

Grand Harbour, Malta

Group 2: Decarbonisation and restoration of grey infrastructure

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EU MISSIONS

RESTORE OUR OCEAN & WATERS



Grand Harbour, Malta

Position the port as a cultural heritage site and a leading example of environmental restoration through nature-based solutions



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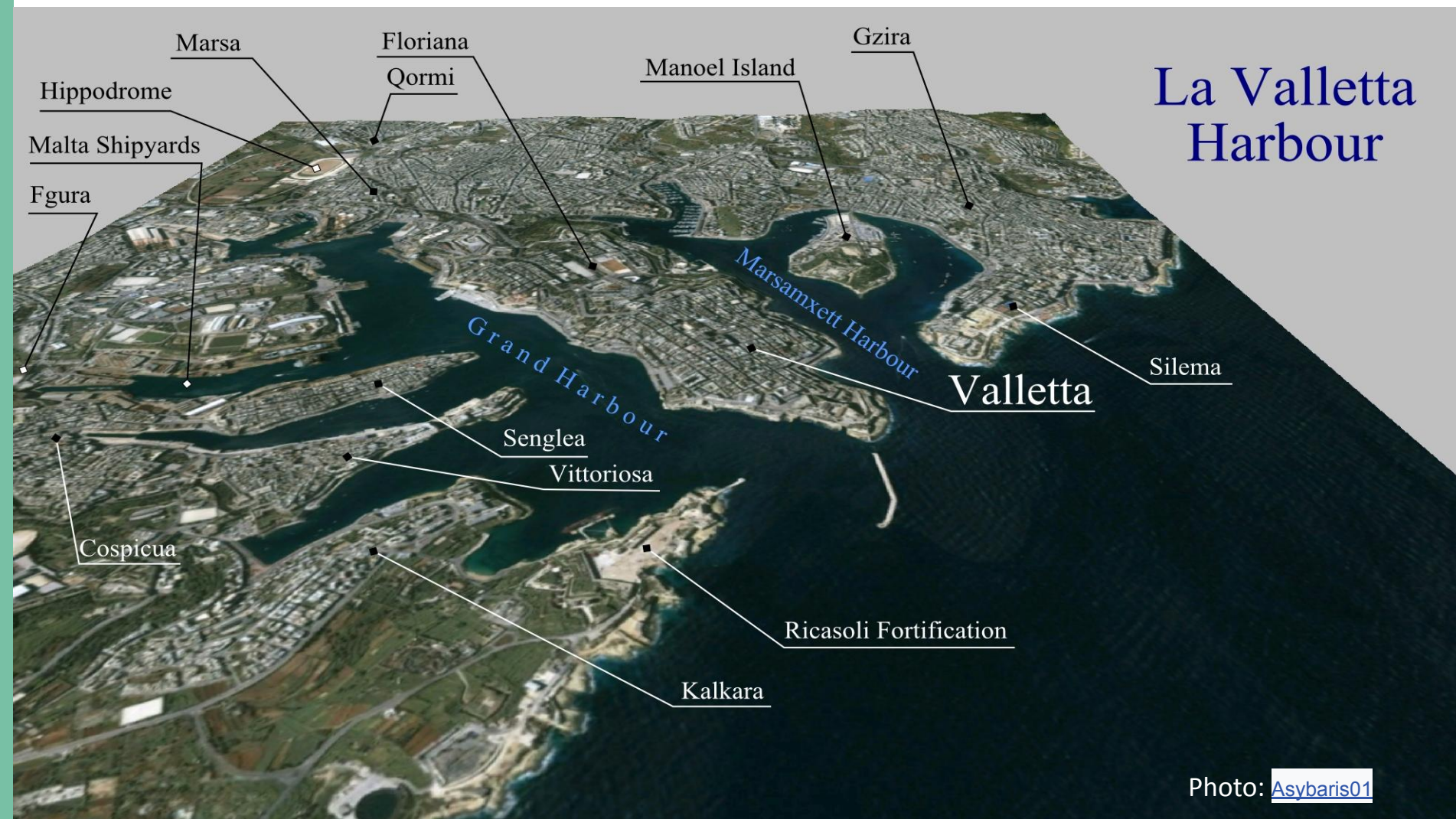
Co-funded by
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UK Research
and Innovation

The Grand Harbour

- Naturally deep harbour (~7.7 m)
- Series of inlets, surrounded by land
- Fortified since the Knights of St. John
- Enclosed by Valletta and the Three Cities (Birgu, Senglea, Cospicua)
- Central battleground of the Great Siege of 1565



- Strategic harbour during WWI & WWII
- Naturally sheltered → year-round access
- Malta's main maritime gateway
- Extensively modified by docks and port infrastructure
- Major hub for shipping, cruise, and logistics

The Grand Harbour

Passenger maritime transport & tourism sector



The Grand Harbour

Commercial fishing sector



The Grand Harbour

Commercial shipping sector



The Grand Harbour

Ship repair and maintenance sector



Source: Google Earth; annotations by Olivia Grech



Photo: Olivia Grech, 2025



Photo: Olivia Grech, 2025

THE PROBLEM

What environmental pressures are affecting the Grand Harbour?

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FOUR KEY ENVIRONMENTAL PRESSURES



1 Air pollution

- High emissions from ships and cruise liners
- Ultrafine particle levels can reach 100–200× higher when vessels are in port
- Reduces local air quality around the harbour



2 Noise pollution

- Continuous vessel traffic and port operations
- Disturbs nearby communities and waterfront users
- Affects quality of life in surrounding urban areas



3 Sediment pollution

- Contamination from industrial discharge, fuel residues and port activities
- Polluted sediments degrade water quality
- Can affect marine habitats and harbour ecology



4 Biodiversity loss

- Degradation of marine habitats
- Decline in ecological health and species abundance
- Reduced resilience of the harbour ecosystem

WHY THIS MATTERS

1 Impacts public health

Air and noise pollution affect residents, workers and visitors around the harbour.

2 Weakens ecosystem health

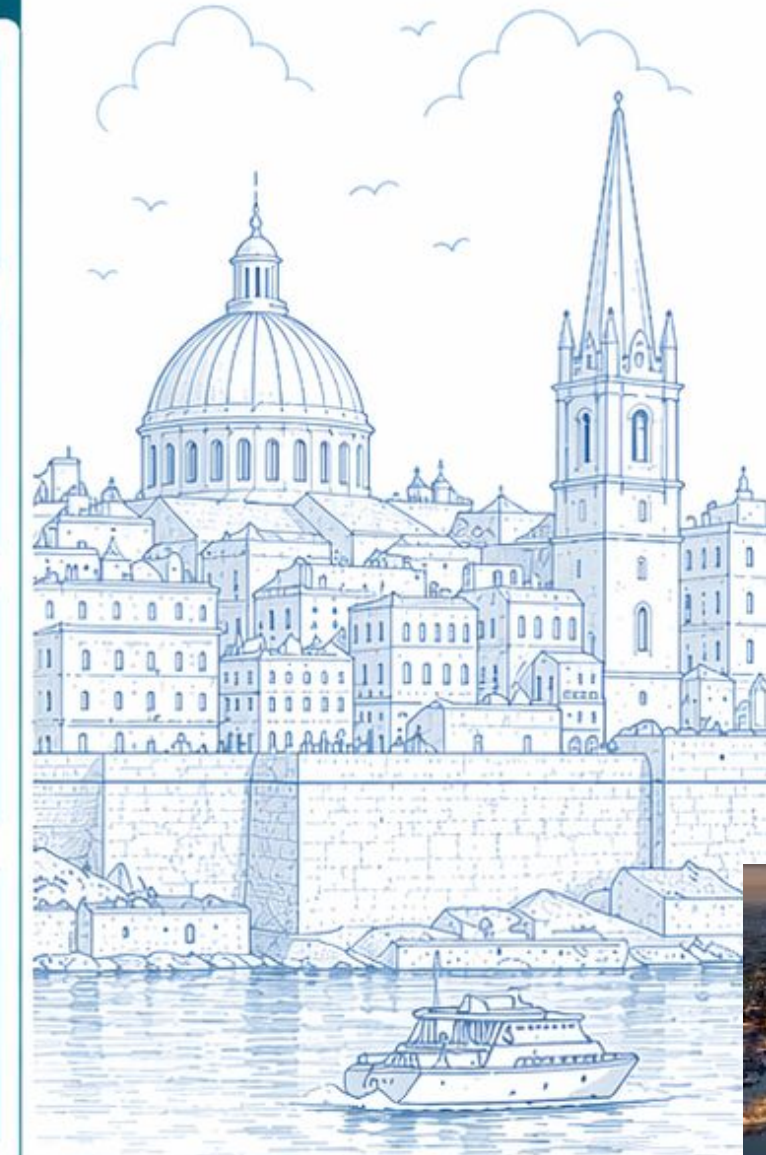
Sediment contamination and habitat degradation reduce water quality and biodiversity.

3 Threatens liveability

Environmental pressures undermine the social and cultural value of the waterfront.

4 A plan exists, but is not yet implemented

The Grand Harbour Revival Plan is already proposed, but implementation is still pending, so these pressures remain unresolved.



Air & noise pressure



Pollution accumulation



Habitat degradation

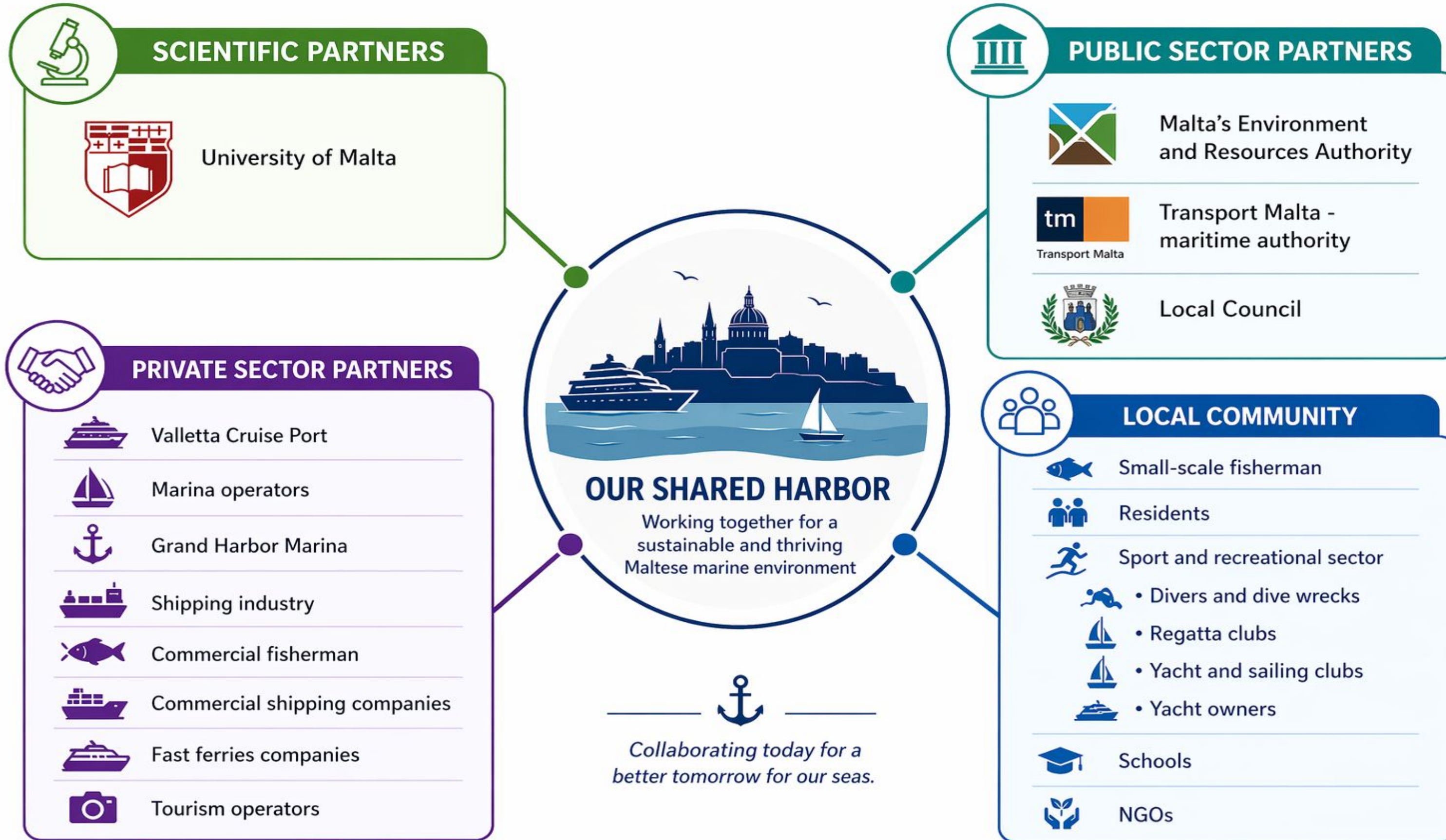


Need for action



The Grand Harbour faces linked air, noise, sediment and biodiversity pressures, and although a revival plan exists, implementation is still pending — making integrated decarbonisation and ecological restoration necessary.

Socio-ecological overview



Socioecological stakes

Benefits and Risks for Actors Involved



Living Lab & Stakeholders

Who is in our Living Lab and how did we co-design the solution?



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Who is in our Living Lab?



1. Scientific partners

- University of Malta / research institute
- Scientific research & technical expertise
- Environmental monitoring & data analysis
- Coastal, marine & heritage studies



2. Public authorities

- Maritime authority
- Environmental Authority
- Local council
- Governance, regulation & long-term planning



3. Port & maritime operators

- Port
- Shipping industry
- Fast ferry companies
- Marina operators
- Infrastructure, access & operational viability



4. Harbour users

- Commercial fishermen
- Small-scale fishermen
- Berthing, storage & access needs
- Local marine knowledge & livelihoods



5. Community & civil society

- Residents
- Vulnerable communities
- Tourism operators
- Sport & recreational sector
- Divers
- Regatta clubs
- Yacht & sailing clubs
- Yacht owners
- Access, public space, noise & heritage concerns

How did we co-design the solution?



1 Stakeholder mapping

Identify all actors affected by harbour restoration and decarbonisation



2 Surveys & interviews

Collect operational, environmental and social concerns



3 Living Lab assembly

Appoint a representative assembly of key stakeholder groups



4 Regular meetings

Meet every couple of months to review progress and adapt the solution



5 Joint evaluation

Assess options using technical, environmental and social criteria



6 Communication strategy

Develop engagement tools to keep actors informed and involved



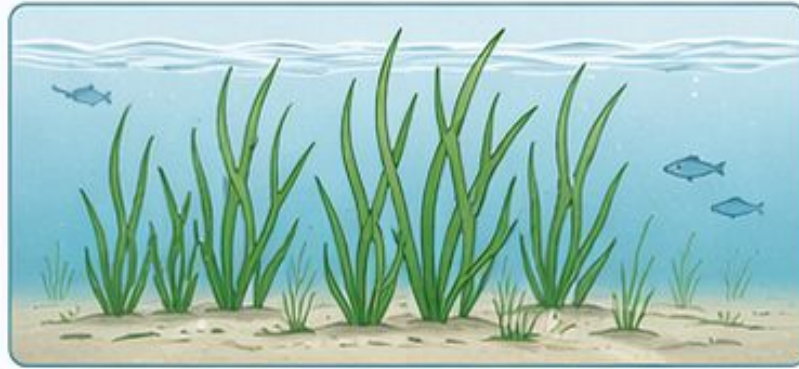
Our Living Lab brings together science, governance, port users and local communities to co-design a solution that is technically feasible, environmentally effective and socially acceptable.

NATURE-BASED SOLUTION (NbS)

How does our NbS restore water quality and harbour ecology?

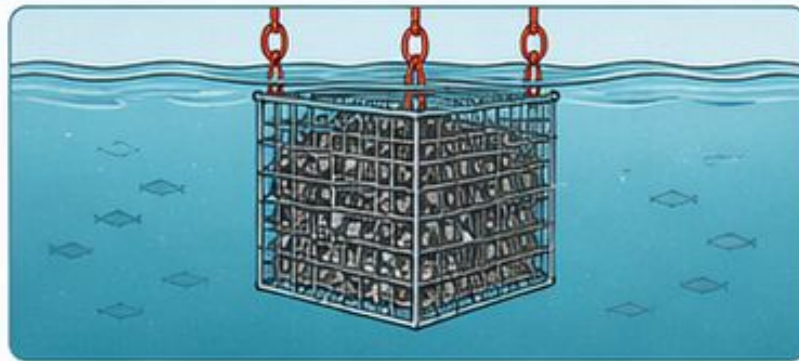
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THREE COMPLEMENTARY NbS COMPONENTS



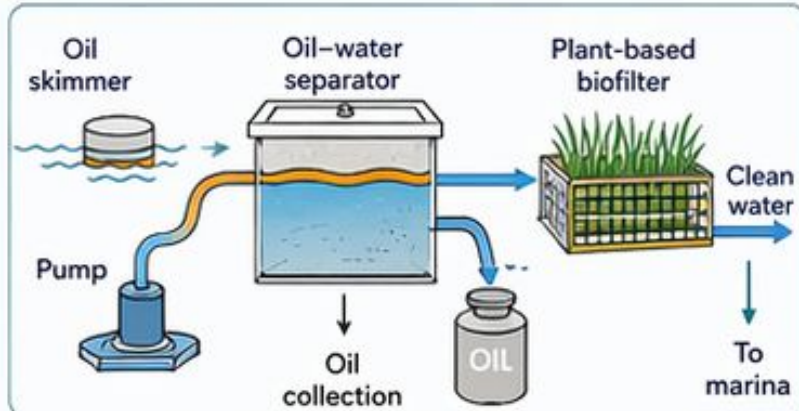
1 Seagrass meadows

- Improve water quality
- Trap suspended particles & nutrients
- Stabilise sediments
- Capture carbon & restore habitat



2 Biodiversity nursery

- Suspended nursery structures
- Support native filter-feeders
- Mussels, sponges & ascidians
- Increase biodiversity & natural filtration



3 Oil–water separation + phytoremediation

- Separate oily runoff from water
- Treat contaminated water before discharge
- Use planted remediation zones
- Reduce harbour pollution at source

WHY THIS NbS WORKS

1 Treats pollution at source

Oil–water separation and phytoremediation reduce contaminant loads before they spread through the harbour.

2 Restores ecological functions

Seagrass meadows improve water quality, store carbon and create habitat for marine life.

3 Strengthens natural filtration

Biodiversity nurseries support native filter-feeders such as mussels, sponges and ascidians.

4 Builds a healthier harbour

The combined system improves biodiversity, resilience and overall harbour conditions.



Pollution control



Habitat restoration



Natural filtration



Healthier harbour



Our NbS combines pollution treatment, habitat restoration and biodiversity support to create a cleaner, more resilient harbour.

TECHNICAL SOLUTION

How do we support the energy transition of harbour operations?

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THREE COMPLEMENTARY TECHNICAL COMPONENTS



1 Green energy + shore power

- Renewable electricity for on-port use
- Existing shore power supply for vessels at berth
- Reduce engine idling and local emissions
- Support cleaner port operations



2 Waste-based biofuel for large vessels

- Use lower-carbon waste-based biofuels on bigger boats
- Reduce lifecycle emissions during transition
- Suitable for large commercial and passenger vessels
- Supports near-term decarbonisation



3 E-boats for tourism + short routes

- Electrify smaller boats for tourism and short-distance transport
- Ideal for ferries and leisure craft on short routes
- Lower air pollution and noise
- Cleaner visitor and local mobility

WHY THIS TECH SOLUTION MATTERS

1 Cuts direct emissions

Reduces fossil-fuel use in port and vessel operations.

2 Supports energy transition

Combines shore power, renewable electricity and cleaner fuels.

3 Improves local harbour conditions

Helps reduce air pollution, noise and fuel-related impacts.

4 Complements the NbS strategy

Works alongside blue carbon and ecological restoration to deliver a fuller decarbonisation plan.



Clean energy



Cleaner vessels



Lower emissions



Decarbonised harbour



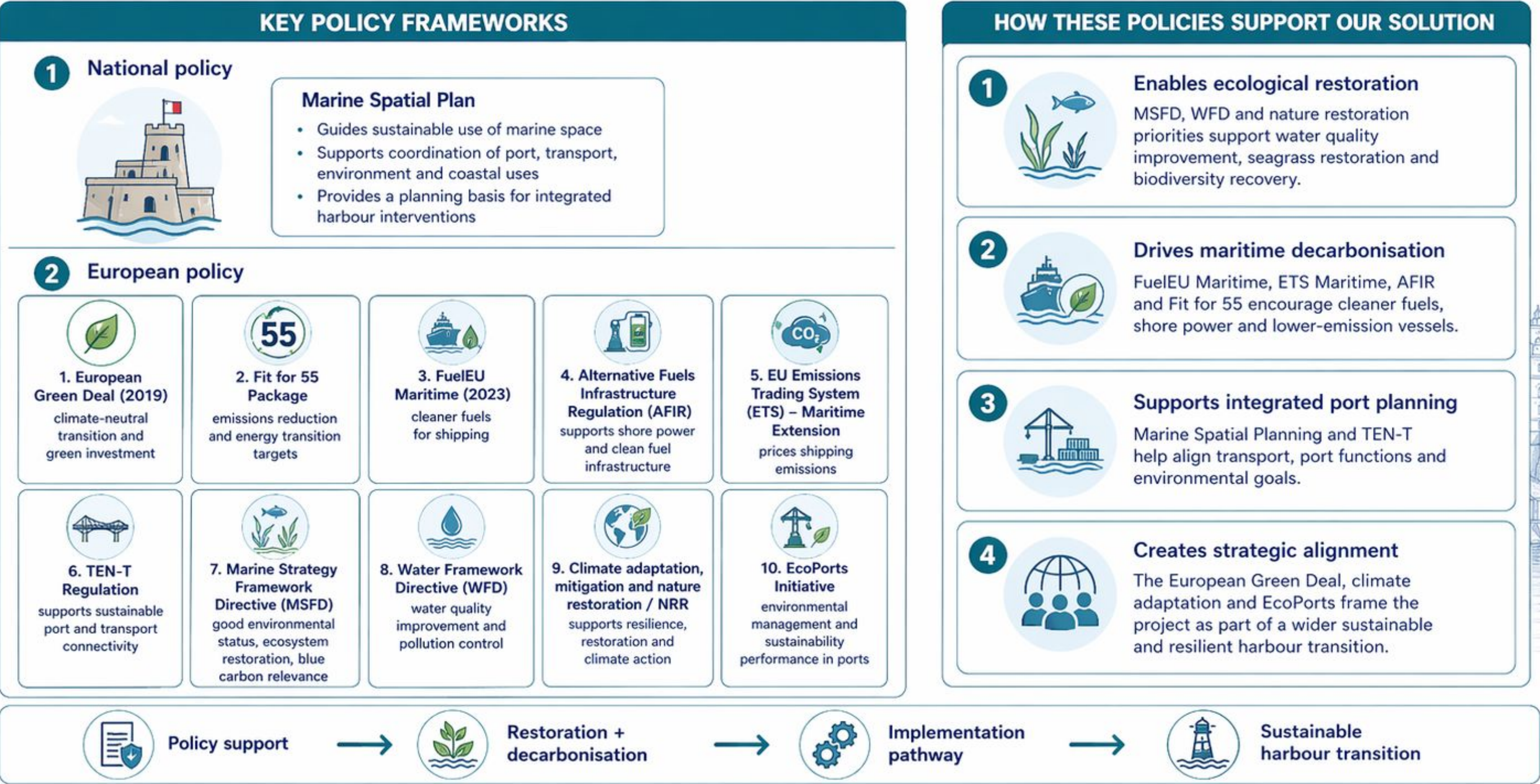
Our technical solution complements the NbS by driving energy transition and reducing emissions from port and vessel activities.

The Solutions



-  Transplanting of *Posidonia Oceanica*
-  Artificial Nurseries Phase 1:
2 Pilot sites (yacht marinas)
-  Oil Skimmer
-  Artificial Nurseries Phase 2:
Scaling across harbour

Policy

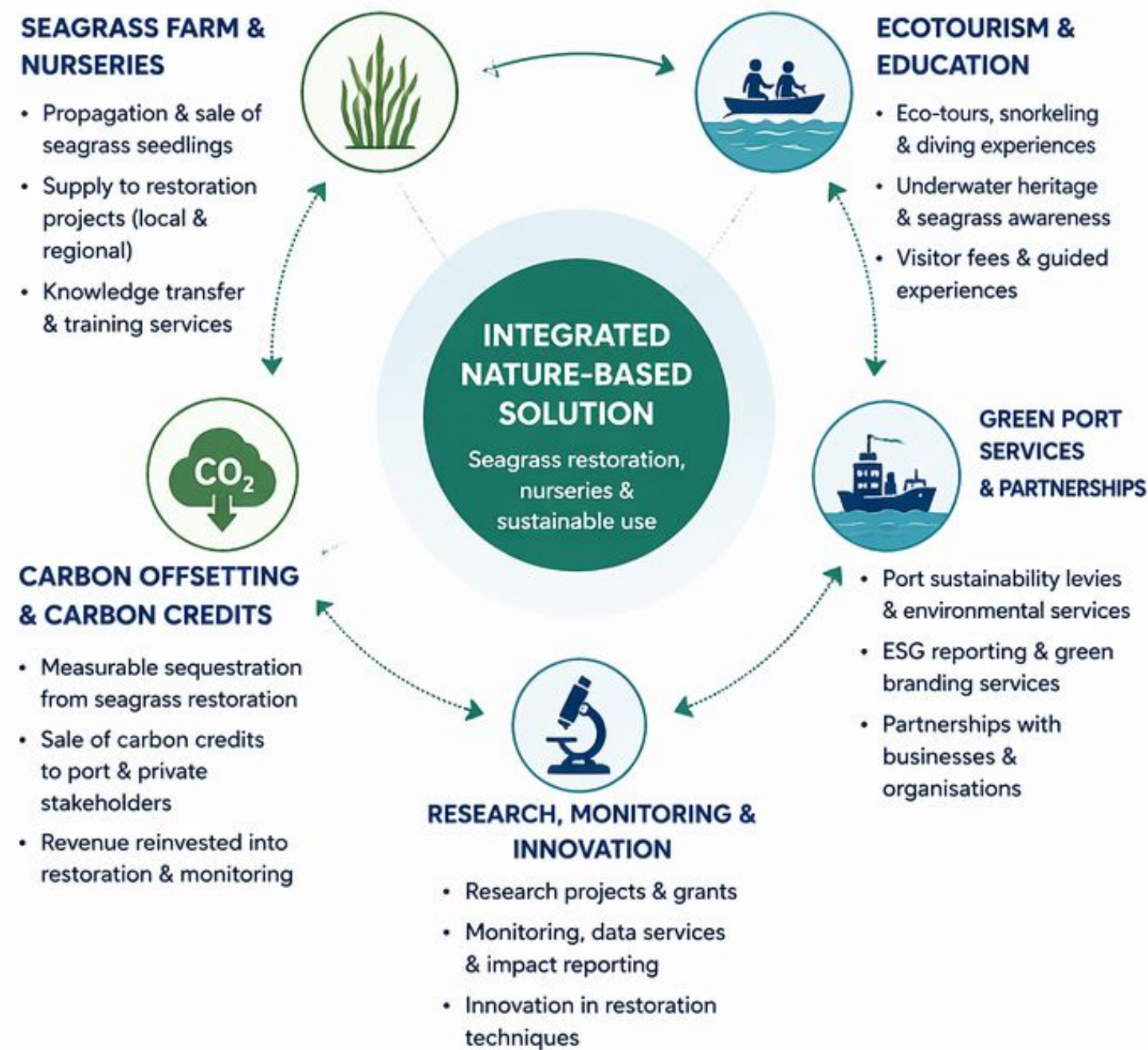


BUSINESS MODEL

How does the solution sustain itself financially?
What is the value proposition?



HOW THE SOLUTION SUSTAINS ITSELF FINANCIALLY



REVENUE REINVESTED
IN RESTORATION, COMMUNITY
BENEFITS & LONG-TERM RESILIENCE



STRONGER ECOSYSTEMS
CLEANER WATERS
HEALTHIER HARBOUR



SOCIAL VALUE
ECONOMIC VALUE
ENVIRONMENTAL VALUE

VALUE PROPOSITION



ENVIRONMENTAL VALUE

- Restores seagrass meadows & biodiversity
- Improves water quality & coastal resilience
- Contributes to climate mitigation (carbon sink)



ECONOMIC VALUE

- New green revenue streams (nurseries, ecotourism, carbon credits)
- Cost savings from ecosystem services
- Attracts green investment & partnerships



SOCIAL & CULTURAL VALUE

- Enhances quality of life & public access
- Protects heritage & sense of place
- Creates jobs, education & community pride



STRATEGIC VALUE FOR THE PORT

- Strengthens ESG performance & reputation
- Meets regulatory & sustainability targets
- Positions the port as a leader in green innovation

CARBON OFFSETTING – A KEY FINANCIAL DRIVER



MEASURE & RESTORE

Seagrass restoration
captures and stores CO₂



GENERATE CARBON CREDITS

Credits verified
& certified



THE PORT BENEFITS

- Sell credits to businesses & shipping
- Incentive for port users & business owners



ASSOCIATE WITH OTHER PORTS

- Replicate & upscale solutions together
- Offset twice the amount to generate more carbon credits
- Strengthen partnerships and shared impact



OUR MODEL CREATES A POSITIVE CYCLE: RESTORE NATURE → GENERATE VALUE → REINVEST → GROW IMPACT TOGETHER

WHAT WE NEED FROM THE COUNCIL



1

Seed funding & co-financing

For pilot actions, stakeholder engagement and environmental monitoring



2

Access to land & waterfront space

For seagrass nurseries, pilot restoration sites and demonstration areas



3

Political mandate & institutional support

To align the project with local sustainability and waterfront goals



4

Partnership & coordination

Bring together authorities, port actors, researchers and communities



5

Planning & permitting support

Help streamline approvals and integrate the project into local planning



6

Long-term commitment

Support monitoring, communication and scaling of successful pilots



Grazzi!

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