

Mapping the coastal area below the surface to support climate resilience

Climate change is increasing the risk of coastal flooding, erosion, and rising sea levels. To plan effective coastal protection, we need a better understanding of what lies beneath the ground and seabed. Hidden layers of sand, clay, freshwater, and saltwater play an important role in determining how coastlines respond to climate change and how infrastructure can be designed to withstand future conditions.

This Industrial PhD project is a collaboration between Aarhus University and COWI. The project will develop new methods for combining geophysical measurements collected both on land and at sea. These methods allow us to “see” below the surface without extensive drilling, making investigations faster, more cost-effective, and less intrusive.

Today, different geophysical systems are often processed separately, creating gaps in our understanding of the critical transition zone between land and sea. The project aims to overcome this challenge by developing advanced software that can integrate multiple types of geophysical data into one consistent picture of the subsurface.

The work will focus on three main activities. First, new modelling tools will be developed to combine measurements collected onshore and offshore. Second, a new open-source software framework will be created to integrate different datasets and improve the reliability of geological interpretations. Third, the methods will be tested on a real Danish coastal site using existing data as well as new field surveys.

The project will produce detailed maps and models of coastal geology, helping engineers and planners understand conditions below the surface with greater confidence. These models can improve decisions related to coastal protection, infrastructure placement, groundwater management, and climate adaptation planning.

The research is expected to result in three scientific publications and freely available software that can be used by researchers, consultants, and public authorities. By making better use of existing geophysical data and combining information from land and sea, the project will unlock new knowledge about coastal environments.

In the longer term, the results will help support more resilient coastal communities and infrastructure. For COWI, the project will strengthen expertise within climate adaptation and geoscience, while contributing to the company's vision of shaping a sustainable and liveable world. The methods developed in the project have the potential to be used not only in Denmark, but in coastal regions around the world facing similar climate challenges.