

4. Contamination characteristics of urban soils: a statistical analysis of soil survey data from Berlin, Germany

MEKIFFER Beate and WESSOLEK Gerd

Berlin Institute of Technology, Department of Ecology, Chair for Soil Conservation

Abstract:

A data base of about 90.000 data sets, originating from soil surveys, was created in order to analyze properties and contamination characteristics of urban soils and substrates in Berlin. The data was used for answering the following four questions:

- Are Berlin's soils contaminated and which are the underlying distribution functions for various contaminations?
- Do significant differences exist between various urban substrates with respect to their contamination and soil properties?
- Do significant relationships exist in between pollutants in various urban substrates?

- Are the substrates characterized by typical contamination patterns?

The statistical distribution of pollutants and soil properties was calculated for the entire data set as well as for specific urban substrates. The Diversity of contamination sources and substrates in soils of Berlin is high and leads to great difficulties to distinguish between the various substrates, for example debris substrates of WWII and building rubble. In total we differentiate between eleven substrates, namely: debris substrates, (WWII) building rubble, building rubble-mixtures, sand, sandy substrates, humus-rich topsoil, slag, ashes, marl, peat and loam.

The differences between and within the substrates were analyzed with non-parametric statistical methods. For the whole data as well as for several substrate types we've got statistical distributions for pH, EC, Pb, Cu, Zn As Pb, PAHs and Benzo(a)pyren (BaP).

While pH and electrical conductivity can be described by a Gaussian function, heavy metals and PAH show a left-skewed lognormal distribution function which is also true for the whole entity and for individual substrates. A high percentage of Cd, Pb, Cu Zn, Hg exceed the precautionary values of the German Federal Soil Protection Act. Construction debris which is the most mentioned substrate in the municipal assessments shows the widest range of pollutants and soil properties because of its extreme high heterogeneity.

One part of the work addresses the relationships between the parameters within the substrates. For example: average distribution of Polycyclic Aromatic Hydrocarbons in substrates were calculated to recognize substrate-specific PAH patterns.

Correlations between the heavy metals in the construction debris substrates, (WWII) building rubble, sand, sandy substrates, and humus-rich topsoil were tested in order to recognize the existence of specific 'heavy metal paragenesis.' The verified coherences were significant (from $p < 0.05$), but not close.

In summary the statistical analysis of data from municipal soil survey assessments gives a representative overview of the contamination structure of the urban soils in Berlin.

Keywords: Urban soils, substrates, Berlin, contamination, statistical evaluation

Topic: C. Urban soils and ecosystem services

Sub-topic: C5. Pollution status and control of urban soils

Presentation type: Oral

Information of corresponding author

Full Name: Beate Mekiffer

Organization: Technische Universität Berlin/Institut für Ökologie

Mailing address: FG Standortkunde & Bodenschutz, Salzufer 11, 10587 Berlin

Tel: +49 (0)30 314 23307

E-mail: beate.mekiffer@tu-berlin.de