

Abstract

SecuCoast will develop and apply novel geophysical, optical and geochemical techniques to produce significant new understanding of groundwater and seawater interactions in coastal aquifers and the impacts of submarine groundwater discharge on the coastal sea. This will respond to Water4All Call Topic 1 to map, monitor, and assess groundwater and marine ecosystem services in the context of global change. In addition, we will provide critical constraints for the human and climate change pressures on ecosystem services through well-constrained numerical modeling (Topic 2).

The work has three objectives:

- Securing coastal aquifer water quality. Successful management of coastal aquifers involves finding a balance between groundwater pumping rate so that the sustainable levels are not exceeded and seawater intrusion (SWI) is not beyond control. We will incorporate hydrochemical reactions into the numerical groundwater flow models to better quantify sustainable pumping rates and mitigate climate change impacts.
- Protecting coastal sea ecosystem services. Submarine groundwater discharge (SGD) can be a significant source of nutrients and carbon, causing coastal sea eutrophication and acidification. We will conduct novel geochemical analyses, including radioactive noble gases, to quantify SGD and associated fluxes, and combine them with microbial and macrofaunal studies, to assess the impacts on coastal ecosystems and ecosystem services.
- Securing coastal infrastructure. We will assess the risk of seafloor sediment types for SGD-induced liquefaction to inform the design of coastal infrastructure and the sustainable use of marine space. We will carry out geochemical and geophysical investigations to evaluate the factors affecting the transport of saline groundwater in fractured bedrock to inform the design of safe underground nuclear waste facilities.

Secucoast will apply a novel combination of recently-developed geophysical survey methods (FloaTEM, amphibious ERT) and sophisticated (isotope and radio)chemical analyses, microbiological and macrofaunal studies, and top-notch reactive transport modeling to better constrain and understand SWI and SGD and their effects to potable water abstraction and to eutrophication and acidification of coastal seas and consequences on marine ecosystem services (Subtopics 1.1, 2.3).

The novel modeling capabilities allow the coupling to external physical forcings (e.g. sea-level rise and glacial dynamics), improving the prediction of groundwater systems for the foreseeable environmental changes over wide spatial and temporal scales. Our results help mitigate the pressures of human activities and climate change on coastal aquifers and coastal sea ecosystems (Subtopic 2.1 of the Water4All 2023 Joint Transnational Call).

We will address the Water4All SRIA Theme II Water for Ecosystems and Biodiversity by improving the knowledge on the quantity and quality of matter flowing across the coastal aquifer and sea continuum (sub-theme II.I) to mitigate their impacts on and improve the management of coastal groundwater resources and marine ecosystem services (sub-themes II.II and II.III). We embrace Theme VI International co-operation by carrying out joint R&I activities and knowledge and technology transfer among the consortium partners (sub-theme VI.III). SecuCoast supports Theme VII Governance by active stakeholder engagement with institutions managing water (sub-theme VII.II).



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► Project partners

- STOCKHOLM UNIVERSITY - SWEDEN
- IOPAN - POLAND
- GEOLOGICAL SURVEY OF ESTONIA - ESTONIA
- GEOLOGICAL SURVEY OF NORWAY - NORWAY
- UNIVERSIDAD POLITECNICA DE CATALUÑA - SPAIN
- GEOLOGICAL SURVEY OF ISRAEL - ISRAEL

► Funding organisations

AKA (FINLAND) / FORMAS (SWEDEN) / NCBR (POLAND) / ETAG (ESTONIA) / RCN (NORWAY) / AEI (SPAIN) / MOE (ISRAEL)

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3 years

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submarine groundwater discharge
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climate change

KEYWORDS