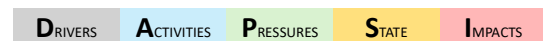


PAHs (Polycyclic Aromatic Hydrocarbons) and metabolites

(CAS numbers: e.g. 50-32-8, 206-44-0, 120-12-7, 5315-79-7, EC numbers: 200-028-5, 205-912-4, 204-371-1, 624-224-9
/ Entry number in HELCOM list of priority substances: 29)

General sectors: Process byproduct, industry and commercial products, off-shore (shipping)



Why a HELCOM priority?

Main evidence

S Concentrations of anthracene exceed the applied threshold value in 6 of the 15 examined areas (assessment units) of the Baltic Sea. The threshold is exceeded in both coastal and off-shore areas (2/10 assessed off-shore areas). In these 6 areas, on average 69% of the **sediment and/or 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, as part of the broader, 'PAHs and metabolites' indicator¹.

By further considering how much above or below the threshold each concentration is, and how often the substance is detected, anthracene scores **7.3/10** (confidence range: **7.3 – 7.3**) 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 anthracene, for sediment and biota, were respectively as agreed for the HELCOM indicator for HOLAS 3 and as listed in the EC proposed Directive amending WFD and EQSD².

Concentrations of benzo(a)pyrene and likely further PAHs, as well as metabolites, such as 1-hydroxypyrene, also frequently exceed their respective threshold values.

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

Supporting evidence

P At least **12 tonnes of PAHs** are estimated to enter the Baltic Sea every year, with atmospheric deposition and direct off-shore inputs appearing to likely dominate among pathways (WATERBASE³, HELCOM BSEFS⁴, EMERGE⁵, Undeman et al, 2022⁶, E-PRTR⁷). Given that PAHs are **very persistent, very bioaccumulative, and very toxic**⁸, current inputs are considered as likely significant, in terms of risk they pose for the Baltic Sea and its ecosystem services. As mentioned above, levels in Baltic Sea have already exceeded thresholds, due not only to current but also historical inputs.

I PAHs are considered of **especially concerning mode of toxicity**, as for example they are carcinogenic, toxic for reproduction, and endocrine disruptors⁹.

Overall assessment

When assessing current levels in the Baltic Sea, current inputs, and the severity of the relevant toxicity mechanism, for example anthracene scores **72-73/100** 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. Besides anthracene, several other Polycyclic Aromatic Hydrocarbons, in particular those with 2-6 benzene rings, have hazardous properties and concerning environmental fate and/or occurrence profiles¹¹. Certain degradation products including metabolites, e.g. hydroxylated PAHs, also have such properties and profiles¹². This substance group entry aims to reflect all such relevant individual substances.

Facts relevant for management considerations

Causal chain and pathways

A In terms of emissions to air, main sectors which officially reported releases to the Baltic Sea catchment in the context of E-PRTR (total reported releases 5-25 tonnes/year, in the period 2018-2022) and the respective shares are as following: **Production of fertilisers** (28%), **Production of cement clinker or lime in rotary kilns or other furnaces** (21%), **Thermal power / combustion** (20%), **Surface treatment of metal/plastic materials by electrolytic or chemical process** (14%). There are also other pyrogenic sources¹⁰ (anthropogenic - various sectors burning coal, oil and gas or wood, forest fires - and natural, e.g. volcanic) (no quantitative info on releases).

In terms of releases to water/soil, the main sector which officially reported releases to the Baltic Sea catchment in the context of E-PRTR⁵ is **independently operated industrial WWTPs** (average total reported releases 0.5 tonnes/year, in the period 2018-2022). There are also anthropogenic petrogenic sources to water (**depositing of dredged material** (>2 t/y, HELCOM BSEFS), **fraction of oil spills from shipping/accidents, riverine oil discharges**), as well as **shipping emissions to water mainly from scrubber waters and bilge water** (perhaps around 1 t/y, EMERGE).

P Based on available estimations for sums of individual PAHs, they appear to enter the Baltic Sea via the four pathways at least at the following amounts: **atmospheric deposition** (>7 t/y), **direct off-shore releases** (>3 t/y), **rivers** (>2 t/y), and direct emissions from land-based activities (>0.02 t/y). There is available information also about estimated inputs of further individual PAHs.

Relevant policies (existing or planned measures)

M (on A/P/I)

- Listed under the **EU POPs Regulation** – ANNEX III (PART B): list of substances subject to release reduction provisions.
- Listed as a priority hazardous substance under the **EU WFD** (and its update proposal) – including respective national

Programmes of Measures for this. 'PAHs and metabolites' is a **HELCOM indicator**.

- For PAHs, some activities are restricted under **EU REACH**. Furthermore, some PAHs are listed as **REACH SVHCs**.
- There are provisions in **EU Best Available Techniques** Reference Documents for PAHs

- PAHs are listed among contaminants with maximum levels in EU Regulation 2023/915, including seafood, however due to contamination in smoked fish.

References: 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.

[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]