

A proposal for a chemical assessment concept for the protection of raw water resources under REACH

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1. Introduction

Chemical substances and their uses that fall within the scope of the REACH Regulation (1907/2006 EG) have to be registered at ECHA in Helsinki. Registrants are requested to ensure a high level of protection of human health and the environment. By doing so, industry guarantees the safe use of chemicals throughout the whole life cycle. Raw water resources for the production of drinking water need a high level of protection. The conservation of clean drinking water is one prominent example where the precautionary principle in our society should be applied.

In Europe drinking water is obtained mainly from groundwater, reservoirs or river bank filtration. If these environmental compartments are exposed to hazardous chemicals a contamination of drinking water is possible. Usually, the society as a whole – and not the polluter – pays for the costs of water treatment. These expenses are likely to exceed the costs of precautionary action during the production and use of the chemical. Thus the precautionary protection of raw water resources gives reasons to evaluate the hazardous substance properties and the exposure of the environment in the risk assessment under REACH.

In the last decade the fate and behaviour of polar substances has been investigated both scientifically and from a regulatory perspective. The finding is that their intrinsic hazard potential is maximised if they are at the same time persistent in the environment and mobile in the water cycle. Once emitted, these substances remain in the aquatic environment and the contamination is irreparable (Steinhäuser and Richter, 2006). The same substance properties might hinder their degradation by ozone and UV or their filtration by activated charcoal during the water treatment process. If in addition they also fulfil the properties of being toxic emissions into water resources should be avoided during the production and downstream use of the substances. To our knowledge, no study yet has proposed criteria for the identification or an elaborated assessment concept for such substances which cause a concern to raw water resources.

2. Proposal for Persistent Mobile Toxic (PMT) assessment

Here we present a proposal for an assessment concept of persistent, mobile and toxic chemicals (PMT substances: see Table 1)). We adopted the criteria for the identification of persistent substances directly from the Annex XIII of the REACH Regulation. However, we propose a decision tree approach focusing on the freshwater criteria. The criteria for the identification of mobile substances were developed based on scientific literature on leaching of pesticides to ground water and an extensive modelling approach using the software

P criteria (half live)	M criteria (for persistent substances)	T criteria
<ul style="list-style-type: none">• freshwater > 40 d additional Annex XIII P criteria: <ul style="list-style-type: none">• sediment > 120 d• soil > 120 d• marine water > 60 d• marine sediment > 180 d	<ul style="list-style-type: none">• water solubility > 150 µg/L and• log K_{OC} < 4.5	<ul style="list-style-type: none">• classified as CMR Cat. 1A, 1B, 2 or as H362 or as STOT RE Cat. 1 or 2• DNEL ≤ 9µg/kg body weight and day• Cramer Class III or structural alerts for genotoxicity and carcinogenicity• suspected to have endocrine disrupting properties• listed in toxic substance inventories

Table 1: Overview of the proposed criteria to identify a PMT substance. For details see full study report.

ECETOC-Targeted Risk Assessment (TRA, Version 3.0). Under standardized conditions, estimated partitioning of 64 partly ionisable substances to surface water and ground water was analysed with regard to decisive physico-chemical parameters. We found no significant correlation with water solubility, the octanol-water partition coefficient (K_{OW}), or Henry's Law constant. Also the influence of an aggregated value, the so called "purification factor" (including degradability, the octanol-water partition coefficient and Henry's Law constant) was declined. In contrast a very close correlation with the organic carbon normalized adsorption coefficient K_{OC} was found and consequently we propose a criterion for mobility of <4.5 log units which requires consideration of ionisability (pH 6 to 8). Our findings are supported by scientific literature. While water solubility was identified not to be correlated with mobility, substances with a water solubility equal to or below $150\mu\text{g/L}$ are regarded as not mobile and not relevant for raw water contamination. The T criterion is fulfilled among other criteria if the minimum DNEL is $< 9 \mu\text{g/kg} \times \text{d}$.

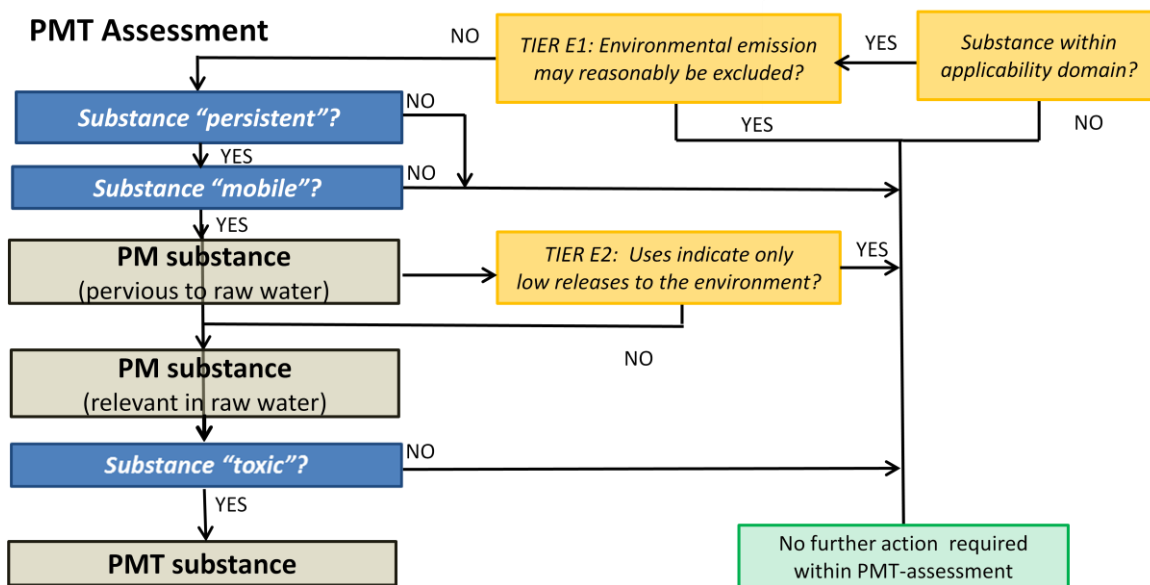


Figure 1: Proposal for a stepwise PMT assessment including emission related assessment steps.

Our assessment concept for the identification of PMT substances is a hierarchical approach to be followed from P over M to T. We propose two simple steps to assess the environmental emissions (E1 and E2) to avoid unnecessary work load within our assessment concept.

3. Conclusions

We applied the PMT assessment concept already to 93 REACH-registered chemicals and confirmed for 14 of them PMT-properties. A monitoring data review confirmed the presents of some of the PMT substances which is an initial validation of the PMT assessment concept. Within this research study a proposal for a practical guide was published. This guide may be used by registrants to assess whether a substance cause a concern for raw water and to fulfil with the responsibility for a safe use of the chemical.

4. References

[1] Steinhäuser K-G, Richter S. 2006. Assessment and Management of Chemicals - How Should Persistent Polar Pollutants be regulated? In: Organic Pollutants in the Water Cycle. Reemtsma T, Jekel Martin, editors, Wiley-VCH Verlag GmbH & Co., Weinheim. 311-339.

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