

Article

Dust and Noise Environmental Impact Assessment and Control in Serbian Mining Practice

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Abstract: This paper presents an approach to dust and noise environmental impact assessment and control in Serbian mine planning theory and practice. Mine planning defines the model of mining operations, production and processing rates, and ore excavation and dumping scheduling, including spatial positioning for all these activities. The planning process then needs to assess the impact of these mining activities on environmental quality. This task can be successfully completed with contemporary models for assessment of suspended particles dispersion and noise propagation. In addition to that, this approach enables verification of the efficiency of suggested protection measures for reduction or elimination of identified impact. A case study of dust and noise management at the Bor copper mine is presented, including the analysis of the efficiency of planned protection measures from dust and noise, within long-term mine planning at the Veliki Krivelj and Cerovo open pits of the Bor copper mine.

Keywords: dust and noise impact assessment and control; air dispersion modeling; AERMOD; noise mapping; SoundPLAN; mine planning

1. Introduction

Adapting the environment to the needs of the social community has consequences that are often unexpected, due to delicate equilibrium of all ecological components. Technogenic impact within the ecosystem can generate a feedback loop to the initiators, causing new conditions and unfavorable effects to the environment and humans. Surface mining and mineral processing, with their salient feature, can pose a threat to the environmental quality. Therefore, activities such as exploration, planning, surface extraction, crushing, milling, flotation, and waste dumping, might cause significant problems for environment protection [1].

The most important parameters for air quality within the area of active surface mines are total suspended particles (TSP) and particles with an aerodynamic diameter smaller than $10\text{ }\mu\text{m}$ (PM₁₀) [2–4]. Dispersion of (airborn) dust is related to all unit operations of surface mining systems [3–6]. It has been established that air dispersion of TSP and PM₁₀ relates to meteorological conditions, besides the technological ones [7–10]. The highest dust concentrations were measured within the area of surface mines, gradually decreasing with distance [9].

Holmes and Morawska [11] analyzed various available dust particles dispersion models, including the Box model, Gaussian plume model, Lagrange-Euler model, and CFD (Computational Fluid Dynamics) model. They concluded that the major shortcoming of particles dispersion modeling was the lack of validation studies, comparing estimated and actual values. Chaulya et al. [12] compared FDM (Fugitive Dust Model) and PAL2 model (Point, Area, and Line sources model) with experimental data during the winter season in the region of a coal mine in India. The results were a correlation coefficient of 0.66 for PAL2 model and 0.75 for FDM. Jaiprakash et al. [13] used AERMOD model and compared

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