

NRP Endocrine Disruptors

Final Summary

Original project title Dynamic substance flow analysis model for selected brominated flame retardants as a base for decision making on risk reduction measures (FABRO)
Project leader Dr. Leo S. Morf
Project number 4050-111389

Please note: Please write your text in a comprehensible way. In other words: Do not use your scientific terminology because the summary will be included into the database of the NRP 50-Website and is therefore accessible to the public.

Model for the use and emissions of brominated flame retardants

Brominated flame retardants (BFRs) are synthetic additives. They are used to reduce the flammability of plastic products, but representatives are potential endocrine disruptors. Emissions occur during production, use and disposal of flame-retarded materials. BFRs have become ubiquitous environmental contaminants.

Research questions

The aim of the project was to model temporal trends of substance flows and stocks in the production and use phase as well as in waste management and emissions to the environment for Switzerland.

Results

The consumption of DecaBDE in Switzerland has been approximately constant at 200 tons/year over the past twenty years. Most of it has been used in electrical and electronic equipment. As PentaBDE was banned by the EU, the consumption has dropped from about 14 tons/year to virtually zero at present. The consumption of HBCD, which is mainly used in insulation panels, has increased to 180 tons/year at present and a further increase is expected. There are large stocks stored in the use phase. The stock of DecaBDE is slightly decreasing, the stock of PentaBDE is strongly decreasing. On the other hand, the accumulation of HBCD will continue.

Emissions to air, water and soil have been estimated based on the uses, the stocks and the substance properties. Most important emission sources are diffuse emissions during the use phase, from electronic appliance and automobile recycling plants and sewage sludge that is used as a fertilizer in the agriculture. Regulatory and technical measures in waste management led to a reduction of emissions from sewage sludge, recycling plants and municipal solid waste incineration plants. For HBCD, the largest proportion of the emissions originates from diffuse releases from installed insulation panels. The emissions of DecaBDE and HBCD would even continue for more than one decade after a ban of these substances. The emissions of HBCD would only halve until 2020.

Predicted environmental concentrations in the atmosphere, soil, water and sediments have been derived from the emission estimates. Comparing the concentrations modelled with field data, it can be concluded that atmospheric emissions, especially from diffuse sources, might be underestimated based on currently available data.

Perspectives

The knowledge about substance flows, stocks and emissions could be improved, even though there are still uncertainties in the estimations. The results may serve as a basis for the evaluation of measures and elaboration of recommendations for future regulatory, technical and other measures to reduce the risk for humans, animals and the environment regarding these substances.