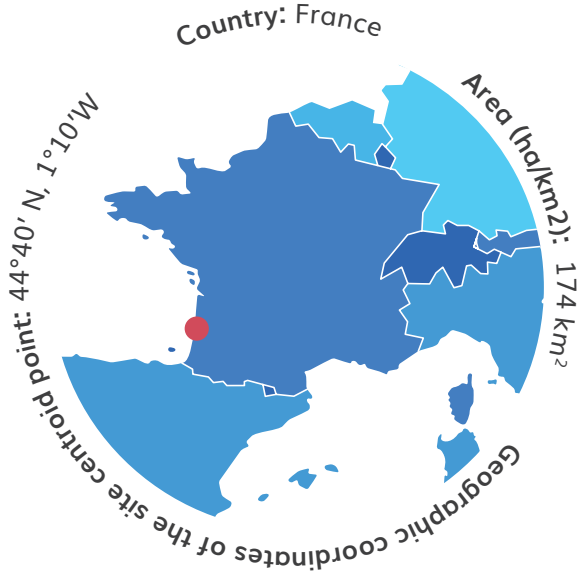
REST-COAST

Arcachon Bay
Pilot Fact Sheet

Julien Dalle, Mathis Cognat



Ecosystem type

Semi-closed lagoon ecosystem open to the Atlantic Ocean and dominated by *Zostera noltei* and Zosteria marina seagrass meadows.

Key habitats

- Marine habitat – 70 km²: *Zostera noltei* meadows, *Zostera marina* meadows, mudflats and sandbanks
- Intertidal habitats – 7 km²: Numerous species typical for silt, mudflats and seashores

Key species

More than five hundred bird species use the Arcachon Basin during migration, wintering, or reproduction. The pilot site is of great importance for a wide range of species, such as Brent Geese, Seahorses, Grey Seals.

From October to February, migratory passage birds are replaced by migratory wintering birds such as the Dark-bellied Brent Goose, which has over 70 000 individuals present each winter, accounting for more than 25% of the global population. Wintering birds, mostly from northern Europe, find milder conditions in the Bay of Arcachon to spend the winter and replenish their energy reserves before returning to their nesting grounds.

The Arcachon Basin shelters 48% of the dwarf eelgrass beds in France. Despite its regressing surface these last few years, this Zostera noltei bed plays an essential role in the maintenance of the ecological balance.

Among the marine mammals present in the Bay of Biscay, 13 species are frequently observed off the coast of the Marine Natural Park or near the open-

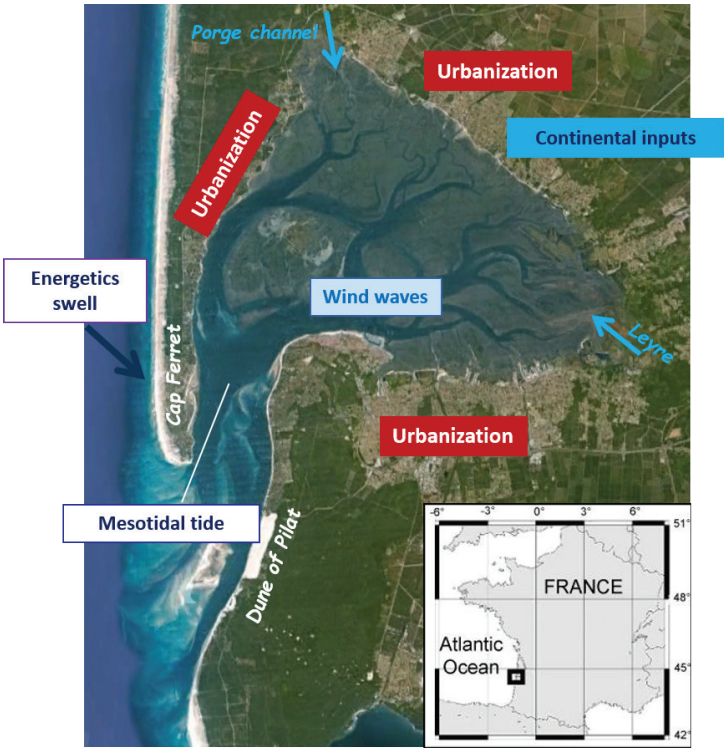


Figure 1: Localization of Arcachon Bay and the environmental factors

This project receives funding from the European Union's Horizon 2020 Innovation Action under grant agreement No 101037097.

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ing of the Basin, such as dolphins, harbor porpoises, and whales. On the coast, the presence of seals is natural and regular, especially in winter; they are often young and weak individuals. The sandbanks of the open basin and the beaches can also constitute natural resting places for these species.

Organisation responsible for the pilot

Seaboost, a French subsidiary of Egis Group working on ecological restoration issues, is leading the Arcachon Bay pilot. Other EGIS teams, INRAE and Ifremer (both are research institutes), are also involved in this pilot.

Pressures, threats and issues

The Arcachon Basin is one of the largest *Zostera noltei* meadows in Europe. These seagrass meadows have been declining for decades due to diverse anthropogenic pressures. The increasing urbanisation, agriculture and development of tourism areas have impaired seagrass, with mechanical degradation (anchoring for instance) and changes in local conditions. Local oyster farming, is a key activity for local economy, but it also has negative impacts on local hydrodynamics and sediment behavior.

With the increase of water temperature related to global change and the increase of water turbidity related to seagrass fragmentation and loss, *Zostera noltei* (fig 2) and *Zostera marina* (fig 3) progressively disappear from the Arcachon Basin due to positive feedback processes (fig 4).

Expected impact of the project

The project is exploring a new restoration approach focusing on hydrodynamics. It aims at reducing hydrodynamics, then increasing sediment deposition, reducing bottom shear stress, and reducing water turbidity. These will contribute to facilitating seagrass anchoring, horizontal and vertical growth from near to far, and large-scale stabilisation and restoration of local seagrass meadows.

On a larger scale, it will provide an "ecological restoration" tool for local governance that can

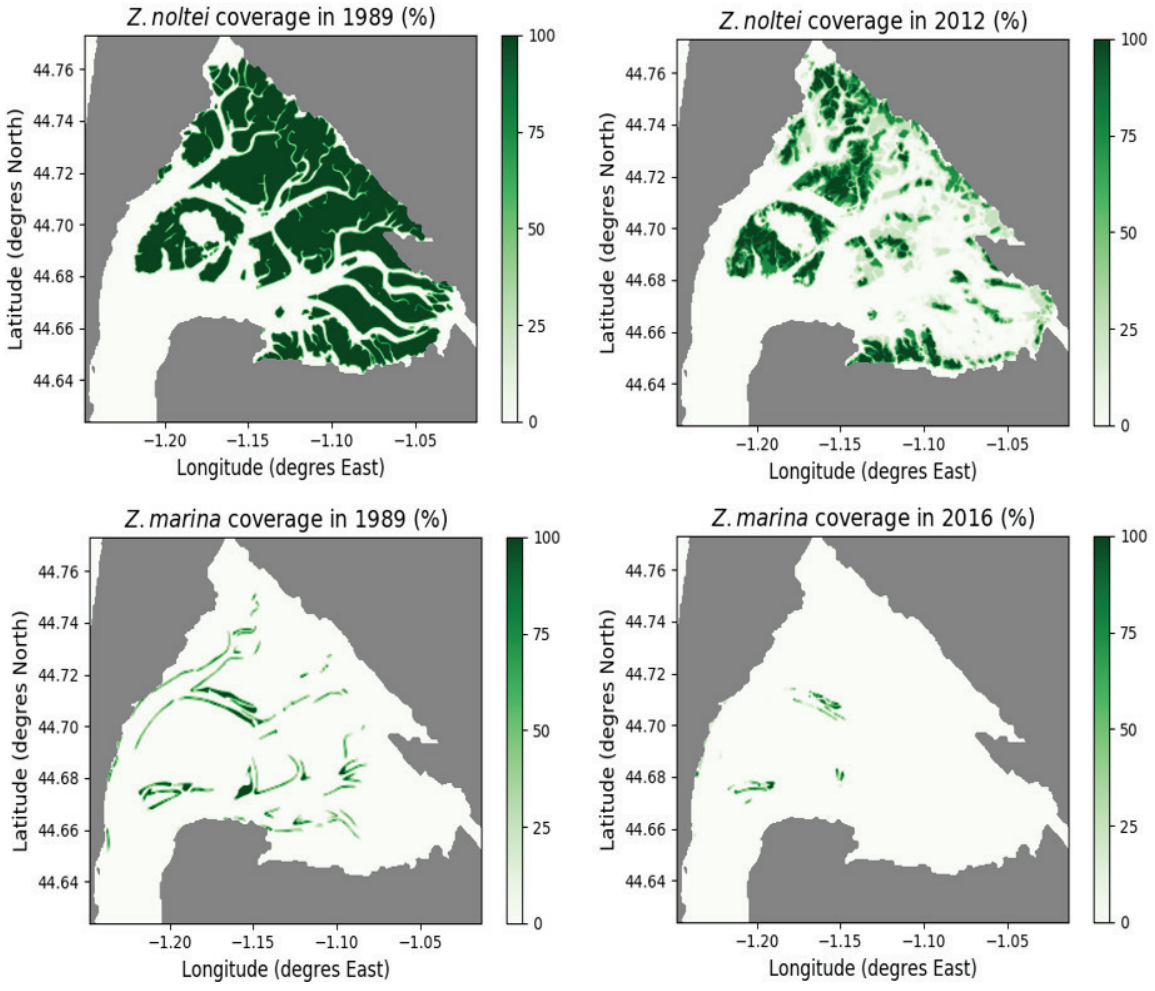

Figure 2: *Zostera noltei* decline between 1089 and 2012

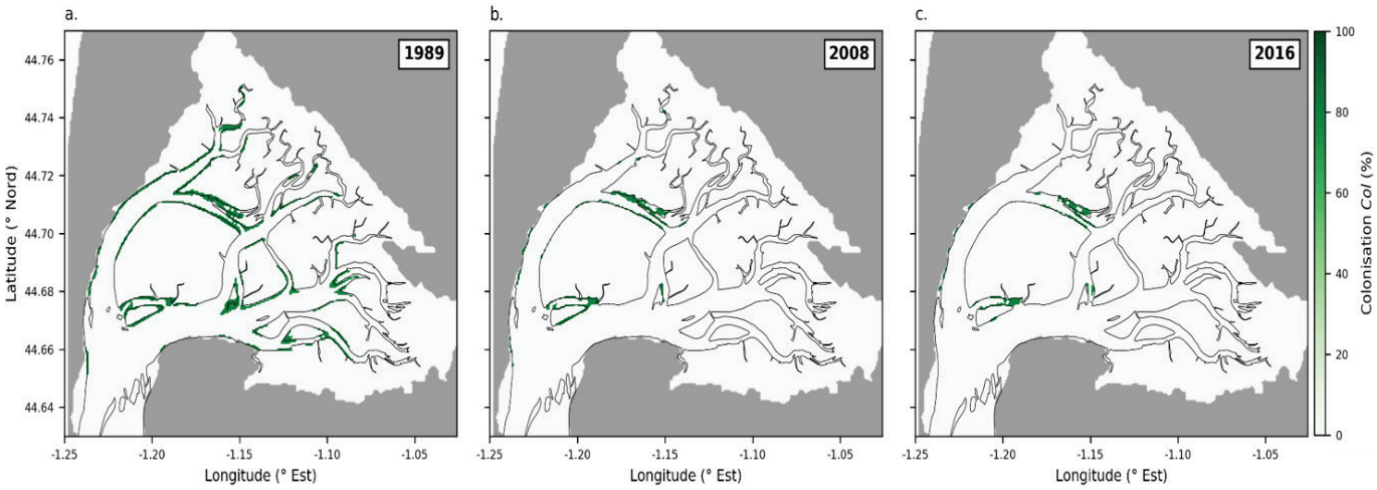

Figure 3: Spatial evolution of *Zostera marina* beds

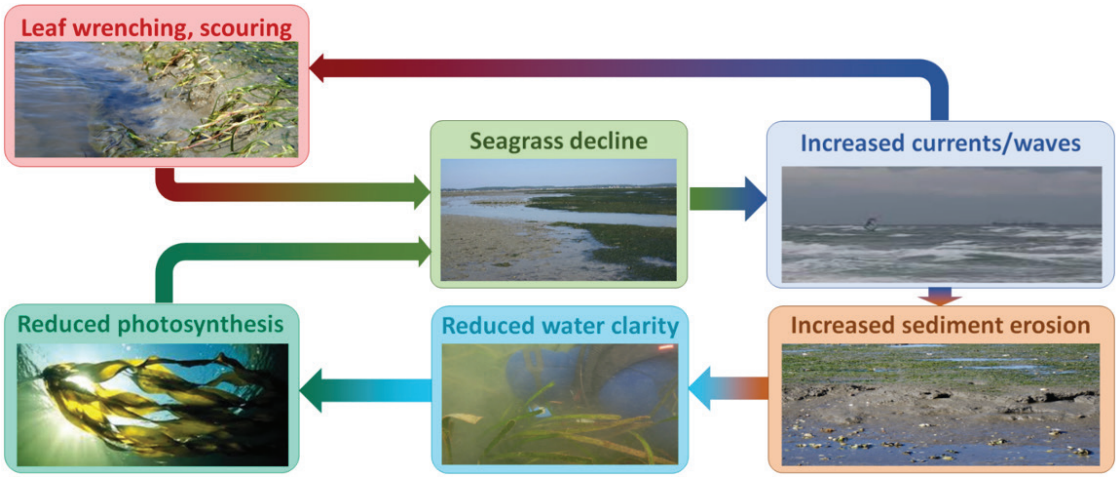

Figure 4: Positive feedback processes concerning seagrass decline in Arcachon Bay

be used to target both biodiversity enhancement and ecosystem co-benefits (carbon offset, biodiversity offset, erosion protection, and so on) in the Arcachon Basin, replicate that approach, and scale it up to meet both ecological and economic expectations at the regional scale.

This project mainly targets key habitat restoration to support local ecological functionalities (habitat, nursery, and substrate, primary and secondary production) that are essential for the whole local ecosystem health and development. It will also deal with coastal protection through erosion protection, as seagrass meadows play a key role in wave and flow attenuation and the protection of coastal infrastructure or beaches, for instance. Then, it is also a matter of water quality, as seagrasses also help keep the water clear.

Illustration of Arcachon bay fauna (Frédéric Lamothe)

Artificial seagrass use to mitigate tidal current velocity in order to reverse the positive feedback processes to allow spontaneous recolonization

Oyster farming in Arcachon Bay (Nathalie Thiers)

Stakeholders

The project relies on multiple local stakeholders. First of all, it involves local area managers, which are the MPA manager (Parc Marin du Bassin d'Arcachon), which is a branch of the French Office of Biodiversity, but also local governance units through the SIBA (Syndicat Intercommunal du Bassin d'Arcachon).

Then, the project involves local representatives and stakeholders, such as the CRC (Regional Committee for Oyster Farming), which supports one of the key socio-economic local activities. Finally, there are scientific stakeholders, such as Ifremer, which has led research on the Arcachon Basin and local seagrass for decades, and Gladys Institute, which brings specific hydrodynamic knowledge.

These stakeholders are involved in the project design, the settlement pattern of our approach so that it fits as closely as possible to multiple local strategies and needs, and in the monitoring of the action to ensure that the results are shared and well understood.

Key variables of relevance to REST-COAST

The project falls within the scope of REST-COAST because it addresses the majority of the biodiversity and ecosystem service expectations.
First, it focuses on large-scale seagrass restoration. The pilot experiment will target 1 ha of seagrass restoration to enhance spontaneous resettlement of seagrass on the site through hydrodynamic stress reduction. This will be monitored through several metrics, such as cover rate, fragmentation, and recovery speed. Zostera seagrass meadows are key to supporting local ecological functionalities and thus the baseline for the whole ecological restoration of local ecosystems.

Several ecosystem services will be provided and assessed. For instance, the capture and sequestration of carbon, which will be monitored all along the project, can be highlighted to better assess the local contribution of Zostera seagrasses and associated species (especially the local microbiome) to greenhouse gas reduction. Additionally, the benefits from seagrass restoration in terms of coastal protection against erosion will be estimated, as seagrass helps reduce local flows and waves. This will be accomplished using numerical models as well as in-person monitoring of the effects of our approach on hydrodynamics. We can assume that the pilot will have two main effects on food production. The first is a direct effect on increased food production from increasing local key habitat (Zostera meadows) and thus associated functionalities and biomass. The second one is associated with water purification, as it may increase on a large scale the health of oyster species and then the productivity of oyster farms (which has yet to be demonstrated).

Finally, by implementing a numerical model, we will be able to project our approach at a larger scale, thereby assisting local governance and strategy through upscaling. It clearly aims to propose a new tool for local area management, with possible biodiversity and carbon offsets, and to promote large-scale ecological restoration through seagrass restoration as a keystone of the global strategy and management plans for the Basin for the upcoming years.