PBDEs (Polybrominated diphenyl ethers)

(CAS numbers: e.g. 41318-75-6, 5436-43-1, 60348-60-9, 189084-64-8, 68631-49-2, 207122-15-4, EC numbers: e.g. 868-402-6, 690-137-8, 690-282-7, 690-350-6, 690-275-9 / Entry number in HELCOM list of priority substances: 30)

General sectors: Industry and commercial products

DRIVERS | ACTIVITIES | PRESSURES | STATE | IMPACTS

Why a HELCOM priority?

Main evidence

S The sum of concentrations of six representative PBDEs (PBDE28 + PBDE47 + PBDE99 + PBDE100 + PBDE153 + PBDE154) exceed the applied threshold value in all the **37** examined areas (assessment units) of the Baltic Sea. The threshold is exceeded in both coastal and off-shore areas (**13**/13 assessed off-shore areas). In these 37 areas, **100%** of the **biota** samples exceed the threshold value. This is based on regular monitoring data gathered by HELCOM Contracting Parties and reported to the HELCOM COMBINE database for the period 2016-2021, in the context of the PBDEs indicator[1].

By further considering how much above or below the threshold each concentration is, and how often the substance is detected, anthracene scores **9.6/10** (confidence range: **9.6 – 9.6**) in the scale established when assessing the criticality/significance of current levels in the Baltic Sea pose, where 5 indicates concern and 10 extreme risk, and the range reflects the level of reliability and representativeness of concentrations and the thresholds.

The threshold value for PBDEs, for biota, was acquired from the EC proposed Directive amending WFD and EQSD[2].

I Current levels in the Baltic Sea indicate potential negative impacts on top predators such as mammals and birds and humans via consumption of seafood.

Supporting evidence

I PBDEs are considered of **especially concerning mode of toxicity.** For example, they are endocrine disruptors[3]. Endocrine disruptors mimic or interfere with hormones and can cause developmental abnormalities, reproductive dysfunction, and population effects.

Overall assessment

When assessing current levels in the Baltic Sea, current inputs, and the severity of the relevant toxicity mechanism, PBDEs score **84-97/100** in the scale established for assessing the overall risk for impacts/threat for the Baltic Sea, where 50 indicates concern, 100 extreme risk, and the width of the span outlines the uncertainty in the assessment. In general, beyond the representative PBDEs listed above, several PBDEs have hazardous properties and concerning environmental fate and/or occurrence profiles – or may degrade to such in the environment[9]. This substance group entry aims to reflect all such relevant individual substances.

Facts relevant for management considerations

Causal chain and pathways

A PBDE emissions originate from the production and use of flame-protected materials, recycling of articles containing PBDEs, and respective waste stage (e.g. landfills and waste sorting sites)[4].

P Based on available estimations, PBDEs appear to enter the Baltic Sea at least at the following amounts: **rivers** (>0.15 t/y, WATERBASE[5], Undeman et al, 2022[6], Gustavsson et al, 2018[7]), direct emissions from land-based activities (>0.03 t/y, Undeman et al, 2022), atmospheric deposition (>0.0003 t/y, PLC[8]). **WWTPs** appears to be the main source of eventual inputs. There is available information also about estimated inputs of individual PBDEs.

Relevant policies (existing or planned measures)

M (on A/P)

- Some PBDEs are listed under **Stockholm Convention** on POPs (signed by all HELCOM Contracting Parties) – Annex A (elimination) – accordingly **EU POPs Regulation –** including respective **national Action Plans for these.** There are specific exemptions registered by CPs.
- **Some PBDEs are restricted under RoHS ((electrical and electronic devices)).** Furthermore, DecaBDE is listed as **REACH SVHC.**
- Listed as a priority hazardous substance under the **EU WFD** (and its update proposal) – including respective national **Progammes of Measures for this**. PBDEs are also a **HELCOM indicator**.
- There are provisions in **EU Best Available Techniques** Reference Documents for these substances

References:

1. 2. 3. 4. 5. 6. 7. 8. 9.

[Note: Listing of detailed references will be provided in an upcoming update of the fact sheet – for a listing of the most common references among the different substances see the section at the end of the consolidated document which includes all the fact sheets]