

# THE IMPACT OF COAL WASTE HEAPS ON THE ENVIRONMENT OF SOKAL DISTRICT OF LVIV REGION

Vasyl Popovych and Andriy Voloshchyshyn

*Lviv State University of Life Safety, Lviv, Ukraine*

*popovich2007@ukr.net*

The environmental situation in Sokal district is one of the most complicated in Lviv region, which is caused by man-made environmental impact of mining, coal preparation and chemical industries. Most of the territory is occupied by coal waste heaps.

Chervonograd mining region is centered in the Sokal district of the Lviv region. According to engineering geological zoning it belongs to the central part of Lviv-Volyn Coal Basin, located at the western border of Ukraine with Poland on the border of Volyn and Lviv regions. This basin is the south-east part of Lublin Coal Basin, which spreads over the large territory in Poland.

One of the major air pollutants within Sokal administrative district and Chervonohrad industrial area is mining industry that is a part of the State Enterprise "Lvivuhillia" and "Lviv Coal Company" (Central Coal Enrichment Plant "Chervonohradska"). Harmful air emissions of the State Enterprise "Lvivuhillya" varies from 6.3 to 7.1 thousand tons per year (sulfur dioxide – 3.9–4.1 thousand tons; nitrogen dioxide – 0.7–0.9 thousand tons; carbon monoxide – 1.0–1.2 thousand tons; solids – 0.7–0.9 thousand tons).

Production activities of mining complex that led to significant changes in the landscape of the region (ground subsidence in the coal bed working areas are 2–4 meters deep), includes environmentally hazardous facilities like waste heaps (the total area of which is 265.9 hectares and the volume of accumulated waste products is 42.1 million cubic meters), coal stores, storage ponds and mine water filter beds. The part of burned rocks in the total amount of rock recovered over the years of mining operation is around 25–30%.

The most dangerous sources of pollution are the burning coal waste heaps. Their combustion causes hazardous air emissions over the vast area. The burning of waste heaps is activated by the moisture and oxygen. The most prominent representative is the waste heap of "Lviv Coal Company", which is located in the village of Sielets, Sokalsky district, Lviv region.

Burning waste heaps are the source of air emissions of around two dozen pollutants: hydrogen sulfide, carbon monoxide, carbon dioxide, sulfur dioxide, hydrogen sulfide, nitrogen oxides, sulfuric acid, sulfur dioxide, hydrogen cyanide, ammonia, cyanides, thiocyanates, etc. It was determined that during combustion of 1 kg of rocks the air emissions tend to 6.7 up to 8.7 mln. m<sup>3</sup>. Numerous scientific studies have established that at temperatures of rock above +100 °C Hg is transferred in an elemental form, and at temperatures below +100 °C it is transferred in the form of chloride (HgCl). Also Cd and Zn can be transferred in small amounts in the elemental form at temperatures above +400°C. In the temperature range of +200-400°C prevail forms of CdCl, ZnCl<sub>2</sub> and ZnBr<sub>2</sub>.

Lithologically waste heaps are represented by argillites, siltstones, sandstones, coal and other rocks. Over 70% of waste heaps are made up of clay argillites, which promotes sorption of heavy metals (Li, B, P, Zn, Pb, Bi, Co), and due to high sulfur content (pyrite) – Hg and As. Significant sulfur content in waste heaps causes local fires, resulting in sulphides transformation into sulphates and acidic water formation in the foot hill of waste heaps.

It is well known that temperature inside burning coal waste heap reaches +1000°C and even more. The combustion process lasts for 20 years. The above indicates that the use of heat that is released during the combustion of coal waste heaps can solve three problems, namely environmental, economic and social ones.

**Key words:** Coal Waste Heap, Combustion, Environmental Hazard