

PROJECT INFORMATION

Project title: Trend analysis of ambient Pb-levels in waters, air, sediment and soil samples

Project ID: 18

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PROJECT DESCRIPTION

Examination of trends in long-term quality data is an effective means of assessing environmental change over time and hereby identifying significant improvement or deterioration in these natural assets. In general, metal concentrations in the environment can be affected by a large number of processes related to the amount released, the spatial and temporal distributions of these releases, and the large number of transportation and transformation processes in water, air and soil.

Due to the reduction of diffuse emissions of lead into the environment over the past decades [e.g., restriction of Pb-addition to fuel], it is expected that ambient Pb-levels in different environmental compartments (water, air, sediment, soil) have decreased over the past decades. The aim of this report is to identify and evaluate the evolution of Pb-levels in these compartments, using available monitoring data that have been collected by various national and international authorities over the past 20-30 years.

The procedures used in this study are based on the methods and concepts laid down in the TGDs (EC, 1996, re-vised 2003) and ECHA Guidance documents [RIP 3.2.2; Chapter R.16: Environmental Exposure Estimation] for environmental risk assessment in the European Union. For data comparison between different [sub]data sets [e.g. temporal trends; year-based analysis] the median [i.e. 50th percentile, SOP] is used instead of the mean or upper limit of the investigated data set. The median environmental concentration is generally a more robust measure of central tendency, because it is not sensitive to the shape of the tail of the distribution or to the occurrence of outliers in the data set, as is the mean or the 90th percentile [Cullen and Frey, 1999]. Post-hoc t-tests (e.g., unequal N HSD test) for detecting significant differences among monitoring data sets for different years only have limited use as these test are based on comparing mean values and their variance (sigma-values) of parametric distributions [hypothesis of normality]. As many data sets are non-parametric, and mean values are often directly affected by the default value of DL/2 for any measurement that falls below the detection limit (see further), this method cannot always be used.

Measurements that fall below the detection limit (DL) should always remain included in the trend analysis. According to the recommendations set in the above-mentioned guidance documents, entries below the detection limit are set to $DL/2$. As a consequence, a data set will be of lesser use for trend analysis if the 50th percentile of a data set is determined by the generic DL-value ($DL/2$) or if the 50th percentile is lower than the highest reported DL.

Where possible, it will be investigated if the variation among year-specific and/or country-specific [or region-specific] median values are significantly different, and the temporal evolution of these median values will be evaluated.