Bisphenols

(CAS numbers: e.g. 80-05-7, EC numbers: e.g. 201-245-8 / Entry number in HELCOM list of priority substances: 5)

General sectors: Industry and commercial products

DRIVERS | ACTIVITIES | PRESSURES | STATE | IMPACTS

Why a HELCOM priority?

Main evidence

S Concentrations of Bisphenol A exceed the applied threshold value in all the **7** examined areas (assessment units) of the Baltic Sea. The threshold is exceeded in both coastal and off-shore areas (**1**/1 off-shore area). In these 7 areas, all the samples in **water** that was possible to evaluate exceed the threshold value, noting also several inconclusive, in terms of exceedance, non-detections (due to a relatively high limit of detection)*. This is based on monitoring data for the period 2015-2024 available in national and international databases[1] and scientific articles/reports[2]. A total number of 39 data points were possible to evaluate for Bisphenol A.

By further considering how much above or below the threshold each concentration is, and how often the substance is detected, Bisphenol A scores **9.1/10** (confidence range: **8.5 – 9.2**) 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 values for Bisphenol A in water was acquired from the EC proposed Directive amending WFD and EQSD[2].

I Current levels in the Baltic Sea indicate potential negative impacts on pelagic biota.

P For Bisphenol A and Tetrabromo-bisphenol A (TBBPA), the amounts estimated to enter the Baltic Sea every year via rivers/WWTPs are **1-3 (data on WWTPs) and 4-17 (riverine data) tonnes per year, respectively** (WATERBASE[3], Undeman et al, 2022[4], Gustavsson et al, 2018[5]). Given that they are **very toxic**[6] (Bisphenol) and **toxic and suspect as very persistent**[7] (TBBPA), current inputs are considered as likely significant, in terms of risk they pose for the Baltic Sea and its ecosystem services. Other bisphenols, such as Bisphenol AF and Bisphenol m, have measured inputs in the orders of up to hundreds of kg, which are considered as possibly significant, given that they have similarly high toxicity / persistence properties. Additional inputs might be expected, including from atmospheric deposition, although Bisphenols degrade relatively fast in the atmosphere[8]. As mentioned above, for the bisphenol for which there is marine data (Bisphenol A), levels in Baltic Sea have already exceeded thresholds, due not only to current but also the historical inputs.

Supporting evidence

I Bisphenol are considered of **especially concerning mode of toxicity.** For example, Bisphenol A is an endocrine disruptor and toxic for reproduction[9]. 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, for example Bisphenol A scores **91-94/100** 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 Bisphenol A, several other Bisphenols (which are substances with two hydroxyphenyl functional groups linked by a bridge, with the phenolic hydroxyl groups on the para position to the bridge – and which may also include possible substituents at the phenyl rings or have the phenolic hydroxyls derivatised) have been shown to or suspected to have hazardous properties and to exhibit concerning environmental fate/occurrence profiles[14]. In fact, monitoring data from WWTP as well as human biomonitoring indicate that measures targeted at Bisphenol A has resulted in an increased use of other Bisphenols. This substance group entry aims to reflect all such relevant individual substances.

Facts relevant for management considerations

Causal chain and pathways

A The REACH registered volume (manufacture/import in the EU) for Bisphenol A is >1,000,000 tonnes/year[10]. According to ECHA's prioritisation assessment for SVCHs[11], although a significant part of the total volume is used as an intermediate, 1,000 - 10,000 t/y is used as epoxy-resins hardener; lubricants, greases, hydraulic and break fluids; paints, lacquers, varnishes; binding agents; stabilisers; surface treatment; food-contact materials. Applications regard diverse sectors, such as building and construction, crop and animal production, hunting, extraction of crude petroleum and natural gas, metals and metal products, manufacture of chemicals and chemical products, computer, electronic and optical products, electrical equipment, vehicles, non-metallic mineral products, transport equipment, paper and paper products, wood and wood products, printing and reproduction of recorded media, retail trade, warehousing, and wholesale trade.

For TBBPA, the REACH authorised volume is >10,000 tonnes/year[10]. According to ECHA's prioritisation assessment for SVCHs, from this amount 1,000 - 10,000 t/y is not used as intermediate, but rather as flame retardant[12]. Another example of bisphenol, Bisphenol AF is used as intermediate and in rubber products, as a crosslinking agent for fluoroelastomers and specialty polymers (e.g., high-temperature composites and electronic materials)[13].

S ? *In order to further improve the evaluation of the magnitude of risk, one aspect that could be relevant in the future is gathering of marine data for further bisphenols than only Bisphenol A.*

Relevant policies (existing or planned measures)

M (on A/P)

- **Four bisphenols are listed as SVHC** (Substances of Very High Concern) **under EU REACH** (depending on the case, on the basis of endocrine disrupting properties / toxicity for reproduction / carcinogenicity). ECHA has developed an **Assessment of Regulatory needs (ARN) for the group of Bisphenols** (dozens of individual substances).
- Bisphenol A is listed as a priority hazardous substances under the **EU WFD/EQSD** update proposal.

References:

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.13.14.

[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]

* considering the inconclusive non-detections, it is possible that the actual average frequency of exceedance in these areas is somewhat lower, but in any case >45%.