

Alternet Day - 12 June, 2024

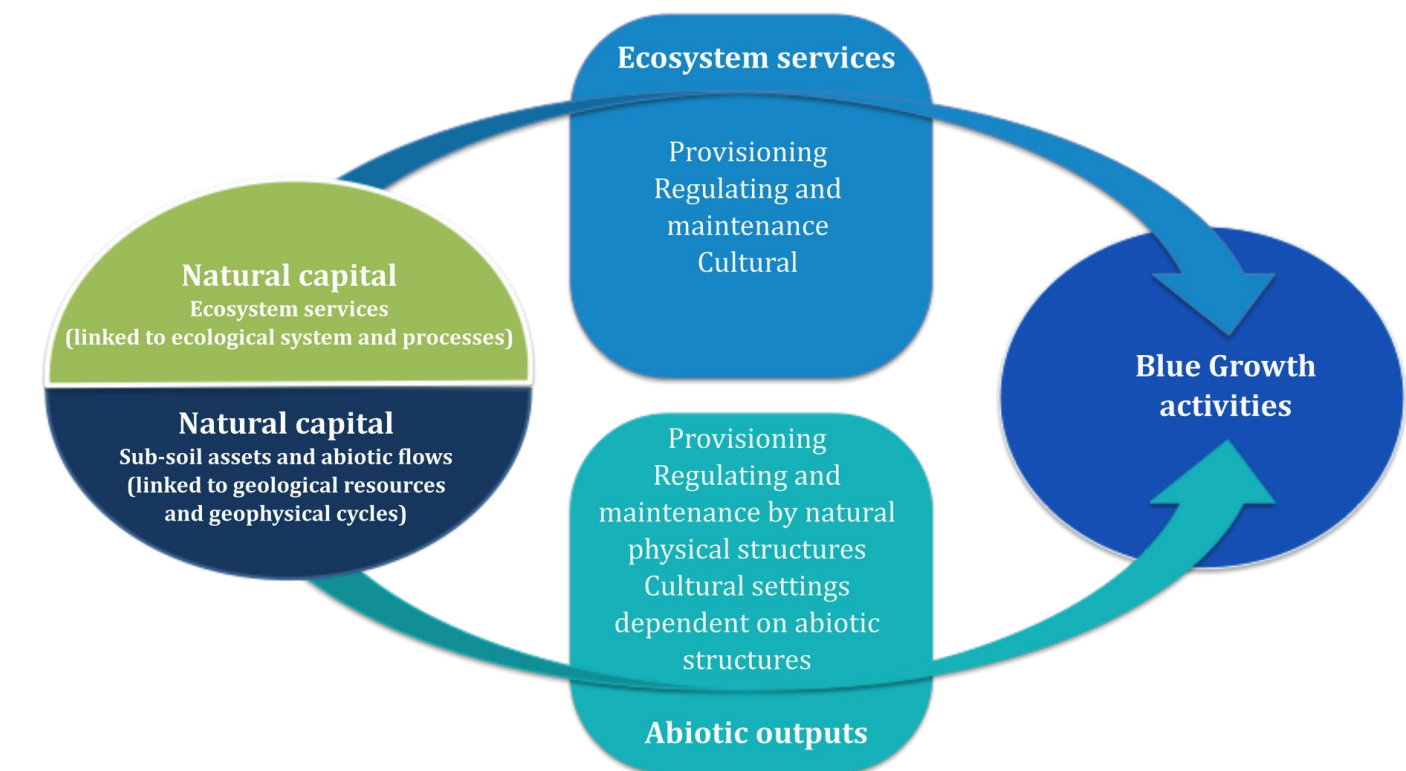
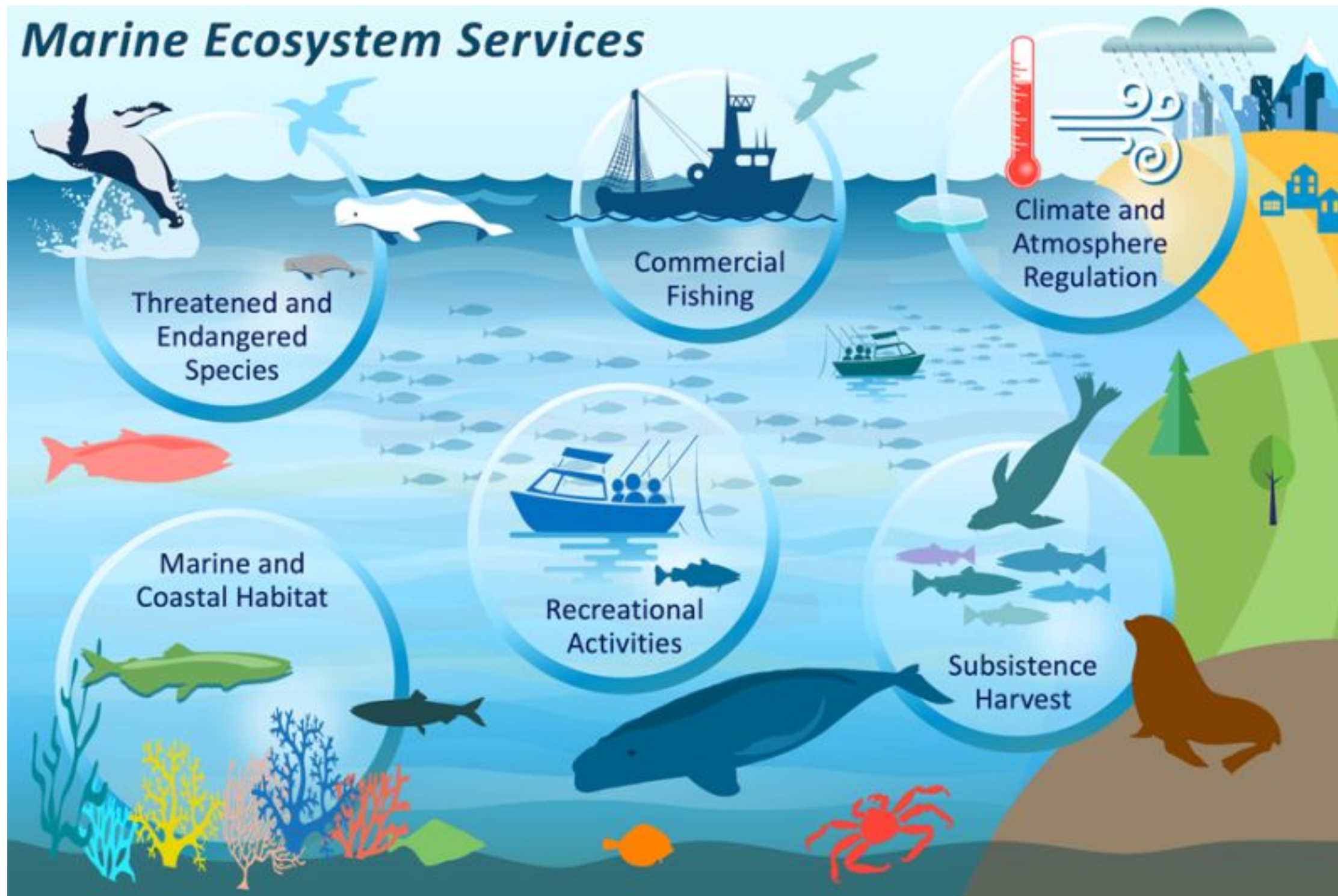
Sustainability Research + Innovation Congress 2024 - Sustainability Science Days

Session 1: Ecosystem restoration for biodiversity and multiple ecosystem benefits

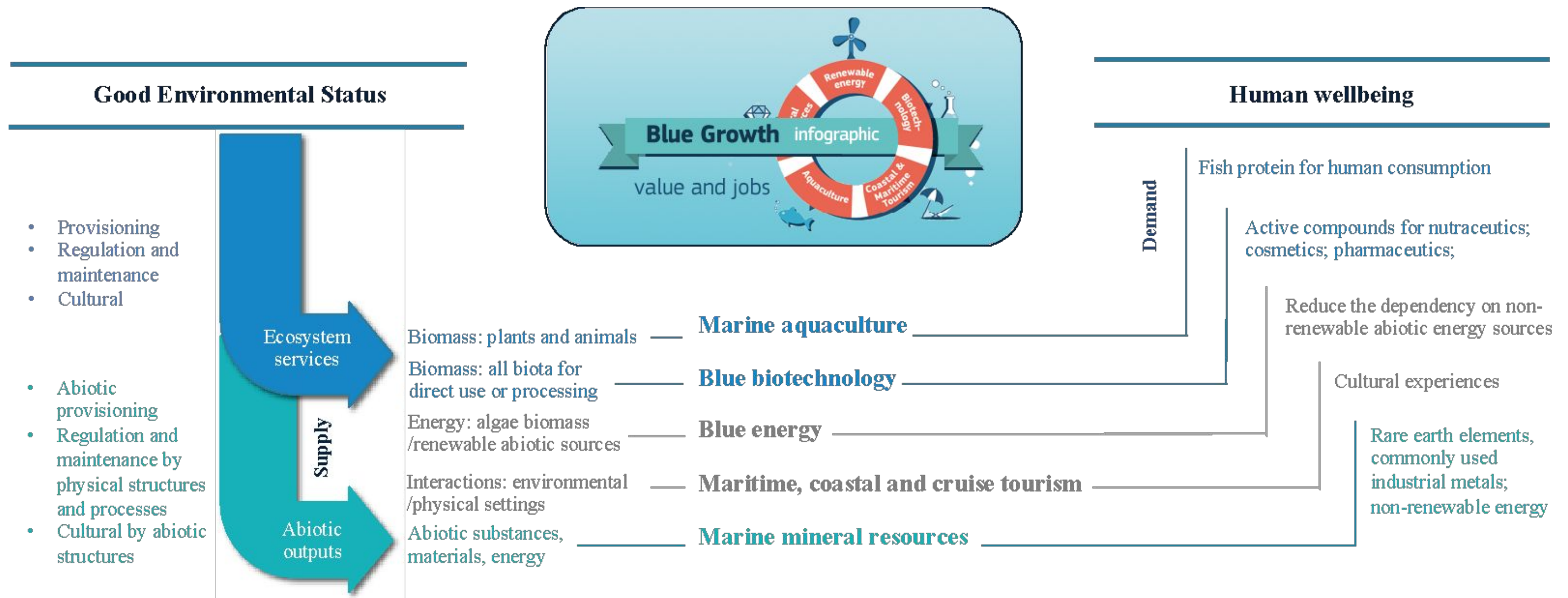
Coastal Restoration with Nature and People : showcasing a living lab approach

Ana Lillebø, CESAM, University of Aveiro, Portugal

Multiple benefits from Coastal Ecosystems



Multiple benefits from Coastal Ecosystems: supply and demand for ecosystem services



Blue Growth requires balanced, social-economic and environmental aspects underpinned by marine Ecosystem Services

Actions

- Implementation of persuasive incentives and/or dissuasive incentives that could reduce the consumption of non-renewable energy
- Monitor relevant MSFD descriptors and promote an effective implementation of EU environmental-related policies
- Follow EU guidelines for compatibleness with EU Nature legislation
- Reduce wild fish inputs into marine aquaculture fish feed formulations
- Adopt more ecologically sound management practices
- Promote eco-tourism and encourage links to other sustainable actions
- Development of key matrices and threshold indicators for marine biodiversity, abundance, habitat quality, population connectivity, heterogeneity levels and community productivity
- Use of the best available science on marine and coastal ecosystems; acknowledge uncertainties and knowledge gaps

Legislation

- Blue Energy Action needed to deliver on the potential of ocean energy in European seas and oceans by 2020 and beyond
- Marine Strategy Framework Directive
- Natura 200 in the marine environment: Birds and Habitats Directives
- Common Fisheries Policy
- Maritime Spatial Planning
- Recommendations on European Tourism Quality Principles
- A European Strategy for more Growth and Jobs in Coastal and Maritime Tourism
- United Nations Convention on the Law of the Sea
- United Nations Convention on Biological Diversity

Good Environmental Status

- Provisioning
- Regulating and maintenance
- Cultural

- Abiotic provisioning
- Regulating and maintenance by physical structures
- Cultural by physical structures

Ecosystem services

Supply

Abiotic outputs

Biomass: plants and animals

Biomass: all biota for direct use or processing

Energy: algae biomass/ renewable abiotic sources

Interactions: environmental/ physical settings

Abiotic substances, materials, energy

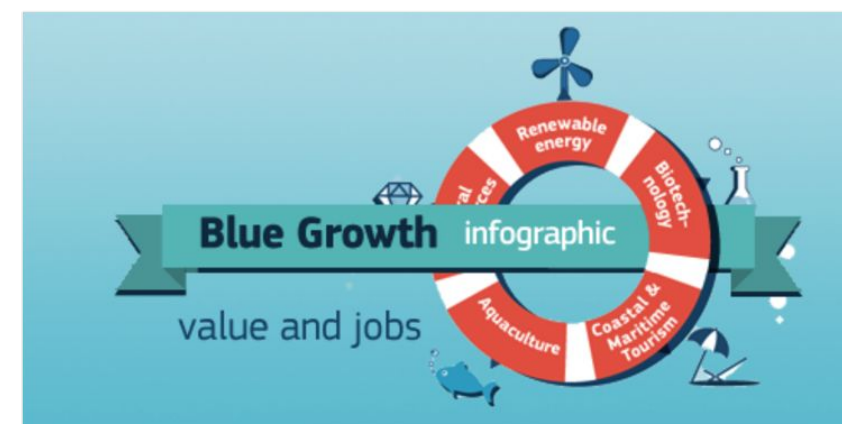
Marine aquaculture

Blue biotechnology

Blue energy

Maritime, coastal and cruise tourism

Marine mineral resources



Human well being

Demand

Fish protein for human consumption

Active compounds for nutraceuticals, cosmetics; pharmaceuticals

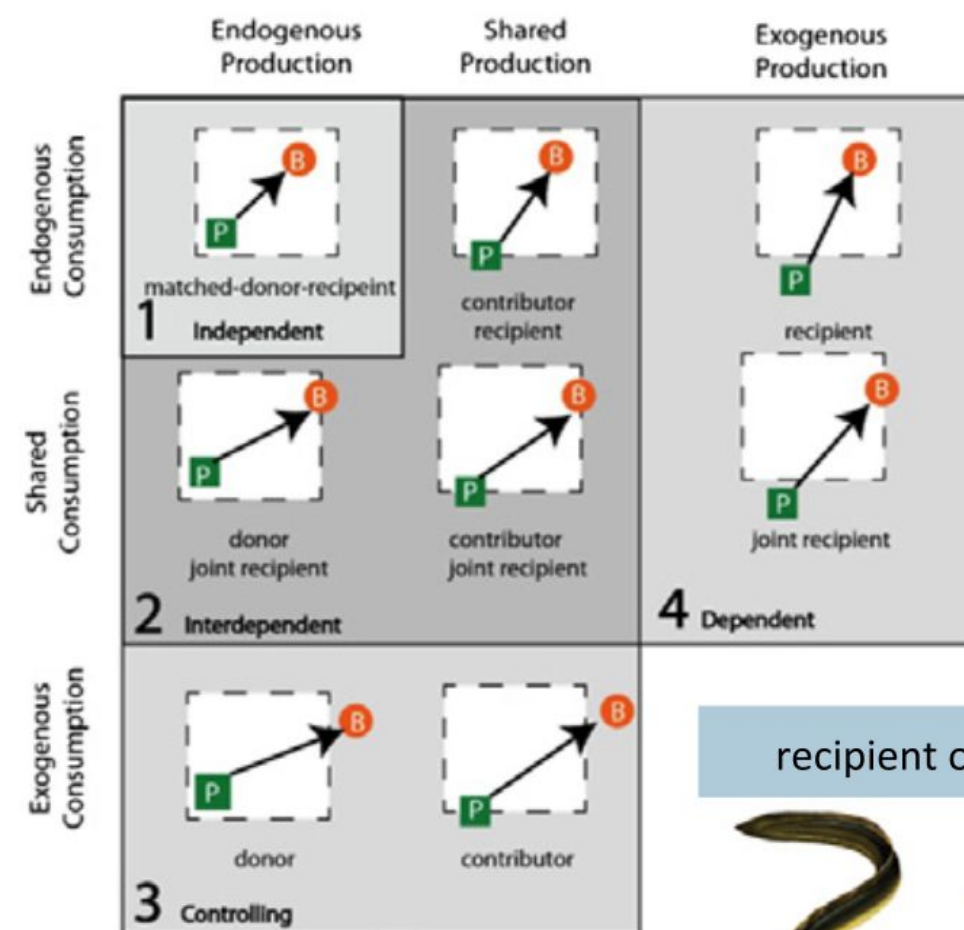
Reduce the dependency on non-renewable abiotic energy sources

Cultural experiences

Rare earth elements, commonly used industrial metals. non-renewable energy

Multiple benefits from Coastal Ecosystems: supply and demand for ecosystem services

Ecosystem services spatial typology

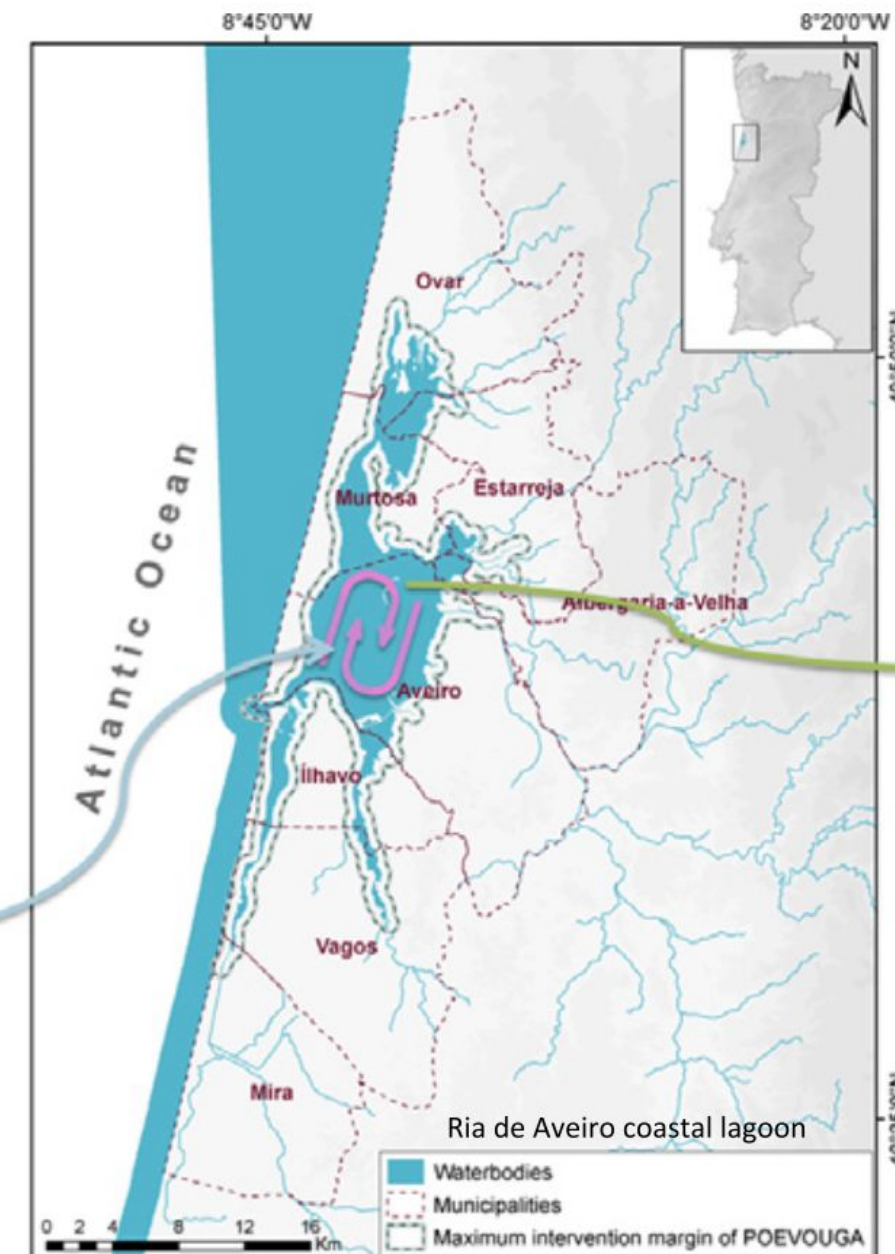


recipient or joint recipient



Eel (*Anguilla anguilla*)

© Scandinavian Fishing Yearbook / WWF



matched-donor-recipient



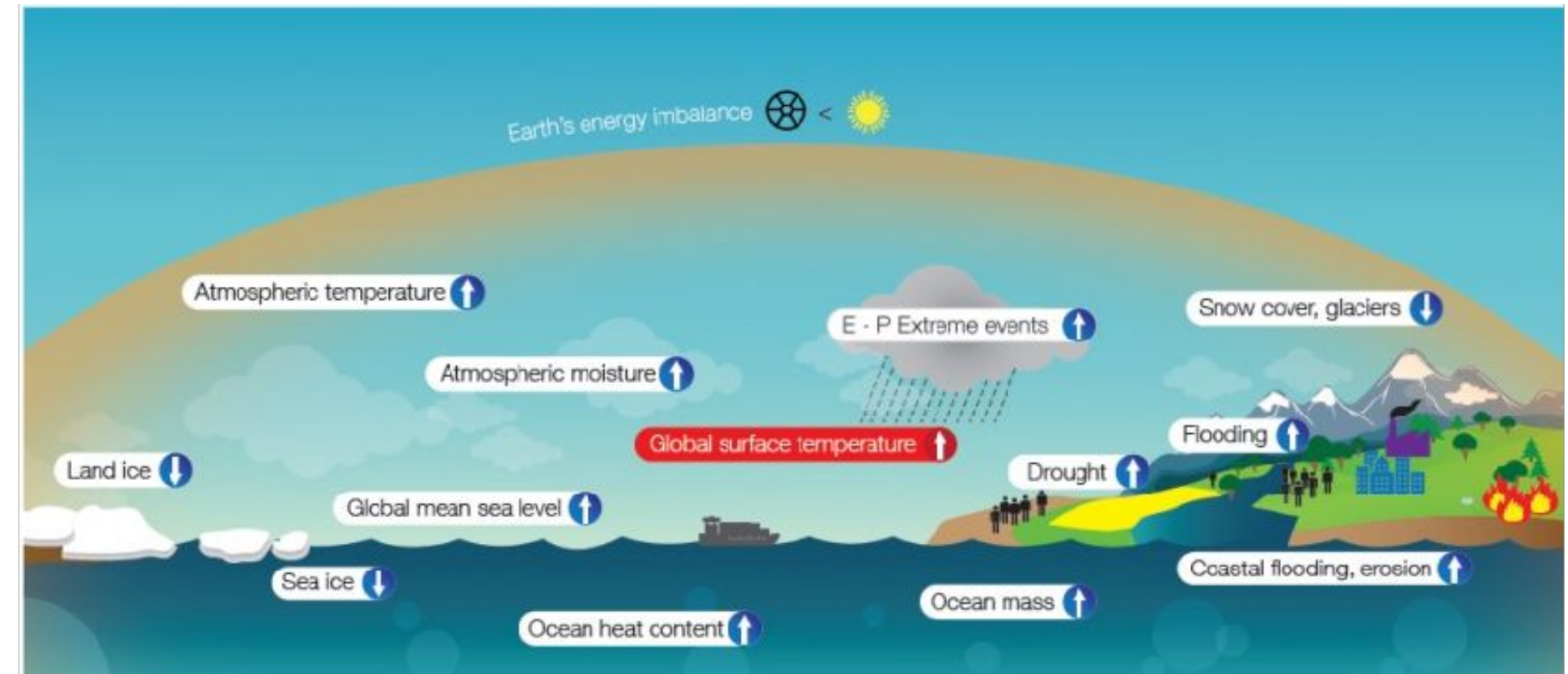
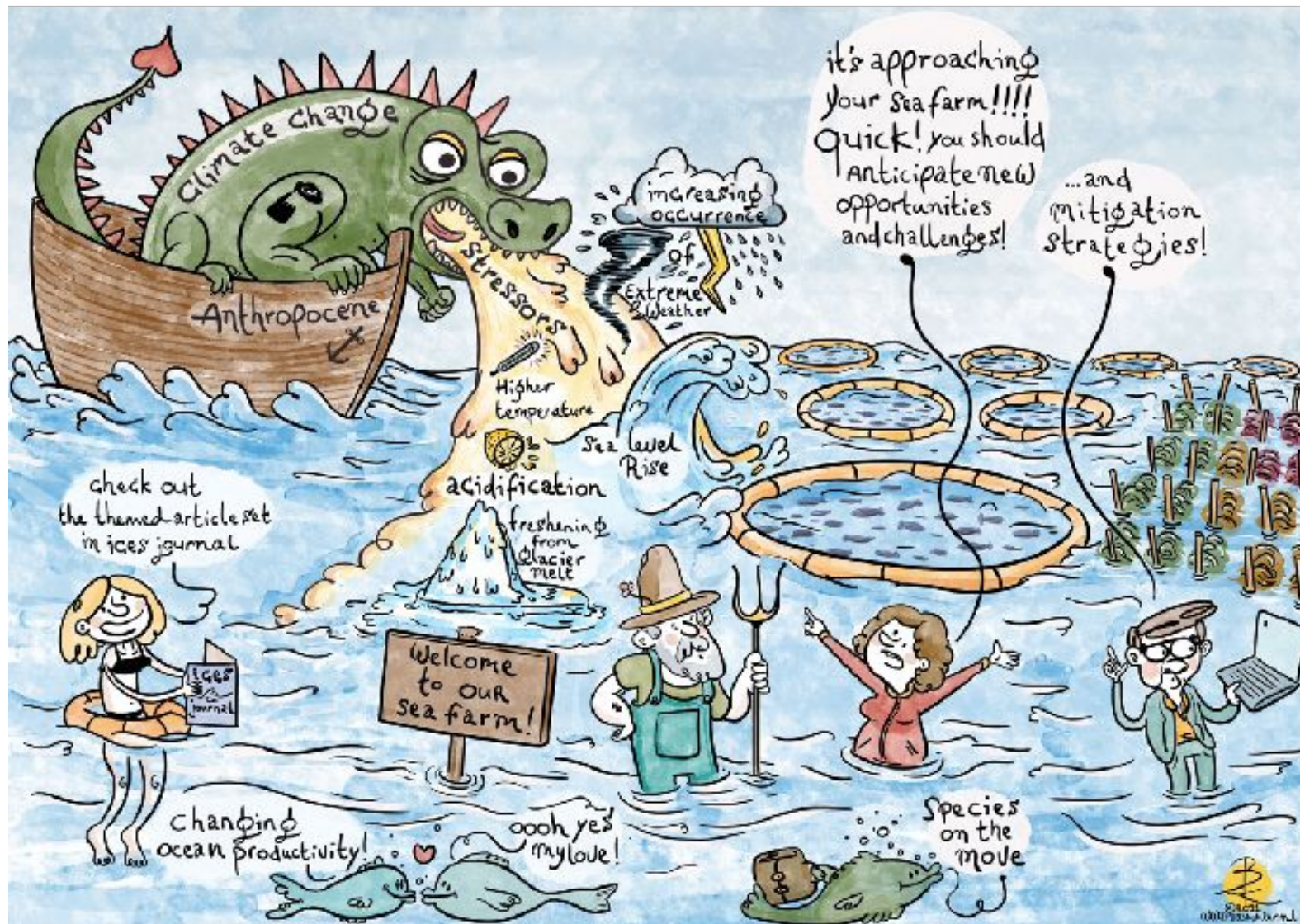
bait digging

donor or contributor



Carbon storage

Climate Change Impacts on Coastal Ecosystems



Ocean warming leads to deoxygenation – a reduction in the amount of oxygen dissolved in the ocean – and sea-level rise – resulting from the thermal expansion of sea water and continental ice melting. The rising temperatures, coupled with ocean acidification (the decrease in pH of the ocean due to its uptake of CO₂), affect marine species and ecosystems and, consequently, the fundamental benefits humans derive from the ocean.

Climate Change Impacts on Coastal Ecosystems: Blue Carbon Ecosystems

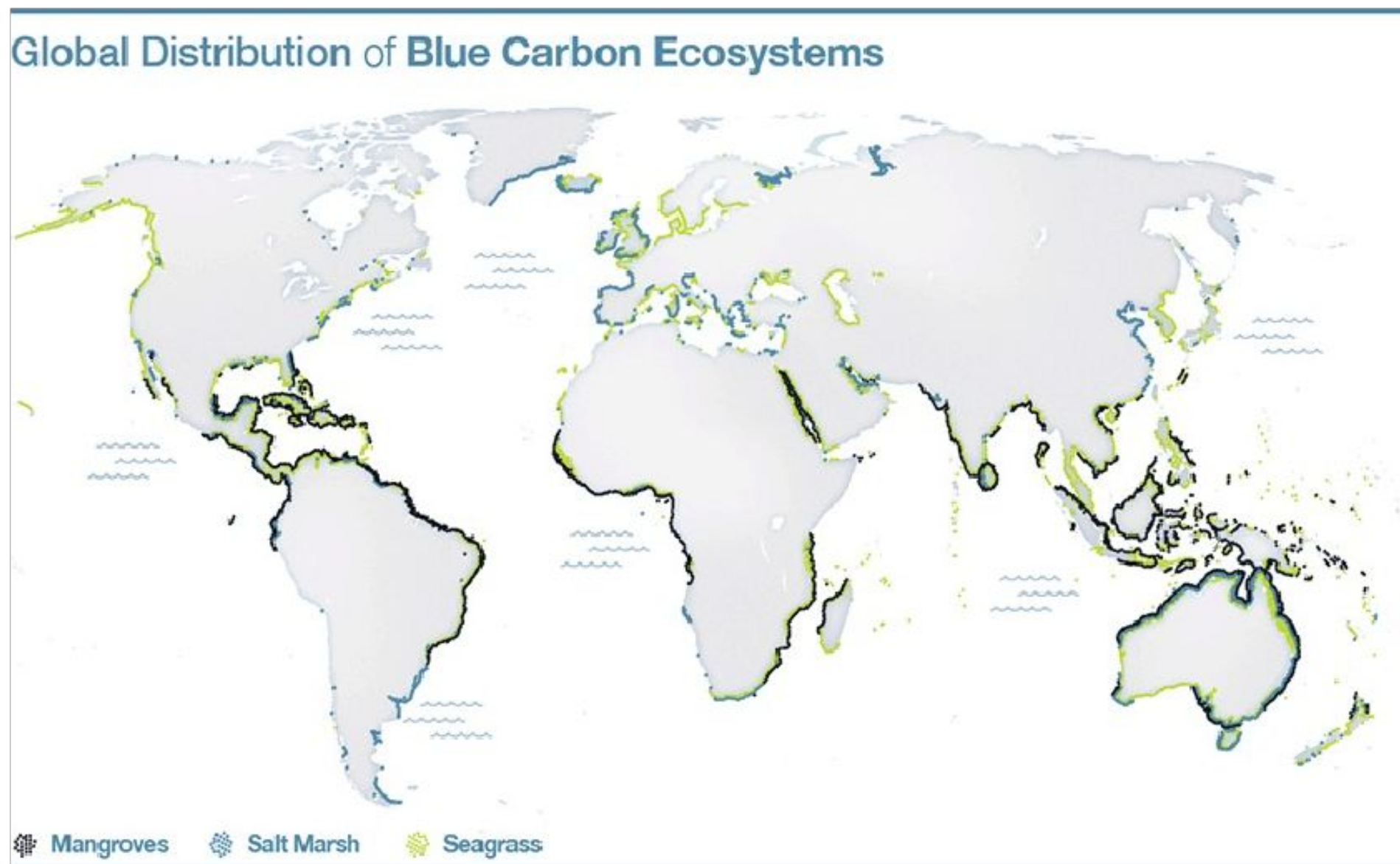


Image source: <https://www.thebluecarboninitiative.org>

* What is the net flux of **greenhouse gases** between Blue Carbon ecosystems and the atmosphere?

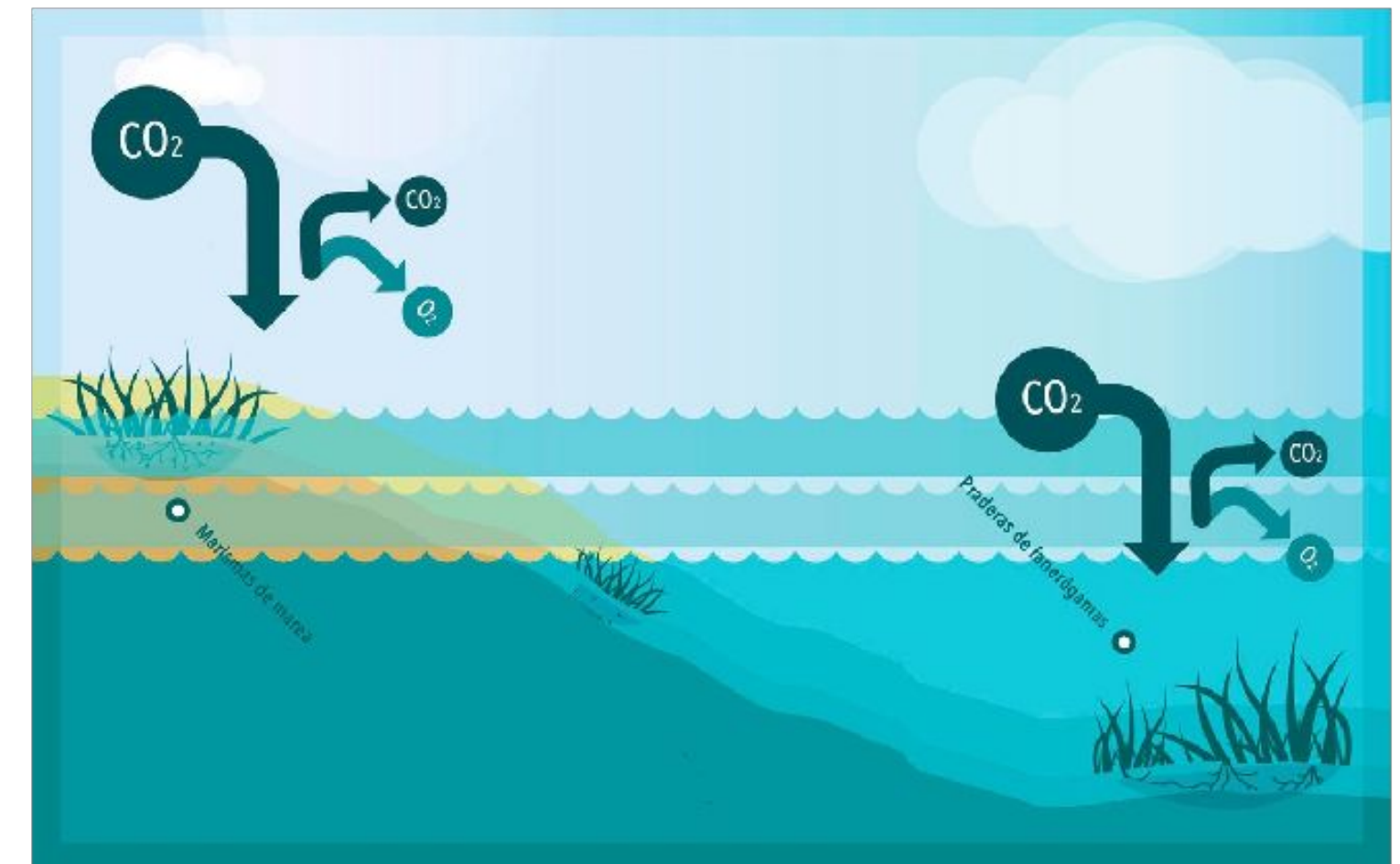


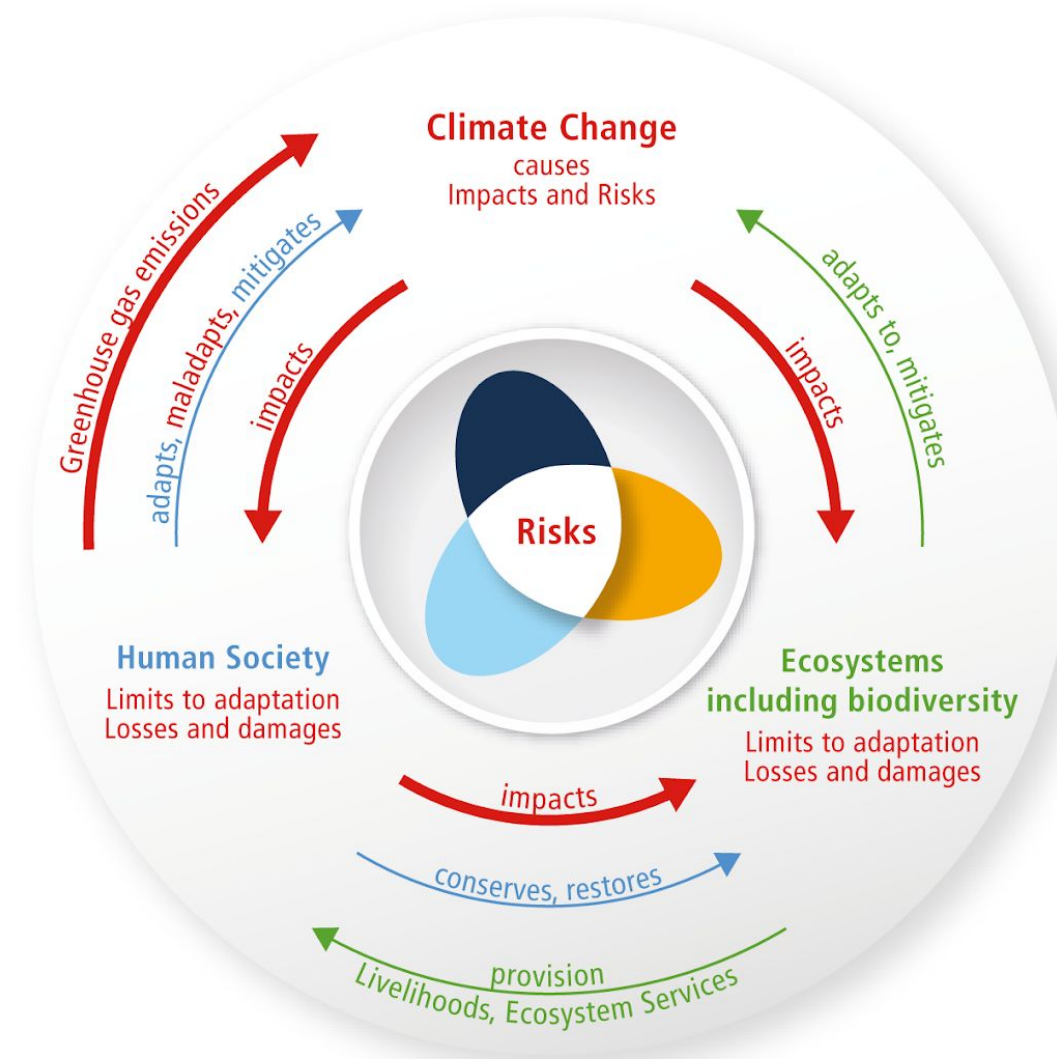
Image source: <https://life-blunatura.eu/en/blue-carbon/>

* Macreadie, P.I., et al., The future of Blue Carbon science. *Nature Communications*, 2019. 10.

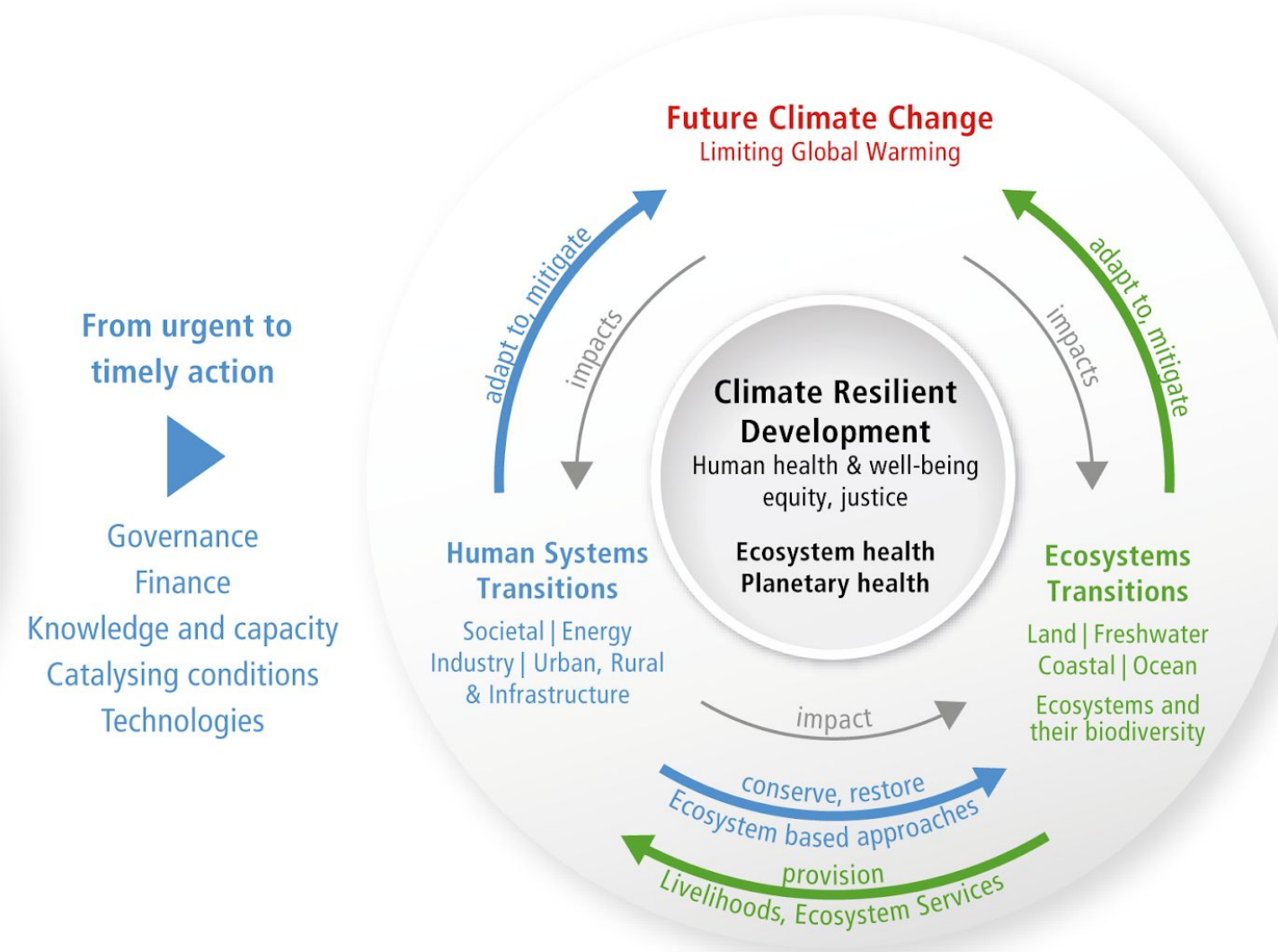
Adapting to Climate Challenges:

From climate risk to climate resilient development: climate, ecosystems (including biodiversity) and human society as coupled systems

(a) Main interactions and trends



(b) Options to reduce climate risks and establish resilience



The risk propeller shows that risk emerges from the overlap of:



Horizon Europe projects



<https://a-aagora.eu/>

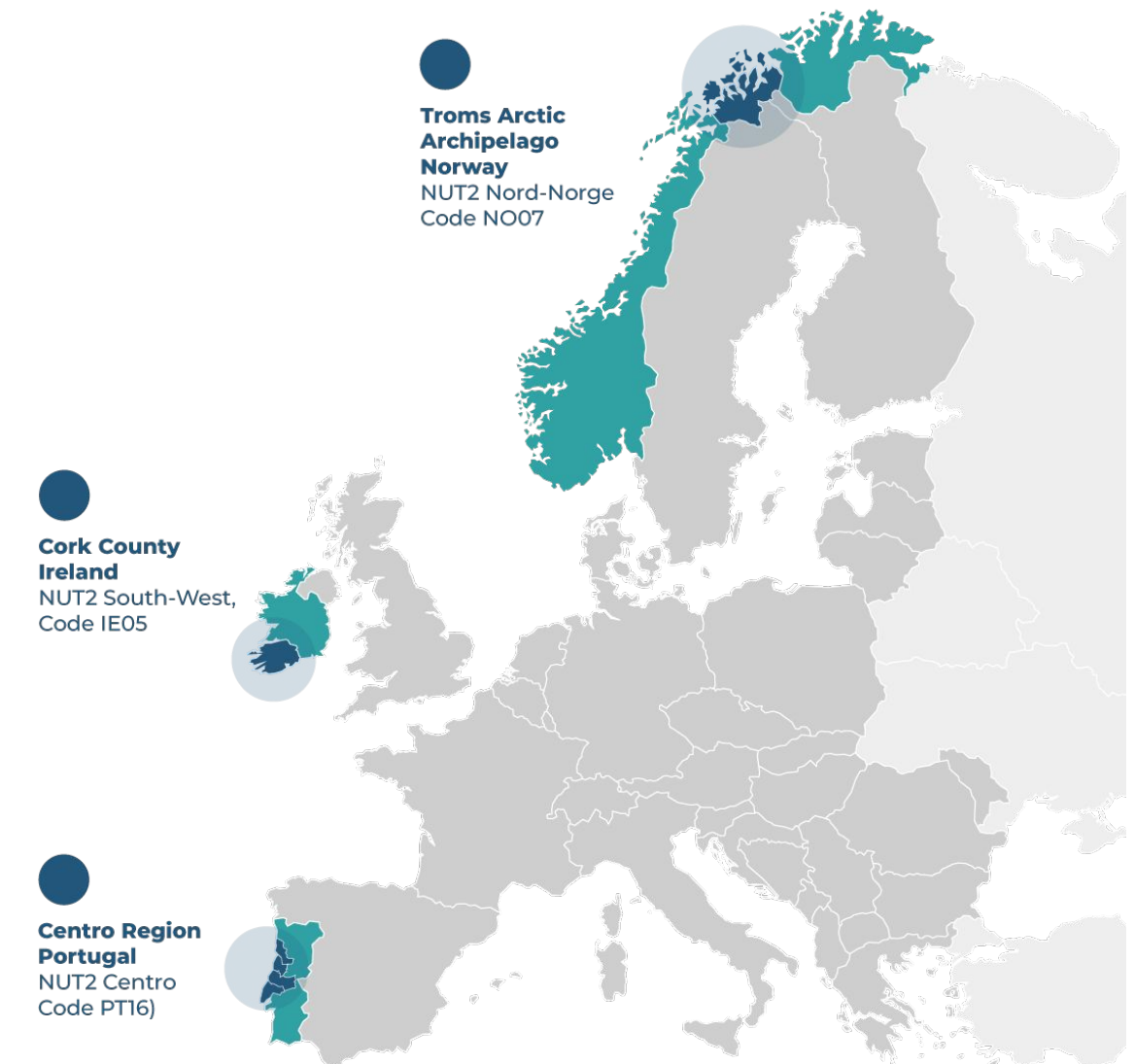


<https://www.restore4cs.eu>



A-AAGORA | BLUEPRINT FOR ATLANTIC-ARCTIC AGORA ON CROSS-SECTORAL COOPERATION FOR **RESTORATION OF MARINE AND COASTAL ECOSYSTEMS** AND INCREASED **CLIMATE RESILIENCE** THROUGH TRANSFORMATIVE INNOVATION

RESTORE4Cs | MODELLING RESTORATION OF WETLANDS FOR CARBON PATHWAYS, **CLIMATE CHANGE MITIGATION AND ADAPTATION**, ECOSYSTEM SERVICES, AND **BIODIVERSITY**, CO-BENEFITS



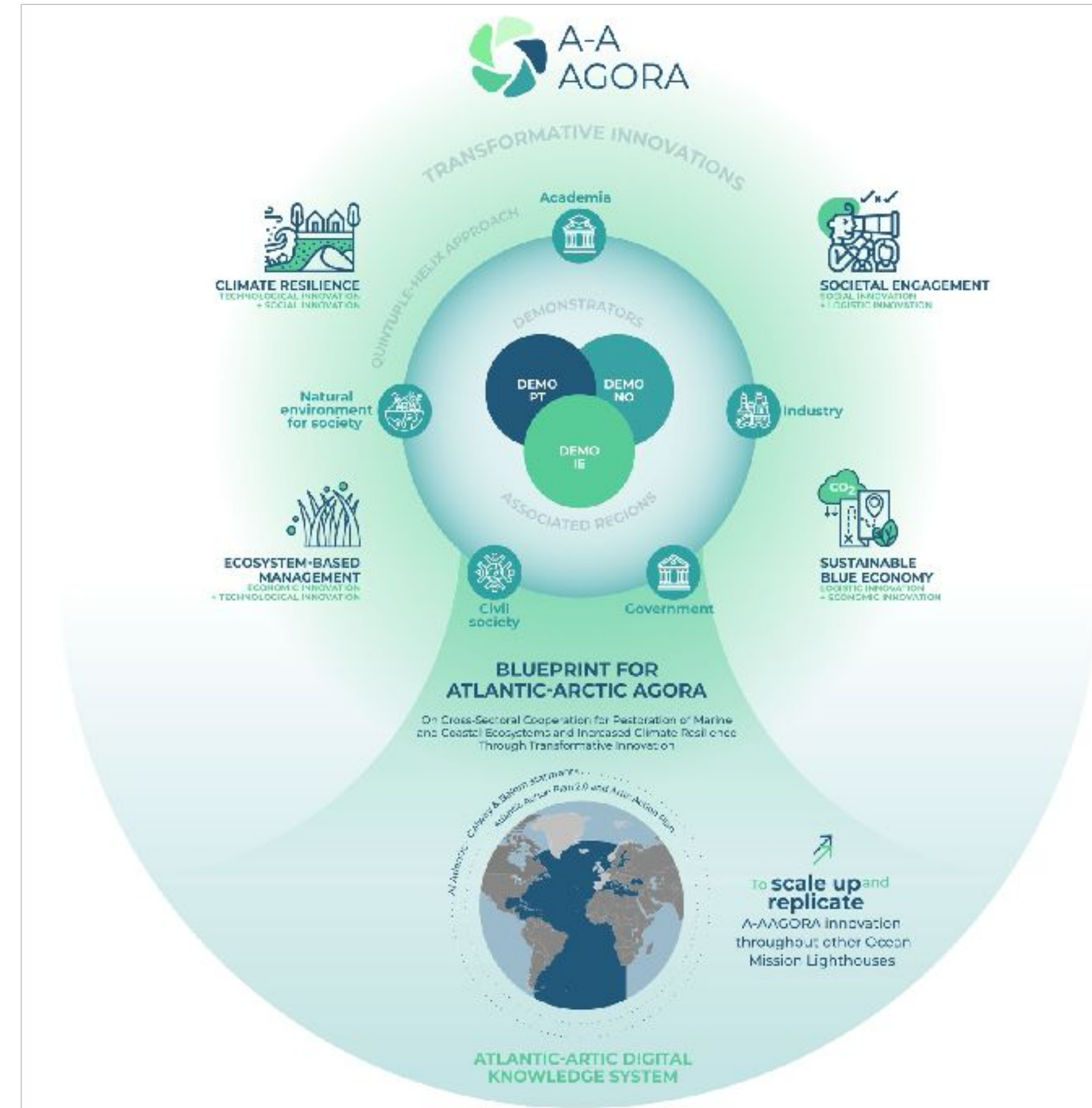
Coastal Restoration with Nature and People : a living lab approach



Mission 'Restore our Ocean and Waters' Goals. © European Union, 2021. All rights reserved.



<https://a-aagora.eu/>

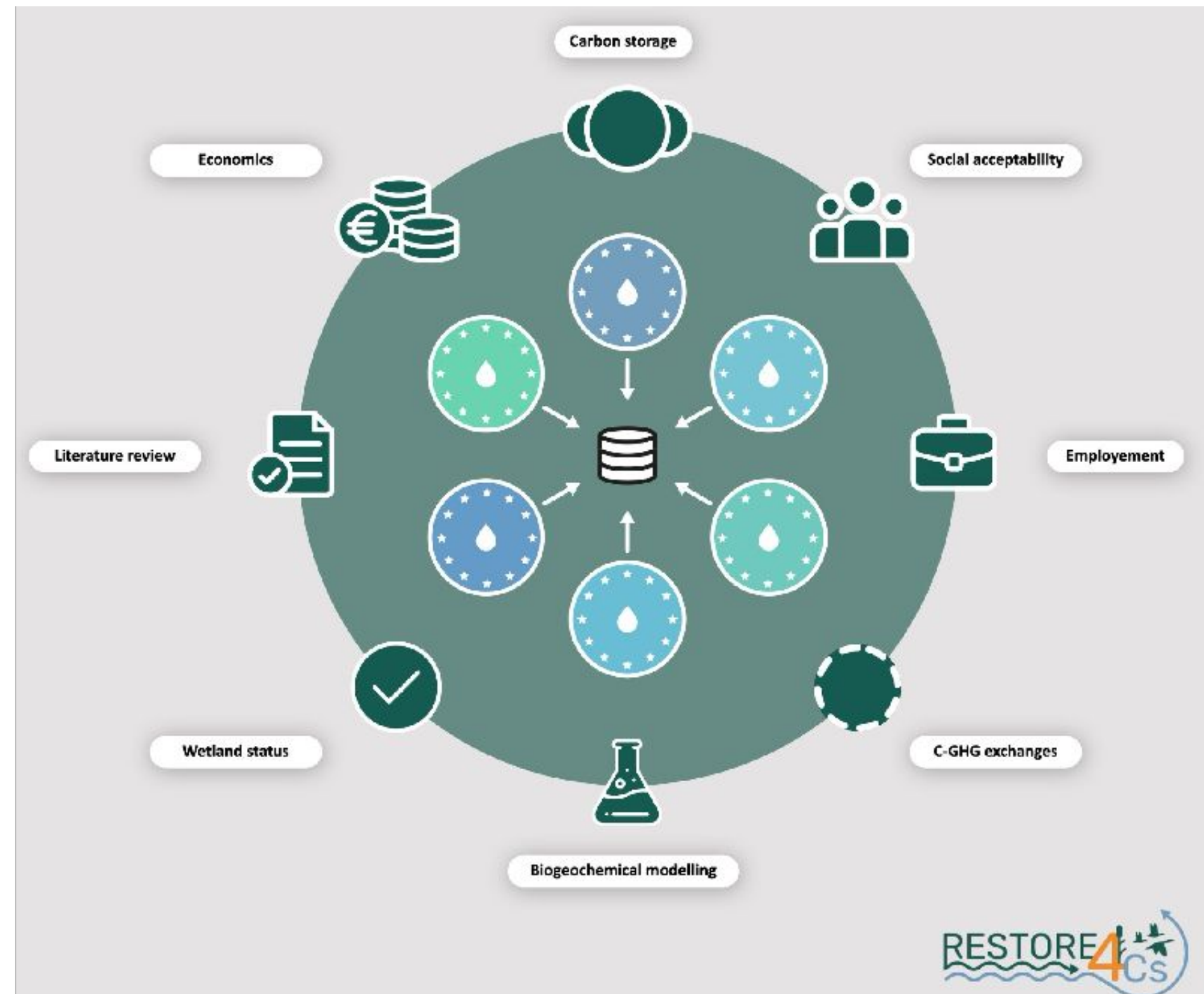


Coastal Restoration with Nature and People : for carbon pathways and co-benefits

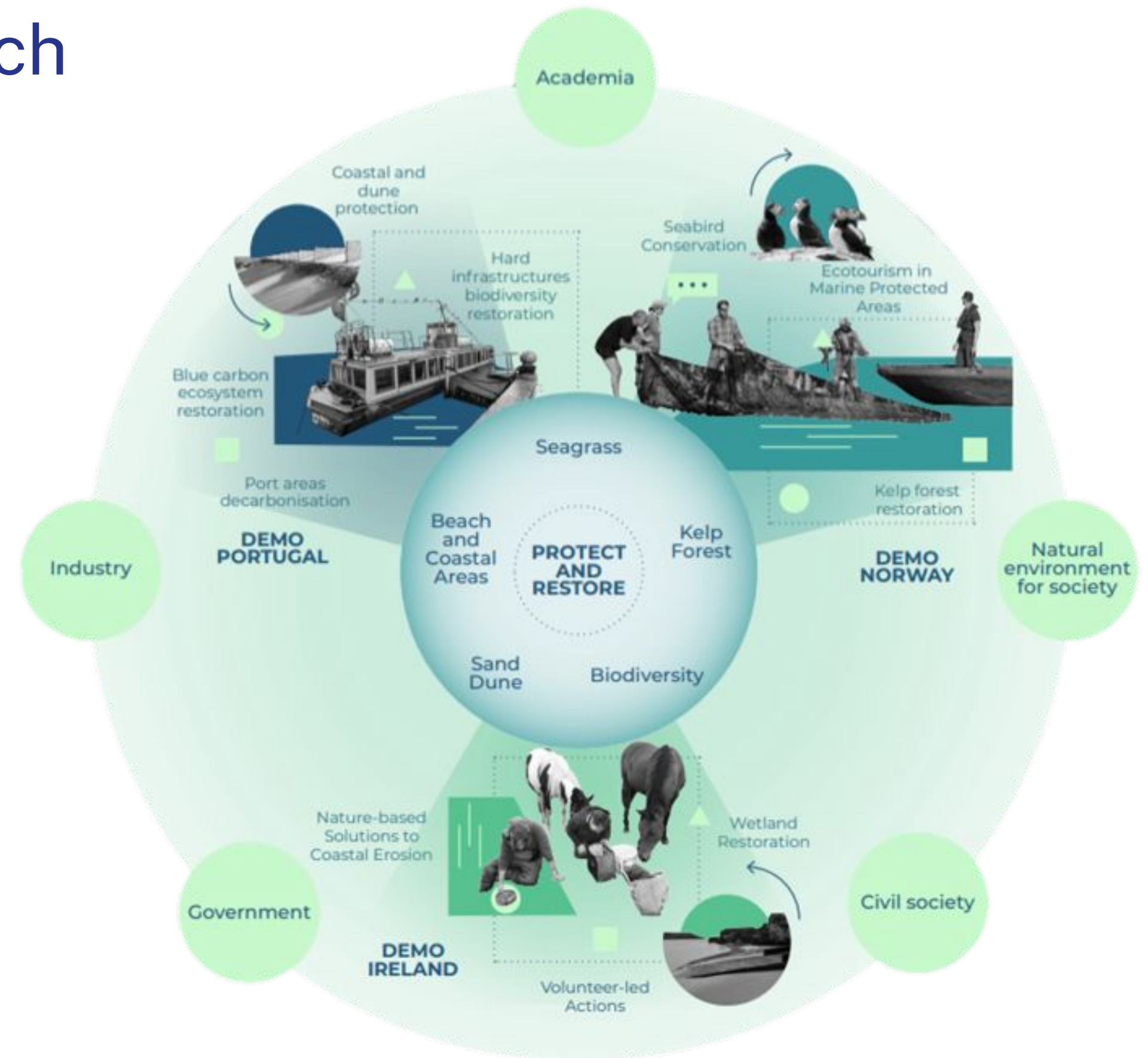
Measuring the abatement of carbon net flux in restored coastal wetlands



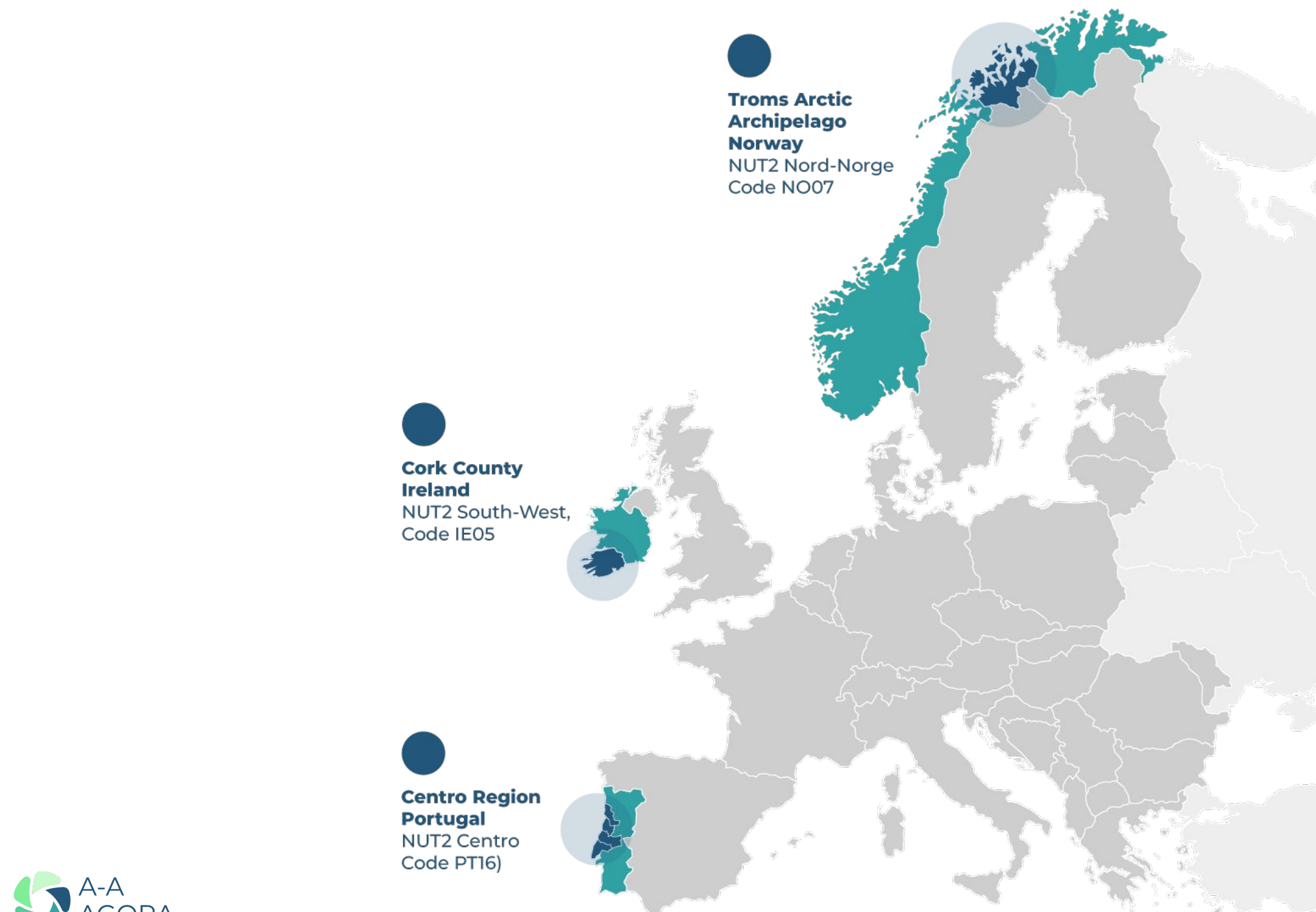
<https://www.restore4cs.eu>



Coastal Restoration with Nature and People : the quintuple helixes approach



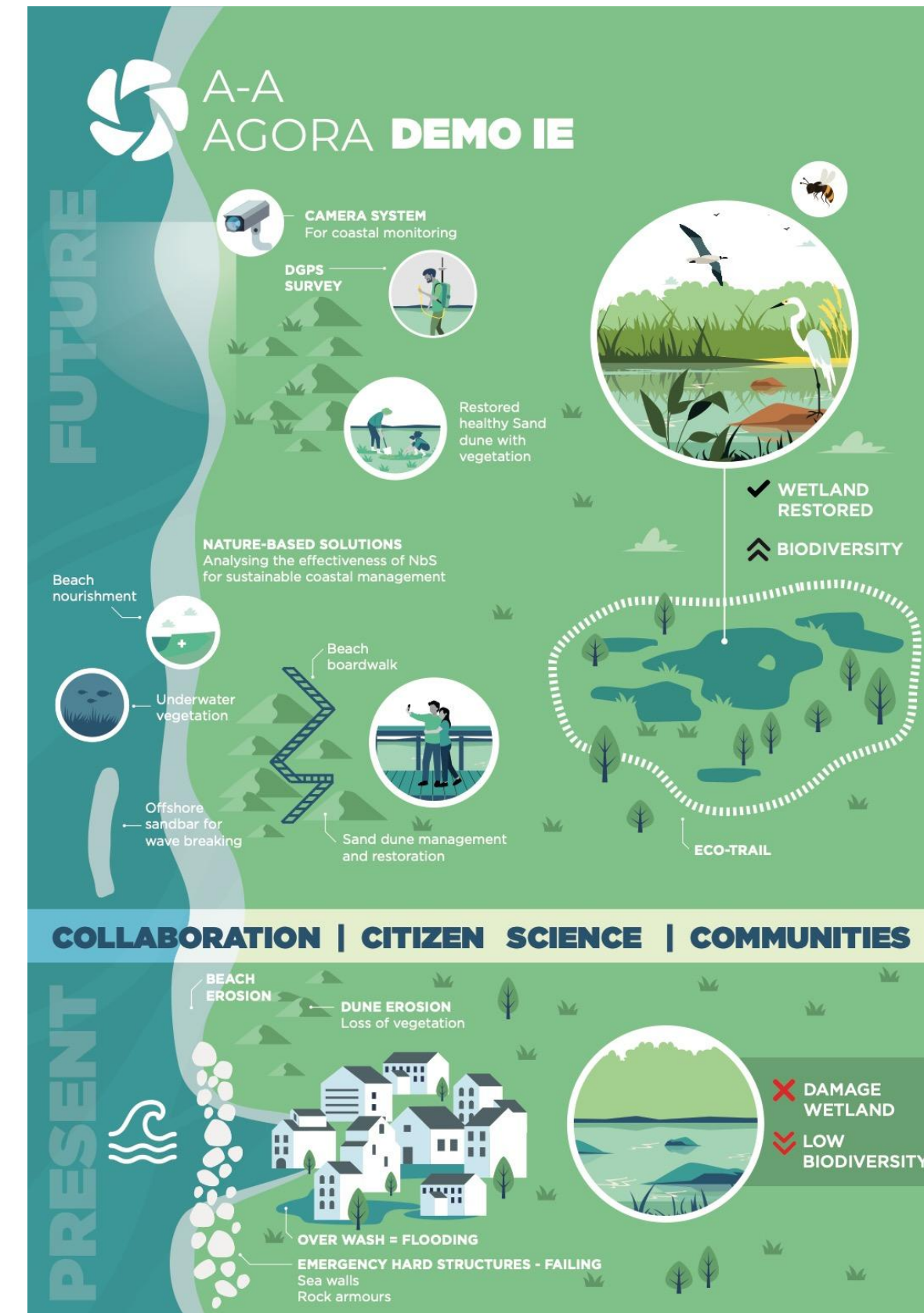
Coastal Restoration with Nature and People : a living lab approach in the Atlantic-Arctic basins



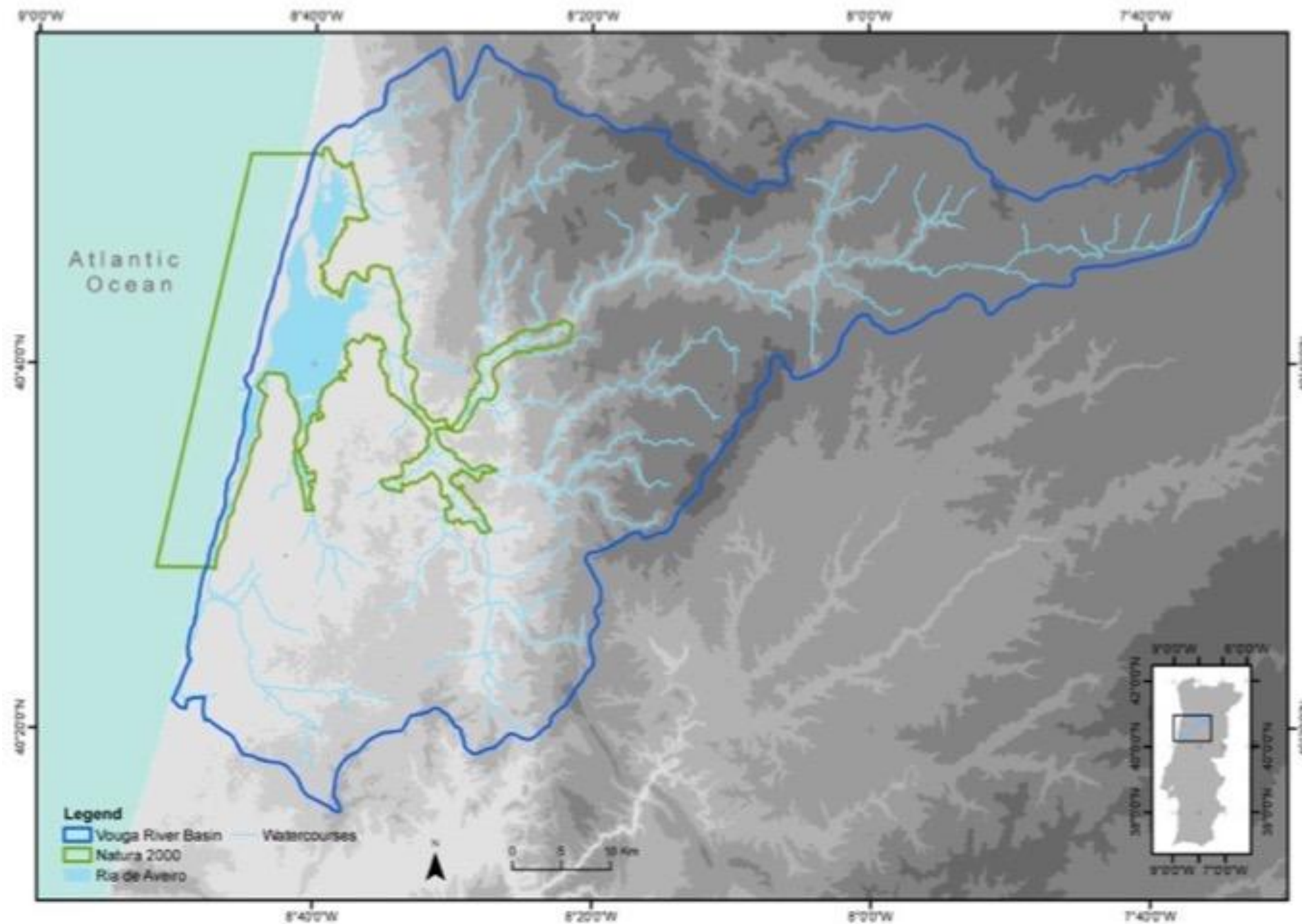
Coastal Restoration with Nature and People



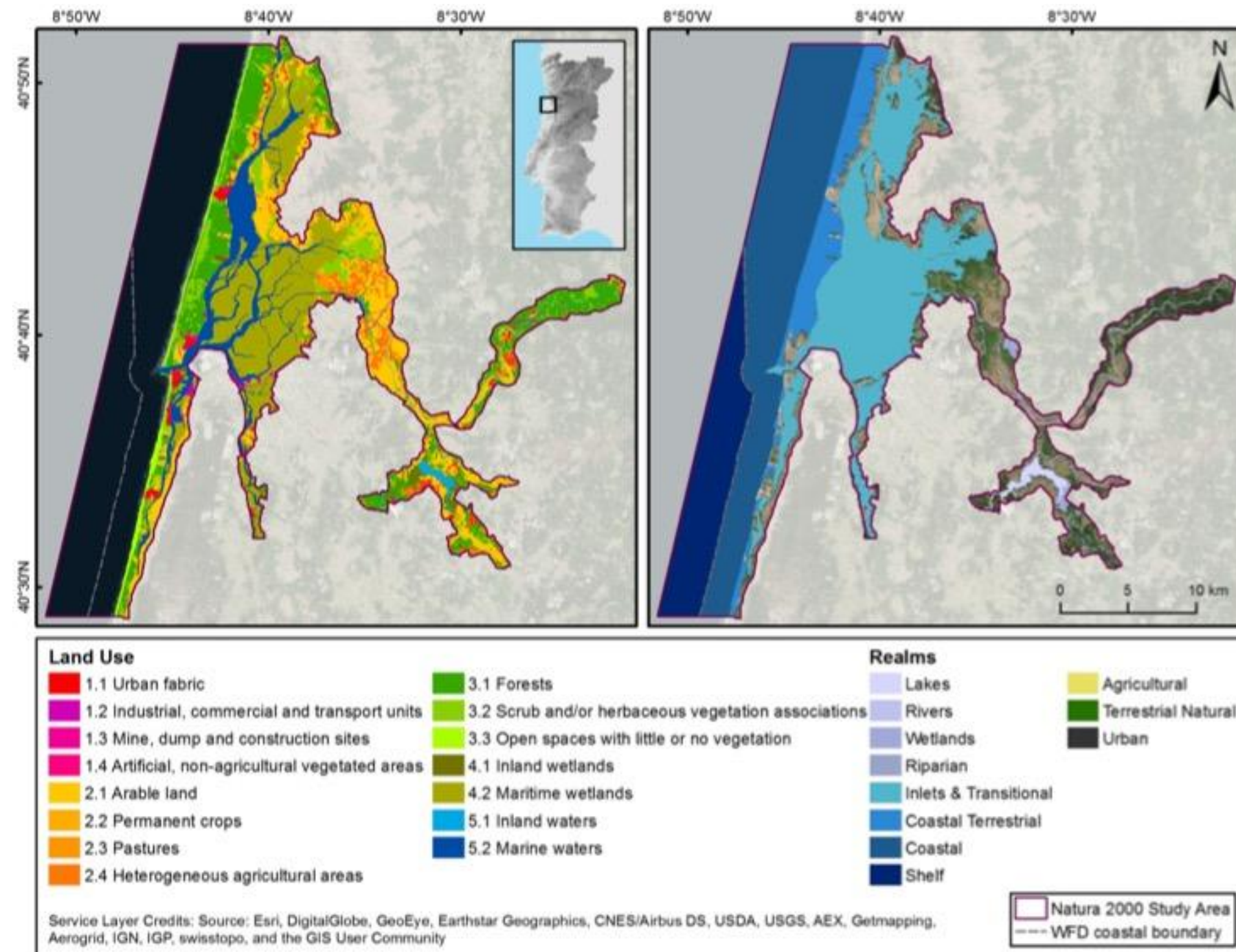
ECOSYSTEM-BASED MANAGEMENT IN AND OUTSIDE PROTECTED AREAS



Coastal Restoration with Nature and People: Ria the Aveiro coastal lagoon region under the Natura 2000 network

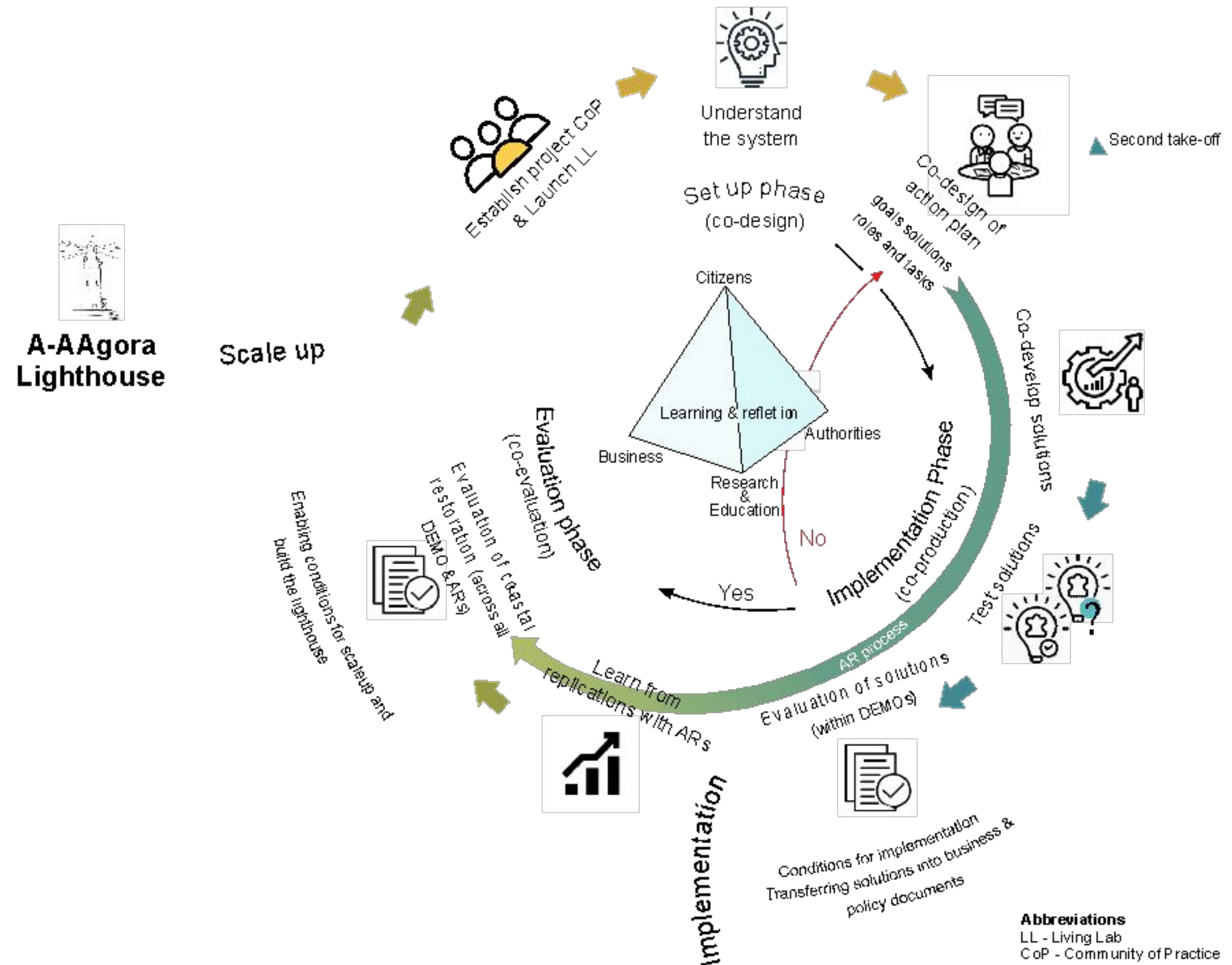


Coastal Restoration with Nature and People: Ria the Aveiro coastal lagoon region under the Natura 2000 network

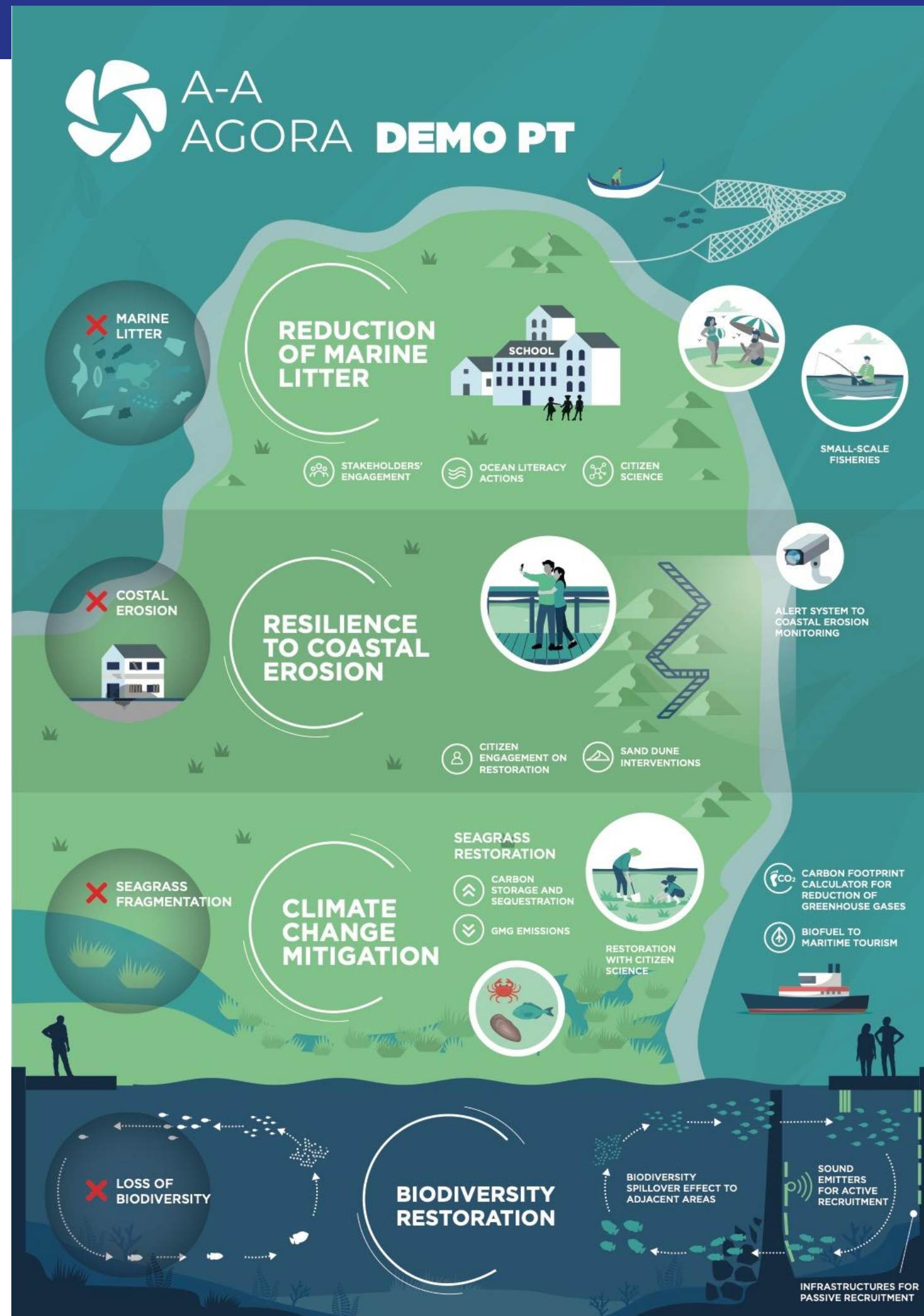


Living lab as a method underpinning co-creation and co-implementation

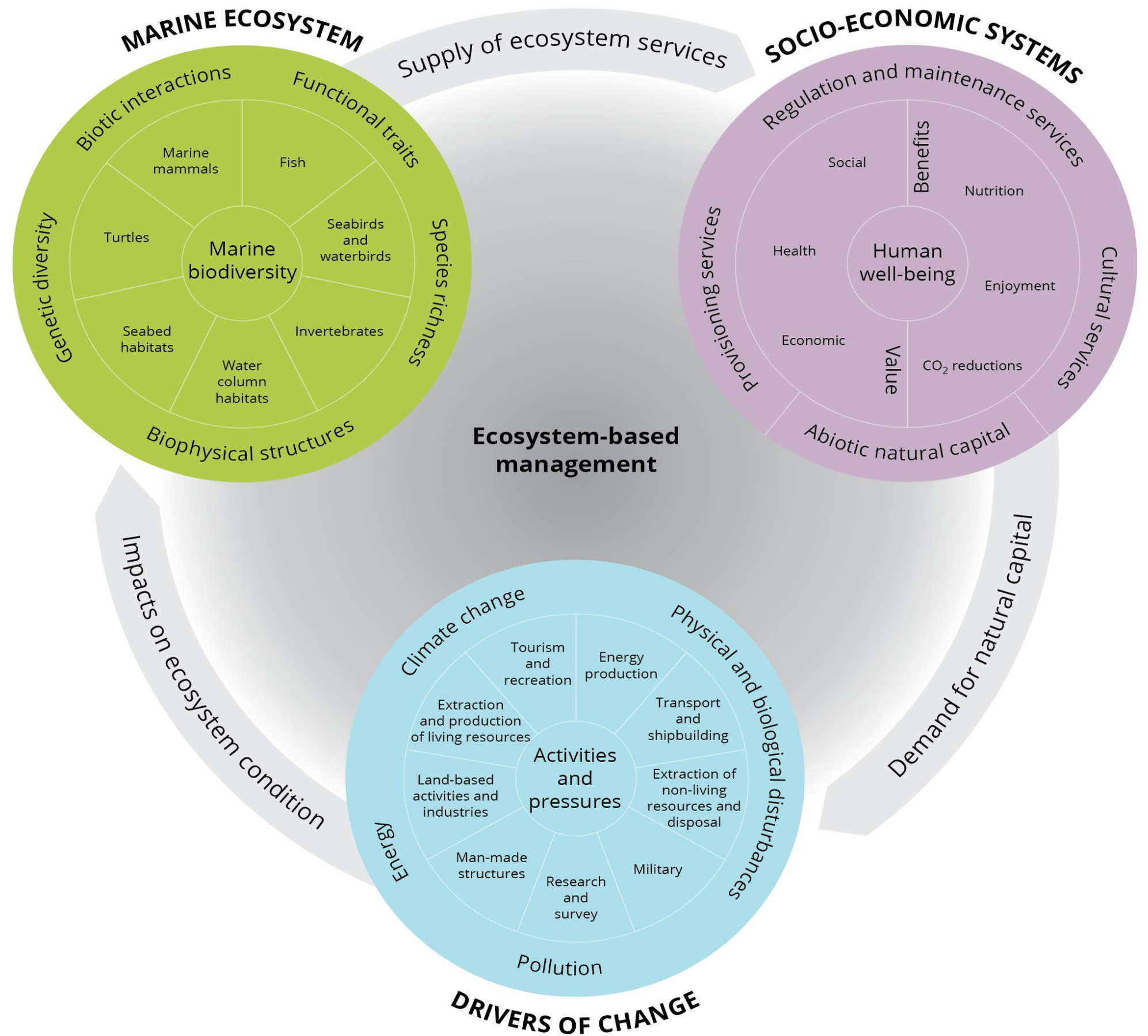
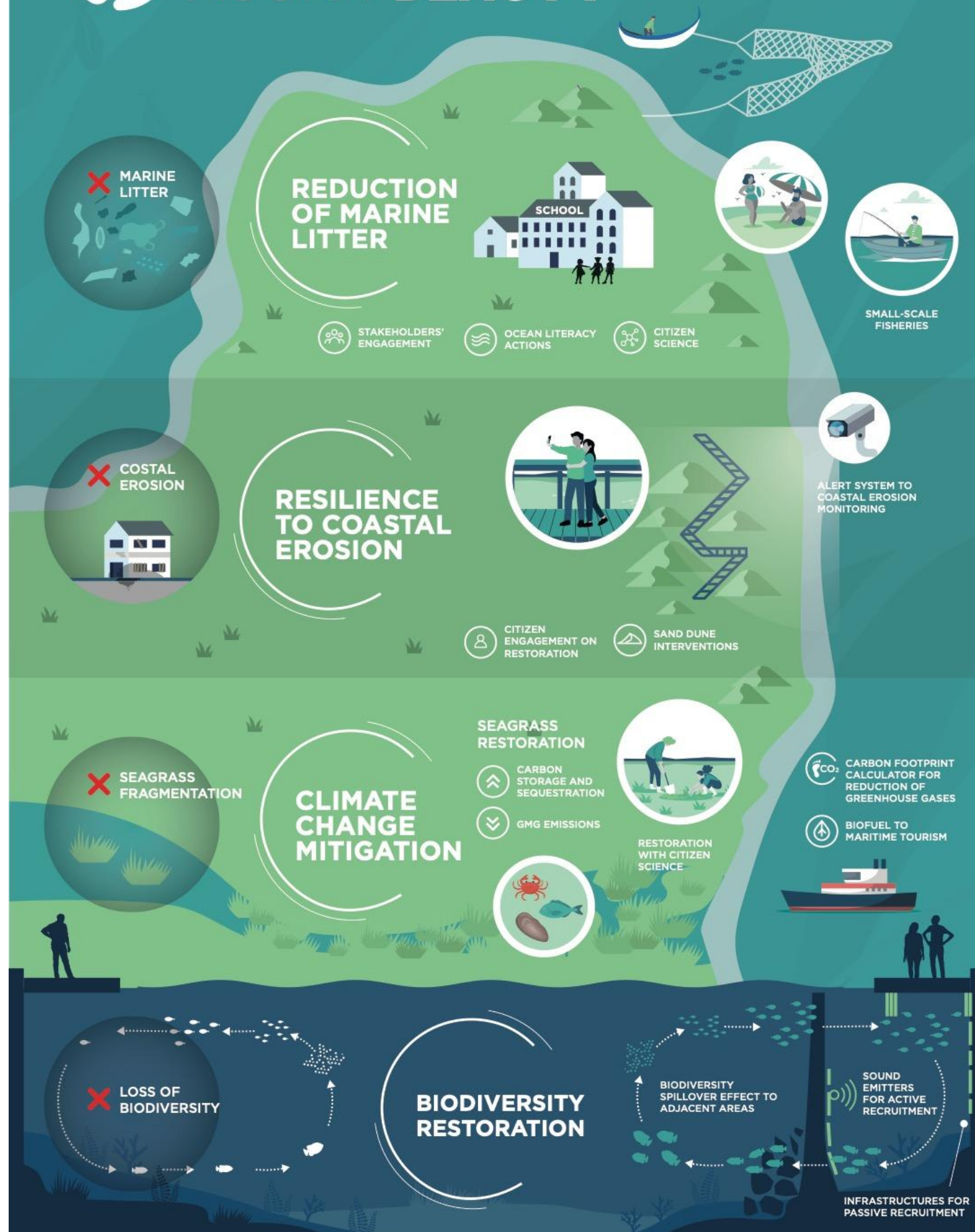
How local communities and stakeholders can enhance coordination and collaboration to achieve sustainability goals and climate challenges through a transformative change?



Coastal Restoration with Nature and People: living lab approach at Ria de Aveiro (Portugal)



A-A AGORA DEMO PT



Coastal Restoration with Nature and People: resilience to coastal erosion



real-time services, bridging sand beach monitoring and sand dunes, for an integrated coastal alert system

Coastal Restoration with Nature and People: climate change mitigation

The colors of carbon

**... (blue, green and teal) highlight the role of carbon in climate change mitigation via sequestration.*

**... (black, brown and red) impact Earth's heat balance or promote cryospheric melting.*



Scaling up seagrass restoration / citizens



Quantifying and modelling GHG fluxes



Testing advanced waste-based fuels



Reduction of GHG emissions

Coastal Restoration with Nature and People: climate change mitigation

bridging blue carbon and ports decarbonization



- blue carbon sequestration
- abatement of GHG emissions
- reduction of GHG emissions

Coastal Restoration with Nature and People: integrated maritime activity and biodiversity



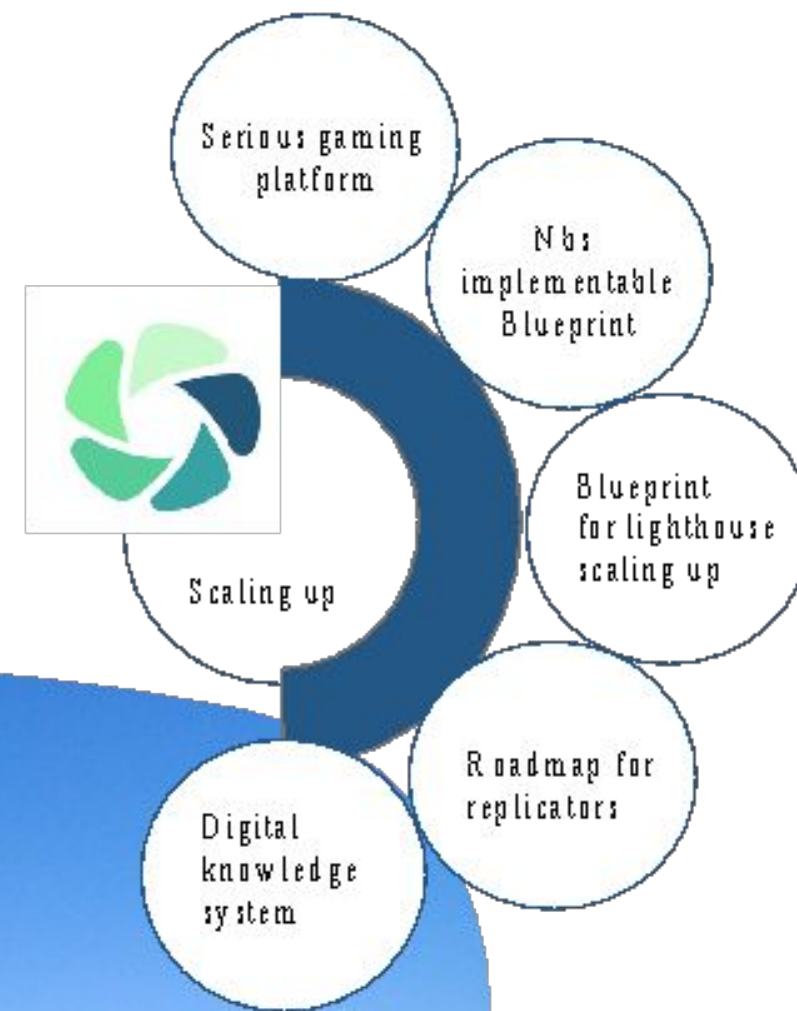
transforming harbours and marinas into nurseries



Coastal Restoration with Nature and People: serious game



Mission 'Restore our Ocean and Waters' Goals. © European Union, 2021. All rights reserved.



Core components of an enabling environment for adaptation to climate change

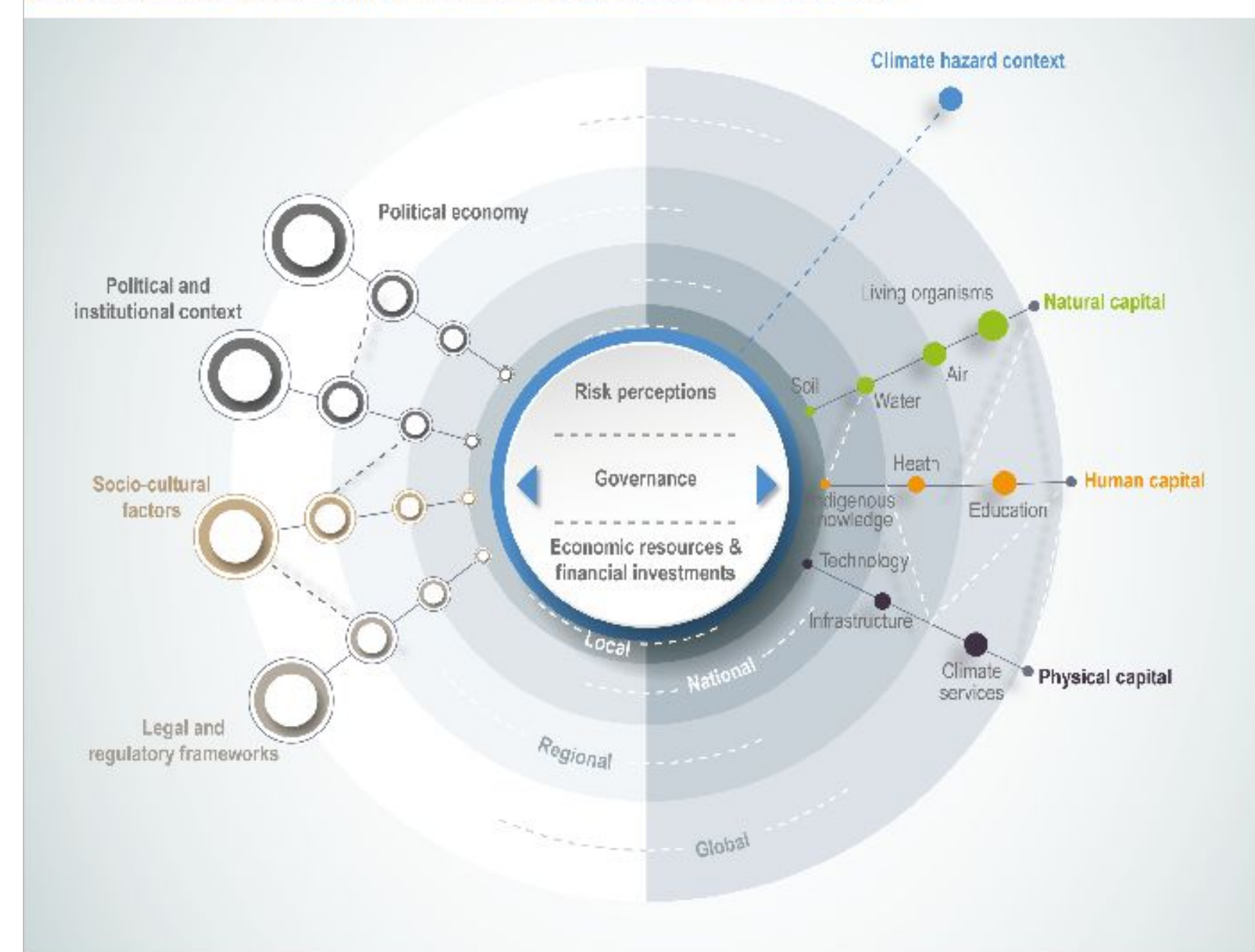


Image source: Figure 8.12 in Birkmann, J., E. Liwenga, R. Pandey, E. Boyd, R. Djalante, F. Gemenne, W. Leal Filho, P.F. Pinho, L. Stringer, and D. Wrathall, 2022: Poverty, Livelihoods and Sustainable Development. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegria, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 1171–1274. doi:10.1017/9781009325844.010.

Coastal Restoration with Nature and People



Thank you!

Ana Lillebø, CESAM, University of Aveiro, Portugal



✉ lillebo@ua.pt

🌐 <http://www.cesam.ua.pt/ana-lillebo>

