REWRITE

Vona Méléder, Nantes Université
Coordinator
On behalf of the consortium

REWRITE

Nantes Université

Co-funded by the European Union

REWRITE

Project Factsheet

- Duration: 60 months
- Coordinated by: Nantes Université
- Topics (call): HORIZON-CL5-2022-D1-02-05
- Project n°: 101081357
- Project Acronym: REWRITE
- Project Title: Rewilding and Restoration of Intertidal Sediment Ecosystems for Carbon Sequestration, Climate Adaptation and Biodiversity Support

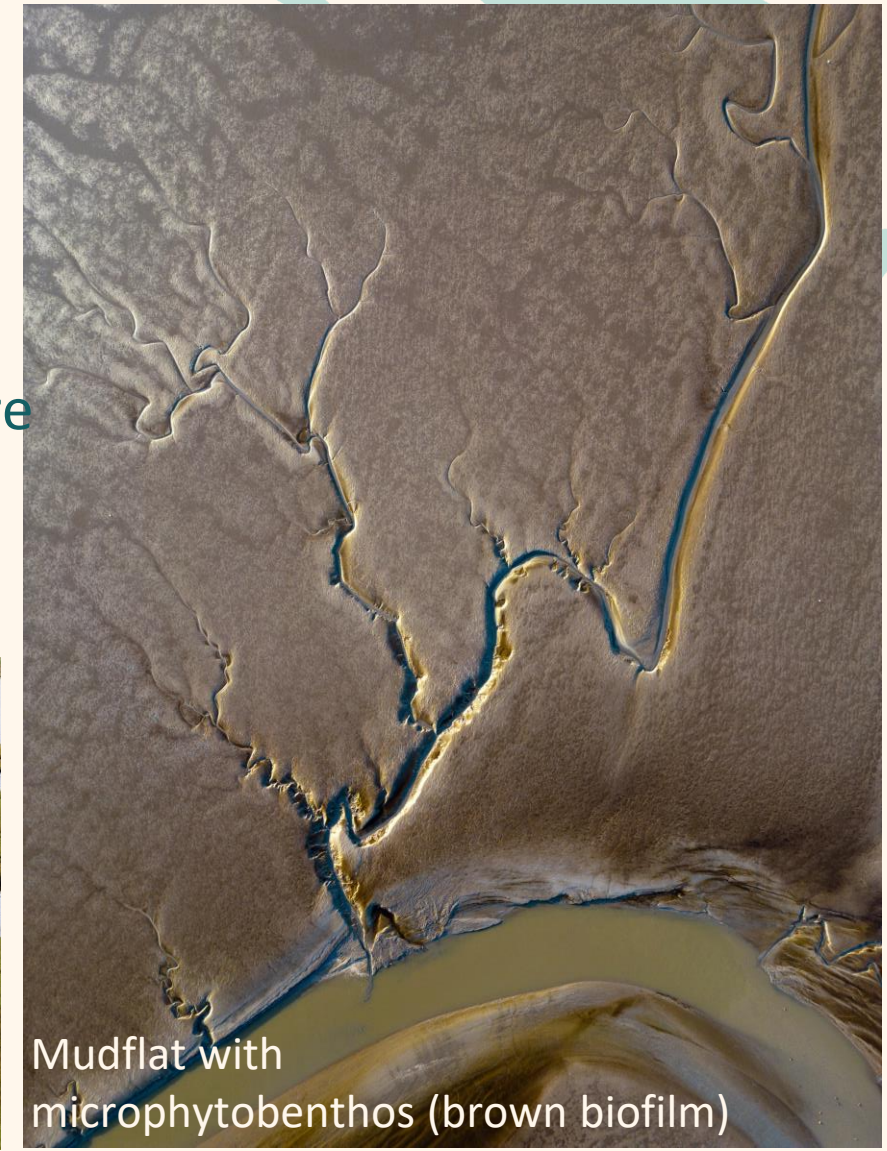
REWRITE

Intertidal soft sediment

- Emerged at each tide low tide
- Form seascapes covering > 10 000 km^2 along the 35 000 km in Europe
- Inhabited by 41% of the European population (more than 200 millions)
- Three key habitats with primary producers:


Seagrass meadows


Saltmarsh


Mudflat with microphytobenthos (brown biofilm)

REWRITE

Intertidal soft sediment

Provide multiple ecosystem services (ES) with high potential to address the biodiversity-climate-society crisis.

- Biodiversity hotspot: supports birds, fish, shellfish, and diverse "ordinary biodiversity," including microbial life.

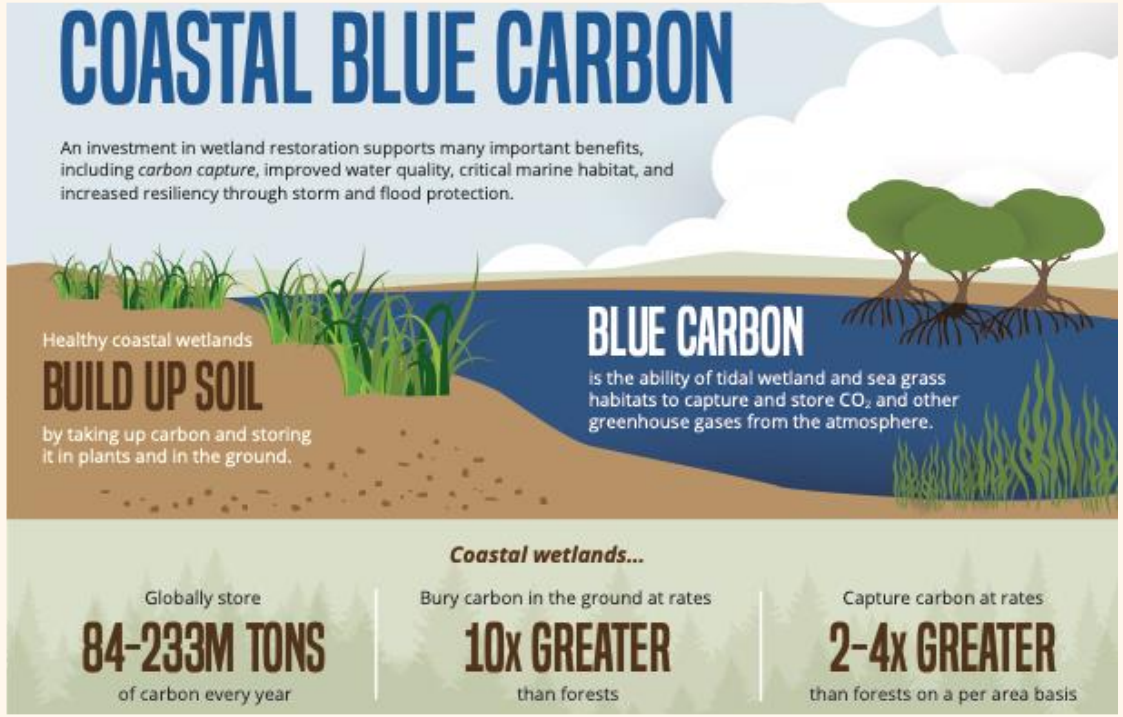



REWRITE

Intertidal soft sediment

Provide multiple ecosystem services (ES) with high potential to address the biodiversity-climate-society crisis.

- Major contributor to the Global Carbon Cycle through Blue Carbon.



REWRITE

Intertidal soft sediment

Provide multiple ecosystem services (ES) with high potential to address the biodiversity-climate-society crisis.

- Natural buffer and protection against sea level rise and extreme events such as storms and flooding.

REWRITE

Intertidal soft sediment

Provide multiple ecosystem services (ES) with high potential to address the biodiversity-climate-society crisis.

- Enhances well-being, cultural heritage, and aesthetic value.

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Intertidal soft sediment

Nevertheless:

- Intertidal coastal area continue to disappear, to be fragmented and to be polluted
- These ecosystems are still often **overlooked by research actions and management**
- Limited knowledge about their functions and services => inability to predict with low uncertainty their trajectories by 2050

- How rewilded coastal area could cope with the current environmental crisis (biodiversity, climate, pollution)?
- How rewilding approach could maintain/increase ES?

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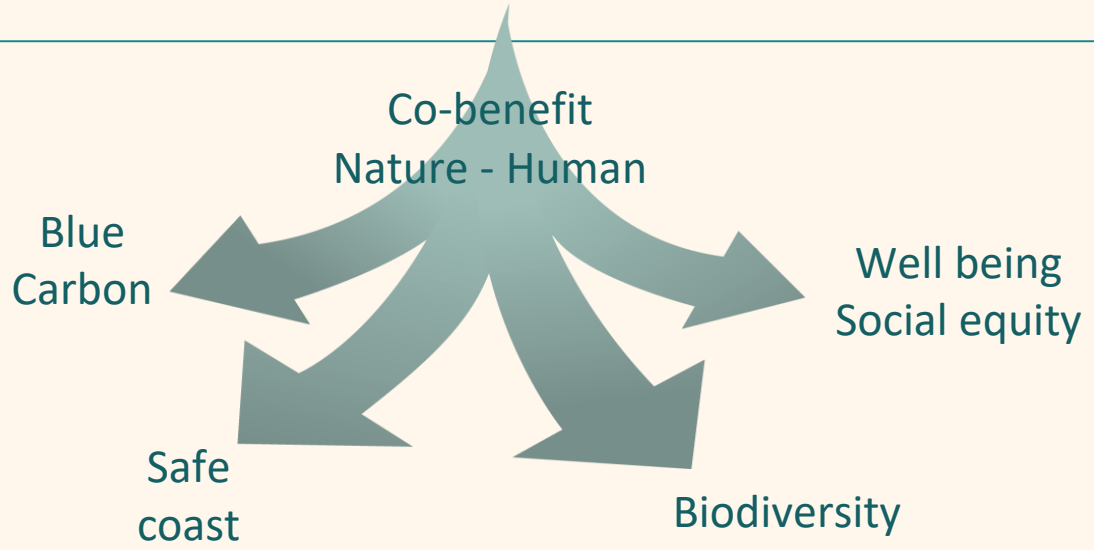
Rewrite main objective

The overall aim of REWRITE is to expand innovative approaches and nature-based solutions for rewilding intertidal soft sediment seascapes, bridging environmental needs (carbon sequestration, climate adaptation and biodiversity support) and societal expectations and uses



Rewrite key challenges

- **Reducing the uncertainty** of the future trajectories of these seascapes by 2050

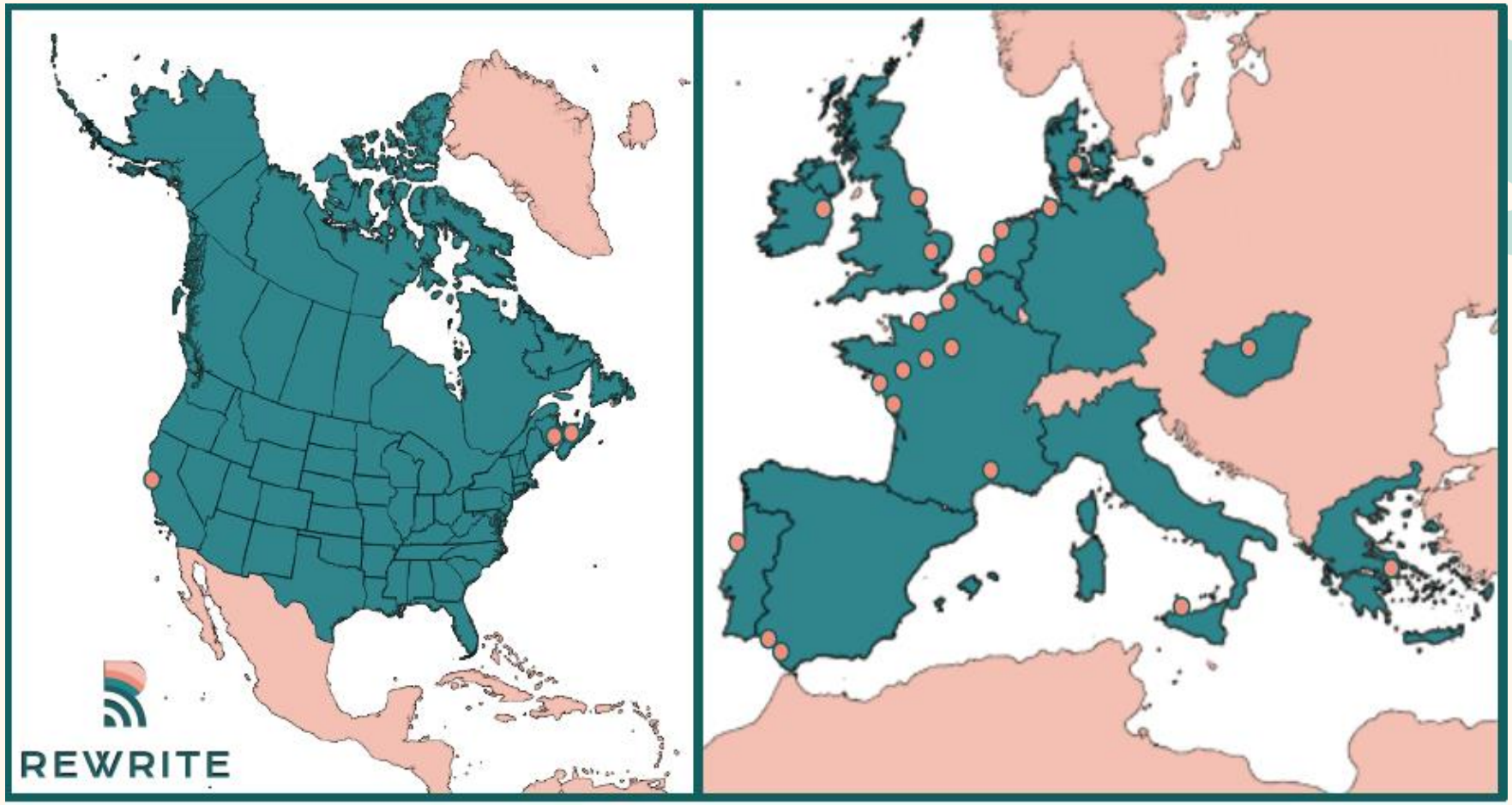
- **Assessing the cascading effect**. Understanding the propagation of the effect of the increase of CO_2, temperature, sea level rise, extreme events and the loss of biodiversity from the local to the global scale

- **Assessing how society engages** to agree upon and / or overcome the trade-offs of rewilding, considering environmental benefits and societal pressures

- **Transferring the rewilding concept to ISS seascapes** from terrestrial ecosystems, using IUCN ten guiding principles to stabilize the rewilding framework (Carver et al., 2021), and based on the ecological and social specificities of ISS seascapes

REWRITE

25 partners, in Europe and beyond



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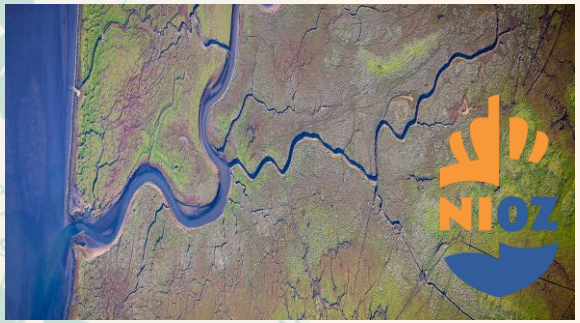
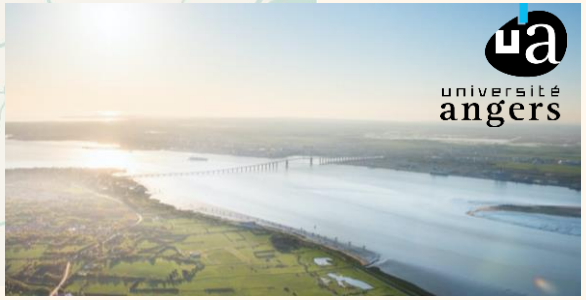




1 DANMARK
GYLDENSTEEN COASTAL LAGOON

2 THE NETHERLANDS
WADDEN SEA

3 THE UK
ESSEX ESTUARIES COMPLEX

4 IRELAND
DUBLIN BAY

5 BELGIUM / THE NETHERLANDS
SCHELDT ESTUARY

6 FRANCE
LOIRE ESTUARY

7 PORTUGAL
RIA DE AVEIRO

8 SPAIN
CÁDIZ BAY

9 CANADA
FUNDY BAY

10 USA
SAN FRANCISCO BAY

REWRITE

Rewrite specific objectives

- Inclusive and dynamic definition of coastal rewilding
- Analyse the changes in ISS functioning within their past and current trajectories
- Estimate and upscale trajectories of ISS seascape changes from the local to the European shoreline (Remote Sensing and modeling, including AI)
- Strongly engage stakeholders to co-design the desired future(s)
- Ensure a high ecological and societal co-benefit / low-cost ratio

REWRITE

Towards an inclusive and dynamic definition of coastal rewilding

REWRITE

Towards a definition of Coastal Rewilding

Coastal rewilding is the reorganization of geo-morphological dynamics, ecological processes and forms of governance to set coastal and estuarine systems on a trajectory toward self-sustaining biodiversity, carbon storage, and climate resilience, with minimal ongoing management. Rewilding coastal ecosystems means restoring natural processes—resuming tidal flows, sediment movement, and trophic interactions—while recognizing **the entanglement of geological, ecological and social processes**.

REWRITE

Towards a definition of Coastal Rewilding

Le rewilding côtier consiste en la réorganiseation des dynamiques géo-morphologiques, des processus écologiques et des formes de gouvernance afin de placer les systèmes côtiers et estuariens sur une trajectoire favorisant une biodiversité auto-entretenue, le stockage du carbone et la résilience face au climat, tout en limitant au maximum une gestion active à long terme.

Restaurer les écosystèmes côtiers par le rewilding signifie remettre en fonctionnement les processus naturels — rétablissement des flux de marée, des mouvements sédimentaires et des interactions trophiques — tout en reconnaissant l'imbrication des processus géologiques, écologiques et sociaux

Towards a definition of Coastal Rewilding

Coastal rewilding challenges rigid nature-culture divides, embracing the Anthropocene for reconfiguring human-environment relations. By integrating natural science knowledge with the humanities and social sciences, rewilding emerges as a form of **rewriting** past, current and future scenarios and imaginaries of the coast. The project REWRITE is literally an active process of negotiating what to restore, what to let go, and what new possibilities to create.

Towards a definition of Coastal Rewilding

Le rewilding côtier remet en question les divisions rigides entre nature et culture, en assumant pleinement les réalités de l'Anthropocène pour repenser les relations entre humains et environnement.

En intégrant les savoirs des sciences naturelles avec ceux des sciences sociales et humanités, le rewilding devient une manière de **réécrire** les scénarios et les imaginaires passés, présents et futurs du littoral.

Le projet **REWRITE** est littéralement un processus actif de négociation : que restaurer, que laisser disparaître, et quelles nouvelles possibilités inventer.

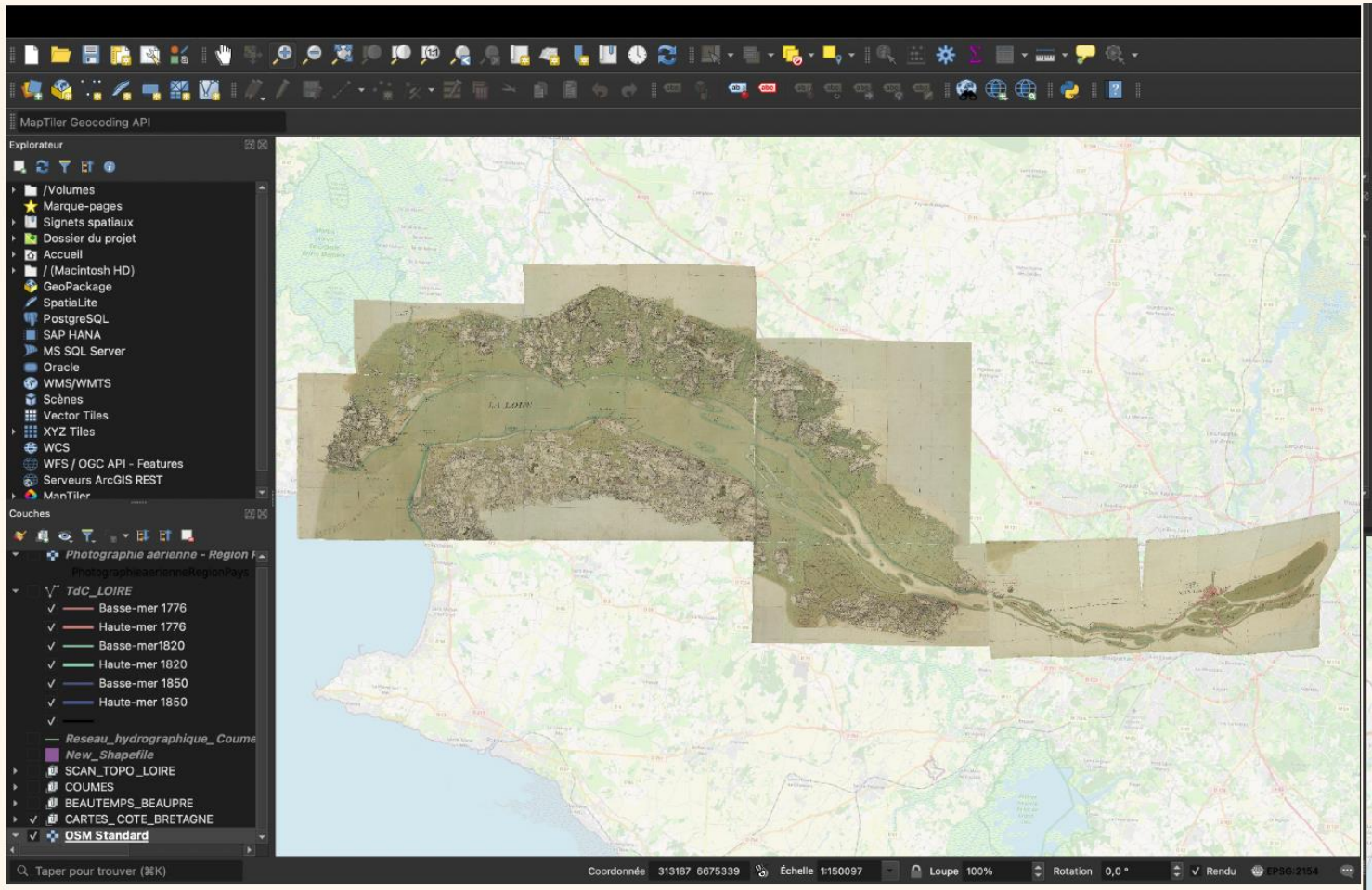
REWRITE

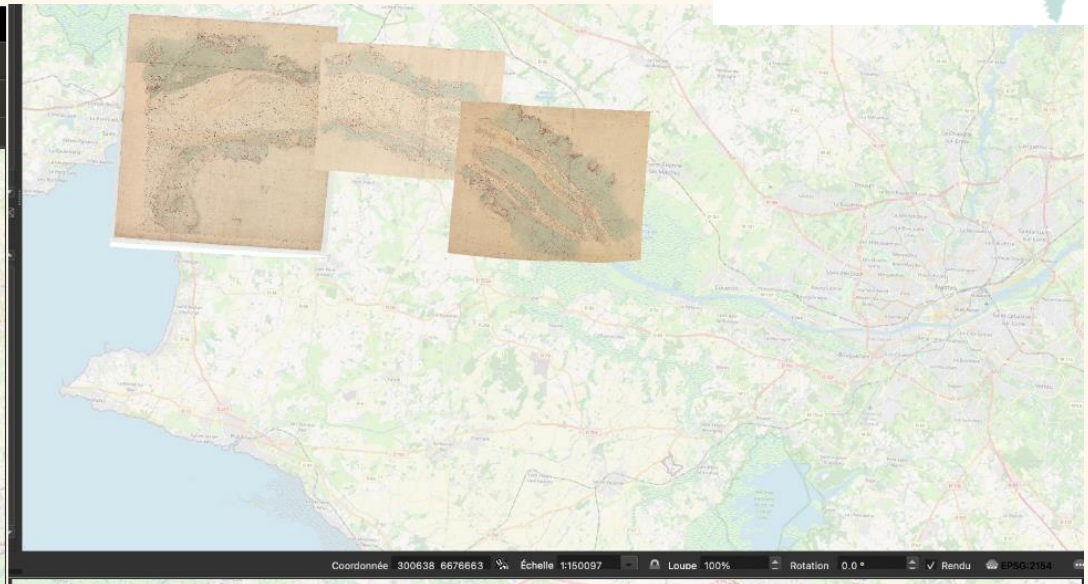
Analyse the changes within their past and current trajectories. Examples

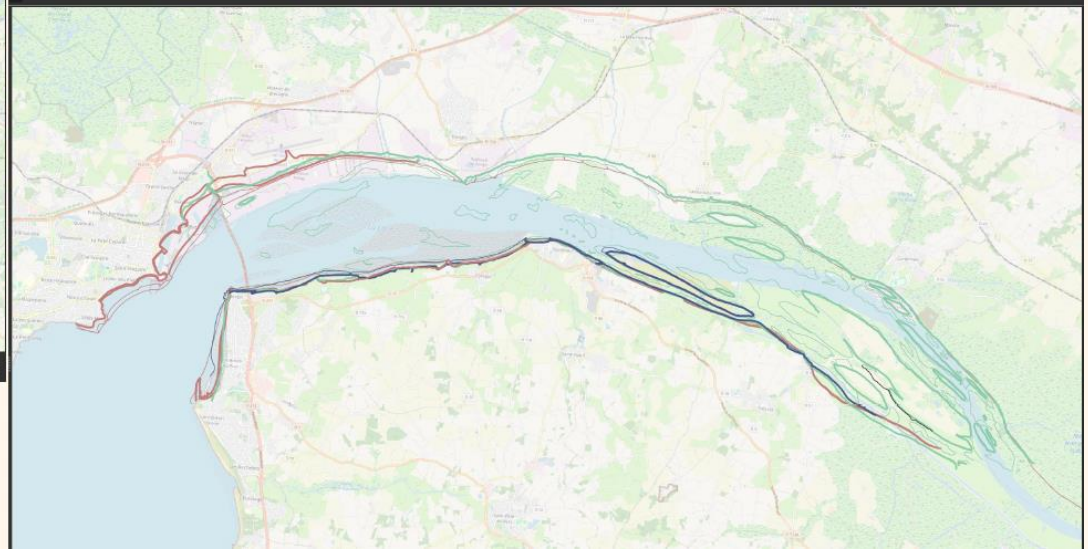
REWRITE

Le Mans Université

Land trajectory of the Loire Estuary (FR)
From the 18e to 21e century







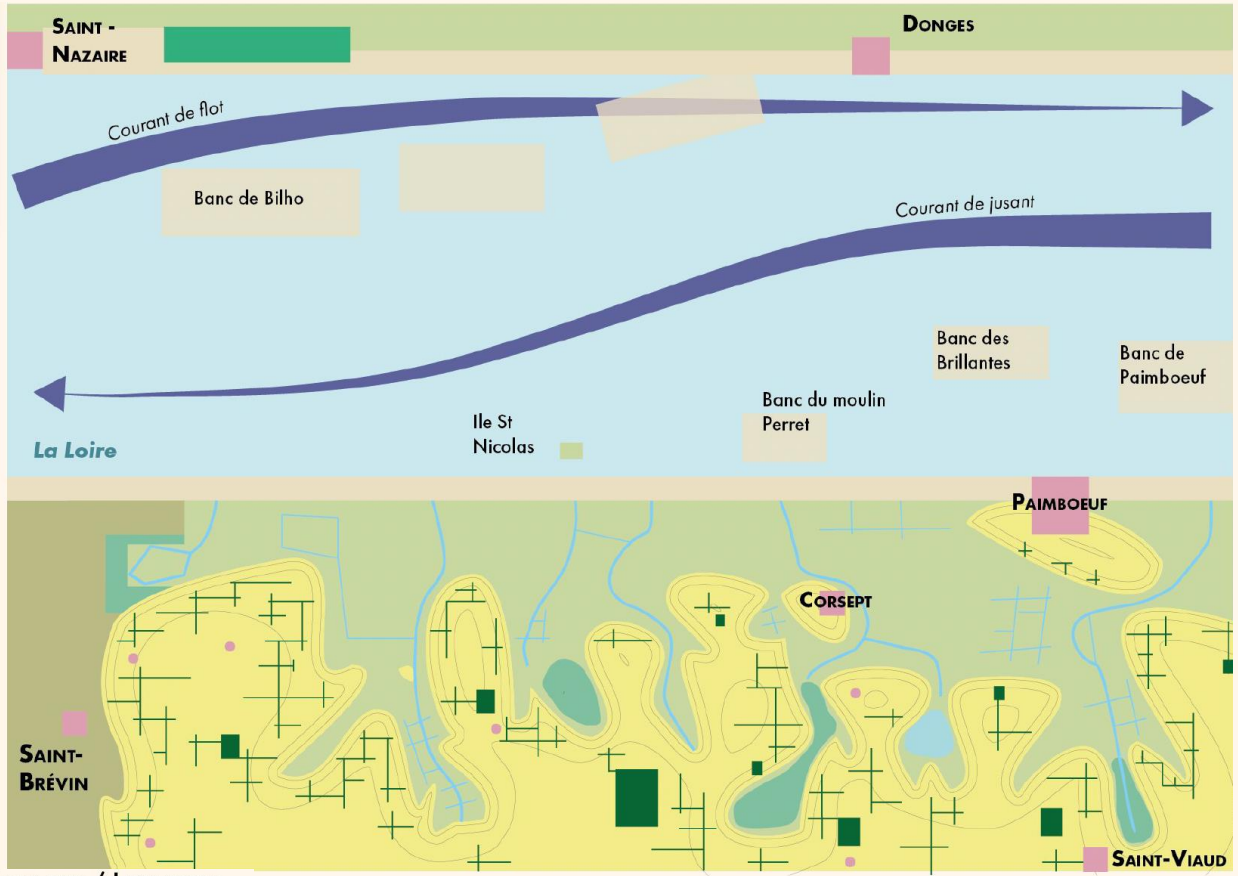
Georeferenced maps using QGIS

Land trajectory of the Loire Estuary (FR)
From the 18e to 21e century

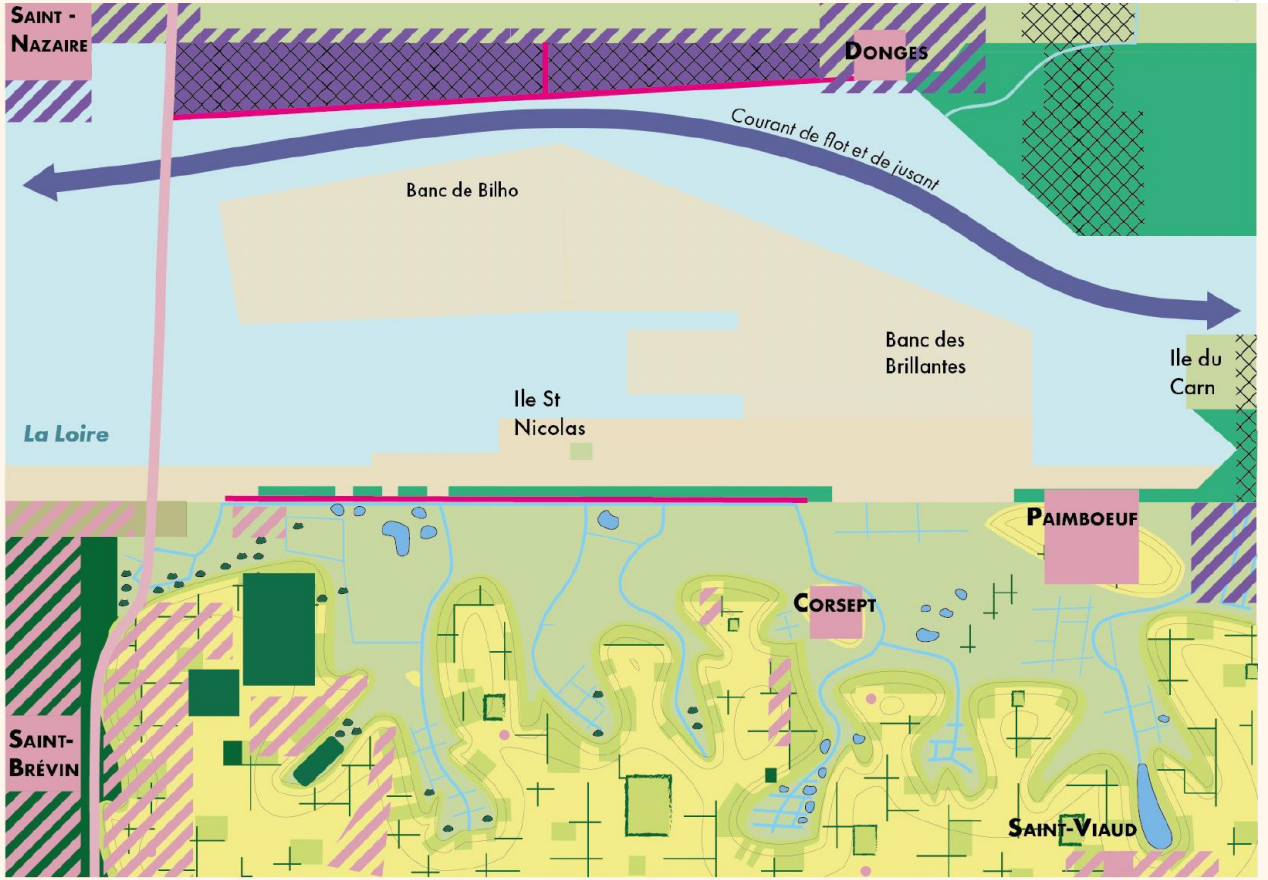
REWRITE

Le Mans Université

18e century



21e century



Land uses / Land cover

- Industrial areas
- Crops
- Grasslands
- Woodlands
- Wetlands
- Dunes

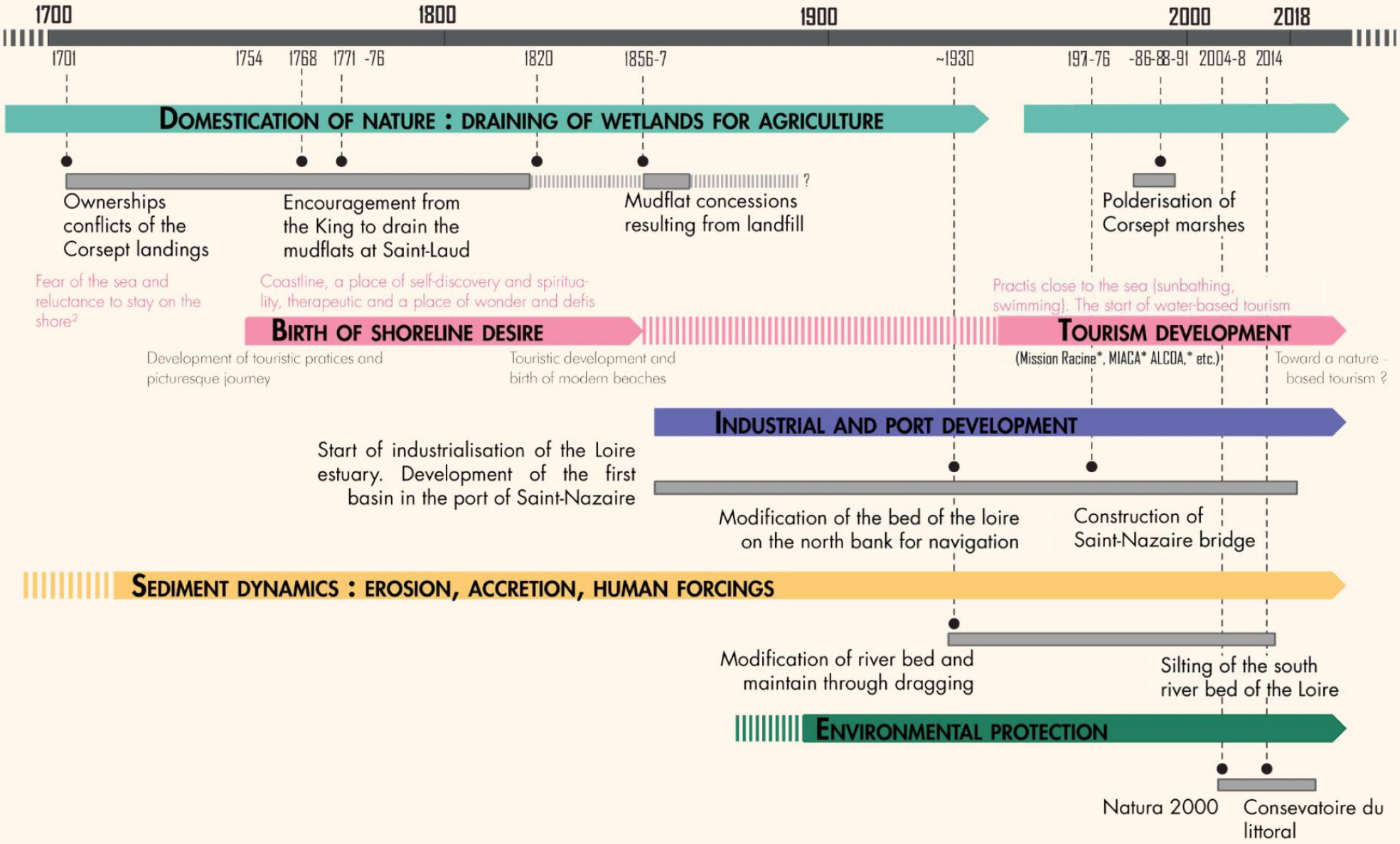
Landscape features

- Main cities
- Hamlets
- Dykes
- Water body
- Watercourse
- Channels
- Mudflat
- Hedgerow

Landscape dynamics

- Urban sprawl
- Industrial sprawl
- Landfill
- Land clearing
- Vegetation colonisation
- Water flow

REWRITE


1700
1800
1900
2000
2018
1701
1754
1768
1771 -76
1820
1856-7
~1930
1971-76
-86-88-91
2004-8
2014
DOMESTICATION OF NATURE : DRAINING OF WETLANDS FOR AGRICULTURE
Ownerships conflicts of the Corsept landings
Encouragement from the King to drain the mudflats at Saint-Laud
Mudflat concessions resulting from landfill
Polderisation of Corsept marshes
Fear of the sea and reluctance to stay on the shore[2]
Coastline, a place of self-discovery and spirituality, therapeutic and a place of wonder and defis
Practis close to the sea (sunbathing, swimming). The start of water-based tourism
BIRTH OF SHORELINE DESIRE
TOURISM DEVELOPMENT
Development of touristic pratices and picturesque journey
Touristic development and birth of modern beaches
(Mission Racine*, MIACA* ALCOA,* etc.)
Toward a nature - based tourism ?
INDUSTRIAL AND PORT DEVELOPMENT
Start of industrialisation of the Loire estuary. Development of the first basin in the port of Saint-Nazaire
Modification of the bed of the loire on the north bank for navigation
Construction of Saint-Nazaire bridge
SEDIMENT DYNAMICS : EROSION, ACCRETION, HUMAN FORCINGS
Modification of river bed and maintain through dragging
Silting of the south river bed of the Loire
ENVIRONMENTAL PROTECTION
Natura 2000
Consevatoire du littoral

REWRITE

University of Essex

Chronosequence approach
Colne & Blackwater estuaries (UK)

Newly restored/rewilded

"Mature"

C stored < C emitted

?

C stored > C emitted

REWRITE

University of Essex

Chronosequence approach
Colne & Blackwater estuaries (UK)

+ 5 reference marshes

Ferry Lane
- 1945
(accidental breach)

Fingringhoe
- 2015 MR

Abbotts Hall
- 2002 MR

Northey Island:
- 2019 MR
- 1991 MR
- 2023 MR

Barrow Hill
- 1953
(accidental breach)

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Methodology

Gas fluxes by chamber (CO_2 and CH_4)

Gas fluxes by eddy-covariance at low and high tide (CO_2)

REWRITE

Methodology

Carbon stocks

- 1 m => Blue Carbon
- 1 cm intervals
- Datation ^{210}Pb

Microbes

- Sediment samples
- 0-1 & 9-10 cm depths

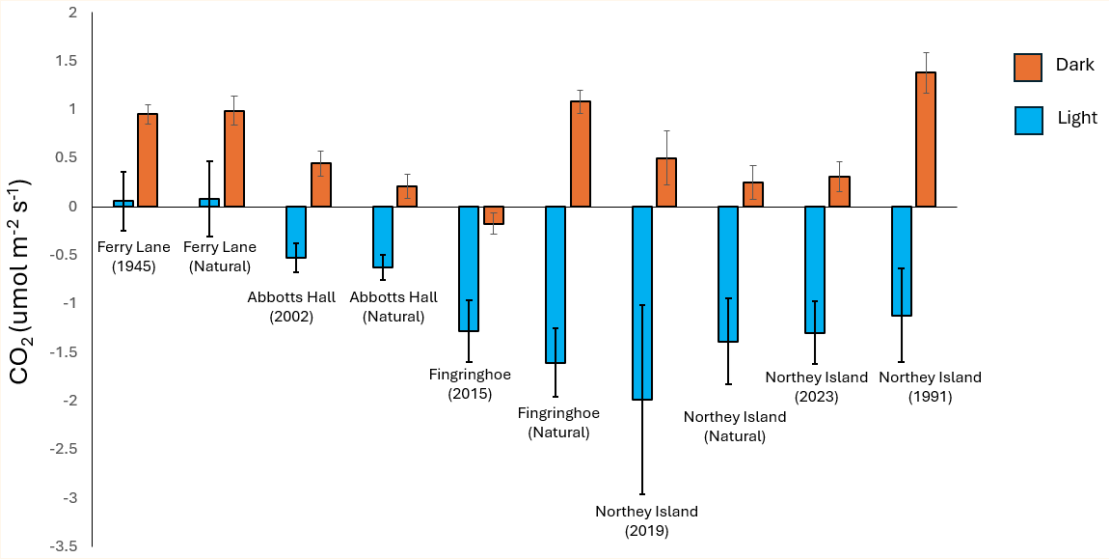
- Metabarcoding (i.e. identification of multiple taxa & functional diversity)

REWRITE

University of Essex

Chronosequence approach
Colne & Blackwater estuaries (UK)

Newly restored/rewilded



"Mature"

C stored < C emitted

Should be not so long than expected

C stored > C emitted

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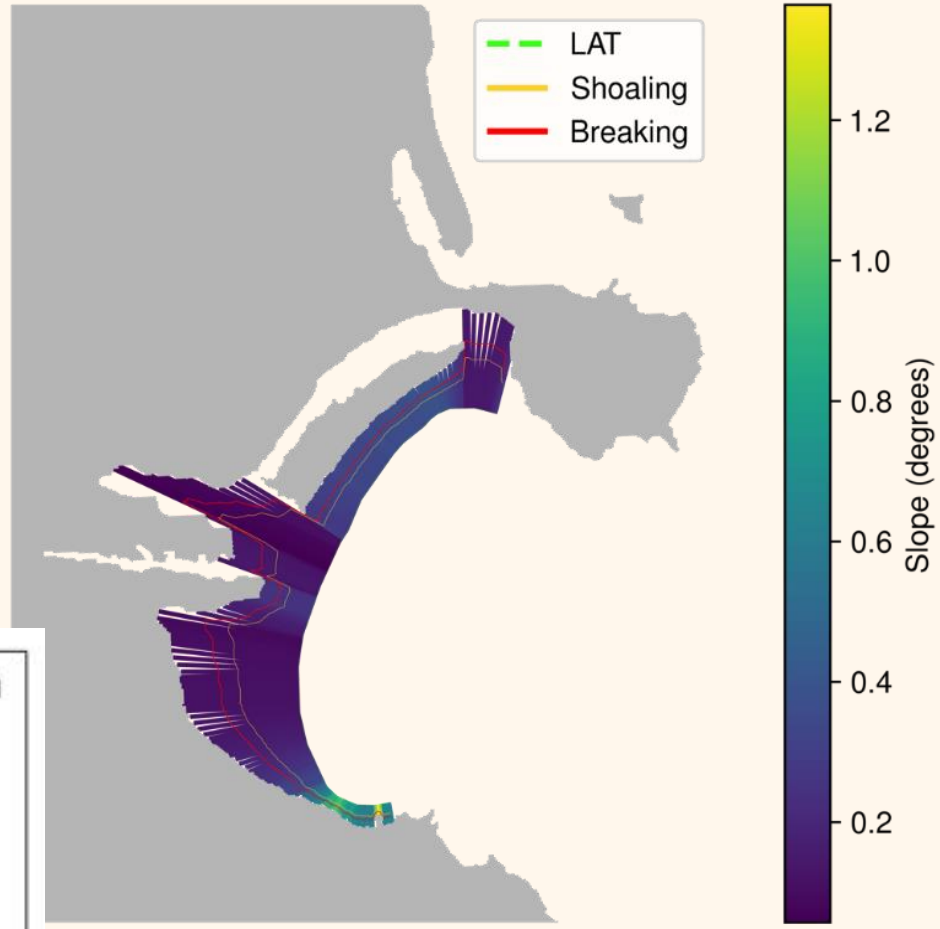
Trinity College Dublin

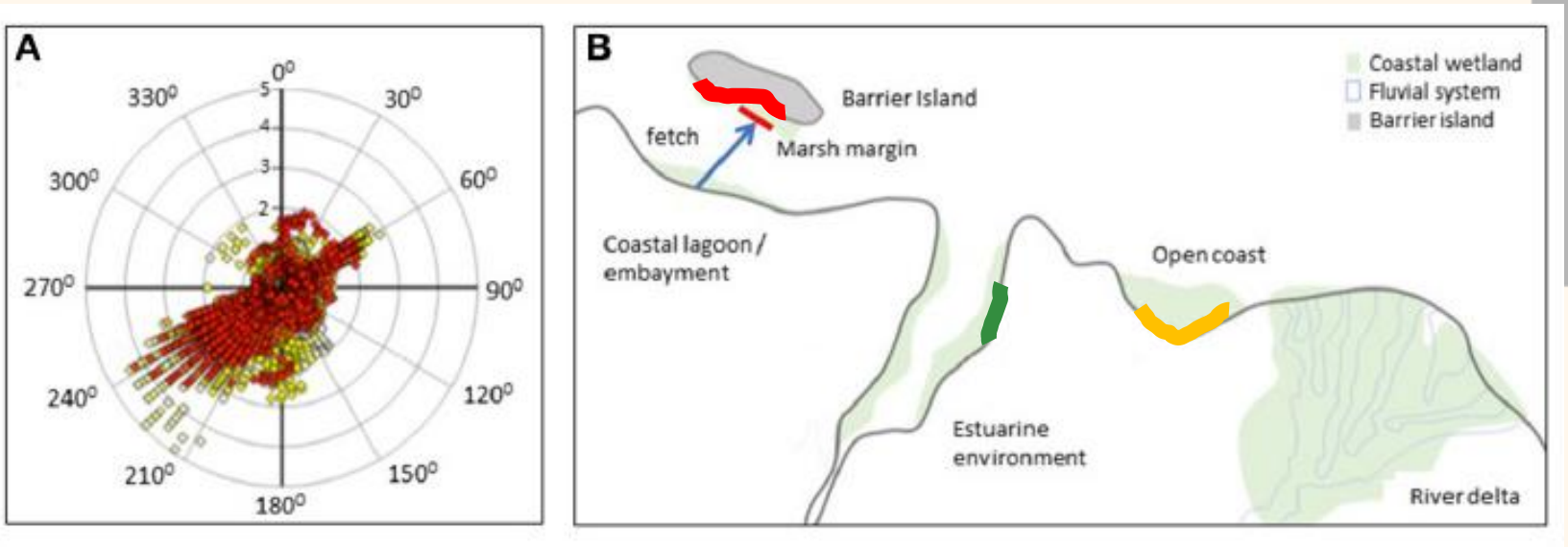
The University of Dublin

Protection from coastal flooding

- Exposure: wind data (wind rose), tidal data (tidal range, low/high astronomical tide)
- Capacity to provide protection: assessing the degree to which coastal ecosystems reduce the threat
- Demand for coastal protection in the hinterland



PROTOTYPE NATURE-BASED WAVE PROTECTION TOOL



Social Investigation & Narrative of Changes

- Pluridisciplinary approach: geography, social and environmental psychology and anthropology
- An exploratory survey based on interviews (questionnaire)
- A common survey for all DM based on focus group and workshop

➢ To collect stakeholder's perceptions, representations and knowledge in each DMs

➢ To answer 2 main questions:

- What is the relationship between them and their territory?
- Which scenarios are the most desired for one individual?

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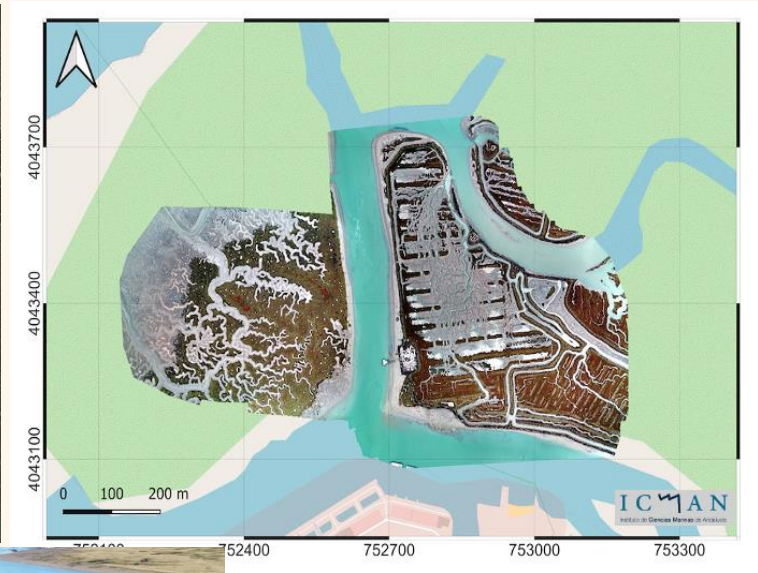
Estimate and upscale trajectories of ISS seascape changes from the local to the European shoreline

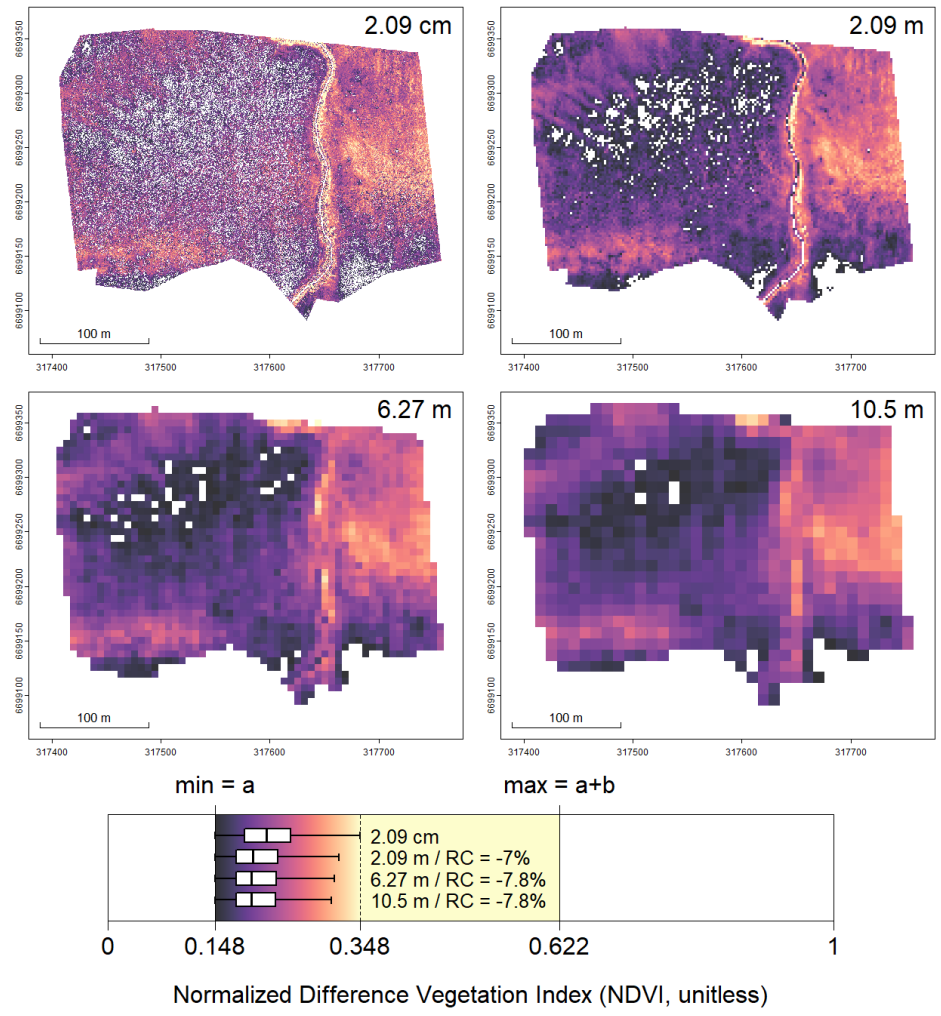
DM8 – Cadiz (ES)

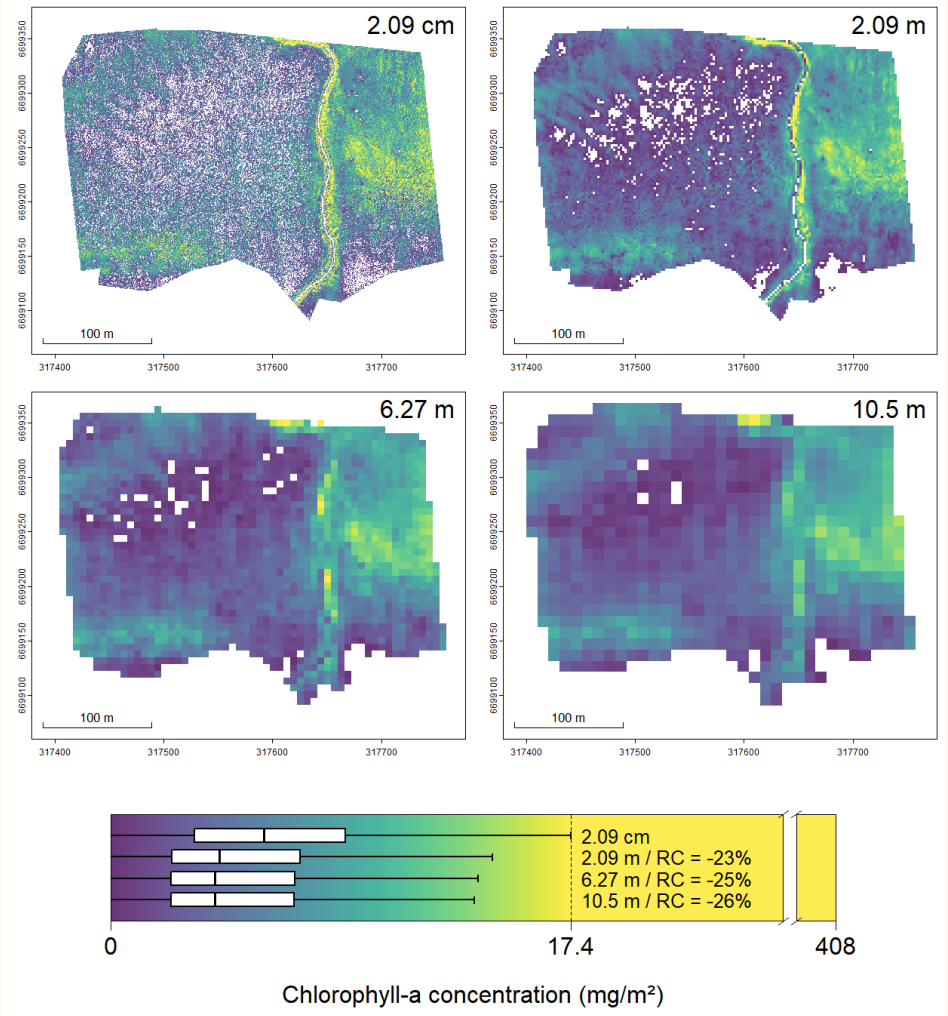


Installation of an EC tower this spring (1) and possibly two more (later): one in a pristine (2); one in an abandoned but not rewilded site (3)

Long cores in the three sites – 1x during the project + drone survey

DM6 – Loire Estuary (FR) - upscaling

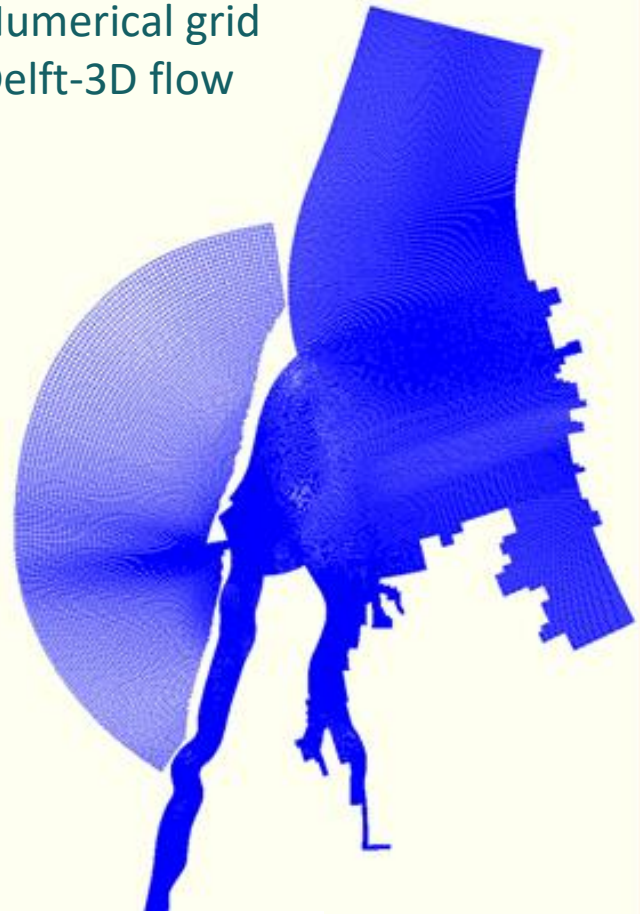




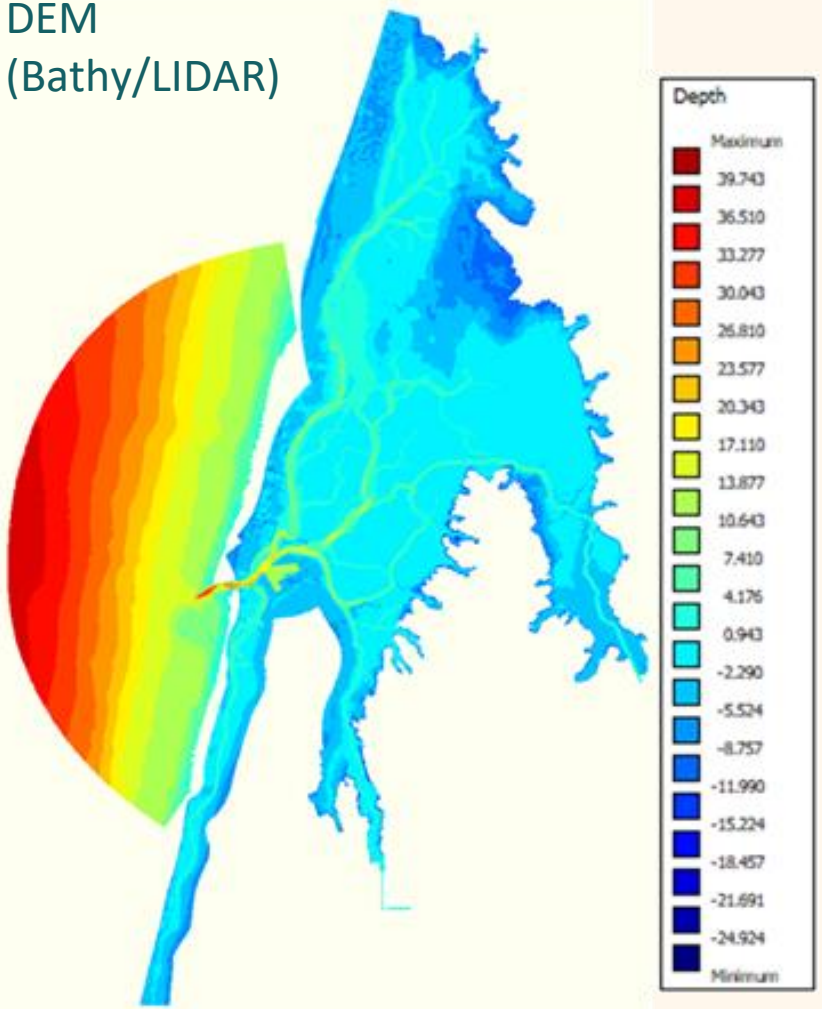
Upscaling bias from the drone to the satellite resolution => underestimation of the NDVI & biomass

DM7 – Ria Aveiro (P) - projecting

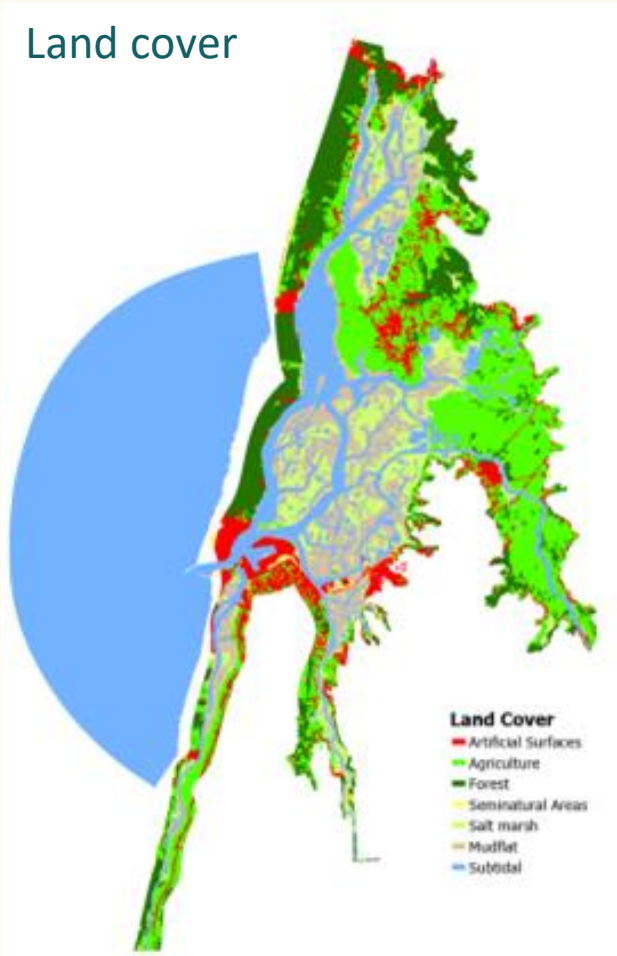
Numerical grid
Delft-3D flow



DEM
(Bathy/LIDAR)



Land cover



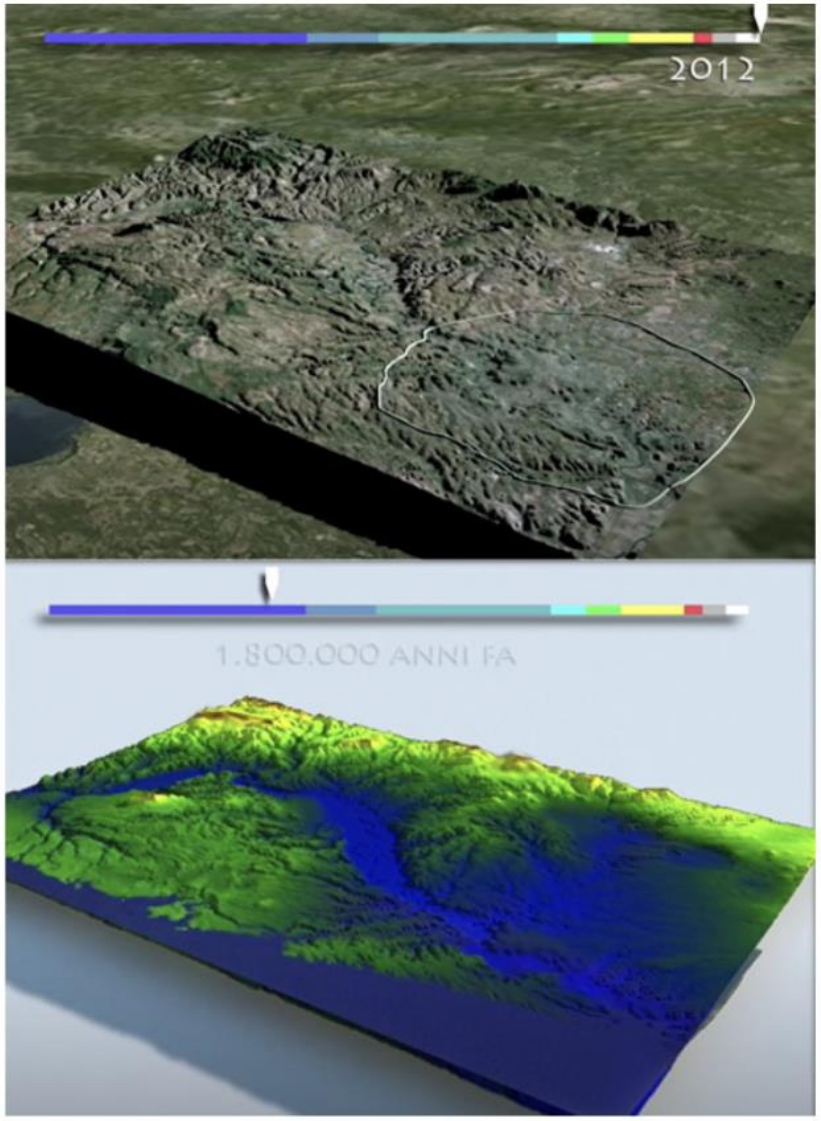
universidade de aveiro

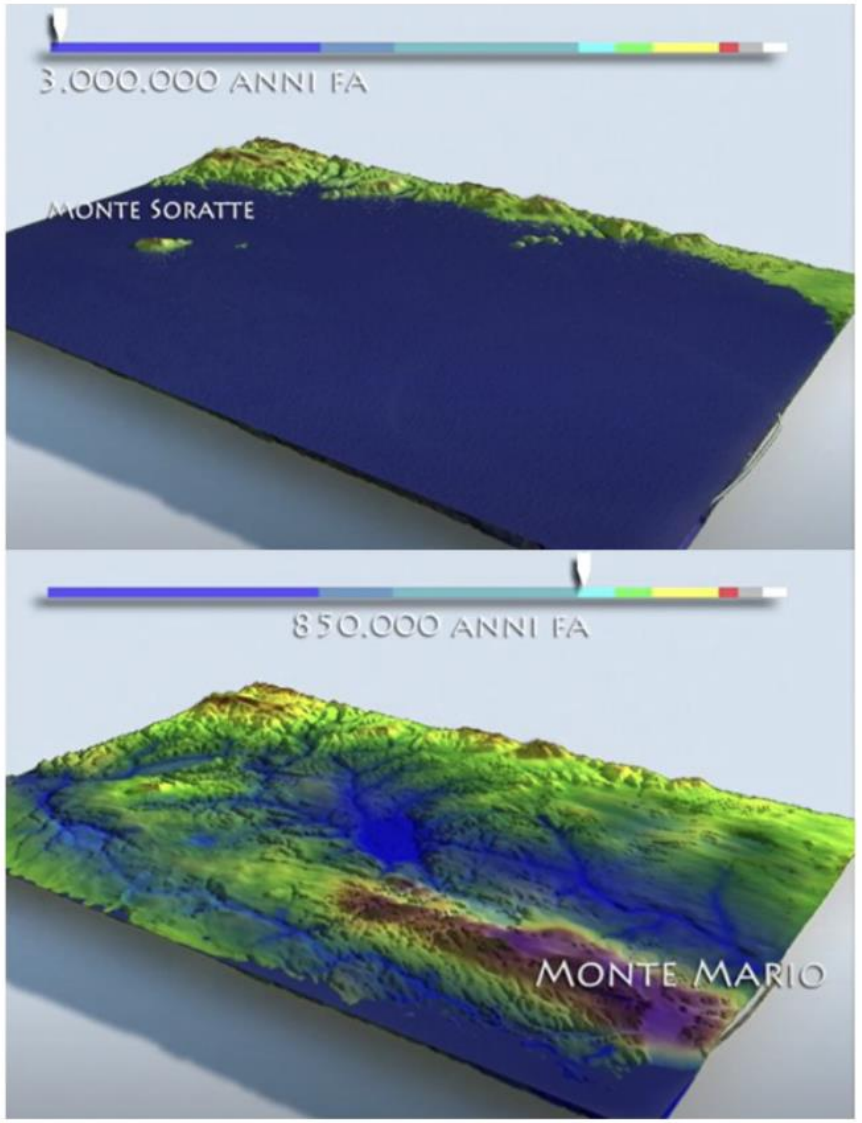
Projecting (under rising sea level) intertidal saltmarsh/mudflat areas based on inundation conditions and Manning bottom roughness depending on class ; validated with water levels. Also planned for Cadiz Bay.

REWRITE

3D visulisation

University of Essex





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Strongly engage stakeholders. The Multi-Actor labs

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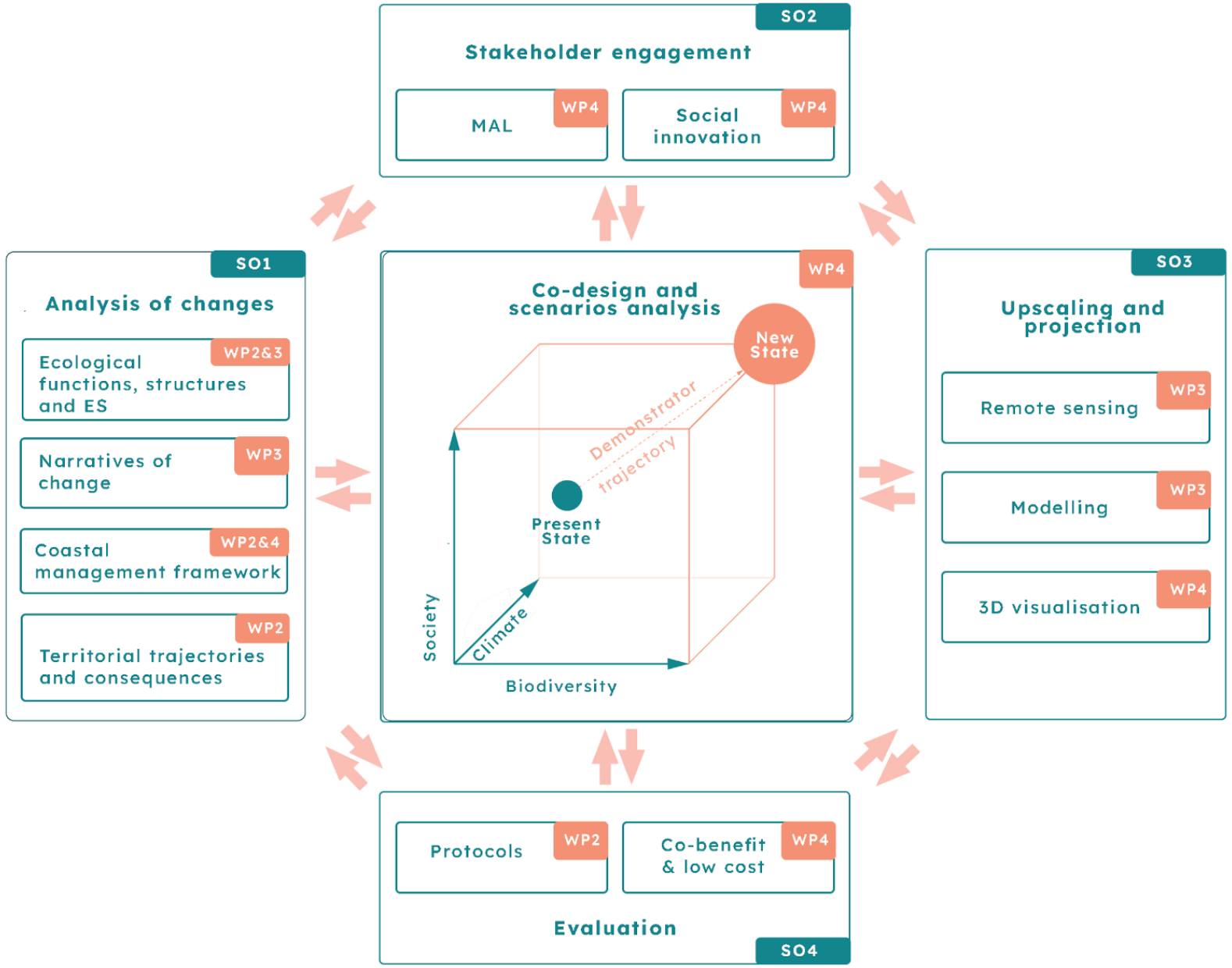

SO2
Stakeholder engagement
MAL
WP4
Social innovation
WP4
SO1
Analysis of changes
Ecological functions, structures and ES
WP2&3
Narratives of change
WP3
Coastal management framework
WP2&4
Territorial trajectories and consequences
WP2
WP4
Co-design and scenarios analysis
New State
Demonstrator trajectory
Present State
Society
Climate
Biodiversity
SO3
Upscaling and projection
Remote sensing
WP3
Modelling
WP3
3D visualisation
WP4
Protocols
WP2
Co-benefit & low cost
WP4
Evaluation
SO4

REWRITE

SDU

umbertopernice
collaborative innovation management

CO-DESIGN & SCENARIO ANALYSIS

Making people part of the rewilding process

The Multi-Actor Labs will play a crucial role in the REWRITE project by providing a platform for stakeholders to share their knowledge and expertise, co-design rewilding scenarios, and engage with the research process.

Back-casting Scenario

REWRITE will work backwords to fulfil what is missing from a desired new state

Cognitive-based Scenario

simulated based on systems thinking and the perception of local communities.

Global Level

Global Multi-Actor Laboratories will ensure the engagement of stakeholders at European and regional level.

Local Level

Local Multi-Actor Laboratories at the demonstartion sites will ensure the engagement of stakeholders at the local level.

Negotiate what to restore, what to let go, and what new possibilities to create.

REWRITE

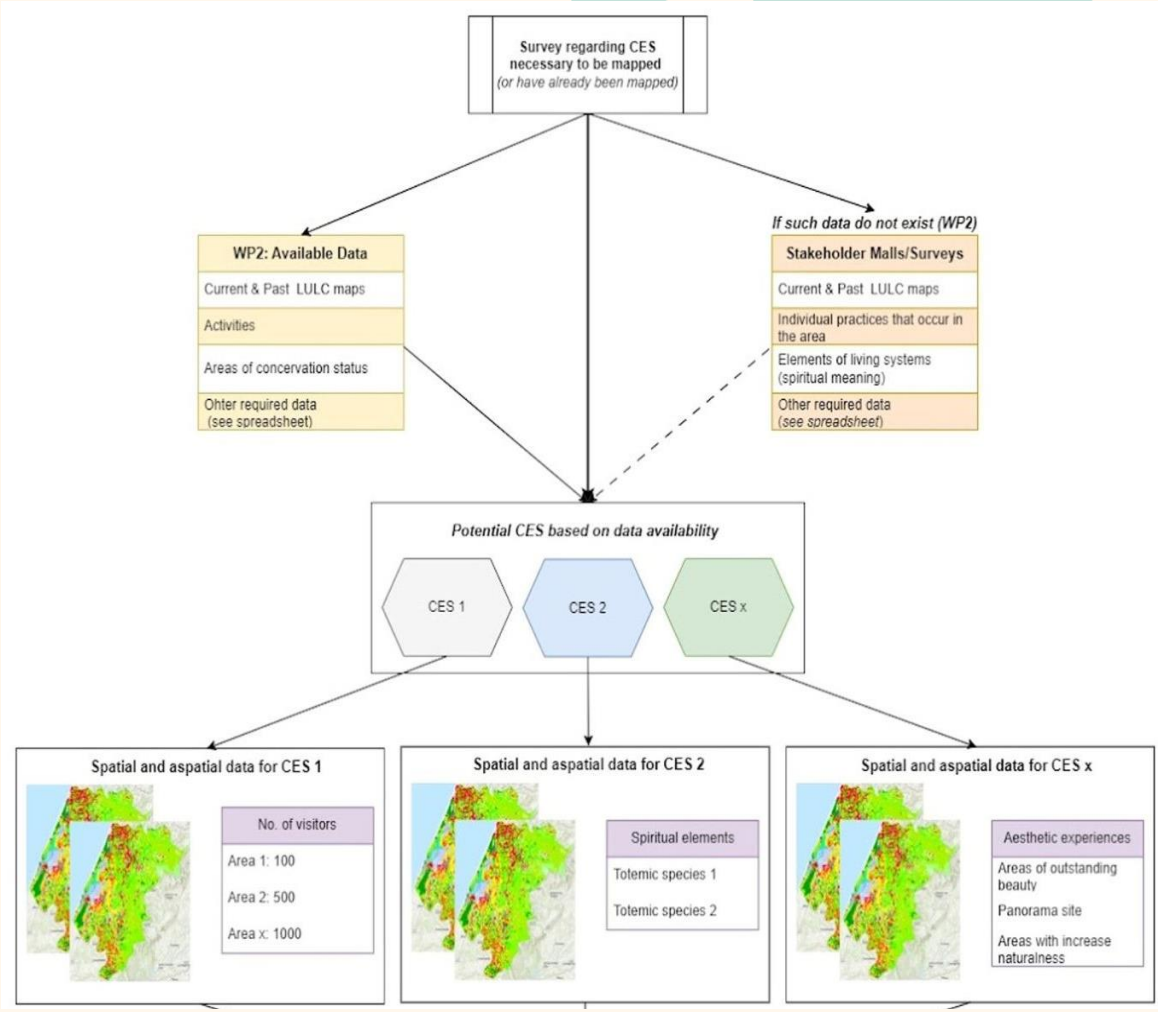
Ensure a high ecological and societal co-benefit / low-cost ratio

REWRITE

ΧΑΡΟΚΟΠΕΙΟ ΠΑΝΕΠΙΣΤΗΜΙΟ
HAROKOPIO UNIVERSITY

Cultural Ecosystem Services (CES)

- Are more “rewilded” seascapes more likely to supply CES?
- In the **mosaic of seascape uses** by society, which ones are valued for their cultural contributions?
- **Pluralism valuation** of all ES



Thanks!

Vona Méléder, Nantes Université
Coordinator
On behalf of the consortium

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Nantes Université

Co-funded by the European Union

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From the, IUCN’s 10 guiding principles in order to stabilize the rewilding framework (published by Carver and al., 2021) 4 key elements of coastal rewilding can be highlighted:

- **Restoring natural processes**
- Allowing tidal flows, sediment deposition, and natural erosion patterns to resume without artificial barriers like seawalls or dikes;
- Reintroducing species that play critical roles in coastal ecosystems, such as oysters, seagrasses...
- **Enhancing biodiversity**
- Creating or improving habitats for marine and terrestrial species, including fish, shellfish, birds, and invertebrates;
- Protecting and regenerating ecosystems that are nurseries for marine life.
- **Mitigating climate change**
- Restoring "blue carbon" ecosystems that store significant amounts of carbon dioxide;
- Enhancing coastal resilience to climate impacts like sea-level rise and storm surges by utilizing natural defenses.
- **Reducing human impact**
- Phasing out harmful practices like coastal dredging, pollution, or overfishing;
- Removing artificial structures and barriers that disrupt natural processes.