

Emission and fate of lead in the European environment, 1958-1995

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The emission of lead into the atmosphere has undergone remarkable variations in the past decades. The main agent of these emissions has been emission from the use of leaded gasoline. Until the mid 1970s there was an almost unabated increase due to the mass motorization in Europe. Then, legislation was introduced in a stepwise manner throughout Europe until in the mid 1980 almost unleaded gasoline became standard.

Reliable long term observations about lead concentrations in the air as well as in plants and human blood began only at about 1980, so that little is known about the peak episode in the early 1970s. In a study at the GKSS Research Center, a reconstruction of lead emissions was fed into a numerical transport model, which advected and deposited the emitted lead throughout Europe. In this way, time dependent spatially detailed maps of air concentration as well as depositions have been derived. The surface transport of that lead, which has been deposited in the Elbe catchment, was also modelled. The simulated lead concentrations in the different compartments were compared with the sparse observations available. Generally the similarity of simulated and observed data was fair, i.e., within a factor of 2. Emitter-receptor matrices have been derived so that now estimates about the fate of all lead, added to gasoline and related to other sources, can be skilfully estimated.

Additionally, the effect on the lead concentration in human blood has been estimated with a simple statistical model for a German region. According to this model, more than 5% of the total population may have suffered from lead levels in their blood considered dangerous.

An interesting detail is that the regulation of leaded gasoline in different countries was based on different knowledge claims. In Anglo-Saxon countries, the reason was related to health, whereas in Germany the main argument had to do with the introduction of catalytic converters needed to reduce forest damages.

The phasing-out of lead must be considered a major albeit somewhat incomplete success of environmental policy. In terrestrial plants and animals lead levels are greatly reduced, but in aquatic and soil milieus still significant amounts of the neurotoxin prevail.

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