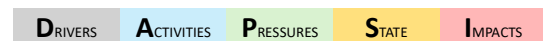


# Estrone

(CAS numbers: e.g. 53-16-7, 19973-76-3, EC number: 200-164-5  
/ Entry number in HELCOM list of priority substances: 17)

General sectors: *Hormone,  
pharmaceutical, industry*



## Why a HELCOM priority?

### Main evidence

**S** Concentrations of estrone exceed the applied threshold value in all the **4** examined areas (assessment units) of the Baltic Sea. The threshold is exceeded in both coastal and off-shore areas (**3/3** assessed off-shore areas). In these **4** areas, **100%** of the assessable samples in **water** exceed the threshold value. This is based on monitoring data for the period 2015-2024 available in national and international databases<sup>1</sup>. A total number of 37 data points were possible to evaluate for estrone.

By further considering how much above or below the threshold each concentration is, and how often the substance is detected, estrone scores **9.3/10** (confidence range: **8.7 – 9.4**) 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 estrone, for water, was acquired from the EC proposed Directive amending WFD and EQSD<sup>2</sup>.

**I** Current inputs to the Baltic Sea indicate potential negative impacts at least on pelagic biota.

### Supporting evidence

**P** Approximately **50-92 kg of estrone** are estimated to enter the Baltic Sea every year, via Wastewater Treatment Plants (WWTPs) / rivers (WATERBASE<sup>3</sup>; Undeman et al, 2022<sup>4</sup>). Given that the substance is **suspect as persistent** and is **extremely toxic**<sup>5</sup>, 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 historical inputs.

**I** Estrone is considered to have an especially **concerning mode of toxicity**. For example, it is an endocrine disruptor<sup>6</sup>. 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 (no relevant measurement data), current inputs, and the severity of the relevant toxicity mechanism, estrone scores **90-93/100** 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** Estrone is a natural estrogen, which is excreted by humans as well as animals. It is the most common livestock-derived estrogen contaminant in the environment<sup>7</sup>. It is also sold as pharmaceutical. Furthermore, it is used in the EU in industrial settings as an intermediate in synthesis<sup>8</sup>.

**P** Based on available rough estimations<sup>3,4</sup>, riverine inputs to the Baltic Sea are at least as high and likely higher (perhaps 1-4 times higher) than direct inputs via coastal WWTPs.

**S** **?** *In order to further improve the evaluation of the magnitude of risk, one aspect that could be investigated in the future is whether background levels have been taken into account in the toxicity threshold in the EC proposed Directive amending WFD and EQSD.*

### Relevant policies (existing or planned measures)

**M (on A/P)** • Listed in the first and second **EQSD Watch Lists**. And also as priority substance in the **EU WFD** update proposal.

## 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]

| \* considering that there were also inconclusive non-detections (in terms of exceedance, due to a relatively high limit of detection), it is possible that the actual average frequency of exceedance in these areas is somewhat lower, but in any case >75%.