

## **Protection the Baltic Sea: reducing heavy metals of ship ballast water**

The research project “Purification of ship ballast water from heavy metal ions to reduce pollution” was launched in January 2025 with the aim of developing a practical solution to reduce heavy metals, in particular chromium (Cr) and nickel (Ni), in ships’ ballast water, thereby lowering pollution loads in the marine environment. The project will be completed in January 2026, delivering a laboratory-validated prototype.

While current ballast water management systems (BWMS) are effective in controlling biological contamination, heavy metal ions remain a significant environmental concern, as they do not biodegrade and accumulate in sediments and the food chain. This issue affects not only the Baltic Sea, but also other high-traffic maritime regions worldwide.

The project focuses on a filtration concept based on locally available sand whose surface electrical potential is modified using ultraviolet radiation or high-energy electron beams. This treatment enables heavy metal ions to be captured through electrostatic interactions during filtration, without the use of chemical reagents.

By the end of the project, a filtration prototype validated at Technology Readiness Level TRL 4 will be available, which could in the future be implemented as an add-on or enhancement to existing ballast water treatment systems. The project is carried out in cooperation between Riga Technical University, the RTU Latvian Maritime Academy and the University of Maryland (USA), combining expertise in materials science, maritime environmental studies and computational modelling.

The project team also invites shipowners, operators, ports and technology providers to participate in follow-up pilot projects. Cooperation with industry would allow the solution to be tested under real operating conditions and advanced towards practical use in international shipping.