

Climate Sensitivity of Dissolved TNT in the Western Baltic Sea

Even decades after the Second World War, dumped munitions on the seafloor of the western Baltic Sea continue to leak toxic substances, such as TNT. This raises the question of how this pollution will evolve under future climate conditions.

To investigate this, researchers at the Leibniz Institute for Baltic Sea Research Warnemünde (IOW) conducted a series of targeted climate sensitivity experiments using a high-resolution coastal model with a spatial resolution of 200 m for the western Baltic Sea. Instead of simulating complete long-term climate scenarios, the study systematically varied key environmental drivers such as temperature, sea level, and wind conditions.

This approach allows isolating and quantifying how individual factors influence the transport and fate of TNT within the marine system. The results are presented in Figure 1.

The experiments reveal a clear pattern: sea level rise (hereafter SLR) leads to a decrease in TNT concentrations (−14% for +50 cm, −25% for +100 cm), while stronger winds increase TNT levels (+14% for +5% wind speed). Warming reduces TNT overall (−3% for +1 K and −30% for +2 K).

When combining these effects (SLR +100 cm, wind speed +5%, and a warming of +2 K), the total TNT still decreases (−20%), indicating non-linear interactions between the different drivers.

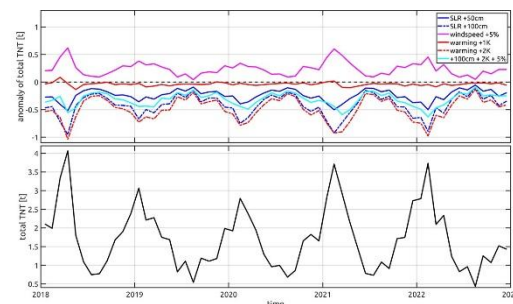


Fig. 1: The lower panel shows the total amount of dissolved TNT in the western Baltic Sea, while the upper panel displays the deviation of each climate sensitivity experiment from the reference simulation.

These changes can be explained by physical and chemical processes at the seabed. Higher sea levels reduce the impact of wind-driven waves on the seafloor, thereby decreasing the release of TNT from exposed munitions. In contrast, stronger winds enhance wave activity and promote the release of TNT.

Higher temperatures accelerate both the dissolution and the degradation of TNT. However, because degradation increases more strongly than release rates, the overall concentration of TNT declines.

Gefördert durch:

These findings improve our understanding of how climate change may affect pollution from dumped munitions and constitute an important

foundation for future risk assessments and monitoring strategies.

Contact: Ulf Gräwe ulf.graewe@iow.de

CONMAR on the International UN Stage

At the end of April 2026, CONMAR participated in the *International Meeting of Mine Action National Directors and UN Advisers* in Geneva, Switzerland—a high-level United Nations conference dedicated to addressing the global risks posed by munitions. As part of the programme, Jens Greinert joined representatives from leading international organisations in a panel discussion on the challenges and future management of marine munitions. The event was organised and chaired by Paul Trautendorfer of JPI Oceans.

Its inclusion at the international UN level underscores the growing recognition that legacy submerged wartime pollution is not only a regional issue but also a global environmental challenge requiring international cooperation,

scientific exchange, and sustainable management strategies.



Fig. 2. The panelists from left to right: Prof. Jens Greinert (GEOMAR), Clifford Tunuki (Solomon Islands), Sean Moorhouse (UNDP), Prof. Christian Bueger (UNIDIR).

Contact: Daniela Henkel dhenkel@geomar.de

CONMAR at the European Maritime Day 2026 in Limassol, Cyprus

From 21 to 22 May 2026, the annual *European Maritime Day 2026* will take place in Limassol, Cyprus. sustainMare will be represented by an information booth, offering insights into its research projects. CONMAR will be represented by two project members and will participate in a workshop on the topic of *'Towards an EU-wide strategy for the removal of munitions from the sea'*. The EMD provides an excellent opportunity to present the mission's activities on an international stage and to showcase German marine munitions research to a broad European audience.



Contact: Daniela Henkel dhenkel@geomar.de