THE GERMAN DIOXIN DATABASE APPLICATION IN TREND MONITORING OF POLYCHLORINATED DIBENZO-P-DIOXONS AND FURANS IN THE ENVIRONMENT

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1 INTRODUCTION

In 1991, the 37th Conference of Environment Ministers of Germany commissioned the DIOXINE Working Group (Federal-Länder joint working group) with compiling, documenting and evaluating data from measuring and observation programmes at Federal and Land level on the substance group PCDD/F, PCB and other organo-chlorinated substances in a central database. This database is to be used inter alia:

- to monitor the effects of emission-reducing measures,
- to place recommended and limit values on a scientifically founded basis,
- to support drawing up an overall picture of the level of pollution in Germany,
- to evaluate current dioxin findings, for example compared to data with background levels [1] [2].

An overview is given of the sources, the concentrations in the various environmental compartments and the temporal trend development of PCDD/PCDF in Germany. An evaluation is made with regard to the concentrations and findings against the background of legal regulations and ordinances.

2 MATERIAL AND METHODS

The basis for the compilation is data from Federal and Land measuring programmes. In part this concerns monitoring programmes which are geared towards monitoring the environment. They provide information, for example, on background pollution with PCDD/PCDF in the soils, air and biota compartments. In addition, monitoring programmes are enforced by the Länder which monitor the entry of pollutants into the environment.

Source-based data in the DIOXINE database originate from monitoring programmes for sewage sludge (total: 100 records). Sampling and analysis take place in accordance with the provisions of the Sewage Sludge Ordinance [3]. Information on the site where the sample was taken and on sampling and analysis are stored in the database as meta-information (descriptive data on the measuring data) in addition to the analytical results (congeners). The environmental authorities in the Länder carry out these investigative programmes in order to identify local sources and to introduce measures should the given limit values be exceeded

With regard to quantifying the entry of PCDD/F via different sources, reference is made here to national and international studies [4],[5],[6].

The Länder and the Federal Environmental Agency carry out extensive measuring and monitoring programmes on ambient air and deposition. The DIOXINE database contains the analytical measuring results (individual congeners and I-TEQs) and the meta-data on each measuring site (total: 2800 records). Sampling and analysis are carried out in accordance with the DIN provisions in the Technical Instruction on Air Quality Control (TA Luft). The advanced standardisation of methods for atmospheric measuring ensures a comparability of the investigations. On the one hand, the ambient air stations are located in rural areas in order to determine the background PCDD/F pollution of air in Germany. On the other hand, the measuring stations operated by theLänder are located in urban areas or agglomerations. Some stations have measured the pollution of air with PCDD/F continuously for more than 10 years (e.g. Hesse: Frankfurt/Main area). In the Eastern Länder, the local authorities set up measuring stations near busy traffic routes in the centre of medium-sized towns (Erfurt, Gera, Greiz).

Soil samples are taken at selected sites and analysed for PCDD/F within the framework of the continuous monitoring programmes in the Länder. More than 3000 records are in the database from the Länder programmes and the programmes of the Federal Environmental Agency. Thus it is thebest documented compartment with samples dating back to 1985. Sites are selected according to different strategies. Firstly, a targeted selection of sites is made from continuously monitored areas in the background area (rural areas). Background levels in soils are derived from this. These are used for the legislative provisions of the Federal Soil Protection Act [7].

Secondly, soil samples are taken in regions where anthropogenic soil pollution is suspected. These investigations are necessary for enforcement (introduction of rehabilitation measures) (e.g. Halle/Bitterfeld industrial area). A further strategy is to select sites according to situational criteria. In other words, urban soils in agglomerations, for example, are sampled according to different types of uses. Play areas and allotments play a particularly important role here. Allmeta-information required for evaluating the results are found in the DIOXINE database, as is information on the site, sampling and analysis. The sampling and analysis methods are laid down in the legislative provisions of the Federal Soil Protection Act [7].

The concentration of PCDD/F in **bio-indicators** is influenced by different variables, for example the type of monitoring (active or passive monitoring), the type of sample (e.g. spruces or fish), the duration of exposure, the geographical location and the time the sample was taken. The Länder authorities and the Federal Environmental Agency implement theseprogrammes. Since the beginning of the 1990s, Bavaria has carried out comprehensive bio-indication programmes for kale and on standardised grass cultures (darnel). Similarly, the Federal Environmental Agency has been taking bio-indicators from terrestrial and marine ecosystems since 1985 as part of operating the environmental specimen bank. The DIOXINE database contains around 200 samples in this compartment. Such types of samples are well-suited for detecting temporal trends in the level of air pollution. A correlation of the data with the data from the atmospheric measurements (ambient air and deposition) can be used to illustrate typical patterns of air pollution for certain regions.

3 RESULTS AND DISCUSSION

Ambient air: The annual average from 1990 to 1999 lies at a value between 20 - 95 fg I-TEQ / m^3 (Fig. 1). The measuring series carried out by the Länder of Hesse and Thuringia over several years show a clear decline in dioxin pollution since the beginning of the measuring series. From 1995, there has been a continuous decline in particular in Hesse, which can be traced back to emission-reducing measures in the industrial sector.

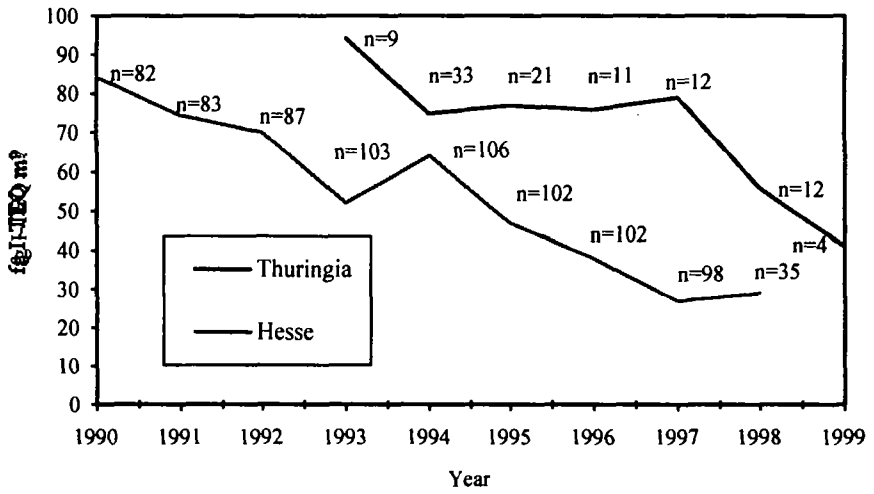

Figure1: Annual averages (fg I-TEQ/m^3) from 1990 to 1999 in ambient air data of the Länder Hesse and Thuringia

Deposition: The value area of the annual average from 1990 to 1999 lies between 4 - 60 pg I-TEQ/m^2d). Similar to the dioxin concentrations, the measuring series of the deposition show a decrease in dioxin pollution. A continuous decrease can be clearly seen in Hesse from 1992 onwards (Fig. 2).

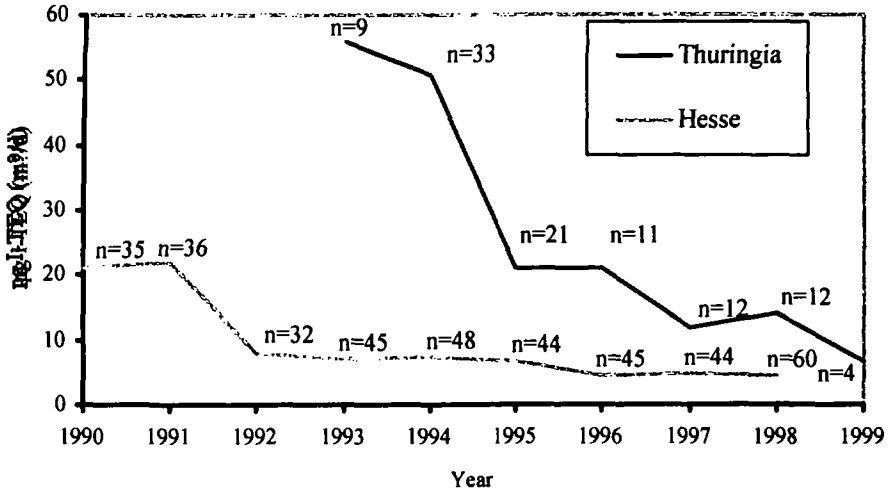

Figure 2: Annual averages (pg I-TEQ/m^{2}d) from 1990 to 1999 in deposition data of the Länder Hesse and Thuringia

4 ACKNOWLEDGEMENTS

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