

# A nation-wide survey of polluted sediments in Sweden

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**Introduction:** To achieve a healthy water environment in Sweden there is a need of increased activities related to identification, investigation, and remediation of contaminated sediments. As part of a government mandate, initial investigations have been performed in selected sediment areas across the country. The objectives with the survey were to contribute to an improved national overview of contaminated sediments, and to provide a basis for further development of a methodology for prioritization and initial investigation of sites with contaminated sediment. The outcome of the survey is briefly presented here.

**Methods:** Study areas along the coast, in lakes and waterways were selected based on the water administration's risk assessments, known sources of emissions and local hydrological and geological



**Fig. 1.** Investigated areas in Sweden.

conditions. The selection was refined in consultation with representatives from the County Administrative Boards. The approx. 70 sites that were selected (Fig. 1), as well as 15 sites for a separate survey of lake Vänern, were investigated using hydroacoustic methods to select suitable localizations for sediment sampling. Surface (0-5 cm) and deeper (15-20 cm) sediment layers were analyzed for metals and organic pollutants (e.g., PAHs and PCBs). Moreover, a wider range of substances such as PFAS, chlorinated pesticides and pharmaceutical substances were selected based on the assessed impact at each area. Degree of contamination was reviewed for substances with national environmental criteria. At selected areas, tests for toxic response (CALUX, Chemical Activated LUCiferase gene eXpression) were carried out regarding dioxins, PAHs and estrogen-like substances.

**Results:** Metals and PAH were occurring in elevated levels at sites in the vicinity of urban areas, harbors,

and larger industries. PFOS and substances with risk being enriched higher up the food chain, such as PCBs and dioxins, were also frequently detected. The pattern for the different dioxin congeners varied among the areas and may provide information for further studies of sources to pollution. The toxic response measured by means of CALUX generally co-varied with measured levels in the chemical analysis of the respective substance group.

The results of the investigations are presented in field reports [1][2], and yet another field report and summary report will be published later in 2023 (in Swedish with English summary) available at [renasediment.se](https://renasediment.se). Analysis data is reported to the open data hosting for sediments at the Geological Survey of Sweden.

**Discussion:** The surveys have contributed to the national overview of sediment pollution in Sweden, and with increased knowledge about methodology and choice of parameters for further work with prioritization and investigation of sediment. A thorough review of information on potential pollution sources and sediment geology is crucial for prioritizing suitable areas for investigation, especially in watercourses and highly impacted urban areas. Hydroacoustic measurements proved to be essential to understand the conditions at each location and to select appropriate sampling points. The results also show that toxicity tests may be a useful complement to chemical analysis and a tool for the interpretation of total load of substances that have similar effects and impacts on the benthic environment.

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**References:** [1] Larsson et al. (2021) [SGU-report 2021:21](#). [2] Norrlin et al. (2022) [SGU-report 2022:16](#).