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The Pollution Potential of Water and Soil at Coal and Iron ore Mines in Mongolia

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Mongolia is one of the countries with vast amount of natural resources, and subsequently mining industry covers the core of the national economy. However, mining subsurface materials to above ground surface causes various environmental problems from dust to water pollutions. Thus, the environmental management system needs to be implemented for prevention and mitigation of mining disasters and for the sustainability of both the society of mining area and the resource development itself. This study is objected to identify pollution potential of water and soil in the typical coal and iron mining areas of Mongolia, and to provide the baseline information on the current situations of the mines for their environmental sustainability.

Study areas cover Baganuur coal mine and Tumur Tolgoi iron mine, presently under operation as open-pit mining. Water samples include surface water from the discharge, lake, groundwater and seepage water (probably interflow) flowing through the exposed bedrock and ore bodies. Soil samples were collected from waste dumps and background pasture. Chemical compositions of water and soil samples were analyzed and compared with national and international environmental guidelines.

Groundwater samples from both mines were acceptable to drinking compared with WHO guidelines. Groundwater in the Baganuur coal mine shows mostly C3-S1 type in the SAR plots, implying potential utilization for halophyte to prevent desertification and dust generation. In the Tumur Tolgoi mine, surface water, that is applied to prevent fugitive dust, has exceeding levels of Ni, NO_3, and SO4, Thus, potential impacts by these components to water and soil characteristics need to be further studied.

Soils in between coal seams of the Baganuur mine show high S content and pH of 2.77, implying the potential of AMD generation. In the Tumur Tolgoi iron mine, waste rocks have also pyrites showing the potential of AMD generation, however, the AMD could be easily buffered by carbonate from marbles in the bedrock. Particle size less than 150 μm covers more than 80% of the particles less than 2 mm in diameter, indicating that desertification is possible in both mining areas. In addition, in the Tumur Tolgoi, the dust contains high levels of As, Cd, Cu, Co, Zn and Mo exceeding the soil pollution guidelines of Mongolia.

In summary, water pollution by the AMD and metal dissolution is possible in the Baganuur, but could be limited in the Tumur Tolgoi due to the acid-buffering interaction with marbles. Fugitive dust generation, desertification and potential soil pollution by metals are possible in both mines, requiring proper management measures.