

New Approaches in Determining the Impacts of Chemical Pollution to Protect the Biodiversity of the Baltic Sea

Detect2Protect

Newsletter No. 4



THE MISSION

Detect2Protect (*New approaches in determining the impacts of chemical pollution to protect the biodiversity of the Baltic Sea*) examines the relationships between chemical pollution and biodiversity in the Baltic Sea. Apart from gaining important new knowledge on this linkage the objective is to develop integrated chemical-biological monitoring and assessment frameworks for the marine environment.

PARTNERS OF THE PROJECT



- Marine and Freshwater Solutions, Finnish Environment Institute, Helsinki, Finland (Syke)
- Department of Marine Systems, Tallinn University of Technology, Tallinn, Estonia (TalTech)
- Laboratory of Ecotoxicology, Nature Research Centre, Vilnius, Lithuania (NRC)
- Institute of Oceanology, Polish Academy of Sciences, Sopot, Poland (IO PAN)
- Marine Monitoring, Latvian Institute of Aquatic Ecology, Agency of Daugavpils University, Riga, Latvia (LHEI)
- Department of Biological and Environmental Sciences, University of Gothenburg, Gothenburg, Sweden (BIOENV)
- Environmental Science, Stockholm University, Stockholm, Sweden (SU)
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Detect2Protect Stakeholder Seminar

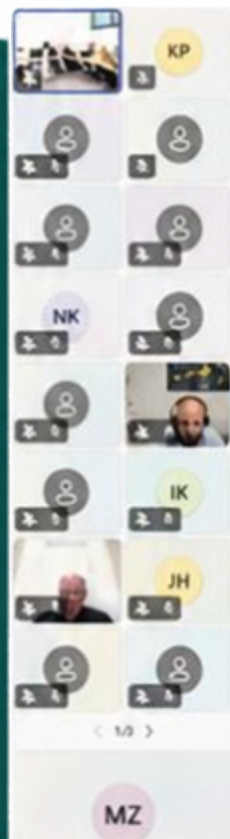
The Detect2Protect Stakeholder Seminar was held online on 20 May 2026. Main results on chemical pollution, biological effects, biodiversity/eDNA and integrated analyses at the Baltic Sea study sites were presented to an audience consisting of representatives of various stakeholder groups from all partner countries. The key message from the seminar was that the measurement of chemical concentrations alone is not sufficient to assess their ecological risk. Detect2Protect shows the value of linking contaminant data with biomarkers, eDNA, stable isotopes and modelling to achieve a better understanding of the impacts of pollution on organisms, communities and ecosystem functioning. The seminar highlighted the need for better integrated chemical-biological monitoring to support early warning risk assessment and thus a better protection of Baltic Sea biodiversity.



biodiversa+
 European Biodiversity Partnership

Detect 2Protect Stakeholder seminar

May 20, 2026 | MS Teams



CHEMICAL PRESSURE

Mistures of hazardous substances (HOCs, metals) in sediments and organisms



BIOLOGICAL RESPONSE

Effects in organisms: detoxification, DNA damage, oxidative stress, reproduction



BIODIVERSITY IMPACT

Changes in community structure, functional diversity and ecosystem functioning

Stakeholder perspectives

After the Detect2Protect Stakeholder Seminar, stakeholders were invited to share their perspectives on the needs, challenges and future directions in the monitoring of chemical pollution in the Baltic Sea. Their answers underline the need for more integrated, practical and policy-relevant approaches linking chemical data with biological effects.



Lotta Ruokanen
Deputy Executive Secretary of HELCOM



What practical steps are needed to integrate effect-based methods (EBM) for chemical pollution assessment into Baltic Sea regional monitoring programmes?

“Recent project work has significantly advanced the acceptance and application of effect-based methods in regional assessment and policy processes. Key achievements include the development of monitoring guidelines, the incorporation of test cases assessments in HOLAS 3, and the identification of the role of EBM within regional approaches for the prioritisation and management of hazardous substances. To further integrate EBM into Baltic Sea regional monitoring programmes, several practical steps have been identified in the recently adopted HELCOM Recommendation and the draft Regional Action Plan on Hazardous Substances. These include:

- expanding the spatial coverage of EBM monitoring across the Baltic;
- broadening the range of effect-based methods applied, including methods targeting additional taxonomic groups (e.g. algae) and different trophic levels;
- developing additional assessment threshold values, particularly those relevant to Baltic Sea conditions, to support status assessments; and
- strengthening data integration and interpretation by linking chemical occurrence data with observed biological effects.

An important next step would be to make full use of the datasets generated through the first holistic implementation of the regional strategic approach. These datasets combine information on chemical concentrations and biological effects and can support confirmation analyses to identifying the substances or mixtures most likely responsible for observed biological responses. Such work will help improve the interpretation of monitoring results and strengthen the role of EBM in regional chemical pollution assessments. Further progress will also depend on the integration of EBM into national monitoring frameworks by Contracting Parties, building on the harmonised guidelines and assessment approaches already developed at the regional level.”

Stakeholder perspectives



Galina Garnaga-Budrė
EPA, Head of the Environmental Research
Department, Lithuania



What currently limits the wider use of innovative monitoring methods for assessing chemical pollution and its biological effects?

“The wider use of innovative monitoring methods for assessing chemical pollution and its biological effects is currently limited by several factors. First, many emerging methods still lack standardized protocols and harmonized assessment criteria, which makes it difficult to ensure comparability of results between countries and monitoring programmes. Second, regulatory frameworks are often based on traditional chemical analyses and may not yet fully cover novel approaches. Finally, the implementation of innovative methods often requires specialized expertise, laboratory capacity, and additional financial resources.”



Maruta Vehi, senior hydrogeologist and inland water specialist at the Latvian Environment, Geology and Meteorology Centre (LVGMC), Latvia



What kind of monitoring information on chemical pollution and its biological effects would be most useful for local and regional environmental management?

“For local and regional management, the ideal monitoring package is a tiered, risk-based approach that aligns with the objectives of the revised Water Framework Directive (WFD). The updated WFD mandates moving beyond traditional chemical standards by integrating effect-based methods (EBM) to address the systemic challenge of chemical mixtures. In practice, this means utilizing high-frequency EBM screening to flag areas of biological concern – effectively capturing the 'cocktail effect' – followed by targeted chemical analysis to identify specific drivers of toxicity. Finally, these findings must be translated into a management report that defines concrete, cost-effective mitigation measures.”

Stakeholder perspectives



Patrycja Nowakowska
Marine Ecosystem Protection Specialist, MARE
Foundation, Poland



What environmental challenges related to chemical pollution in the Baltic Sea require better monitoring tools and greater attention from science and monitoring programmes?

“Chemical pollution in the Baltic Sea requires better monitoring tools and greater attention from science and monitoring programmes. Important challenges include emerging pollutants such as PFAS, pharmaceuticals and microplastics, as well as legacy pollution sources, including shipwrecks, dumped munitions and chemical warfare agents on the seabed. Better tools are needed to identify pollution hotspots and trace contaminants from land-based and maritime sources. Another key issue is the cumulative effect of chemical mixtures. Marine organisms are exposed to many substances at the same time, while monitoring often focuses on selected individual chemicals. This may lead to an underestimation of real environmental risks. Future monitoring should therefore combine chemical analyses with biological indicators and effect-based methods. Such an integrated approach would help detect early signs of stress in marine organisms and provide a more complete picture of pollution impacts on Baltic Sea ecosystems.”



Kai Künnis-Beres
Tallinn University of Applied Sciences,
Estonia



What environmental challenges related to chemical pollution in the Baltic Sea require better monitoring tools and greater attention from science and monitoring programmes?

“Monitoring should pay greater attention to pollution originating from transport, including heavy metals, as well as pesticides such as glyphosate. In marine environments, pharmaceutical pollution, including synthetic hormones, is also an important issue requiring more attention.”

Project highlights

The Detect2Protect links three levels of environmental information: chemical contamination, biological effects in organisms, and biodiversity. This increases the understanding of biological and ecological consequences of marine pollution, and provides scientific support to the development of integrated chemical-biological monitoring.



Project highlights



- Contamination levels in sediments varied between the study regions, sites and chemical analytes; chemical pressure is highly site-specific.
- Chemical contamination gradients were observed and allowed the distinction of less, moderately and heavily polluted sites while the categorization differed according to the contaminant group.



- eDNA analyses showed that chemical contamination is markedly associated with changes in both bacterial and eukaryotic biodiversity in sediments.
- For bacterial communities, contamination explained a significant part of variability while the differences in the type of chemicals present were important.
- Most variability in eukaryotic biodiversity seems ecosystem-driven and linked to environmental and geographic gradients.



- Biological effects methods show whether chemical pressure is already affecting organisms, filling an important gap left by contamination-based monitoring.
- Chemical mixtures were linked with biological harm at different levels: DNA damage, oxidative stress, neurotoxicity and reproductive disorders.



- The Con-Bio-Eco framework examines whether chemical contamination translates into biological effects.
- It improves the prediction of ecological changes and provides site-specific biodiversity hazard scores.
- The framework suggests to move from concentration-based pollution assessments to risk assessment including **biological effects, biodiversity indicators and relevant environmental factors**.

Take home message: To obtain early warning signals of negative effects of chemicals we must move from measuring only their concentrations to an integrated chemical-biological-ecological monitoring and assessment framework to improve the protection of Baltic Sea ecosystems.



Latest activities

Final Detect2Protect meeting in Helsinki

The final meeting of the Detect2Protect project was held on 20–22 May 2026 at the Finnish Environment Institute (Syke) in Helsinki, held back-to-back with the Stakeholder Seminar. Project partners discussed the current status of the project, remaining tasks, reporting issues, and the next steps for finalizing the project outputs. Partners also discussed the future of the Baltic Sea biomarker community and possibilities for continued collaboration after the project. The meeting was an important step towards finalizing Detect2Protect results and translating them into recommendations for future chemical-biological monitoring in the Baltic Sea.



The work continues.....

Detect2Protect partners will continue working on manuscripts, data integration and final outputs. Please follow our website for updates!

