Lindane (gamma Hexachlorocyclohexane)

(CAS numbers: e.g. 58-89-9, EC number: 200-401-2
/ Entry number in HELCOM list of priority substances: 23)

General sectors: Legacy pesticide, legacy pharmaceutical

DRIVERS | ACTIVITIES | PRESSURES | STATE | IMPACTS

Why a HELCOM priority?

Main evidence

S Concentrations of Lindane exceed the applied threshold value in **8** of the 30 examined areas (assessment units) of the Baltic Sea. The threshold is exceeded in both coastal and off-shore areas (**4**/12 assessed off-shore areas). In these 8 areas, on average **59%** of the assessible samples in **sediment** and/or **biota** exceed the threshold value. This is based on monitoring data for the period 2015-2024 available in national and international databases[1], as well as scientific articles/reports[2]. A total number of 1526 data points were possible to evaluate for Lindane.

By further considering how much above or below the threshold each concentration is, and how often the substance is detected, Lindane scores **6.9/10** (confidence range: **6.6 – 7.5**) 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 values for Lindane, for sediment and biota, were acquired from the ecotoxicology database of the NORMAN Network[3].

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

Supporting evidence

P Approximately **30-100 kg of Lindane** are estimated to enter the Baltic Sea every year via WWTP effluents (Undeman et al, 2022[4]). Further riverine emissions (and any atmospheric deposition) are possible. Historical inputs have been higher. Given that the substance is **very persistent and very toxic**[5], even current inputs are 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 the historical inputs. For a different isomer, alpha Hexachlorocyclohexane, a smaller, still **possible significant, inputs have been estimated to enter the Baltic Sea (2-9 kg/year)**.

I Lindane is considered to have a concerning **mode of toxicity**, as it is neuroactive[6]. Neuroactive substances cause sublethal neurological impacts like disorientation or altered behaviour that can affect feeding success, predator avoidance, and overall survival.

Overall assessment

When assessing current levels in the Baltic Sea, current inputs, and the severity of the relevant toxicity mechanism, Lindane scores **69-74/100** 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.

Facts relevant for management considerations

Causal chain and pathways

A No known on-going activities causing emissions.

P The reported load of Lindane in WWTP effluents is not easily justified considering that no active use is expected in Contracting Parties. Beyond such inputs, atmospheric deposition can in general be a relevant pathway for Lindane, however its legacy status may mean that such inputs are expected to be low or even negligible.

S **?** *In order to further improve the evaluation of the magnitude of risk, one aspect that could be investigated in the future is a review of the toxicity threshold (sediment, biota).*

Relevant policies (existing or planned measures)

M (on A/P)

- Listed under **Stockholm Convention** on POPs (signed by all HELCOM Contracting Parties) – Annex A (elimination of manufacture and use, with specific exemptions possible) – accordingly **EU POPs Regulation. No acceptable purposes or exemptions reported** by any HELCOM Contracting Party. Therefore considered as banned.
- Listed as a priority hazardous substance under the **EU WFD** and its update proposal. The EQSD update proposal also includes an EQS for total of active substances in pesticides, including their relevant metabolites, degradation and reaction products.
- There are provisions in **EU Best Available Techniques** Reference Documents for lead

References:

1. 2. 3. 4. 5. 6.

[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]