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VIEWPOINT

Soil and natural water contamination risk in the industrial area of Partizansk Coal-Burning Power Plant (south of the Russian Far East)

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The Partizanskaya River valley is located in the southernmost area of the Russian Far East (figure 1). It is a unique ecosystem as it was not affected by glaciations in the Quaternary Period and preserved the southern and northern flora species. The uniqueness of the geographical location predetermined favorable natural conditions in that valley, causing active settlement from the middle of 19th century and development of a few sectors of agriculture, coal industry, fuel, and energy. In the second half of 20th century, the area suffered a decline of economic development, resulting in a number of ecological problems that could lead to environmental catastrophe in the region.

One of the industrial structures in the area is the Partizansk Coal-Burning Power Plant (CBPP), operating since 1954 (figure 2). Due to the increase of power consumption in the southeast region of Primorskiy Krai by 4.7% to 6% each year, the plant was renovated in 2008 to 2009.

Partizansk CBPP has continued negative impacts on the environment. Ash is the main contaminant. Partizansk CBPP annually produces up to 100,000 t (220,462,233 lb) of ash. The problem is the overfilled old ash dump. It was thoroughly exhausted in 2002. The search for a new site began in 1986, and by 1999, a candidate site was selected in the Novaya Sila community in Partizansk district outside the Partizanskaya River basin. However, the referendum held in 1999 by community inhabitants outvoted the ash dump in the district.

Ash dumps are typically separated from other environmental objects by a dam. However, during the great floods in 1989, 1992, and 1995, the ash dump's dam was damaged. On May 22, 2004, heavy rain broke the ash dump dam, causing the discharge of about 100,000 m^3 (3,531,466 ft^3) of industrial wastes into the Partizanskaya River. The samples of polluted water in the Partizanskaya River estuary showed radioactive components. An ecological study in 2005 showed high radioactivity levels.

Partizansk CBPP's ash is an artificial bulk material, deposited on alluvial gray humus soil. The fill is layered with the dominant gray color. The top 30 to 50 cm (1 to 1.6 ft) of ash dump mass is dry, while moisture increases the deeper you go. Most of the ash dump area is covered with a thin layer of a brown-orange substance—latex used for ash dump remediation. However, heavy monsoon rains broke both this cover and the ash dump body, causing erosion processes. In general, ash is an erosion-unstable substance. An ash dump diffuses more during humid periods, grows in volume, gets heavier, and floats like water (50% moisture) in the rainfall season.

Two solutions to improve the ecological situation in the Partizansk CBPP area are ash dump remediation and development of technologies to utilize ash in different industries. Another possible solution is refitting the CBPP to gas combustion upon the construction of gas pipeline from Sakhalin Island.

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Figure 1

Location of Partizansk Coal-Burning Power Plant.

Figure 2

The industrial area of Partizansk Coal-Burning Power Plant.