 85 %, the rest of the territory is salted with terricone brine [4].

Table 1 – Quantity of potash fertilizer production wastes in salt and sludge storage facilities of JSC "Production association "Belaruskali"

Year	Total waste in saltwater	Total amount of clay-salt sludge
2010	807159,5	96704,8
2011	832323,5	99655,9
2012	854587,4	702150,4
2013	873723,3	104254,4
2014	902873,8	107332,0
2015	932722,6	110484,1

Settling on soil, emissions contaminate the upper fertile arable soil layer with salts and heavy metals. Maximum pollution is observed in spring, when there is no continuous vegetation cover, and the amount of precipitation is minimal. For this reason, salt dust and heavy metals settling from smoke waste accumulate on the soil surface. In autumn, salts falling on the soil surface dissolve under the influence of precipitation and migrate from the upper layers to the deeper ones.

Salinization of soil, surface and groundwater is observed at salt waste storage sites. Fresh groundwater is the most vulnerable to intensive man-made contamination, as there are no clay water supports in the geological section of this region [5]. The ground water salinization front is almost universally expanded beyond the contours of salt tanks and sludge storage facilities. Salinization areas increase every year and spread to surface waters. Thus, in the water of Soligor reservoir increased content of sulphates, chlorides, hydrogencarbonates was found.

Drilling wells are used to develop deposits of fresh and mineral groundwater, table salt (by underground dissolution method) and oil extraction.

More than 2,000 wells with a depth of more than 2,500 m have been drilled for oil exploration and production in Belarus, including 7 wells with a depth of more than 5,000 m. More than 600 hectares of land in the area of oil production have been disturbed and contaminated with spent drilling fluids, wastewater and drilling mud. Oil in Pripyat deflection is referred to as inter-salt or salt deposits; therefore, all wastes are salted. The volume of drilling waste water at each well is about 4 – 5 thousand m^3. 20 years after drilling, no wells have recovered soil fertility and have not been completely salted.

There are 2 main methods for storing and burying drilling drains:

– To accumulate in special earth barns (pits) with a depth of about 2 m and a volume of more than 2 thousand m^3. The depth of the pits does not reach 2 m, but their area increases significantly. Research of Rechitsky, East Pervomaysky and other fields showed that the area of salinization ranges in them reaches 4 – 5 hectares. Salt content in soils is 0.5 to 30 g/kg depending on distance from barns. Water mineralization at depth 2 – 5 m is 50 – 60 g/l, while natural mineralization – 0.5 – 1 g/l;

– Pumping into deep aquifers (more efficient). In 1974-1975 drilling waters were buried in the thickness of Perm and Triassic deposits. Intake capacity of absorbing wells is – from 120 to 1060 m^3/day. At mouth pressure 20 – 60 kg/cm^2. Drilling drains were pumped for 3 – 3.5 months. Volume of injected effluents – from 1600 to 5250 m^3. As a result, the salinity range was 5 – 6 times less than in wells with barns. For example, at Demehovsky field - only 0.8 hectares [6].

During extraction, enrichment and processing of ores of ferrous and non-ferrous metals, mining-chemical and coal raw materials a huge amount of wastes is generated, which differ by a great variety of physical and mechanical, technological and other properties. At the stage of ore mining solid wastes are formed in the form of overburden and containing rocks, empty mine rocks, non-standard ores, wastes of flotation, gravity, dumps of flotation washing are generated at the stage of enrichment of the extracted raw materials.

On the one hand, the prevention of a possible ecological catastrophe consists, , in the method and amount of extracted energy, on the other hand, in an integrated approach to the rational use of natural resources, in the extraction of minerals, in the use of the whole volume of extracted ores, most of which are stored in tailings and in the contours of deposits already developed according to the operating conditions.

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ВОЗМОЖНОСТИ ИСПОЛЬЗОВАНИЯ АЭРОГЕЛЯ КАК ПЕРСПЕКТИВНОГО ТЕПЛОИЗОЛЯЦИОННОГО МАТЕРИАЛА С ЦЕЛЬЮ СОЗДАНИЯ СОВРЕМЕННЫХ МОДЕЛЕЙ СПЕЦОДЕЖДЫ ДЛЯ КРИТИЧЕСКИХ ТЕМПЕРАТУР

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В настоящие время отмечается тенденция активного освоения месторождений Крайнего Севера. Статья посвящена аэрогелю, свойства которого позволят благоприятно повлиять на работоспособ-