

Geochemical reactivity and availability of lead in urban soils: from data to improved soil policy

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Lead levels in most urban areas across the world have increased due to emission from traffic and industry. In the Netherlands specific cases of lead pollution are caused by shipping of lead polluted waste material to otherwise non-affected areas. In Portugal elevated levels of lead in urban soils are common as well, and have been observed in the vicinity of highways and airports (e.g. near Porto). Lead is a potentially toxic element and is particularly dangerous to small children where it can affect the development and functioning of the brain.

At present, soil policy in view of human health is rather protective because of this impact of lead. However, the resulting maximum allowed soil levels in urban soils (in the Netherlands) are exceeded frequently and in large areas. This would either mean that such soils are not suitable for use as a vegetable garden or that soils need to be cleaned. To assess whether or not such elevated levels in soil actually pose a risk, studies on the levels of blood from children in urban areas have been performed both in the Netherlands as well as in Germany. The results from these screenings indicated that blood lead levels from children can be higher in urban areas compared to rural areas albeit less than pronounced than predicted by soil exposure models. This is partly

related to the rather protective model calculations, especially those dealing with the soil to plant transfer of lead. At present this is based exclusively on the total lead level using a linear transfer model. Recently collected data both in the Netherlands and Portugal however confirm that the actual chemical reactivity of lead is low due to the strong binding of lead to soil constituents or the chemical forms of lead in soils. This obviously leads to far lower uptake levels than those predicted by linear transfer models. The knowledge gained from screening of lead in urban soils focussing on the characterization of the geochemical reactivity and the resulting uptake by common crops has resulted in an improved soil to plant transfer model. This model is recently being used to improve the Dutch soil legislation on lead in urban soils.

In the presentation we will show how soil properties (e.g. organic matter, metal oxides, clay content and pH) affect the geochemical reactivity of lead and to what extent this affects soil to plant transfer. The approach used here can be seen as a first step towards the implementation of the concept of availability in soil policy and legislation. As such the approach is easy to adapt for different conditions and soil types across and beyond the EU.

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