Factsheet #4
Threats of Munitions in the Sea to the Blue Economy

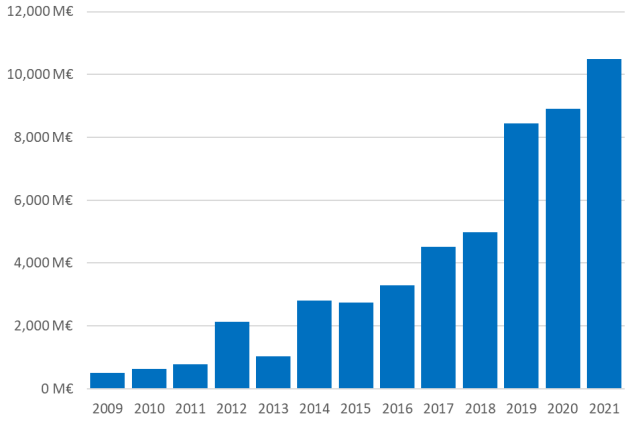
#4

Munitions in the sea constitute a threat to the blue economy. Raising awareness is the first and most important step towards understanding the associated risks and addressing them effectively.

Although recent projections do not predict significant growth in the blue economy's GDP, spatial demands are expected to rise – especially due to the expansion of offshore wind energy and aquaculture. As a result, key sectors must be prepared to deal with the issue of submerged munitions.

There are two primary patterns of munitions distribution in the ocean. One is the presence of concentrated contamination hotspots, such as former dump sites. In these areas, risks can often be managed through spatial planning and avoidance. The second—and arguably more challenging—pattern is the random distribution of munitions across the seafloor, especially in coastal and nearshore areas. This widespread legacy of past military activities requires sector-specific risk mitigation measures. Addressing the issue proactively entails costs in terms of personnel and funding, but helps prevent accidents that could result in injury, loss of life, or material damage.

A projected ninefold increase in spatial ocean use between 2018 and 2050 will lead to a higher frequency of munition encounters. The way these threats materialise depends on multiple factors. Sectors most at risk are those that interact directly with the seabed. This fact sheet focuses on offshore construction and development (including wind farms, cable laying, shipping lane extension and other dredging activities), fishing, and tourism. Other industries, such as aquaculture and port operations may also be affected. Shipping, although a major sector economically, is generally only marginally exposed – except in the unlikely case of a freak accident.



Annual net investment in offshore energy in the European Union. Growth is primarily driven by Germany, the Netherlands, Denmark, and Belgium. (Data: EU Blue Economy Observatory)

Three Threat Pathways

1. Explosion Risk: Munitions contain explosive compounds intended to detonate. While dumped munitions are usually not equipped with a functioning fuze, unexploded ordnance (UXO) from combat zones may still function as originally intended. Their various fuzes – some triggered by pressure, magnetic field changes, impact or even sound – make them unpredictable. A detonation underwater generates rapidly rising gas bubbles, shock waves and intense sound, all of which can cause serious harm to people, vessels, and other equipment. This represents the most immediate and severe threat to the blue economy.

2. Toxic exposure: Even without detonation, contact with toxic materials – such as chemical warfare agents (CWAs), incendiaries, or toxic explosive compounds – can be dangerous. CWAs like sulfur mustard (mustard gas) are highly toxic and can cause injury or death with minimal exposure. In seawater, mustard gas forms lumps with a liquid core that can break

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open when moved or handled without care. Accidental contact with munitions or its compounds poses an ongoing risk, particularly for the fisheries and beachgoers.

3. Environmental Contamination: Over time, toxic compounds from corroding munitions can leach into the marine environment and accumulate in seafood species. While current concentrations are not considered hazardous to human health, contamination monitoring is important.

Various munitions that were cleared during a shipping line extension in the German North Sea are prepared for detonation at low tide (Photo: SeaTerra).

Sector Specific Impacts

Offshore construction and development projects are commonly avoided in dump sites or other contamination hotspots. In areas where munitions may be randomly distributed, interactions with the seabed are inherently hazardous. Activities like dredging, pile driving, and cable ploughing carry inherent risks without prior explosive ordnance disposal (EOD). The four EOD phases - (I) a desk-based preliminary survey, (II) technical site survey, (III) investigation of potential objects, and (IV) clearance and disposal of munitions – must be performed by trained professionals.

One notable example: construction of the Nord Stream 1 pipeline involved the removal of over 100 munitions in Russian, Finnish, Swedish, and German waters. This demonstrates that EOD is the way of risk management that is accepted throughout the construction and development sector. While EOD processes entail additional costs, they are a small fraction of total budgets and significantly reduce the risk of delays or catastrophic incidents.

Fishing: The fishing sector is especially vulnerable. Hauling up munitions or CWAs can cause explosions or toxic exposure—both with potentially fatal outcomes. In the Baltic Sea, fishers have repeatedly been exposed to all kinds of munitions. Bottom trawling poses the highest risk, but any gear that contacts the seabed may result in unintended recoveries, as shown by the near-fatal incident aboard the crab potting vessel Galwad-Y-Mor.

Marked exclusion zones and areas labeled as “foul ground” in nautical charts offer some protection. Yet, encounters are not limited to official dump sites. In the Bornholm Basin, of 327 encounters with chemical warfare agents (CWA) that were reported to Danish authorities from 1961 to 2012, only 26 occurred inside the boundaries of the dumpsite as it is shown on officially issued maps. Guidance documents have been issued, e.g., by HELCOM, Poland, and Denmark, to instruct fishing personnel on how to act, when munitions are encountered.

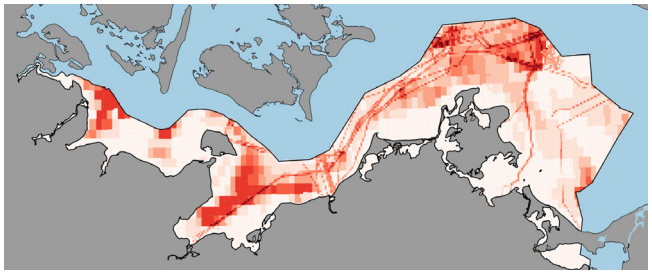
Tourism: Although tourists are unlikely to interact with large-scale seabed munitions, small objects—including explosive lumps or incendiary materials—can wash ashore, particularly after storms. White phosphorus, for instance, resembles amber but can spontaneously ignite when dry, burning at temperatures up to 1,300°C. Children are especially at risk.

Such incidents may negatively impact tourism in affected areas. Regular beach patrols by EOD experts and clear signage can help prevent accidents and reassure the public.

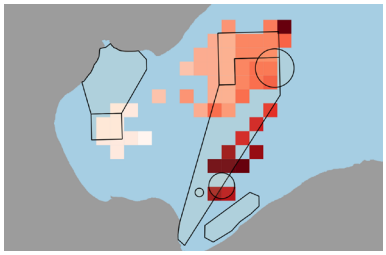
Threat and Risk Assessment

To assess risks, data on munition type, location, and condition must be combined with information on maritime use. Since detailed data is often unavailable, area-wide threat assessments can be carried out using hypothetical munition objects. These models help identify zones where preventive surveys are warranted.

For areas where munition information and blue economy data are both equally available, a risk assessment can be performed. In this case, a high risk should be followed by a recommendation for clearance in the respective area.



Potential threat map for the German Baltic Sea assuming uniform munition distribution. Darker red indicates highe threat levels, correlating with fishing intensity and shipping routes. (Illustration: GEOMAR/GCF).



Median risk map for the Lübeck Bay, based on real munition pile distribution. Darker red indicates greater risk. (Illustration: GEOMAR/GCF).

Conclusion

The threat posed by munitions in the sea increases with a sector’s interaction with the seabed. The offshore construction industry has developed comprehensive safety protocols. The fishing sector, by contrast, remains the most accident-prone. Coastal tourism, while employing the most people within the blue economy, is comparatively less affected, though not entirely risk-free.

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