

## *Research overview project MeNorth (Methane Emissions in the North Sea) – a NIOZ, TNO and SodM joint adventure*

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The North Sea hosts large hydrocarbon reservoirs, and commercial exploitation has given rise to a dense array of production platforms and more than 20,000 drilled wells. Once reservoirs are depleted or become non-profitable, wells are sealed with concrete and the casings are cut off some metres below the seafloor. Nevertheless, several research expeditions have shown that abandoned wells may leak methane, which is released into the water column and potentially into the atmosphere. This has raised scientific and societal concern, calling for further investigations. In a combined effort, NIOZ, TNO and SodM initiated the project MeNorth – Methane Emissions in the North Sea. Since 2022, we have conducted four research cruises with R/V Pelagia and employed a multidisciplinary approach to investigate methane leakage from abandoned wells as well as natural seepage in the Dutch sector of the North Sea.

We first used a combination of multibeam and single-beam echosounders to detect bubble plumes in the water column, directly indicating that some, but not all, wells are leaking. Methane concentrations in the water column were measured using laser-based spectroscopy and gas chromatography. Bubble plumes and seafloor features were investigated visually using ROVs, which were also used to collect gas samples from the seabed for isotope analysis and to deploy two novel lander systems close to or directly above bubble release sites. The landers measured dissolved methane concentrations and bubble fluxes in situ. Methane consumption by methanotrophic bacteria was quantified in discrete water samples using radioisotope assays. Finally, methane emissions to the atmosphere were measured with a ship-mounted gradient system combined with laser spectroscopy. In this presentation, we provide an overview of the project's activities and will discuss the frequency of methane leakage, methane dynamics and its further fate in the Dutch sector of the North Sea.