Chromium and its compounds

(CAS numbers: e.g. 7440-47-3, EC numbers: e.g. 231-157-5 / Entry number in HELCOM list of priority substances: 9)

General sectors: Industry and commercial products, off-shore (shipping, dredged material deposition), personal care product

DRIVERS | ACTIVITIES | PRESSURES | STATE | IMPACTS

Why a HELCOM priority?

Main evidence

S Concentrations of Chromium exceed the applied threshold value in **22** of the 32 examined areas (assessment units) of the Baltic Sea. The threshold is exceeded in both coastal and off-shore areas (**9**/12 assessed off-shore areas). In these 22 areas, on average **80%** of the assessible samples in **water and/or 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] and scientific articles/reports[2]. A total number of 1158 data points were possible to evaluate for Chromium.

By further considering how much above or below the threshold each concentration is, and how often the substance is detected, Chromium scores **8.0/10** (confidence range: **7.4 – 8.3**) 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 values for Chromium were acquired from the ecotoxicology database of the NORMAN Network[3] (water), national EU MSFD assessments[4] (sediment), and national EU WFD assessments[5] (biota).

I Current levels in the Baltic Sea indicate potential negative impacts on pelagic biota, sediment dwelling biota, and potentially for top predators such as mammals and birds and humans via consumption of seafood, maybe depending on chemical speciation (e.g. Cr(III) vs Cr(VI)[6]).

Supporting evidence

P Approximately **200 – 400 tonnes of Chromium and its compounds** are estimated to enter the Baltic Sea every year, mainly via rivers (PLC[7]) and depositing of dredged material (HELCOM BSEFS[8]). Given that the substance is **very persistent (metals do not degrade) and suspect as toxic**[9], 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. Likely increased inputs in the near future are possible, due to it use in emerging sectors, such as in batteries.

I Chromium is considered to have a concerning **mode of toxicity**, as for example it affects the metabolic system[10]. Contaminants that disrupt energy production or utilization (energy metabolism dysfunction) can affect growth, reproduction, and overall fitness of marine organisms.

Overall assessment

When assessing current levels in the Baltic Sea, current inputs, and the severity of the relevant toxicity mechanism, Chromium scores **70-84/100** 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 Chromium and its compounds are manufactured/imported in the EU in quantities 1,000,000 – 10,000,000 tonnes/year[11]. The **REACH registered uses** include base metals ans alloys, surface treatment products, pigments, welding and soldering products, and other sectors.
Main sectors which officially reported releases to the Baltic Sea catchment in the context of E-PRTR[12] and the respective shares for the reported emissions are as following:
Releases to water/soil (average reported releases 16 t/y, in the period 2018-2022): **Industrial plants for the production of pulp from timber or similar fibrous materials** (70%), Installations for the production of pig iron or steel including continuous casting (9%), Underground mining and related operations (5%). Releases to air (average reported releases 24 t/y, in the period 2018-2022): mainly **Thermal power / combustion** (64%), **Metal ore (including sulphide ore) roasting or sintering installations** (9%), Installations for the production and/or smelting of non-ferrous metals (7%), Installations for the production of pig iron or steel including continuous casting (6%). Further E-PRTR-reporting sectors, with smaller contributions, include for example metal processind and landfills.
Emissions from shipping relate to scrubber wash water, bilge water, grey water, and sewage[13]. Furthermore, chromium is used as micronutrient.

P Based on available estimations, Chromium appears to enter the Baltic Sea mainly via **rivers** (104-167t/y, PLC) and **depositing of dredged material** (81-95t/y, HELCOM BSEFS). And to lower extent via direct inputs from land activities (15 t/y, Undeman et al, 2022[14], E-PRTR[15]) and atmospheric deposition (12-18 t/y, EMERGE[16]). Shipping emissions have been estimated to contribute to a lower degree, with about 2 t/y (EMERGE[13]). Chromium(VI) is not detectable in proximity of river mouths (WATERBASE[17]), with measurement data however being representative only for 1 Contracting Party.

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 (including whether background levels taken into account; furthermore, it is relevant to assess compatibility in terms of form (soluble/total – specifically for water, chemical speciation e.g. Cr(0) vs Cr(III) vs Cr(VI)) between measured levels and the threshold; as well as potentially the influence of salinity on ecotoxicity).*

Relevant policies (existing or planned measures)

M (on A/P)

- **For Chromium(VI), some activities are restricted under EU REACH** (cement and cement-containing mixtures, leather articles coming in contact with skin) and some under EU RoHS (electrical and electronic devices). **Several Chromium(VI) substances are listed as SVHC** (Substances of Very High Concern) **under EU REACH** (e.g. on the basis of CMR properties) and further under **REACH Auhtorizaiton list**. For suh substances, ECHA has more recently submitted an intention to submit a restriction proposal, taking stock of the granted authorisations as well as processed and pending applications for authorisations for Chromium (VI) substances (ECHA[18]). ECHA has recently developed an **Assessment of Regulatory needs (ARN) for the group of substances including chromium metal and simple trivalent chromium compounds** (covering 38 individual substances, ECHA[19]).
- There are provisions in **EU Best Available Techniques** Reference documents for this substance.

References: 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.13.14.15.16.17.18.19

[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]