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Antimony and arsenic distribution and impacts at a derelict antimony mine in Scotland

Lenka Mbadugha, Duncan Cowper, Sapar Dossanov, and Graeme Paton
University of Aberdeen, Institute of Biological and Environmental Sciences, Plant and Soil, United Kingdom of Great Britain – England, Scotland, Wales (lenka.mbadugha@abdn.ac.uk)

Mining activities are acknowledged to introduce contaminants into localised environments and cause wider spread diffuse pollution. The concentration, distribution and fate of arsenic (As) and antimony (Sb) were studied at the former metalliferous Louisa Mine at Glendinning, Scotland. The associated deposit is one of very few able to produce Sb in the UK and was mined for three brief periods between 1793 and 1922.

The remnants of the mine consist of the ore processing area and two spoils. Soils withing these zones as well as around the mine were sampled and complemented by water samples from the adjacent stream, the Glennshanna Burn. All samples were subsequently analysed to map the distribution of contamination and identify pollution sources. The maximum concentrations of As and Sb, 15490 and 1504.2 mg kg^{-1} respectively, were determined in soils associated with the ore processing area and spoil heaps. Anthropogenic activities also redistributed As and Sb within these mine zones and altered their relative ratios. The fractions of dissolved As and Sb in soils were < 1 and < 5% of total soil content, respectively, confirming findings of previous studies that As and Sb are relatively immobile. Yet, the concentrations of As and Sb released by soils exceeded regulatory limits.

Concentrations of As and Sb in surface water in the immediate vicinity of the mine were impacted by a gully discharge, but rapidly diluted. While the concentrations affected by the run-off waters did not exceed EU environmental standards for freshwater, the concentrations of As and Sb sharply increased to 11.43 ± 3.43 and 9.28 ± 0.59 µg l^{-1}, respectively, approximately 100 m downstream of the mine site. The unaltered As to Sb ratios in water samples suggested a geogenic source of contamination.

While there is a justifiable concern about the soil pollution caused by the historic mining in the studied area, the Glenshanna Burn is affected more by indigenous geochemical processes than the derelict mine.