Bioassays, biomarkers and bioindicator systems for assessing soil quality

Biological methods are used to assess the actual ecological risk of soil pollution, which can be used among others to determine the urgency or priority of soil remediation. These biological methods include bioassays, which are applied to assess toxicity of field samples, and field observations to determine the ecological status of the contaminated land. Together with chemical analyses, these biological observations are the pillars of the so-called TRIAD approach.

In addition to bioassays and field observations, biochemical measurements, also called biomarkers, may be applied to assess the possible exposure and effects of soil contamination. These biomarkers may be applied to organisms exposed in laboratory bioassays as well as to organisms captured in the field. As such, biomarkers may act as a tool that links the bioassay and field observations. Field observations focus on the abundance and species diversity of the soil community, while in situ bioassays may be used to assess e.g. the functioning of the community in important ecological processes like litter decomposition or nutrient cycling.

In this ongoing project, existing methods are applied and new methods are developed for assessing the effects of soil contamination on soil invertebrates. Focus is on the following aspects:

- Developing new and applying new and existing bioassay methods for assessing the toxicity of contaminated soil;
- Assessing toxicity of contaminated soils in relation to the potential impact of other factors, like climate change;
- Unravelling the cause of toxicity by identifying the main contributing factors, including the application of mixture toxicity concepts;
- Developing new biomarker methods and assessing the potential of existing and new biomarker methods for understanding the exposure and possible effects of pollution on soil invertebrates;
- Assessing the possible bioindicator value of soil organisms (at different levels of biological organization);
- Assessing the potential application of the new concepts of “trait-based analysis” and “ecosystem services” in assessing the ecological risk of contaminated land.

All studies performed within this framework will be accompanied by extensive physical-chemical characterization of the test soils and assessment of total and available concentrations of the main pollutants present. Also bioaccumulation of selected pollutants (metals, PAH) in test organisms will be measured.

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