

Dioxins (dioxin-like-PCBs, dioxins and furans)

General sectors: Process byproduct, off-shore (shipping)

(CAS numbers: e.g. 1746-01-6, 40321-76-4, 39227-28-6, 57653-85-7, 19408-74-3, 35822-46-9, 3268-87-9, 51207-31-9, 57117-41-6, 57117-31-4, 70648-26-9, 57117-44-9, 72918-21-9, 60851-34-5, 67562-39-4, 55673-89-7, 39001-02-0, 32598-13-3, 70362-50-4, 32598-14-4, 74472-37-0, 31508-00-6, 65510-44-3, 57465-28-8, 38380-08-4, 69782-90-7, 52663-72-6, 32774-16-6, 39635-31-9. EC numbers: e.g. 217-122-7, 694-814-9, 694-767-4, 694-811-2, 694-835-3, 694-829-0, 694-762-7, 694-762-7, 694-761-1, 694-812-8, 694-837-4, 694-765-3, 694-831-1, 694-815-4, 694-836-9, 694-806-5, 634-804-3, 690-324-4, 690-324-4, 634-808-5, 690-296-3, 621-375-2, 690-284-8, 682-346-8, 620-601-7, 690-279-0, 690-199-6, 682-345-2, 690-157-7
/ Entry number in HELCOM list of priority substances: 15)

DRIVERS

ACTIVITIES

PRESSURES

STATE

IMPACTS

Why a HELCOM priority?

Main evidence

S Concentrations of Dioxins exceed the applied threshold value in **all the 29** examined areas (assessment units) of the Baltic Sea. The threshold is exceeded in both coastal and off-shore areas (**9/9** assessed off-shore areas). In these 29 areas, **100%** of the assessable samples in **biota** 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, 'PCBs, dioxins and furans' indicator¹.

By further considering how much above or below the threshold each concentration is, and how often the substance is detected, Dioxins scores **9.5/10** (confidence range: **9.5 – 9.5**) 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 Dioxins, for biota, was acquired from the EC proposed Directive amending WFD and EQSD².

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

S Some increasing trends have been observed in monitoring in Sweden.

I Dioxins are considered of **especially concerning mode of toxicity**, as for example they are carcinogenic³ (beyond their aquatic toxicity), thus posing high long-term risk to populations (e.g. for human health via consumption of seafood).

Overall assessment

When assessing current levels in the Baltic Sea, current inputs, and the severity of the relevant toxicity mechanism, Dioxins scores **84-96/100** 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. This substance group includes polychlorinated dibenzo-p-dioxin (PCDD), dibenzofuran (PCDF) compounds, as well as dioxin-like PCBs (PCBs with a co-planar structure very similar to that of dioxins and dioxin-like effects, i.e. CB-77, CB-81, CB-126, CB-169, CB-105, CB-118, CB-156, CB-157, CB-167, CB-114, CB-123, CB-189).

Facts relevant for management considerations

Causal chain and pathways

A Dioxins are byproducts of combustion processes, forest fires, impurities of chlorinated products⁴. Main sectors which officially reported releases to the Baltic Sea catchment in the context of E-PRTR⁵ and the respective shares for the reported emissions are as following:

Releases to air (reported releases >0.0002 TEQ dioxins/furans per year, in the period 2018-2022): mainly **Thermal power / combustion** (69%), **Manufacture of basic organic chemicals** (11%), **Production of pig iron or steel** 8%). Releases to water/soil (reported releases >0.000033 TEQ dioxins/furans per year, in the period 2018-2022): Thermal power / combustion (92%), Landfills (excluding landfills of inert waste or which were closed before 2002) (5%).

P Based on available estimations, Dioxins appears to enter the Baltic Sea via **rivers** (>0,0005 t/y, sum of 30 dioxins/furans, WATERBASE⁶), **atmospheric deposition** (0.0001 TEQ dioxins/furans, PLC⁷), and **direct emissions from land-based activities** (>>0,00001 t/y, 2 individual dioxins/furans, Undeman et al, 2002⁸).

Relevant policies (existing or planned measures)

- M (on A/P/I)**
- Listed under **Stockholm Convention** on POPs (signed by all HELCOM Contracting Parties) – Annex C (minimize unintentional releases) – accordingly **EU POPs Regulation** – including respective **national Action Plans for these**.
 - Listed as a priority hazardous substance under the **EU WFD** (and its update proposal) – including respective national **Programmes of Measures for this**.
 - There are provisions in **EU Best Available Techniques** Reference documents for dioxins
 - 'PCBs, dioxins and furans' is a broader **HELCOM indicator**.
 - Dioxins are listed among contaminants with maximum levels in EU Regulation 2023/915, including seafood**, with some derogations applicable e.g. for Finland and Sweden.

References:

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

[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]