# Heavy metal contamination in the vicinity of some abandoned base metals and Au-Ag mines in Korea : A Review

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Heavy metal contamination in the areas of abandoned metal mines in Korea was investigated to assess the level of metal pollution and to draw general conclusions about the fate of toxic heavy metals in the mining areas. In this study, a total of eight abandoned base-metal and Au-Ag mines were selected, and the results of environmental geochemical surveys in those areas were discussed and compared between sites.

In the base-metal mining areas, such as the Sambo Pb-Zn-barite, the Shinyemi Pb-Zn-Fe, the Geodo Cu-Fe and the Shiheung Cu-Pb-Zn mine, agricultural soils, stream sediments and stream water around each mine were severely contaminated by heavy metals. The dispersion pattern of metals was mainly controlled by the feature of geography, prevailing wind and the distance from the mine. Most heavy metals were identified as non-residual chemical forms, and those are very susceptible to the change of ambient conditions of a nearby environment. In general, Cd and Zn have a higher fraction in exchangeable form than other elements presenting the highest mobility in the soils or sediments. Analysis of metals in plants from the study areas indicates that leafy vegetables, especially tobacco, tend to accumulate higher metal concentrations than grain or fruit crops. In the Sambo mining area, significant levels of metals were found in rice grain which can lead to a large amount of metal intake by residents, and relatively high contents in plants were found under the oxidizing conditions rather than the reducing environment. Particularly, Cd and Zn were more easily uptaken by plants due to the different geochemical

behaviour of the metals.

In the Kubong, the Samkwang, the Keumwang and the Kilkok Au-Ag mine areas, elevated levels of As, Cd, Cu, Pb and Zn were found in agricultural soils and food crops sampled in the vicinity of mine tailings. Arsenic might be the most characteristic contaminant in the Au-Ag mining areas. The main As sources were from tailings and its effluent which have been discharged directly into nearby stream and agricultural area without treatment or control. Arsenic and heavy metals were found to be mainly associated with sulfide gangue minerals, and mobility of these metals would be enhanced by the effect of oxidation. In order to assess the level of heavy metal contamination, the concept of pollution index was applied in this study. Because soil contamination involves not single but a number of elements, it is convenient to treat and interpret multi-element data simultaneously. The elements included in this pollution index were As, Cd, Cu, Pb and Zn.

It is strongly recommended that an environmental guideline for reclamation in the vicinity of abandoned mine areas should be set and the environmental impacts of past and present mining activities must be monitored continuously. Finally, interdisciplinary coworks with specialists in medical geology or environmental toxicology is needed to investigate the adverse health effects to the residents or animals in the study areas.