



# dl-PCB in the soils of Baden-Württemberg

## DL-PCB IN DEN BÖDEN VON BADEN-WÜRTTEMBERG

In order to obtain an initial overview of the soil contamination situation in Baden-Württemberg with regard to dioxin-like PCBs (dl-PCB), as part of the continuous soil monitoring, from the end of 2009 until the beginning of 2010, samples were taken from a total of 50 locations in Baden-Württemberg. The use categories included grassland with and without flood influence, farmland and forest, and these samples were tested for dl-PCB, dioxins/furans (PCDD/F) and indicator PCB (PCB<sub>6</sub>).

### DL-PCB

Depending on the contamination level, at least four of the twelve dl-PCB congeners were quantitatively determined in the first mineral soil horizon. Therefore, ubiquitous spread of dl-PCB in the soils can be assumed. The fraction of dl-PCB in the total PCDD/F+dl-PCB content, in relation to the entire composite sample, is 30 % (median). The congener PCB 126 dominates with a summation term of 26 %. This shows the need to include this substance group in the soil conservation legal standards. The highest dl-PCB stocks were found in grassland locations affected by flooding (median: 8.1 mg WHO-TEQ/kg). Floodplain areas are generally more highly contaminated as, depending on the sedimentation conditions, contaminated river sediment or contaminant sorbates in suspended matter are deposited in the flood area. The dl-PCB stock reduces in the order: flood areas > farmland topsoil > forest topsoil with organic cover > grassland topsoil. In the case of the levels,

in contrast to the stocks the distribution pattern is different. The organic cover, with a median of 3.4 ng WHO-TEQ/kg, has the highest dl-PCB level due to its low unit weight. The levels reduce in the order: organic cover > forest topsoil > flood areas > grassland topsoil and farmland topsoil. In farmland soils the low levels are due to the diluting effect of working the soil. No nationwide data is available for the dl-PCB levels in soil. Exemplary comparisons with the data of other federal states show that the levels lie within a similar order of magnitude.

### PCDD/F

PCDD/F show a similar distribution pattern to dl-PCB. With a maximum value of 22 ng I-TEQ/kg, the target value of the Federal/Federal States DIOXINS Working Party of 5 ng I-TEQ/kg for unrestricted agricultural and gardening soil use was exceeded in 4 of 13 flood areas. For precautionary reasons, a worsening of the contamination situation must be avoided in the areas concerned.

The PCDD/F levels in the topsoil appear to be stable over a period of around 17 years and lie within the range of the background values [LABO, 2003]. In the organic cover, a fall in levels is indicated by the considerable reduction in the median from 17 ng I-TEQ/kg to 6.7 ng I-TEQ/kg. This is also plausible, due to reducing immissions. Compared with nationwide data, with the exception of forest topsoils, slightly lower PCDD/F levels were found in Baden-Württemberg [Federal/Federal States DIOXINS Working Party, 2007].

**PCB<sub>6</sub>**

The six indicator-PCBs represent the contamination of an environmental compartment with PCB. They closely correlate with the absolute dl-PCB level and display the same distribution pattern within the individual use categories. In two flood areas and one flood area the precautionary value and the action value for grassland areas (plant quality) respectively, in accordance with the Federal Soil Conservation and Contaminated Land Regulations (BBodSchV), were exceeded. For reasons of precaution, worsening of the contamination situation in these locations must be prevented or the use and management of the areas must be adapted.

The PCB<sub>6</sub> levels in the farmland and grassland topsoils lie within the range of the background values [LABO, 2003] and therefore appear to be unchanged. In forest topsoils the median is slightly higher. As the measured values can fluctuate significantly, due to the soil heterogeneity alone, a trend towards higher levels in forest topsoils cannot be deduced. Analogous to PCDD/F, a fall in PCB<sub>6</sub> level is indicated in the organic cover. Compared with nationwide data, lower PCB<sub>6</sub> levels were found in Baden-Württemberg [Federal/Federal States DIOXINS Working Party, 2007].