Arsenic enrichment in the soil of the Salek Valley, Slovenia

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Arsenic is distributed rather uniformly in major types of rocks and its common contents in most rocks range from 0.5 to 2.5 μg/g. Although arsenic minerals and compounds are readily soluble, arsenic migration is greatly limited due to the strong sorption by clays, hydroxides, and organic matter. Strongly adsorbed arsenic in soil is hardly to be desorbed again and generally the retention of arsenic by soil progressed with the years. Arsenic enrichment in agrillaceous sediments as well as in surface soils, as compared to contents in igneous rocks, apparently reflect also some external arsenic sources, such as pollution (Kabata&Pendias and Pendias, 1986). Significant anthropogenic sources of arsenic are related to industrial activities (coal combustion, pyrometallurgical non-ferrous metal production, steel and iron manufacturing, cement production, etc.) (Dobson *et al.*, 1992), in agriculture the use of arsenical pesticides and arsenical sprays. Numerous studies have demonstrated significant arsenic contamination in soil, plants, and animals in the vicinity of combustion sources (Adriano, 1986).

In the Salek valley, which is one of the most polluted areas in Slovenia, the coal-fired Sostanj Thermal Power Plant (TPP) is a large regional emission source of SO_2, NO_x, dust and trace elements.

In the Salek valley several environmental pollution studies have been made in which the general effects of industrial activities were investigated. Estimation of soil contamination related to air pollution began recently in the Salek valley. In this work a study of arsenic enrichment in the soil of the Salek valley is presented with the aim of estimating the arsenic contents in three different types of soil in comparison to the background content.

Method

Soil were chosen on three mean geological formations in the valley (andesitic tuff, pliocene sediments, and calcareous rocks). See Fig. 2. At each formation

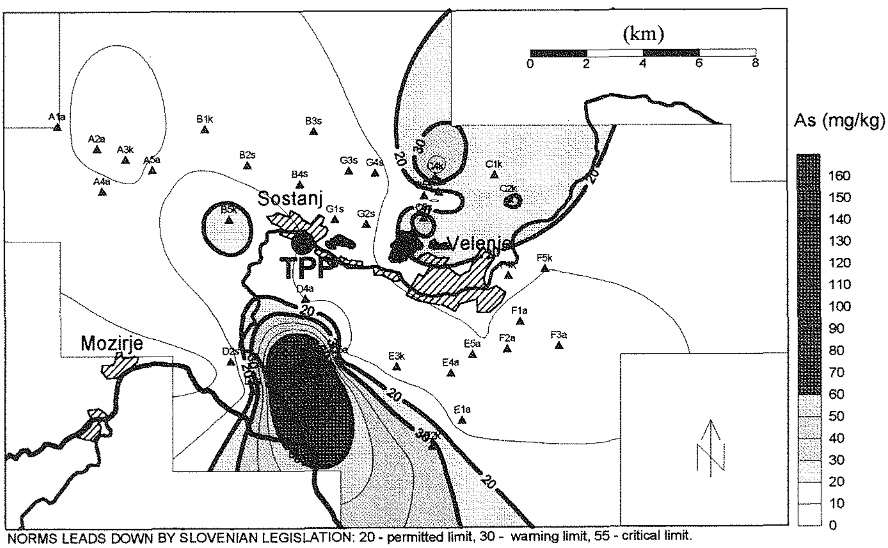

FIG. 1. Map of sampling locations and interpolated As contents.

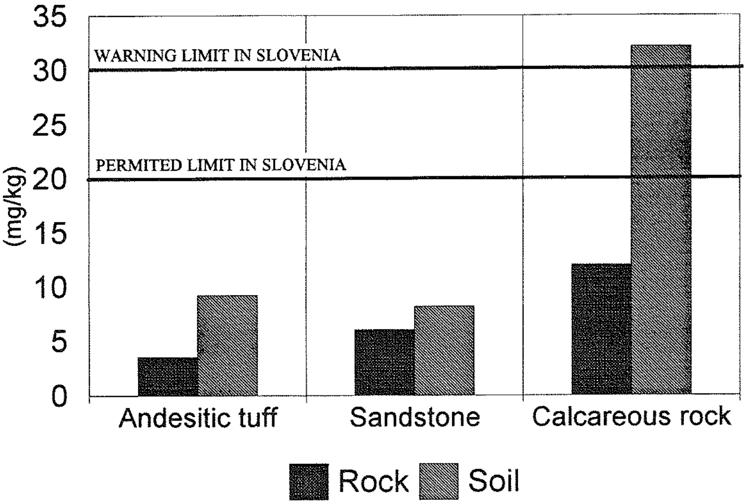

FIG. 2. Average As contents in different types of soil.

15 samples of soil were taken and 3 at a reference station. There also rock samples were taken. All together 54 samples of soil at the 10 cm soil depth and 18 rock samples were analysed. The content of arsenic in soil and rock samples was determined by the inductively coupled plasma method (ICP), after a total digestion using HNO_3-$HClO_4$-HF and HCl.

Results and discussion

The results shows increased contents of arsenic in the soil, which also exceed the norms laid down by Slovenian legislation (Fig. 1). Arsenic is enriched in soil of calcareous rock, whereas in soil of andesitic tuff and sandstone rock its contents are normal (Fig. 2). Results of arsenic enrichment in soil apparently reflect parent rock and an external arsenic source, such as air pollution.

References

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