

Quality of tidal mudflats changes in gas extraction area of Wadden Sea

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Sieving one of the nearly 5,000 soils samples taken with SIBES on the intertidal mudflats of the Dutch Wadden Sea. Credit: Kees van de Veen

As tidal flats subside due to gas extraction, their composition changes. This is shown in a paper published in this month's *Journal of Applied*

Ecology. "The average grain size in the parts of the mudflats where gas is extracted has decreased over 10% in 12 years. With that, sand is getting finer," says NIOZ researcher Allert Bijleveld. In this period, the composition of the benthic life in subsided areas has also changed in comparison to similar areas where subsidence due to gas extraction did not occur.

Long-term monitoring

The data on [soil](#) composition and benthic life are derived from the long-term monitoring program SIBES. In this Synoptic Intertidal Benthic Survey, soil has been sampled annually for 15 years along a web of nodes spaced every 500 meters across the intertidal mud flats. In total, this includes about 5,000 sampling locations.

SIBES shows that the [grain size](#) in the areas that are affected by [gas extraction](#) around Ameland decreased by an average of 1 micrometer each year between 2008 and 2020, while no decrease was seen in reference areas. Over the entire period, the average grain size decreased from 154 to 138 micrometers. Bijleveld says, "This means that there is increasingly fine soil material in the 'bowl' that is created by [gas extraction](#). That may have consequences for the benthic animals that live there."

Altered life

This study provides the first indication of these alterations in benthic life. The total biomass in the subsided area decreased slightly, although that decrease was not statistically significant compared to the reference areas. The composition of the bottom life did change statistically significant in favor of animals that prefer deeper bottoms, such as cat worms. Conversely, there has been a reduction in animals that prefer

shallow mudflats, such as mudsnails, for example.



Taking a soil sample from the boat to determine sediment composition and biodiversity of benthic life. Credit: Kees van de Veen



Cockles that were collected at a sampling station. Credit: Kees van de Veen

Hand on tap

In the legal permit for mining activities under the Wadden Sea World Heritage Site, it was agreed upon that gas and salt will be extracted "with a hand on the tap." According to the permit, if gas extraction has effects on natural values, extraction must be slowed down. Because "natural values" are difficult to measure, attention is primarily paid to subsidence. This research now shows that subsidence in itself is not a good signal for a vigilant hand on the tap. Bijleveld says, "Strictly spoken, there has been no net subsidence in recent decades, because the affected area has been refilled on average. But the quality of the soil did

change and with it the composition of soil life."

The Dutch petrol company NAM has been extracting gas from under the mud flats near Ameland since the 1980's. The gas extraction area is currently comprised of more silt than expected. However, due to a lack of proper monitoring in the time before extraction began, it is now impossible to determine with certainty whether the silt was already present or if it was caused by the extraction. This research gives a preliminary indication of the latter.

Out of sight

Bijleveld advocates for the inclusion of long-term research such as the SIBES monitoring program in decisions regarding mining and other activities in the Wadden Sea. "For the legally required 'hand on the tap,' the salt extraction around Harlingen now only looks at the bottom at a very limited number of stations. This leaves the actual effects of subsidence out of sight. For a serious assessment of effects, it is necessary to start measuring even before an intervention and to automatically monitor comparable areas as well through an extensive and long-term study such as SIBES. In addition to any net decrease in the soil elevation, the composition of the soil and soil life in particular, should become a measure," Bijleveld argues.

More information: Paula de la Barra et al, The effects of gas extraction under intertidal mudflats on sediment and macrozoobenthic communities, *Journal of Applied Ecology* (2023). [DOI: 10.1111/1365-2664.14530](https://doi.org/10.1111/1365-2664.14530)

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