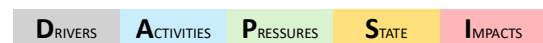


# Arsenic and its compounds

(CAS numbers: e.g. 7440-38-2, EC numbers: e.g. 231-148-6  
/ Entry number in HELCOM list of priority substances: 4)

General sectors: *Industry and commercial products, off-shore (shipping, dumped chemical warfare agents)*



## Why a HELCOM priority?

### Main evidence

**S** Concentrations of Arsenic exceed the applied threshold value in **25** of the 33 examined areas (assessment units) of the Baltic Sea. The threshold is exceeded in both coastal and off-shore areas (**10/12** assessed off-shore areas). In these 25 areas, on average **97%** of the assessable samples in **water and/or sediment** (and/or biota, which are exceeded more rarely) exceed the threshold value. This is based on monitoring data for the period 2015-2024 available in national and international databases<sup>1</sup>, as well as in scientific articles/reports<sup>2</sup>. A total number of 1741 data points were possible to evaluate for Arsenic.

By further considering how much above or below the threshold each concentration is, and how often the substance is detected, Arsenic scores **8.6/10** (confidence range: **8.0 – 8.8**) 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 Arsenic were acquired from the ecotoxicology database of the NORMAN Network<sup>3</sup> (water – Arsenic has also a CLP harmonized classification as Aquatic Acute 1 and Aquatic Chronic 1) and national EU MSFD assessments<sup>4</sup> (sediment, biota).

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

### Supporting evidence

**P** Approximately **210 – 230 tonnes of Arsenic and its compounds** are estimated to enter the Baltic Sea every year, mainly via rivers (WATERBASE<sup>5</sup>) and secondly deposition of dredged material<sup>5</sup>. Given that the substance is **very persistent (metals do not degrade) and toxic<sup>6</sup>**, 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.

**S** According to expert information provided, according to an EQS value that has been developed by **Denmark all areas where measured appear to be subGES** (not good environmental status). Furthermore, **arsenic in sediments of the Skagerrak show an increasing trend over time**.

**I** Arsenic is considered to have an especially **concerning mode of toxicity**: for example it is carcinogenic<sup>7</sup> (beyond its aquatic toxicity), thus posing high long-term risk to populations (at least 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, Arsenic scores **85-88/100** 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** The substance is manufactured/imported in the EU in quantities >300 t/y (not complete calculation of EU REACH registered volume<sup>8</sup>, as there are several substances containing Arsenic). Main sectors which officially reported releases to the Baltic Sea catchment in the context of E-PRTR<sup>9</sup> and the respective shares for the reported emissions are as following (a broader overview including REACH-registered uses with potential emissions has not been compiled here):

Releases to water/soil (average reported releases 10 t/y, 2018-2022): **Opencast mining and quarrying** (52%), **Underground mining and related operations** (24%), Chemical installations for the production on an industrial scale of phosphorous, nitrogen or potassium based fertilisers (5%).

Releases to air (average reported releases 8 t/y, 2018-2022): **Power stations and other combustion installations** (57%), **Installations for the production and/or smelting of non-ferrous metals** (27%), Production of non-ferrous crude metals by metallurgical, chemical or electrolytic processes (6%).

**Shipping emissions** have been estimated as 1.4 t/y (scrubber wash water, bilge water, grey water, sewage) (EMERGE<sup>10</sup>). Furthermore, certain chemical warfare agents contain Arsenic, and can be released from **dumped munitions**.

**P** Based on available estimations, Arsenic appears to enter the Baltic Sea mainly via **rivers** (~200 t/y, WATERBASE) and secondly via direct off-shore emissions (12-33 t/y:11-31 t/y via **deposition of dredged material**, HELCOM BSEFS<sup>11</sup>; plus 1.4 t/y via shipping, EMERGE). The contribution of Wastewater Treatment Plants appears relatively low (estimated to account for approximately 4t/y out of the 200t/y of riverine inputs plus 1 t/y of direct emissions) (Undemann, 2022<sup>12</sup>). Direct emissions from E-PRTR reporting land-based sectors were in the order of 1 t/y. Inputs via atmospheric deposition seem to be negligible (10-40 kg/y, EMERGE).

**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. organic vs inorganic) 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/I)** • **Some activities are restricted under EU REACH** (antifouling, wood preservation, treatment of industrial waters). **Some Arsenic substances are listed as SVHC** (Substances of Very High Concern) **under EU REACH** (on the basis of CMR properties): Arsenic acid, Diarsenic pentaoxide, Diarsenic trioxide, Calcium arsenate, Trilead diarsenate, Triethyl arsenate – the three first have further been included in the **REACH Authorization list**. ECHA has also developed an **Assessment of Regulatory needs (ARN)** for complex inorganic substances

**originating from metallurgical processes excluding slags**, including heavy metal alloys with arsenic and other elements resulting from smelting / arsenic oxides (ECHA<sup>13</sup>).

- Arsenic and its compounds is **listed under the 'indicative list of the main pollutants' of EU WFD (Annex VIII)**. Germany has many projects on dumped munitions. Germany and Denmark are exploring EQS development, on sediments and biota (mussels – likely everywhere exceeded) respectively.
- There are provisions in **EU Best Available Techniques** Reference documents for arsenic
- **EU is developing an EQS for inorganic As in food**. Relevant HELCOM and national measures to be listed.

## **References:**

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.

[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]