

# From waste to soil—carbon contents, respiration rates and ecotoxicological effects of an uncovered landfill site after 50 years

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## **Abstract**

### **Purpose**

In this study, the ecotoxicological effects of the soil contaminations at an uncovered landfill site are assessed with two biological tests (earthworm avoidance test and luminous bacteria test). Furthermore, the state of rotting of the organic substance is estimated. Therefore, total organic carbon (TOC) contents and basal respiration rates are measured.

### **Materials and methods**

The study has been carried out with polluted samples originating from the old deposit I 27 in Bielefeld, North Rhine-Westphalia, Germany. To assess the ecotoxicological effects, heavy metal contents were determined and earthworm avoidance tests were conducted. Luminous bacteria tests with *Vibrio fischeri* were applied to the soil eluates. Furthermore, the TOC contents and the basal respiration rates were measured regarding to the stability of the organic substance.

### **Results and discussion**

Although the determined heavy metal contents showed high values, the results of the biotests do neither indicate an emission of contaminants with the seepage water nor a toxic disturbance of the soil function as a biological habitat. Beyond that, the respiration rates turned out to be in a range that is typical for natural soils.

### **Conclusions**

Due to the aerobic decomposition of the organic matter and the associated development of humic substances, the contaminants contained in the material seem to be mainly immobile. The organic matter is stabilised to a large part. Altogether the results accord to the long-term perspective for the environmental behaviour of artificially aerated waste.

**Keywords** Aeration - Carbon dynamics - Earthworm avoidance test - Ecotoxicology - Landfill - Respiration - Waste