

Building capacity for Restoring *Posidonia oceanica* meadows in Cyprus (ResPos)



THE CHALLENGE



Coastal development
and dredging



Physical damage from
anchoring and boating



Pollution and
poor water quality



Climate change and
marine heatwaves



Once lost, seagrass has
very slow recovery



Posidonia oceanica meadows are
shrinking across the Mediterranean
due to multiple anthropogenic
pressures.

OUR INTERVENTION



MAP STAKEHOLDERS & CREATE THE LIVING LAB

Co-design with all
stakeholders, engage
communities and
build shared ownership.



SITE IDENTIFICATION & PRESSURE CONTROL

Identify suitable sites,
reduce or remove
pressures and secure
legal and management
protection.



PREPARE THE SITE & COIR MESH

Ensure suitable substrate
(including dead mat),
prepare the site and place
a biodegradable coir mesh
on the dead mat.



TRANSPLANT & SECURE

Place naturally detached
shoots on the coir mesh
and secure with
U-shaped metal stakes.



MONITOR, EVALUATE & ADAPT

Monitor survival and
growth, evaluate results
and adapt actions for
long-term success.



We restore degraded *Posidonia* meadows through
community collaboration, pressure control and
science-based restoration.

THE FUTURE WE BUILD



Thriving *Posidonia*
meadows



Richer marine
biodiversity



Coastal protection
and clearer waters



Blue carbon
and climate action



Strong communities
and stewardship



Healthy *Posidonia* meadows deliver
ecosystem services, support climate
resilience and benefit people today
and for generations to come.

OUR APPROACH IS:



Science-based
restoration



Collaborative
and inclusive



Evidence, monitoring
and adaptive learning



Nature-positive
and climate-smart



Scaling up for
long-term impact

Key messages

- **Start with the Living Lab.**

Map stakeholders early and co-design the restoration pathway with authorities, scientists, sea users and local communities.

- **Restore only where pressures are controlled.**

Site selection must account for anchoring, coastal development, pollution, water quality and climate-related stressors.

- **Check substrate readiness.**

Stable dead matte and healthy seagrass around it before installing coir mesh and transplanting shoots.

- **Use low-impact restoration material.**

Prefer naturally detached shoots or collect selectively and sustainably from healthy donor meadows and use biodegradable coir mesh at the transplanted sites.

- **Plan for long-term learning.**

Monitor survival, growth, substrate stability and stakeholder compliance, then adapt the method before scaling.

Policy relevance

International and EU policy

- EU Nature Restoration Regulation
- EU Habitats Directive - 1120* *Posidonia* beds
- EU Biodiversity Strategy for 2030
- Marine Strategy Framework Directive
- Marine Spatial Planning Directive
- Barcelona Convention / SPA-BD Protocol



Healthy *Posidonia oceanica* meadow

Dense seagrass meadows provide habitat, stabilize sediments, support biodiversity and store blue carbon.

“Transplantation only works when the right site is selected, pressures are controlled, governance and community support are in place”

What is the challenge?

Posidonia oceanica meadows in Cyprus and across the Mediterranean are under pressure from coastal development, anchoring and boating, pollution, poor water quality and marine heatwaves. Once lost, recovery is very slow even if the pressures are controlled because seagrass has very slow growth rates, only a few cm each year.

- Restoration will fail if the original pressures continue.
- Suitable sites require clean waters, available dead matte, adequate light, medium to low exposure and hydrodynamics, permits from the authorities and stakeholder support.

“Restoration should support protection, not substitute it; it only builds recovery where the conditions are right and natural recolonization is slow”



An innovative solution

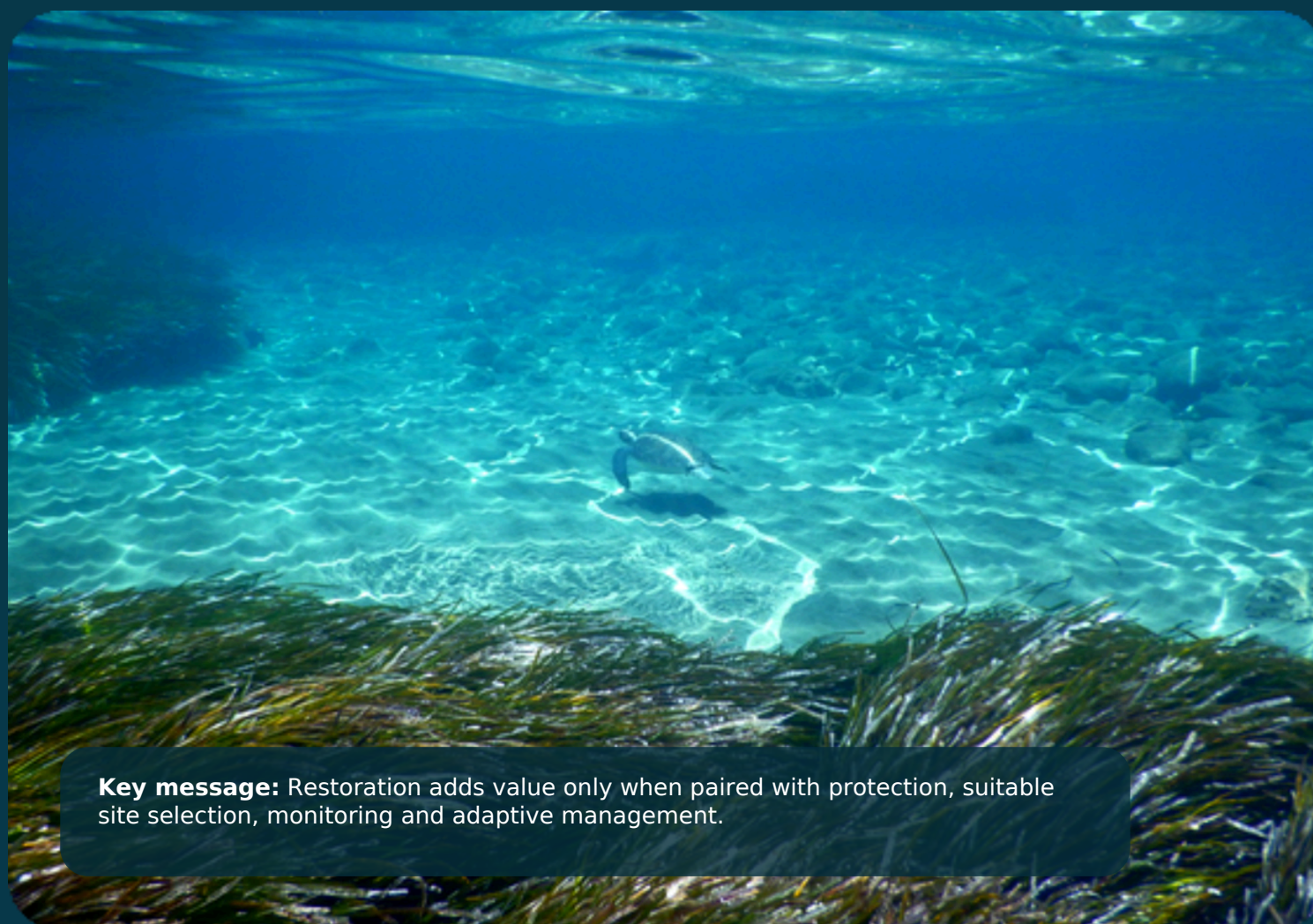
ResPos combines the Living Lab approach with science-based site selection, pressure control and low-impact transplantation.

- Map stakeholders and create a shared restoration pathway before field implementation.
- Select sites where pressures are controlled and suitable dead matte exists alongside healthy meadows.
- Prepare biodegradable coir mesh and use naturally detached shoots or selective, sustainable collection from healthy donor meadows.
- Place shoots ensuring the roots are touching the substrate and fix the coir mesh using U-shaped metal stakes.
- Monitor survival, growth and coir mesh stability to adapt the method before scaling.

Benefits produced by the solution

Restoring *Posidonia oceanica* meadows can rebuild ecosystem functions where the right site conditions exist and pressures have been controlled. The solution supports ecological recovery and long-term local stewardship.

“Healthy *Posidonia oceanica* meadows are living infrastructure for biodiversity, climate resilience and coastal protection”



Key message: Restoration adds value only when paired with protection, suitable site selection, monitoring and adaptive management.

Benefits for nature and people

- 1 Accelerates meadow recovery where natural recolonization is too slow or unlikely.
- 2 Enhances biodiversity by restoring habitat, shelter and nursery functions.
- 3 Supports blue carbon storage and climate-change mitigation.
- 4 Improves coastal protection by stabilizing sediments and reducing erosion.
- 5 Improves water quality by absorbing nutrients and pollutants.
- 6 Supports fisheries and recreation.
- 7 Builds collaboration between science, policy, authorities and communities.

Development status, transferability and readiness

How developed is the solution?

Current development stage: ResPos has demonstrated a practical restoration protocol and stakeholder-engagement pathway in Cyprus. It should be presented as a capacity-building and pilot restoration approach.

Before scaling, resolve:

- Long-term survival and growth under local hydrodynamic and sediment conditions.
- Best attachment method and substrate type for different local contexts.
- Availability of detached shoots and seasonal constraints.
- Effectiveness of pressure-control measures, especially anchoring and coastal development impacts.

Who is this relevant to?



Marine and coastal authorities
permits, protection, enforcement

Municipalities
development decisions, site access

Researchers and divers
assessment, design, monitoring

Fishers, boaters and tourism
local knowledge and compliance

NGOs, schools and citizens
stewardship and ocean literacy

Where could this be applied?

**Historical or nearby
*Posidonia oceanica***

Recover degraded meadow footprints or strengthen meadow edges where natural recovery is too slow.

Manageable pressures

Avoid sites where anchoring, sedimentation or pollution will continue to damage the meadow.

Clean water and stable substrate

Adequate light, medium to low exposure and stable dead matte.

Supportive governance

Authorities and local users support monitoring, compliance and long-term stewardship.

What needs to be in place?

Before transplantation:

- Clear diagnosis and evidence that *P. oceanica* loss or degradation is localised.
- Baseline habitat maps and information on historical meadow extent.
- Pressure-control plan for anchoring, coastal works, pollution and turbidity.
- Confirmation that dead matte is available and suitable.
- Donor-material strategy prioritising detached shoots and avoiding damage to healthy meadows.
- Permits, diving safety arrangements and a monitoring plan.
- Stakeholder map with roles, responsibilities and feedback loops.

Restoration succeeds only when ecological suitability, pressure control and local ownership align.

Key components of implementation

Implementation should follow a staged pathway: first build ownership and governance, then select the right site, reduce pressures, install carefully, and monitor before scaling.

1

Map stakeholders & create the Living Lab

Identify authorities, users, economic interests, researchers, divers, NGOs and local communities. Agree roles, responsibilities and communication routes.

2

Diagnose pressures and governance

Map anchoring, coastal development, pollution, dredging and climate-related pressures. Clarify permits and management responsibilities before action.

3

Select restoration sites

Prioritise clean waters, adequate light, medium to low exposure and hydrodynamics, stable dead matte and nearby healthy meadows.

4

Secure materials and permits

Prefer naturally detached shoots or collect selectively and sustainably from healthy donor meadows. Prepare biodegradable coir mesh and U-shaped metal stakes.

5

Transplant and install carefully

Place shoots on coir mesh so roots touch the substrate. Secure the mesh with U-shaped metal stakes and leave no material behind.

6

Monitor, learn and scale up

Track survival, growth, coir mesh stability and pressure recurrence. Adapt the method before expanding to larger areas.



Co-design with stakeholders



Availability of dead matte adjacent to healthy patches



Transplantation and monitoring in the field with scientific support

Keep the sequence: community and governance first, then ecological suitability, pressure control, transplantation and adaptive monitoring.

Monitoring success

Monitoring should start before transplantation and continue long enough to capture survival, growth, substrate stability and pressure recurrence.

1

Establish a baseline

Before installation, record georeferenced stations, photo/video points, depth, light, substrate condition, nearby healthy meadow, shoot density/cover and all active pressures.

Core monitoring indicators

What to check	Indicators	Suggested timing
Transplant survival	Living shoots, shoot loss, uprooting, herbivory, sediment burial/scour	1-3 months, 6 months, 12 months
Installation stability	Coir mesh integrity, U-shaped metal stakes, roots touching substrate	Every follow-up dive in year 1
Meadow recovery	Shoot density, leaf length, new shoots, rhizome anchoring, expansion	Annual monitoring for at least 3-5 years
Pressure control	No new anchoring scars, dredging effects, pollution inputs or disturbance	Repeated site inspections and stakeholder feedback
Social readiness	Stakeholder participation, permits, compliance, awareness and stewardship	Throughout the project

Use monitoring to adapt. If survival is low, revisit site choice, pressure control, substrate stability, mesh design, shoot handling and installation depth before scaling.



“Success is not only shoot survival - it is evidence that the site is moving toward self-sustaining meadow recovery”

Costs, timeframes and challenges

Indicative costs and timeframes

Activity	Cost level	Indicative timeframe
Stakeholder mapping and Living Lab	Low-medium	Start early; continue throughout
Permits and governance coordination	Low-medium	1-6 months or longer
Baseline mapping and site selection	Medium-high	Weeks to months
Pressure assessment and control	Medium-high	Months to years
Substrate readiness and dead matte checks	Medium	Weeks to months
Shoot collection, coir mesh and installation	Medium	Days to weeks per pilot
Monitoring and adaptive management	Medium-high	Minimum 3-5 years

Challenges you may encounter

- 1 Site selection**
Candidate sites may still be under active pressure or lack clean water, light or stable substrate.
- 2 Permits and governance**
Responsibilities can be split across marine, municipal, port and national authorities.
- 3 Donor material**
Detached shoots may be limited; collection must avoid damage to healthy donor meadows.
- 4 Installation**
Storms, burial, erosion or poor anchoring of the coir mesh can reduce early survival.
- 5 Monitoring**
Recovery is slow, so funding and commitment must outlast the pilot phase.
- 6 Community support**
Compliance can weaken if users do not see the rationale or benefits of restrictions.

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What to plan before scaling

- 1 Pressure control first** - Restoration should not compensate for ongoing anchoring, dredging, pollution or unmanaged development.
- 2 Living Lab development** - Map responsible authorities, local users and community partners early so goals and actions can be co-designed.
- 3 Pilot before scale-up** - Use early survival, mesh stability and substrate response to refine the method.
- 4 Budget for time** - Slow growth means ecological response is measured over years, not weeks.

"Restoration succeeds when good science, local ownership and long-term monitoring meet the right ecological conditions"

Blueprint

Building capacity for
Restoring *Posidonia
oceanica* meadows in
Cyprus (ResPos)

***Restoration is a long-term commitment:
protect first, restore carefully, monitor
and adapt.***



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and Innovation