Carbon Sequestration in BLUe EcoSystems (C-BLUES)

EU-China Cooperation on Blue Carbon Ecosystem Management

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C-BLUES aims
to significantly advance knowledge and understanding of blue carbon to secure and promote blue carbon ecosystems and fill key gaps in reporting of greenhouse gas inventories

Overarching objective 1
Advance scientific knowledge on BCEs to improve quantification and reporting

Overarching objective 2
Increase inclusion of BCEs in national GHG inventories and provide input to enhance reporting

Overarching objective 3
Promote the role of blue carbon for delivering global climate policy goals

SO1
Advance understanding of the distribution and functioning of BCEs, including climate responses

SO2
Innovate & define best practices for measuring, modelling & monitoring emissions and removal of GHGs in BCEs

SO3
Reduce uncertainty in quantifying emissions and sequestration of GHG in BCEs

SO4
Estimate actual and project potential contribution of GHG emissions and removals by BCEs

SO5
Advance knowledge of how human activity affects sequestration potential of BCEs
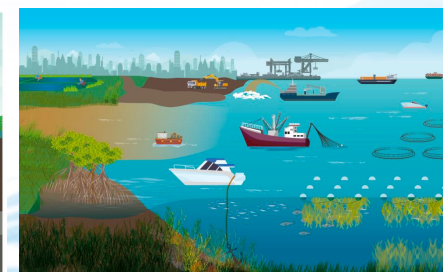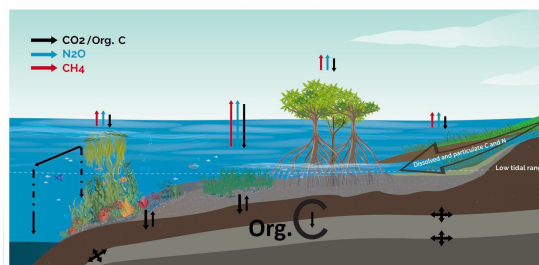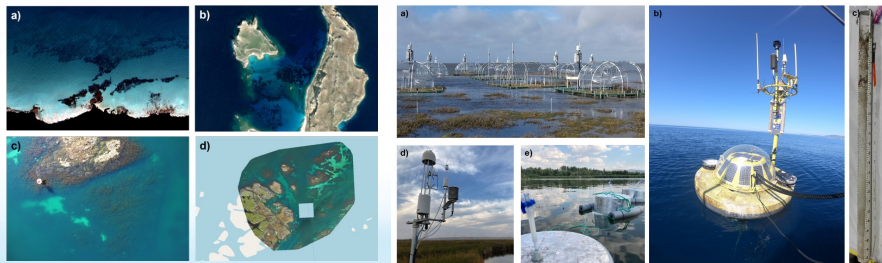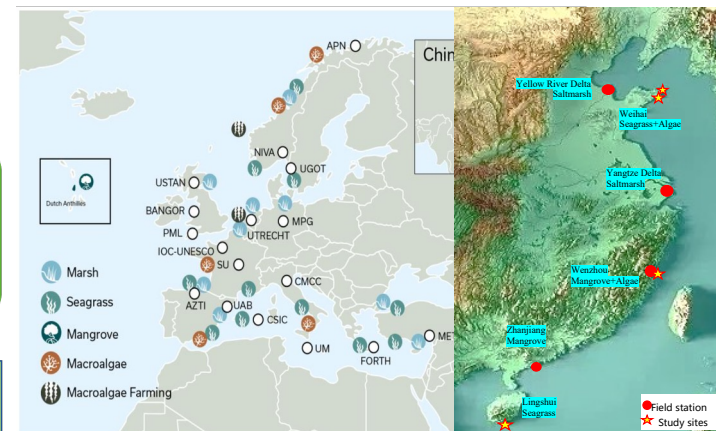
SO6
Identify ideal conditions for promoting sustainable management, restoration and protection of BCEs and optimising carbon sequestration
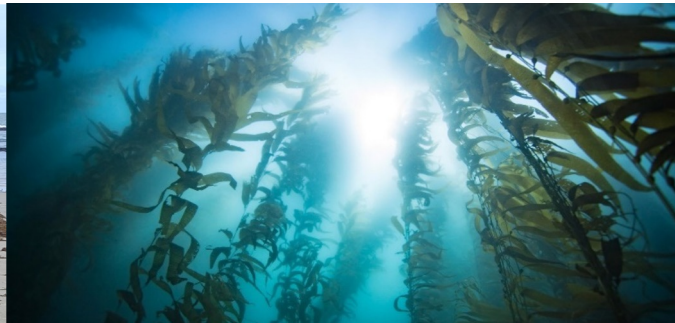
SO7
Evaluate current reporting under UNFCCC and promote increased inclusion of BCEs in national GHG inventories

SO8
Increase awareness of importance of BCEs through stakeholder engagement, capacity building & public outreach

Key information flow

| Observing and monitoring Coastal Blue Carbon Ecosystems | ⟷ | Improve understanding of biogeochemical pathways |

Understand the impact human activities on Blue Carbon Ecosystems

Reporting, accounting and promoting Blue Carbon Ecosystems

Marsh
Seagrass
Mangrove
Macroalgae
Macroalgae Farming
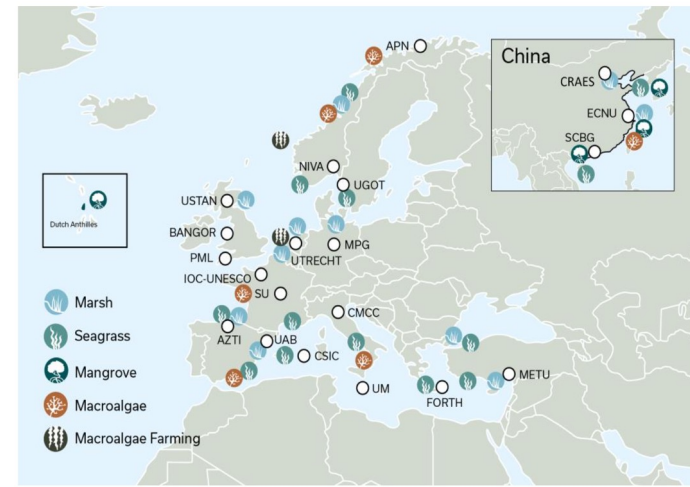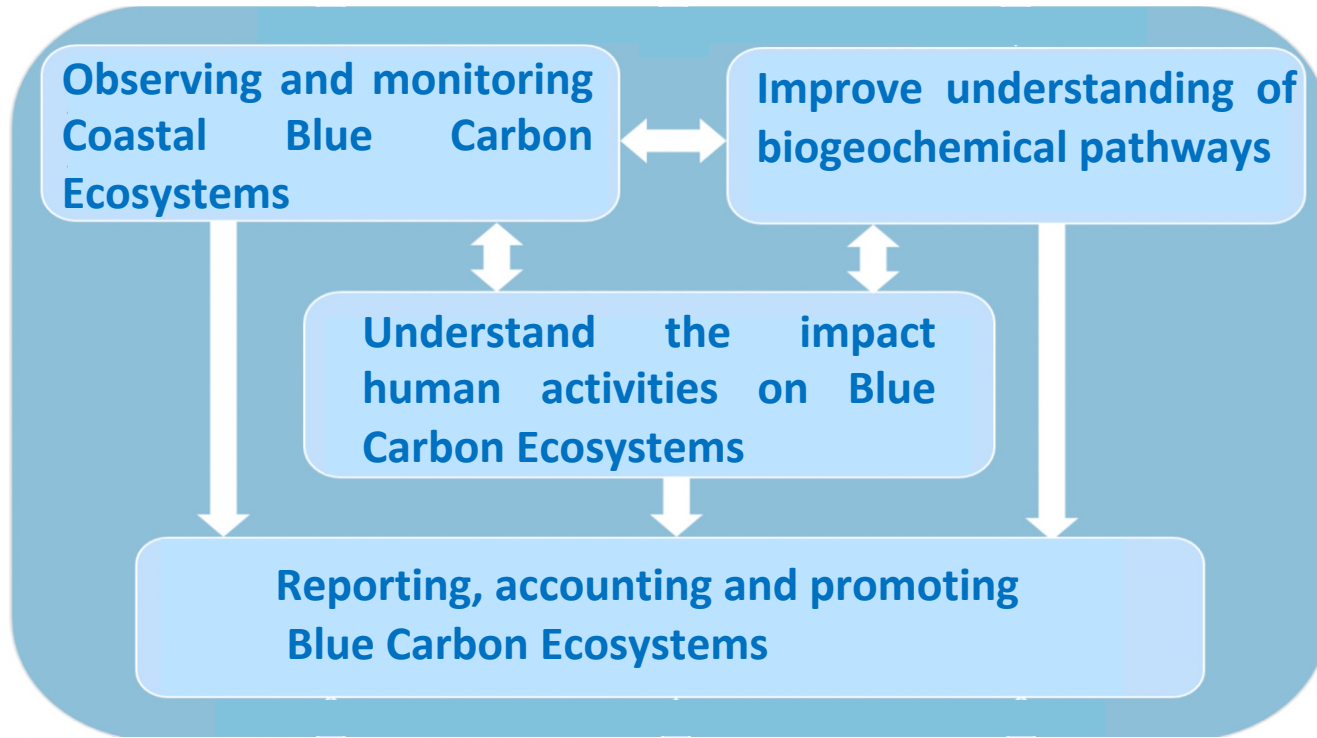
Existing (or soon to be) data on BCE cover & extent

- Local mapping exercises – i.e. Balearic Government (CAIB)
- National/World mapping (Seagrass Atlas)
- Satellite databases (EMODNET)

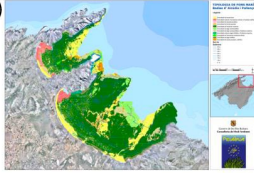UNEP-WCMC, Short FT (2021). Global distribution of seagrasses (version 7.1). Seventh update to the data layer used in Green and Short (2003). Cambridge (UK): UN Environment World Conservation Monitoring Centre. Data DOI: https://doi.org/10.34892/x6r3-d211

- Relevant SCALE, RESOLUTION

Existing data on GHG emissions

European Fluxes Database Cluster

global **Carbon Atlas**

Marine CH_4 - N_2O database
MEMENTO

Drones for environmental mapping

Drone image acquisition

| Rotor (detailed mapping) | Fixed-wing (large scale mapping) | VTOL (Combining the two) |

Kelp forest mapping, Helgeland, Norway
Using fixedwing drones, RGB + MSI data, and AI classification

| RGB image | Habitat classification map North level 3 | Uncertainty map North level 2 |

1 km

Gundersen et al in prep (subm plan 1 mai 2024)

Data sources and storage options

1. **EMODnet (European Marine Observation and Data Network)**
   a. EMODnet provides access to a wide range of marine data including physical, chemical, biological, and geological data from the European seas and oceans.
   b. https://emodnet.ec.europa.eu/en
   c. Contains data on …
2. **European Environment Agency (EEA, Data Portal)**
   a. The EEA provides various datasets related to the environment, including coastal ecosystems, covering aspects such as biodiversity, habitat types, and water quality.
   b. https://www.eea.europa.eu/en/analysis
   c. Contains data on…
3. **EUROSTAT**
   a. Eurostat offers statistical data related to various aspects of the environment, including coastal regions, covering factors such as population, employment, and economic activities.
   b. Link..
   c. Contains data on…
4. **ICES (International Council for the Exploration of the Sea) Data Portal**
   a. ICES offers datasets related to fisheries, marine ecosystems, and oceanography, covering the European region and beyond.
   b. https://data.ices.dk/
   c. Contains data on…
5. **European Seafloor Observation Network (ESONET)**
   a. ESONET provides data related to seafloor observations, including aspects relevant to coastal ecosystems such as seafloor mapping and monitoring.
   b. https://cordis.europa.eu/project/id/36851
   c. Contains data on…
6. **Seascape European Database**
   a. This database focuses on the mapping and characterization of marine habitats in European waters, including those found in coastal areas.
   b. https://data.europa.eu/data/datasets/c49faca1-44b9-4c2d-8fe4-1b2c5922fb64?locale=en
   c. Contains data on…
7. **Marine Strategy Framework Directive (MSFD) Data Portal**
   a. This portal offers data related to the implementation of the MSFD, including monitoring data on various indicators relevant to coastal ecosystems.
   b. https://water.europa.eu/marine
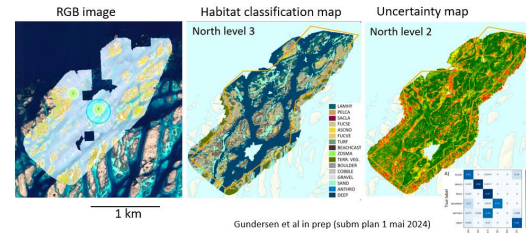
c. Contains data on…
1. **PANGEA (OA-ICC), data compilation on the biological response to ocean acidification**
   a. https://doi.pangaea.de/10.1594/PANGAEA.962556
   b. User friendly portal https://oa-icc.ipsl.fr/
2. **UN-WCMC Global Distribution of Seagrasses, salt marshes, mangroves**
   a. On seagrass: https://data.unep-wcmc.org/datasets/7
   b. Seagrass, tidal marsh, mangrove distribution (and kelp)
   c. On saltmarshes: https://data.unep-wcmc.org/datasets/43
   d. On mangroves: https://data.unep-wcmc.org/datasets/5
3. **MEMENTO database for CH4 / N2O in the watercolumn**
   a. https://memento.geomar.de/introduction
4. **Global Carbon Atlas**
   a. https://globalcarbonatlas.org/
5. **European Fluxes Database Cluster**
   a. http://www.europe-fluxdata.eu/
6. **Coastal carbon atlas**
   a. https://shiny.si.edu/coastal_carbon_atlas/
7. **HUB Ocean**
   b. **Commercial service**
   c. https://www.hubocean.earth/platform
8. **Seagrass trait database. Global data base of curated seagrass traits**
   https://seagrasses.ccmar.ualg.pt/
9. **Algae trait database. A trait database for (European) seaweeds**
   https://algaetraits.org/

Seagrass example

attribute	Basque Coast BCEs	Greek sites	Nice	Ischia	Panarea	Kristineberg	Mørekysten	Oslofjorden
contact	chust_valle	poursanidis	comeau	comeau_teixido	comeau_teixido	infantes	niva	niva
Country	Spain	Greece	France	Italy	Italy	Sweden	Norway	Norway
location	Euskadi		French Rivie	Ischia	Panarea	Kristineberg	western Norway	southern Norway
habitat	seagrass	seagrass	seagrass	seagrass	seagrass	seagrass	seagrass	seagrass
habitat_status	protected;pristine		unmanaged / pro	unmanaged			PARTLY	PARTLY
habitat_mapping	TRUE	TRUE		TRUE	TRUE	TRUE	TRUE	
sed_Corg	TRUE			TRUE		TRUE	SOME	SOME
sed_Cinorg				TRUE		TRUE		
sed_d13Corg				TRUE		FALSE		
plant_Corg	TRUE							
plant_d13Corg			TRUE	TRUE	TRUE	FALSE		
Pb_210	coming up			TRUE		FALSE		
dCO2			TRUE	TRUE		TRUE		
dCH4						FALSE		
dN2O						FALSE		
DOC			TRUE			TRUE		
DIC			TRUE	TRUE	TRUE	TRUE		
pH			TRUE	TRUE	TRUE	TRUE		
TAlk			TRUE	TRUE	TRUE	TRUE		
dissolved_nutrients			TRUE	TRUE	TRUE	FALSE		
f_sed_water_CO2						FALSE		
f_air_water_CO2						FALSE		
f_sed_water_CH4						FALSE		
f_air_water_CH4						FALSE		
f_sed_water_N2O						FALSE		
f_air_water_N2O						FALSE		
f_discharge_river_SGD						FALSE		
population_dynamics	TRUE	TRUE				TRUE		
genetics	TRUE			TRUE	TRUE	FALSE		
eDNA	TRUE			TRUE		FALSE		
veg_plot_density	TRUE	TRUE		TRUE		TRUE		
growth			TRUE	TRUE	TRUE	TRUE		
leave_cn_ratio			TRUE	TRUE		TRUE		

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