Outline scope of webinar

BIOAVAILABILITY TOOLS FOR SOIL ASSESSMENT

Background

All soil contain measurable concentrations of many potentially toxic metals and metalloids – these are principally derived from the parent rock material on which the soil forms. These are termed "background concentrations". In addition to metals/metalloids derived from the rock, there may also be small concentrations of elements derived from the atmosphere in wind-blown dust or aerosols, and some of these may be derived from man's activities globally. This gives rise to "ambient background concentrations" (ABCs) that represent all elements in soil not derived from a nearby source of pollution. These must be considered in any assessment of potential risks as ABCs can be relatively high for some elements in some soil types e.g. nickel in soils derived from serpentine rocks.

Pollution sources add metals/metalloids to soil and may lead to potentially toxic concentrations being exposed to biota. The solubility and bioavailability of metals and metalloids added to soils are dramatically affected by soil physico-chemical conditions, principally soil pH (acidity/alkalinity) and the electrical charge on soil surfaces – cation- or anion-exchange capacity (CEC/AEC). The soil CEC (or AEC) is governed by the type and amount of clay minerals and organic matter in the soil and by soil pH. Some elements naturally in soil may also interact with added metals/metalloids to form insoluble precipitates e.g. phosphate will precipitate soluble lead (Pb) added to soils.

The bioavailability of metals in wastes added to soils is also affected by the speciation of the metals in that waste – wastes composed of stable, insoluble metal/metalloid compounds will pose less risk to biota than wastes containing very soluble metals. However, if soil quality guidelines (SQGs) are derived based on the toxicological risk for highly soluble metals/metalloids in inorganic salts, most inorganic and organic wastes should pose lower risks.

The above factors pose challenges in setting ecologically relevant SQGs for metals/metalloids, but recent regulatory frameworks have incorporated these issues to derive soil-specific quality standards that are designed to more accurately predict potential ecotoxicological risks.

Accounting for bioavailability in soils using user-friendly tools

User-friendly tools that can account for metal/metalloid bioavailability in soils have been developed primarily to facilitate regulatory use of bioavailability. At present there are two Excel®-based spreadsheet tools to predict the toxicological risk of metals/metalloids in soils using easily measured soil properties – one based on European research (http://www.arche-consulting.be/en/our-tools/soil-pnec-calculator/) and one based on European and Australian research (http://www.scew.gov.au/node/941). These combine ecotoxicological data from the literature and empirical relationships of the effect of soil physico-chemical characteristics on toxicity to derive soil quality guidelines for sensitive species. The basis of the tools will be described and their use will be demonstrated.

After this webinar, you should be able to undertake indicative risk assessments and interpret data in regard to metal/metalloid bioavailability in a regulatory context using user-friendly soil bioavailability tools. There will be an opportunity to ask questions and seek clarifications at the end of this webinar.