REST-COAST

LARGE SCALE RESTORATION OF COASTAL ECOSYSTEMS THROUGH RIVERS TO SEA CONNECTIVITY

FOROS BAY

RESULTS & ACHIEVEMENTS REPORT

SUMMARY

The Foros Bay pilot site, located on the Black Sea coast of Bulgaria, is part of the Burgas Bay. It is characterised by complex and overlapping pressures stemming from decades of hydrological modification, habitat degradation, and ongoing development pressure. The site presents a highly challenging restoration context: many of the modifications to the coastal system are irreversible in the short term, and physical restoration works remain at early or partial stages of implementation. Rather than achieving full on-the-ground restoration, the REST-COAST project focused on seagrass restoration piloting, siltation management planning, and the development of a scenario-based adaptation pathways framework for Nature-based Solutions. These interventions lay the groundwork for future restoration at scale, with key measures anticipated to be taken forward by municipal and regional authorities.

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THREATS AND PRESSURES ADDRESSED

- Severe alteration of natural water circulation
- Port, shipyard, and marina development pressure
- Long-term wetland loss and habitat conversion
- Progressive fragmentation of sea–land ecological connectivity
- Hydrological modification from damming and canal construction
- Irreversible historical modifications to the coastal system
- High nutrient loads and eutrophication
- Ongoing risk of further deterioration

BASELINE CONDITION

Foros Bay and the adjacent Burgas Bay area have been significantly altered by historical infrastructure development, including damming, canal construction, and port and marina expansion. Natural water circulation has been severely disrupted, leading to stagnant conditions, elevated nutrient concentrations, and eutrophication. Long-term wetland loss and habitat conversion have reduced the ecological integrity of the land–sea interface.

The canal connecting Burgas (Vaya) Lake to Burgas Bay generates intensive siltation events when brackish water heavily loaded with suspended sediments flows into the coastal area. Seagrass habitats, which once provided important ecological functions including sediment stabilisation, nursery habitat, and blue carbon sequestration, have declined substantially.

RESTORATION STRATEGY SELECTED AND WHY

Given the extent of irreversible historical modifications and the complexity of governance constraints, the project adopted a dual strategy: targeted ecological intervention where feasible, and evidence-based adaptation pathway planning for broader systemic challenges.

- Seagrass restoration was selected as the core ecological intervention, targeting the EUNIS habitat MB546 (seagrass and rhizomatous algal meadows in Black Sea freshwater-influenced infralittoral muddy sands). In-situ transplantation was used to support assisted recolonisation of soft-bottom areas down to approximately 6 m depth.
- A siltation basin (sediment trap) was designed and proposed for the canal connecting Burgas Lake to Burgas Bay, to reduce turbidity events and improve conditions for coastal habitats.
- An adaptation pathways framework was developed to integrate dune enhancement and nature island measures as complementary soft buffer interventions, addressing hydrodynamic stress and supporting seagrass persistence under different climate and governance scenarios.

HOW THE CHALLENGES WERE ADDRESSED AND KEY RESULTS ACHIEVED

25% Implemented

Severe Alteration of Natural Water Circulation

The adaptation pathways framework positions seagrass restoration as the core ecological intervention to enhance hydrodynamic damping and stabilise sediments. Restoration of hydrological connectivity between wetlands, lagoons, and nearshore waters is proposed as a complementary measure to support sediment balance and nutrient regulation. Modelling results were shared with the Municipality to support the decision to remove the barrier dividing Foros Bay.

50% Implemented

Long-term Wetland Loss and Habitat Conversion

A pilot seagrass restoration was conducted in August 2024 within a sheltered sublittoral silty-sandy area of 0.03 ha. Initial post-transplant inspections in September and November 2024 indicated good transplant condition. A follow-up survey in June 2025 confirmed the establishment of new shoots, with an estimated survival rate of approximately 5%. While survival remains modest, the pilot provides critical lessons for scaling, adaptive refinement, and integration within the broader adaptation pathways framework. Dune enhancement and nature island measures were also included in the adaptation pathways as soft coastal buffer options.

50% Implemented

Hydrological Modification from Damming and Canal Construction

A siltation basin design was developed and proposed for the canal connecting Burgas Lake to Burgas Bay. The measure was taken through the full regulatory approval process: the design was developed by the REST-COAST team, approved by the District Governor, and endorsed by the Regional Environmental Inspectorate and the Basin Directorate. The detailed city plan modification was subsequently approved by the Municipality Council. Physical implementation will be funded by the Municipality.

0% Implemented

High Nutrient Loads and Eutrophication

Within the adaptation pathways framework, upstream nutrient management and reduction of diffuse and point-source pollution are identified as essential prerequisites for improving light conditions and preventing eutrophication, which directly constrain seagrass recovery depth. No dedicated physical interventions were implemented under REST-COAST, but the framework sets out a sequenced approach to addressing these pressures.

0% Implemented

Port, Shipyard, and Marina Development Pressure

This challenge was not addressed through direct physical intervention. Development pressures are acknowledged within the adaptation pathways framework as a governance constraint requiring higher level planning decisions.

25% Implemented

Progressive Fragmentation of Sea–Land Ecological Connectivity

Addressed under the same approach as water circulation: the adaptation pathways framework identifies hydrological connectivity restoration as a key intervention, with seagrass and dune measures contributing to reconnecting the sea–land ecological gradient.

25% Implemented

Irreversible Historical Modifications

Addressed through the adaptation pathways framework, which is scenario-based and accounts for environmental, social, and economic conditions. The framework identifies NbS measures expected to deliver measurable ecological and risk-reduction benefits while remaining adaptive to changing pressures. Under optimistic scenarios, high ecological gains are projected; under moderate or pessimistic conditions, benefits may be partial or require additional upstream interventions.

25% Implemented

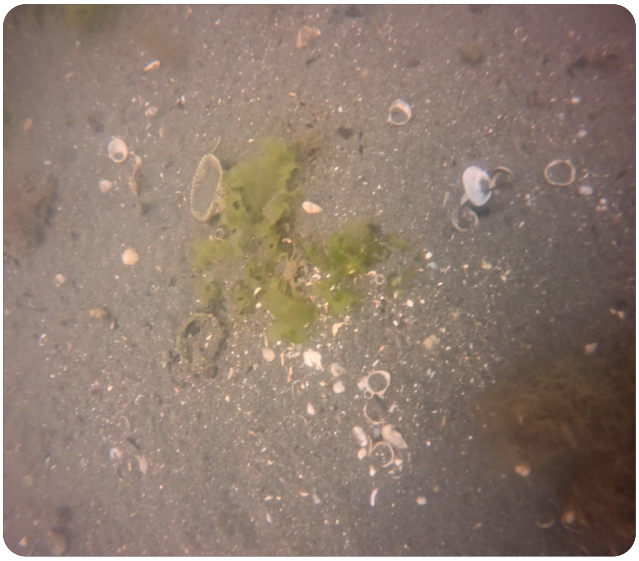
Ongoing Risk of Further Deterioration

The adaptation pathways framework is designed to address ongoing deterioration risks through iterative, scenario-based management. Governance and adaptive capacity are being strengthened through participatory monitoring and stakeholder engagement processes.

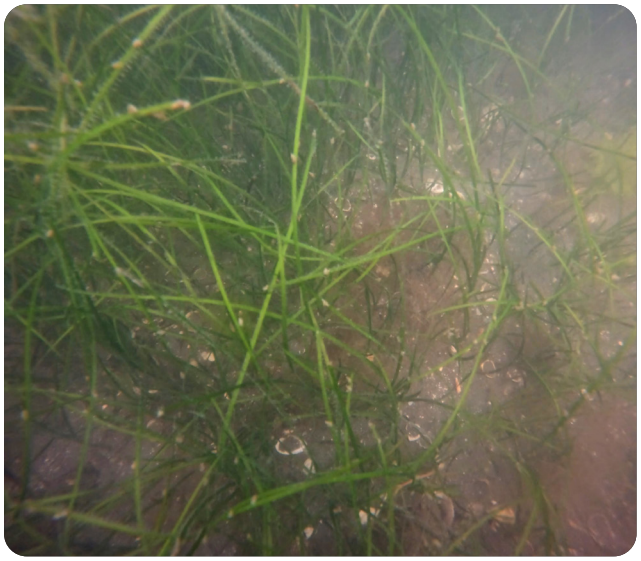
PERCENTAGE OF TARGET ACHIEVED

Implementation varied across challenge areas, reflecting the site's complex governance context and the extent of historical modification. Most physical interventions remain at early stages, with the project's primary contribution being evidence-building, regulatory groundwork, and adaptation pathway development.

Challenge	% Implemented	Status
Severe Alteration of Natural Water Circulation	25%	NbS barrier removal modelling; adaptation pathways
Long-term Wetland Loss and Habitat Conversion	50%	Seagrass pilot; dune/nature island in pathways
Hydrological Modification (Damming/Canals)	50%	Siltation basin approved; implementation by Municipality
High Nutrient Loads and Eutrophication	0%	Addressed in adaptation pathways framework
Port, Shipyard, and Marina Development	0%	Governance constraint; not directly addressed
Fragmentation of Sea–Land Connectivity	25%	See water circulation row
Irreversible Historical Modifications	25%	Adaptation pathways; scenario-based NbS
Ongoing Risk of Further Deterioration	25%	See irreversible modifications row



Pre-restoration



Post-restoration

SPECIFIC SOLUTIONS IMPLEMENTED

Seagrass restoration pilot (0.03 ha)

In-situ transplantation in a sheltered sublittoral area, August 2024. Survival rate of ~5% confirmed in June 2025, with lessons informing future scaling.

Siltation basin design and regulatory approval

Full technical design developed and approved through governmental territorial planning procedures; implementation to be funded by Burgas Municipality.

Adaptation pathways framework

Scenario-based NbS framework developed, integrating seagrass restoration, dune enhancement, nature islands, and hydrological connectivity restoration across multiple climate and governance scenarios.

Barrier removal decision support

Modelling results shared with the Municipality to support the decision to remove the barrier dividing Foros Bay.

CORE-PLAT engagement

Regular stakeholder exchanges, conferences, workshops, public deliverables, policy briefs, and interviews involving local fisheries, municipal authorities, conservation bodies, and technical experts.

KEY STAKEHOLDERS INVOLVED AND HOW

Stakeholders and rights-holders were engaged throughout the project via the CORE-PLAT living-lab platform, targeted meetings, conferences, and workshops. Participants included representatives from local fisheries, Burgas Municipality, the Regional Environmental Inspectorate, the Basin Directorate, conservation bodies, and technical experts. The NbS design and pathway development were grounded in principles of inclusive participation, with particular attention to the legitimate rights and interests of small-scale resource users and local communities. Information was made publicly available through deliverables, policy briefs, articles, and interviews.

INFLUENCE ON DECISION-MAKING

The project directly supported the Municipality's decision to remove the barrier dividing Foros Bay, through the sharing of hydrodynamic modelling results and the presentation of the adaptation pathways framework. The siltation basin design progressed through the full regulatory approval process, with the detailed city plan modification approved by the Municipality Council — a significant institutional outcome. The adaptation pathways framework provides a structured basis for future NbS investment decisions by municipal and regional authorities.

RECOMMENDATIONS FOR FUTURE DEVELOPMENT

Seagrass expansion

Scale up seagrass restoration based on lessons from the 2024 pilot. Target areas where historical evidence suggests broader past distribution, and integrate with sediment stabilisation and water clarity improvements.

Siltation basin construction

Proceed with physical implementation of the approved siltation basin design, funded by Burgas Municipality, to reduce turbidity and improve conditions for coastal habitat recovery.

Hydrological connectivity

Restore connections between wetlands, lagoons, and nearshore waters to re-enable natural nutrient cycling and sediment exchange.

Dune and soft buffer measures

Implement dune dynamics enhancement and nature island measures to reduce coastal erosion, attenuate wave energy, and lower flood exposure.

Upstream pollution management

Address diffuse and point-source nutrient inputs to improve light conditions and remove eutrophication constraints on seagrass recovery.

Monitoring and adaptive management

Establish a continuous monitoring programme for seagrass establishment, water quality, and biodiversity, feeding into the scenario-based adaptive management framework.

FINANCIAL MECHANISMS USED AND PROPOSED

Physical restoration actions and design work were funded through EU Horizon 2020 REST-COAST funding. Municipal co-funding will finance the implementation of the approved siltation basin.

Prospective financial mechanisms include: carbon credit revenues if active seagrass restoration triggers large-scale natural self-colonisation at relatively low cost; flood risk reduction savings reducing reliance on hard infrastructure; and real-estate development compensation measures or voluntary nature-positive investments linked to ongoing development in the wider area. Effective long-term management will depend on close collaboration with research institutes and local experts.

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