Soil and groundwater contamination with heavy metals at two scrap iron and metal recycling facilities - DTU Orbit (18/10/2019)

Soil and groundwater contamination with heavy metals at two scrap iron and metal recycling facilities

Field studies were performed at two actual scrap iron and metal recycling facilities in order to evaluate the extent of heavy metal migration into subsoil and groundwater caused by more than 25 years of handling scrap directly on the ground without any measures to prevent leaching. Surface soil samples, called 'scrap dirt', representing the different activities on the two recycling facilities, all showed very high concentrations of lead (Pb), copper (Cu) and zinc (Zn), high concentrations of cadmium (Cd), chromium (Cr) and nickel (Ni) and somewhat elevated concentrations of many other metals. In particular high concentrations were found for Pb at the car-battery salvage locations (13 to 26 g Pb kg\(^{-1}\)) and Cu at the cable burning location (22 g Cu kg\(^{-1}\)) at one site. The migration of metals below the surface in general (except at the car-battery salvage locations) was very limited even after approximately 25 years of activity. Soil and soil water profiles all showed elevated concentrations in the upper 40 cm but below this depth the soil concentrations as well as the soil water concentrations of metals were comparable with the concentrations found in uncontaminated reference profiles. The retention of the metals in the upper part of the profile was supposedly due to sorption as well as precipitation processes. At one site the metals had migrated to 80 cm depth at the car battery salvage location and at the other site with coarse sandy subsoils, elevated concentrations of Pb, Zn, and Cd were found in the groundwater 3 m below the ground surface. In the unsaturated soil, pH had decreased to about 3.5, facilitating the migration of the metals. This low pH value was presumably caused by the acids from the car batteries. The investigation concluded that the risk of metal migration to the groundwater is limited as long as pH stays high (above pH 6.5) in the top soils containing very high metal concentrations. The now abandoned car battery salvage operated directly on the ground surface has led to very high concentrations of metals in the soil and migration of metals that may affect the groundwater. However, the extent of the metal plume in the groundwater was not investigated.

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