Authorisation of chemicals under REACH: A multimedia stock-pollution approach to inform the socio-economic analysis of PBT/vPvB chemicals

SILKE GABBERT[1], MONIKA NENDZA[2]

[1] Wageningen University, Department of Social Sciences, Hollandseweg 1, 6700EW Wageningen, The Netherlands, silke.gabbert@wur.nl

[2] Analytisches Laboratorium AL-Luhnstedt, Bahnhofstraße 1, 24816 Luhnstedt, Germany, nendza@al-luhnstedt.de

The European chemicals legislation REACH aims to adequately control the risks caused by substances of very high concern (SVHC). PBT and vPvB chemicals are SVHC candidates. If included in Annex XIV of REACH, chemicals can only remain on the market if the European Commission has granted an authorisation (REACH, Article 58), which are limited to specific applications and certain periods of time (REACH, Article 60). Companies who apply for such authorisation must submit a socio-economic analysis (SEA) documenting that the socio-economic benefits from using the chemical outweigh the environmental and health damages due to continued use of PBTs/vPvBs (ECHA 2011). The purpose of SEA is to assess positive and negative impacts arising from the continued use of SVHC, and to weigh them against positive and negative impacts of a removal from the market.

The concentrations of PBTs and vPvBs in the environment increase continuously over time as long as emission rates exceed degradation rates. Thus, persistent chemicals are stock pollutants and can remain in environmental media and biota long after emissions ceased. The relevant timeframe may be several decades. A SEA must, therefore, account for long/term pollution patterns of PBT-vPvB chemicals in order to deliver meaningful results for decision-making on the authorisation of these chemicals.
We developed a dynamic stock pollution model to quantify the concentrations of substances in environmental compartments in period t as a function of the initial stock at t_0, the emissions and the decay rates of the chemicals (Gabbert and Nendza 2015). Then, the stock dynamics model was linked to multimedia fate modelling in order to capture inter-compartmental transport and fate processes. The combined multimedia stock pollution model allows for simulating the time-course of expected concentrations in air, soil, sediment and water. Moreover, for different ways of emissions, e.g. into water or into air, it allows identifying the compartments with the highest expected stocks.

We applied the multimedia stock pollution model to a set of PBT chemicals, including SCCPs and HBCDD. The simulation of stock dynamics provides important insight into long-term risks from PBTs and vPvBs. In particular, our results illustrate that ignoring stock dynamics can lead to highly erroneous conclusions about expected environmental concentrations, thus an underestimation of long-term damage costs. We therefore suggest including the assessment of stock dynamics of PBTs and vPvBs in an SEA of the REACH authorisation process. Furthermore, we show that those compartments which are most at risk do not have to be those where the pollution inflow per period is highest. This underlines the need for conducting a multimedia analysis of stock dynamics.

References:

ECHA (2011): “Guidance on the preparation of socio-economic analysis as part of an application for authorization.” Guidance document ECHA-11-G-02-EN, January 2011, ECHA, Helsinki, Finland.

Gabbert and Nendza (2015): “Authorisation of chemicals in REACH: A stock-pollution approach to assessing impacts of persistent chemicals in a socio-economic analysis.“ Project performed for the Luxemburg Environment Agency, Client Contract Manager: Hans-Christian Stolzenberg (German Federal Environment Agency | UBA), Final project report 31 January 2015.