

# #CoastalFutures23

## Livestream & London

### 25-26 January 2023







30th annual conference

## **Coastal Futures 2023**

***Our Ocean and Coastal Future  
for the Next Decade***



# **SESSION 2**

## **DELIVERING MARINE RESTORATION: Net Gain, Blue Carbon, Restoration and Re-Wilding**

**CHAIR**

**Roger Proudfoot,  
Environment Agency**

25th & 26th January, 2023 | Royal Geographical Society, London & online



[www.coastal-futures.net](http://www.coastal-futures.net)



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# SESSION 2a

**DELIVERING MARINE RESTORATION:  
Net Gain, Blue Carbon, Restoration  
and Re-Wilding**

**Alexis Perry, Environment Bank**

***Making Nature Economically Viable***

25th & 26th January, 2023 | Royal Geographical Society, London & online



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# NATURE BASED SOLUTIONS FOR POSITIVE CHANGE

Alexis Perry

A NEW PLAN FOR  
THE PLANET

**EB** ENVIRONMENT  
BANK



# Why is biodiversity important

55% of global GDP relies on what nature provides

One-fifth of these services are on verge of collapse

Our demand on nature far exceeds its capacity to supply

## Reliance

- Food
- Clean air and water
- Temperature regulation
- Flood mitigation
- Carbon storage
- Resilient Eco-systems
- Genetic Diversity



## Main loss drivers

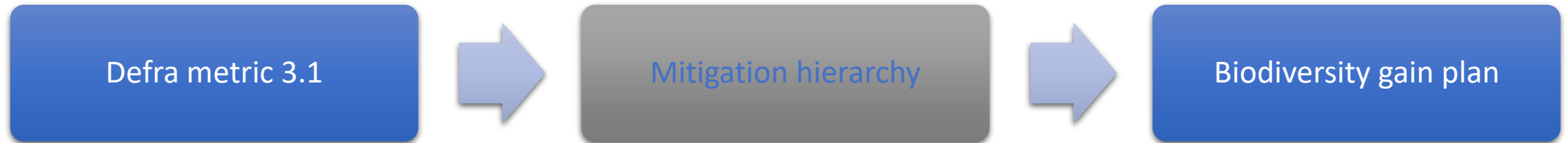
- Poor land usage
- Invasive species
- Pollution
- Climate change
- Population growth

**EB MISSION: MAKE NATURE ECONOMICALLY VISIABLE**



# The Environment Act 2021 & BNG

Legal requirement on all new developments:  
Minimum 10% increase in biodiversity



## Off-site mitigation

- Purchase off-site units
- Removal of liability

## On-site mitigation

- Funding Risk
- Reduce net developable area
- Reduce land values



# Habitat Banks – off-site mitigation

## Best outcomes

Nature | Society | Rural economy

Landscape-  
scale habitat  
restoration

Sited in the best  
place for nature

Biodiversity  
Units raised on  
uplift

Forward funded  
for 30+ years

Annual  
reporting and  
monitoring

Auditable and  
legally  
compliant

Removes liability for  
Landowners and  
developers



# Marine Net Gain

Defra Consultation Closed 13 September 2022 – Response awaited (at time of writing!)

- 5 sections, 9 Principles and 15 Questions
- Aims and Objectives, Methodology, Technical (and financial) Delivery
- Recognition of complexity in the Marine Environment

## **Our Experience with Terrestrial BNG – key learnings**

- MNG must be established with Integrity – Mandate, Metric, Mechanisms and Markets
- Market certainty and Accountability.
- Must support and not hinder Sustainable Development and Energy Security goals.





# A NEW PLAN FOR THE PLANET



The Catalyst, Baird Lane, York  
North Yorkshire YO10 5GA

01904 202990

[environmentbank.com](http://environmentbank.com)





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# SESSION 2a

## **DELIVERING MARINE RESTORATION: Net Gain, Blue Carbon, Restoration and Re-Wilding**

**Vicki Castro-Spokes  
Dr Lewis White, Defra**

*Embedding natural capital approaches  
into policy for marine and coastal  
environments*

25th & 26th January, 2023 | Royal Geographical Society, London & online



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# Embedding natural capital approaches into policy for marine and coastal environments

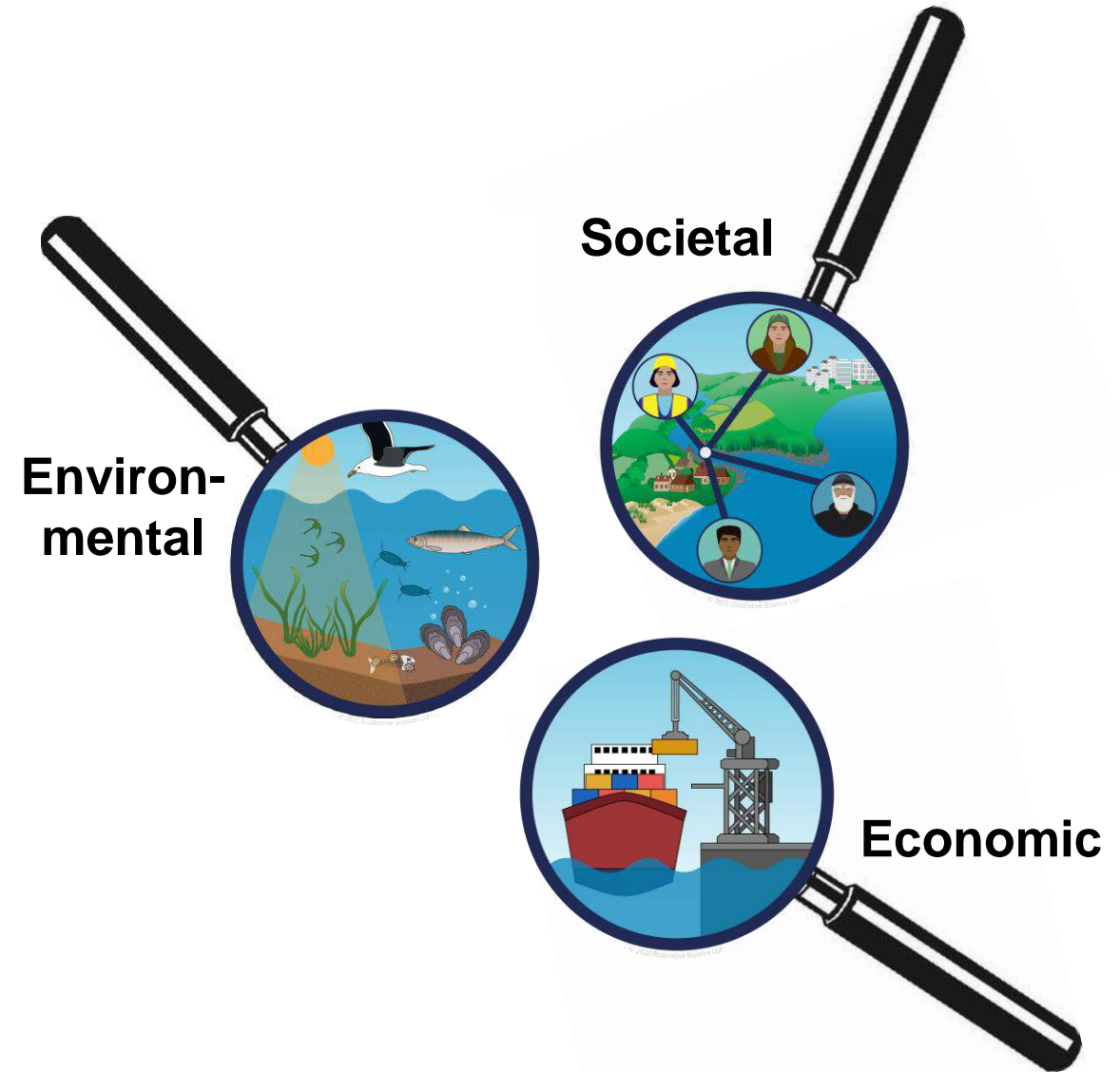
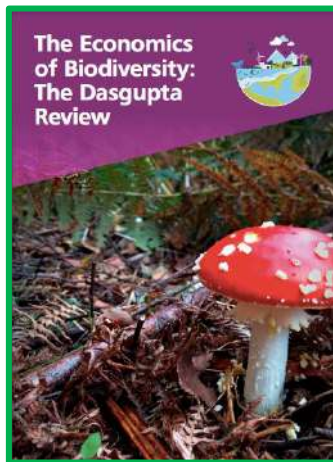
Vicki Castro-Spokes and Dr Lewis White, Defra  
Coastal Futures 2023



# Why we need natural capital approaches

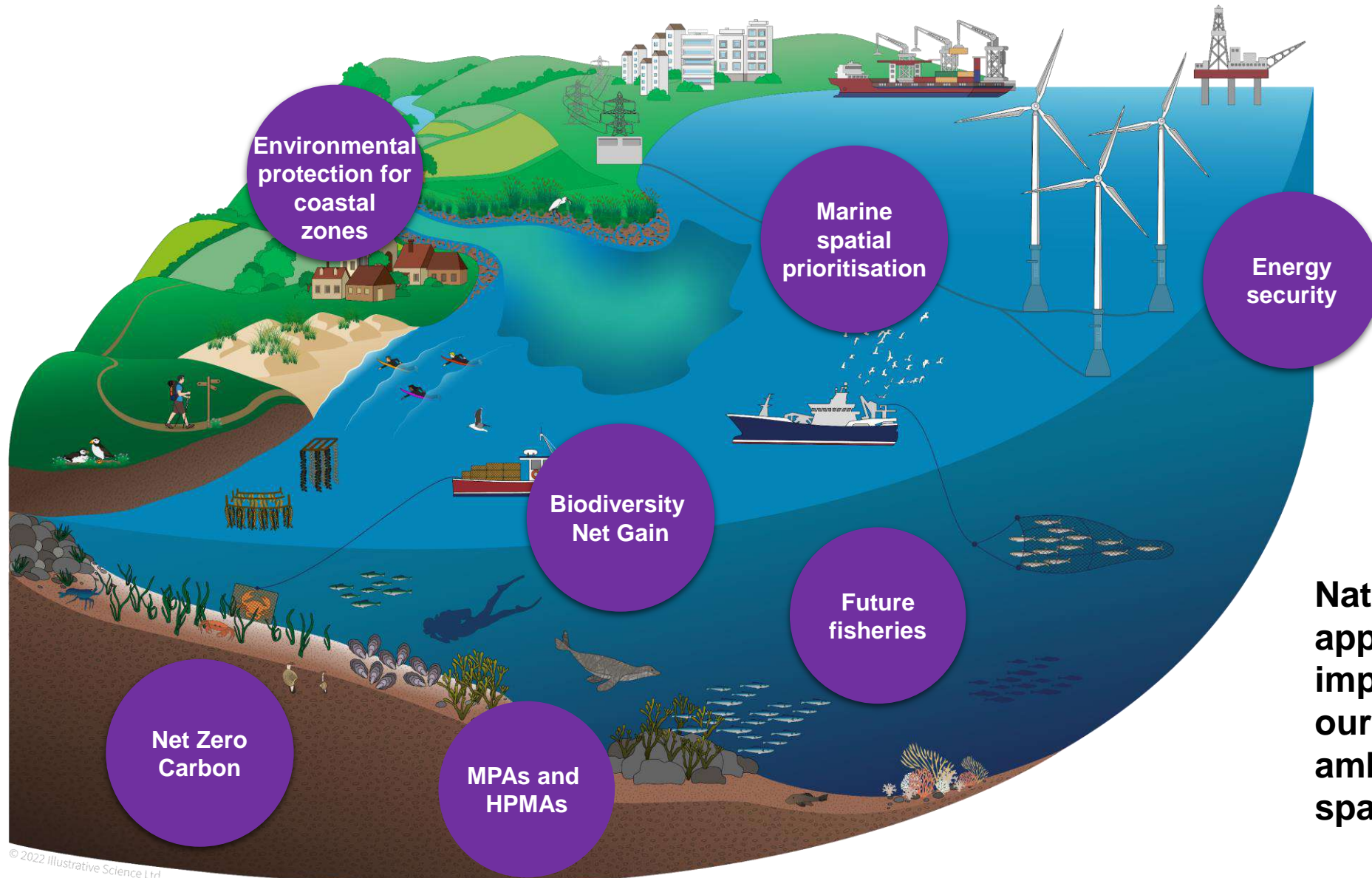
*‘Natural capital is essential for our existence ... We are embedded in Nature; we are not external to it. But until relatively recently, influential writers on economic development saw natural capital only as luxuries’*

**The Dasgupta Review, 2021**





# Why we need natural capital approaches



**Natural capital approaches are imperative for meeting our key political ambitions in the marine space.**



# The NCEA programme



- Land and sea (terrestrial and marine)
- Three years (to March 2025)
- Launched April 2022, following test years
- £140m HMT allocation to Defra
- A partnership programme





Our vision is for:

***‘A thriving marine environment where nature is at the heart of decision making’***

We need:

- (1) Better evidence
- (2) Ways to apply this evidence
- (3) Cultural change

## Years 1-2

- Impact of terrestrial land management on inshore waters
- Estuaries & coasts
- Inshore fish
- Offshore benthic habitats
- Inshore benthic habitat
- Pelagic and plankton communities
- Inshore cetaceans
- Inshore marine birds
- Marine birds at sea

Data sharing platforms and data accessibility

**Data exploration & digital solutions**

Integrating socio-economic data  
Utilising industry data for marine planning

Natural capital tools and frameworks

Place based decision making

State of natural capital reporting

Marine natural capital asset service matrix

Coastal communities and heritage

Marine planning

Sustainable fisheries and FMPs

**Monitoring marine & coastal environments**

**Marine NCEA**

**Decision making frameworks & analytical tools**

**Innovation in data collection & analysis**

Unlocking industry investment

Citizen science initiatives

DNA technologies

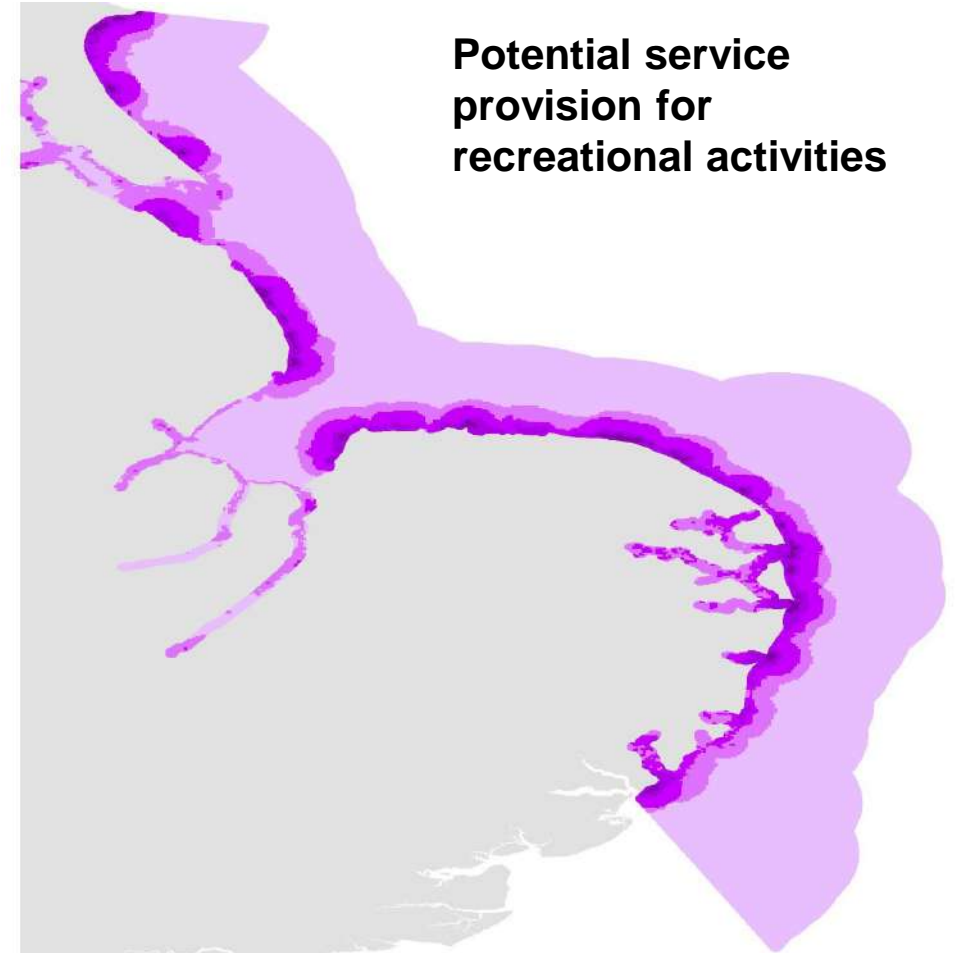
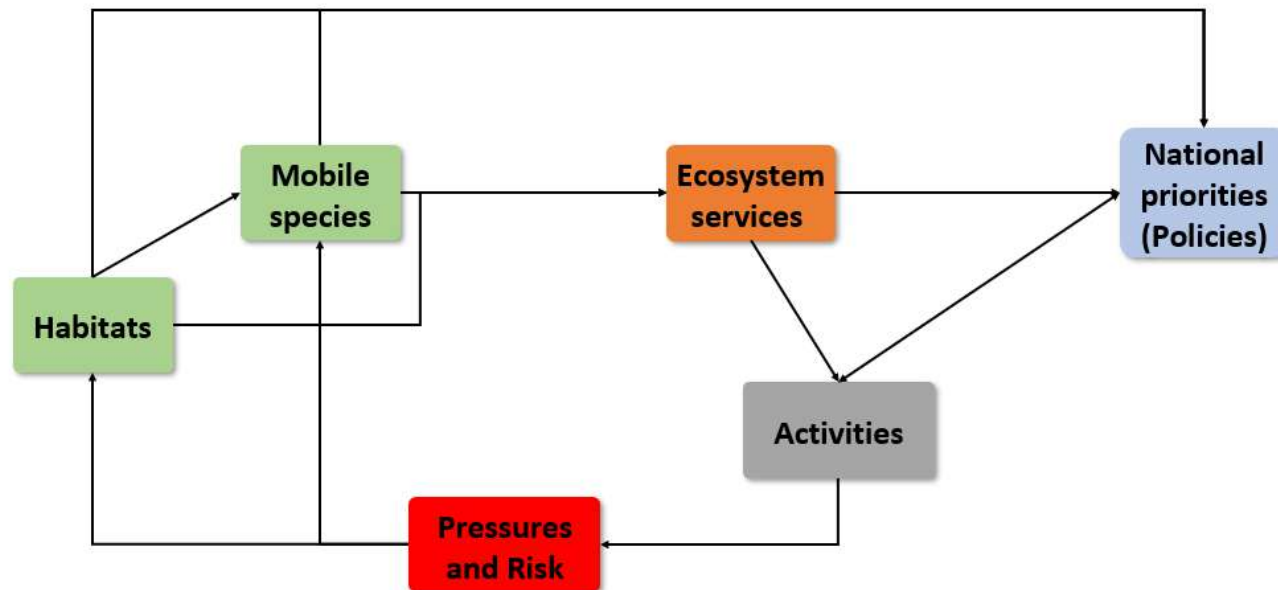
Marine autonomous vehicles

Earth Observation

# Case study: Marine planning



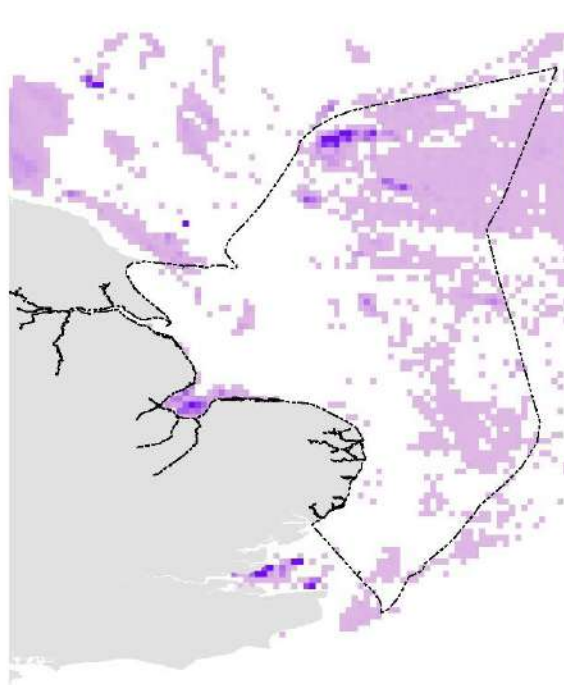
## Embedding a natural capital approach into marine planning





# Case study: Marine planning

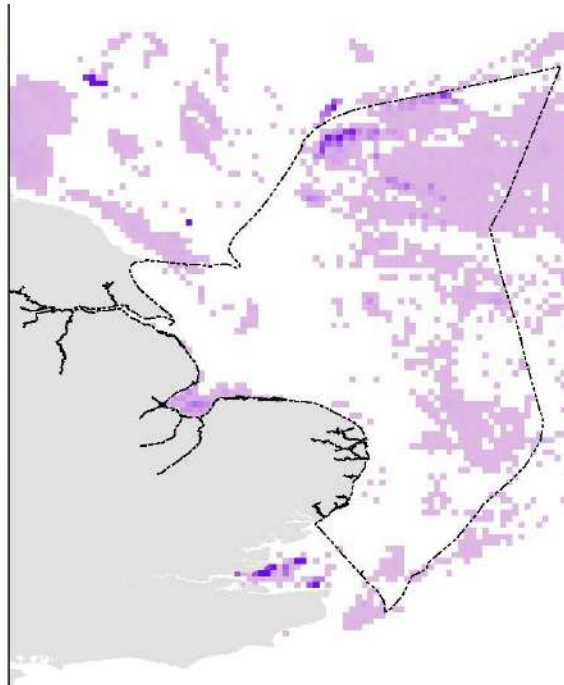
## Landings by benthic trawls



### Legend

#### 2020 VMS Value Benthic Trawl

Value £ per hectare



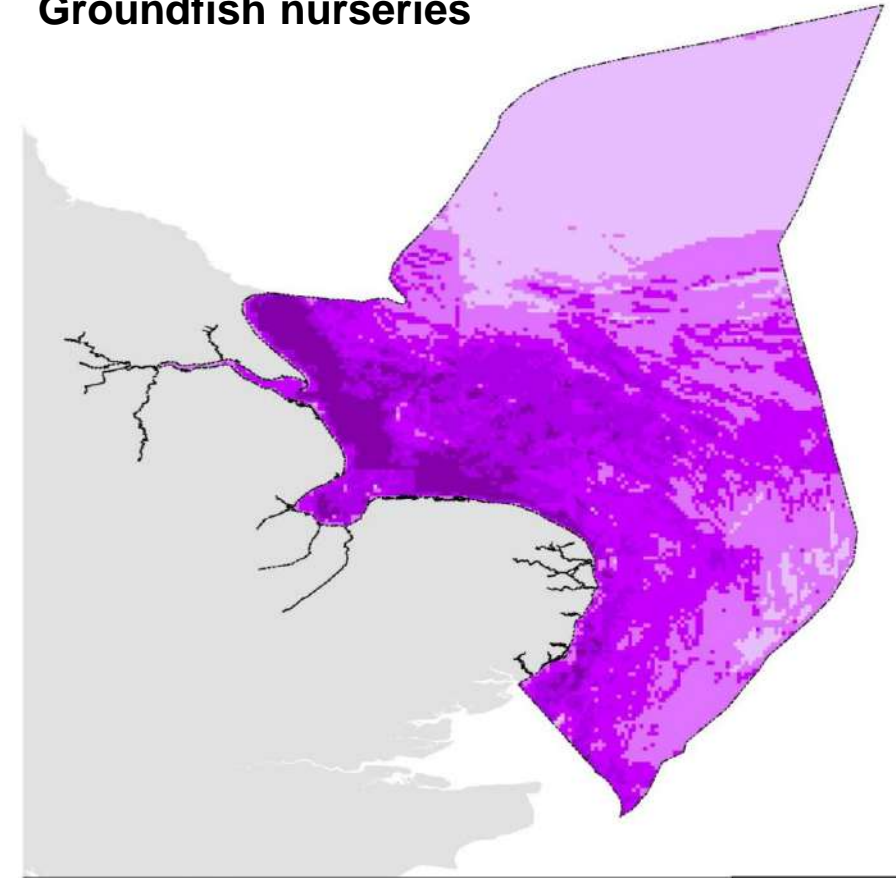
### Legend

#### 2020 VMS Landing Benthic Trawl

Tonnes per hectare



## Groundfish nurseries



### Legend

UK landmass

East marine plan area

#### Demersal fish nurseries

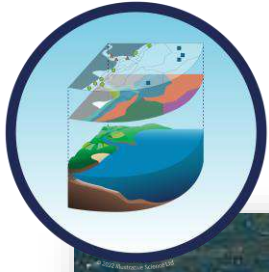
Capacity to supply service

low  
Medium  
High

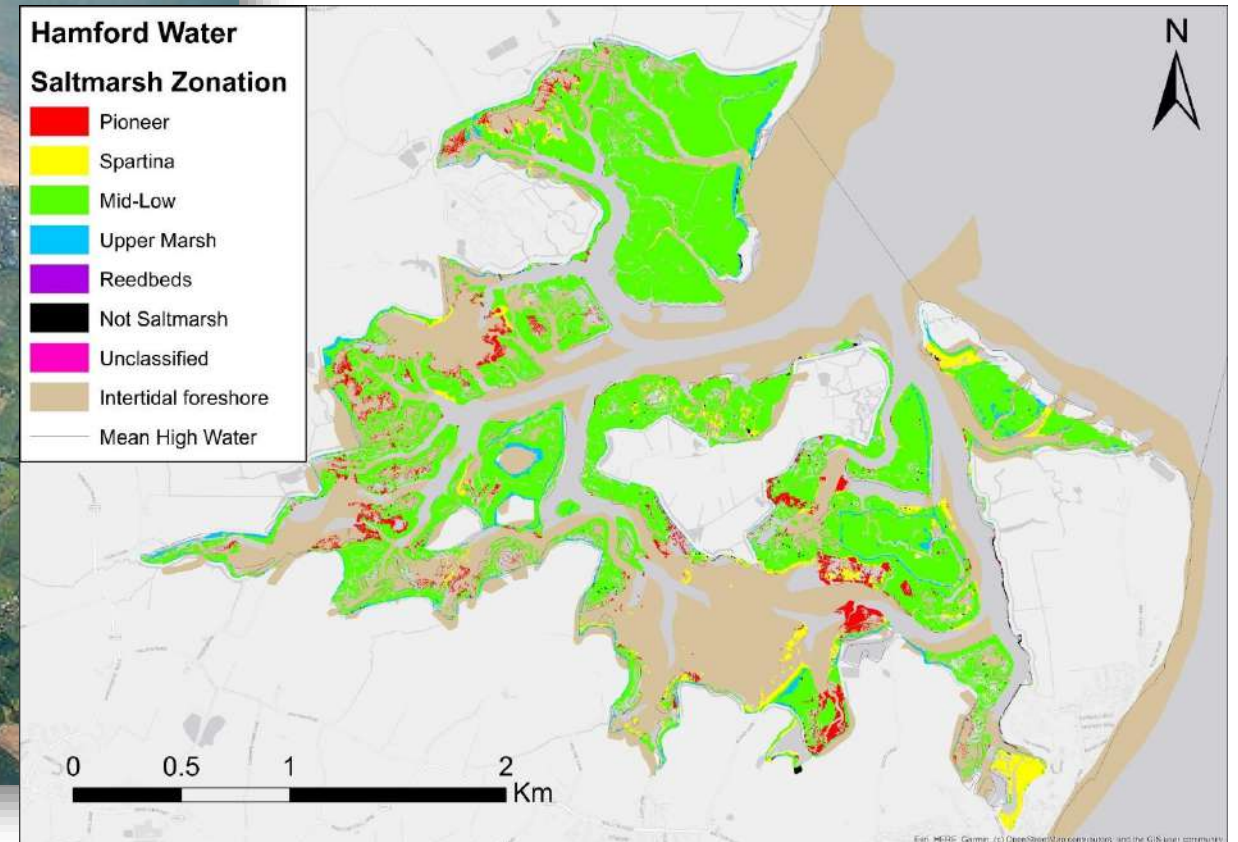


Marine  
Management  
Organisation

# Case study: Saltmarsh zonation



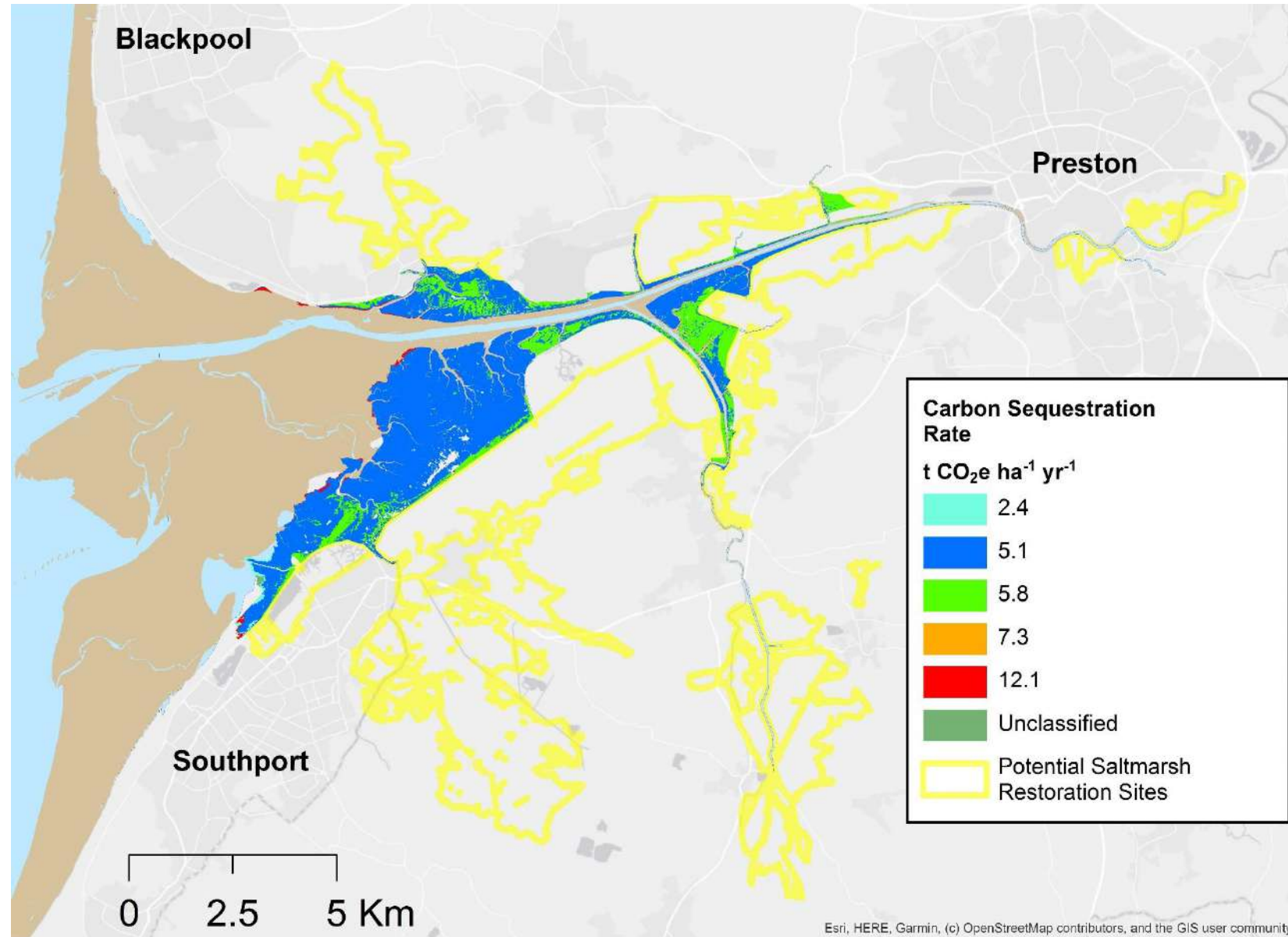
Increasing the coverage of saltmarsh zonation to help understand natural capital benefits



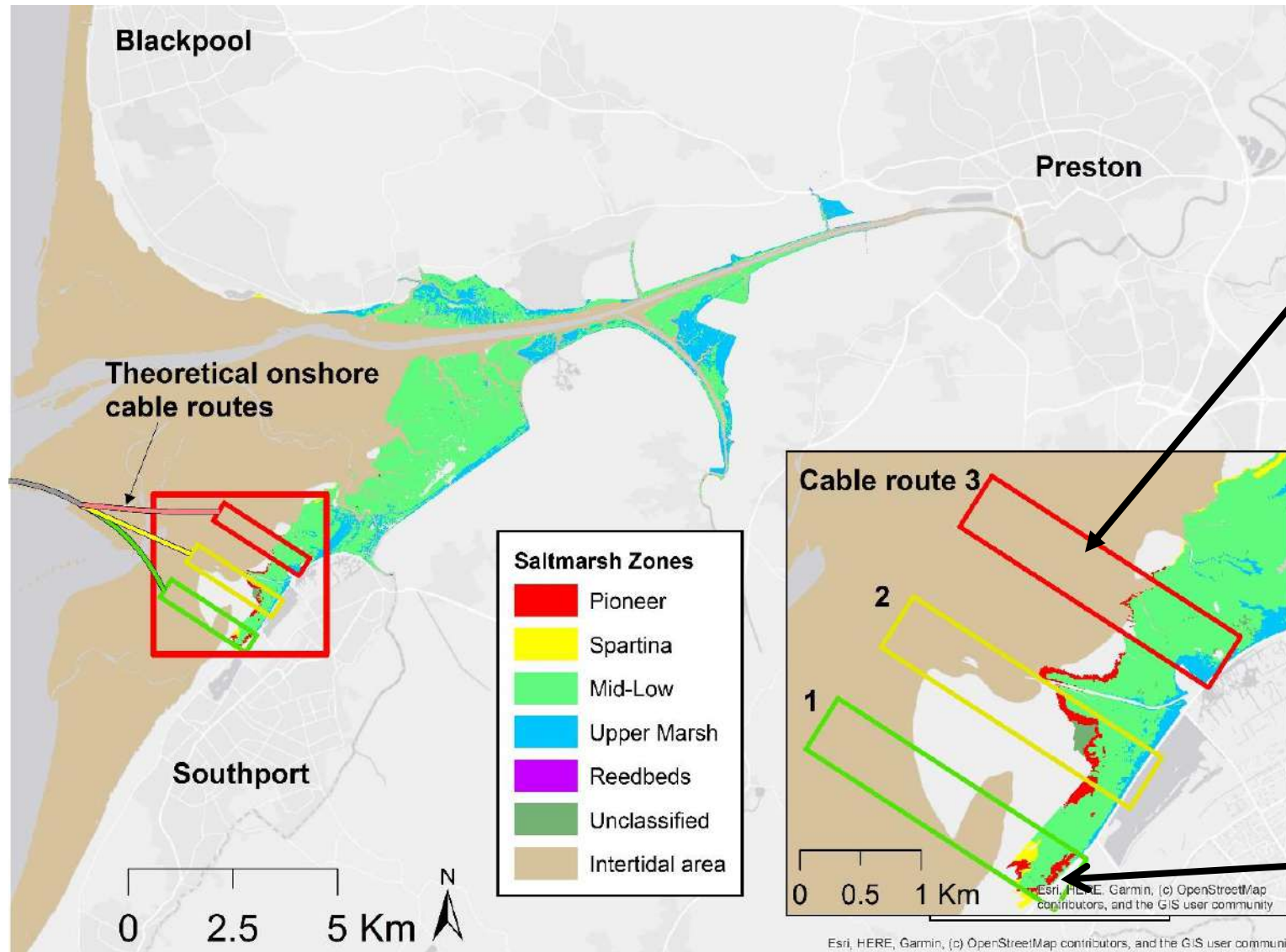


# Case study: Saltmarsh zonation – The Ribble

- 2418 ha of saltmarsh
- Sequesters 12,808 t C per year
- Equivalent annual emissions of **1472 households**



# Case study: Saltmarsh zonation – The Ribble



Cable route 3 has most stored carbon and highest total sequestration rate.

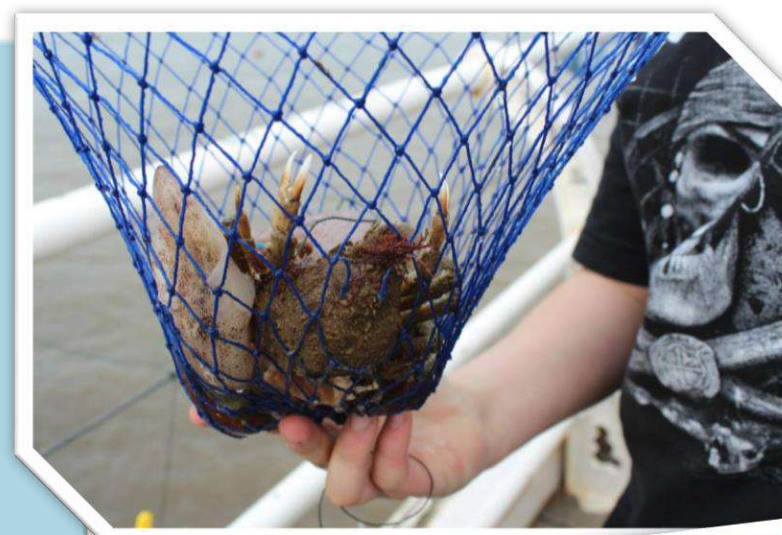
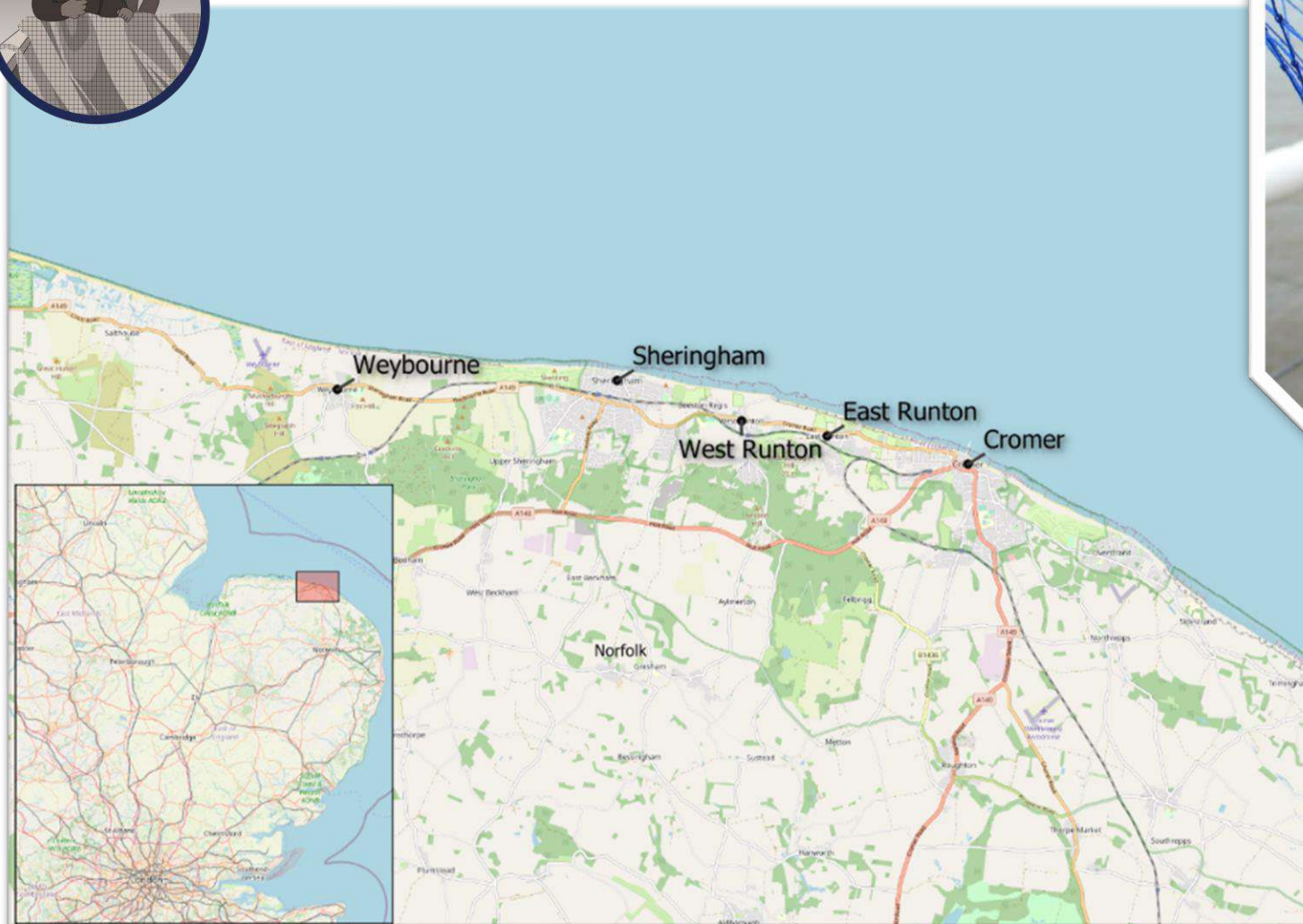
However, although a smaller area, the highest sequestration rate *per unit area* is in cable route 1



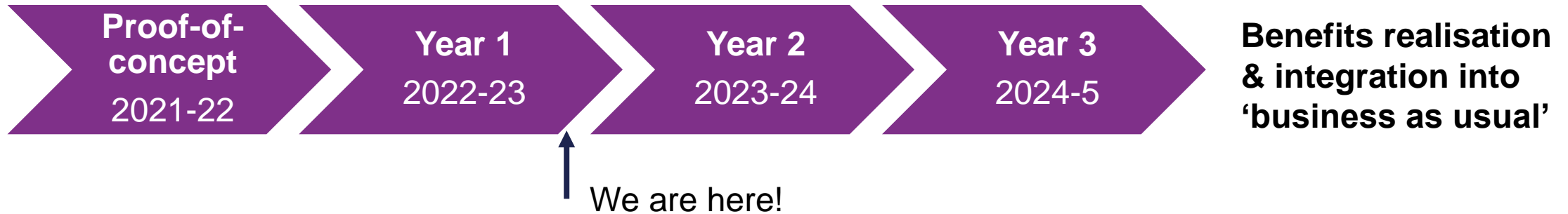
# Case study: Coastal heritage



## North Norfolk Crab and Lobster fishery



# What's next?



Contact [marineNCEA@defra.gov.uk](mailto:marineNCEA@defra.gov.uk) to learn more and to:

- Sign up to marine NCEA stakeholder news bulletins
- Ask us about publications and case studies
- Connect with our project leads
- Talk to us about your work, share ideas and opportunities for collaboration





Natural Capital  
and Ecosystem  
Assessment

Contact: [marineNCEA@defra.gov.uk](mailto:marineNCEA@defra.gov.uk)



Department  
for Environment  
Food & Rural Affairs



Cefas



Environment  
Agency



JNCC

Joint Nature Conservation Committee



Marine  
Management  
Organisation





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# SESSION 2a

## **DELIVERING MARINE RESTORATION: Net Gain, Blue Carbon, Restoration and Re-Wilding**

**Vicky West, ABPmer**

*Implications of net gain*

25th & 26th January, 2023 | Royal Geographical Society, London & online



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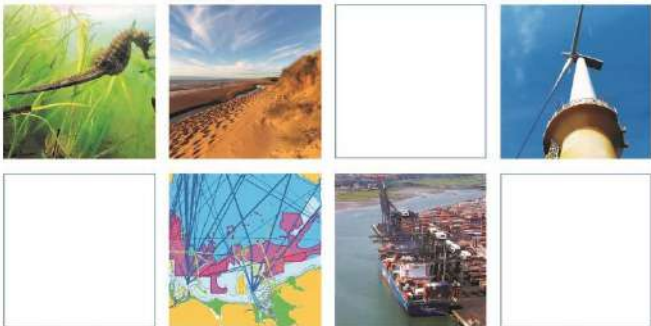


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# Implications of net gain and the natural capital approach for marine and coastal restoration

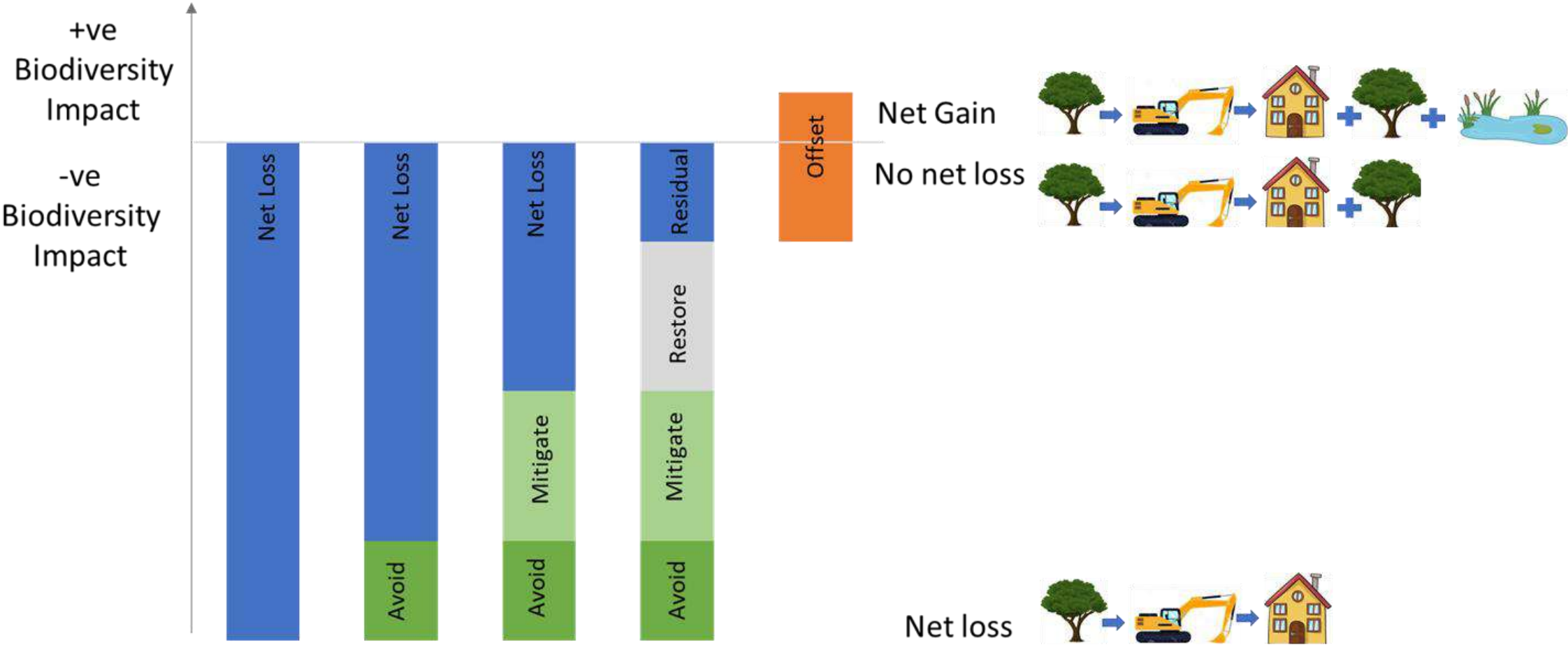
Vicky West





# Biodiversity Net Gain

“Net gain is development that leaves biodiversity in a better state than before”



*“Marine Net Gain should be a strategically managed process led by the government to which funding and delivery of projects is contributed to by industry”*

Strategic Net Gain Targets Task & Finish Group<sup>\*</sup>, 2021

*Strategic Net Gain Targets Task & Finish Group, 2021. Strategic Net Gain Targets for Coastal and Marine Environments.*

<sup>\*</sup> SUDG, The Crown Estate, Defra, Energy UK, Natural England, Renewable UK, RSPB, The Wildlife Trusts and UK Major Ports Group, supported by ABPmer





# Net Gain and the Natural Capital Approach

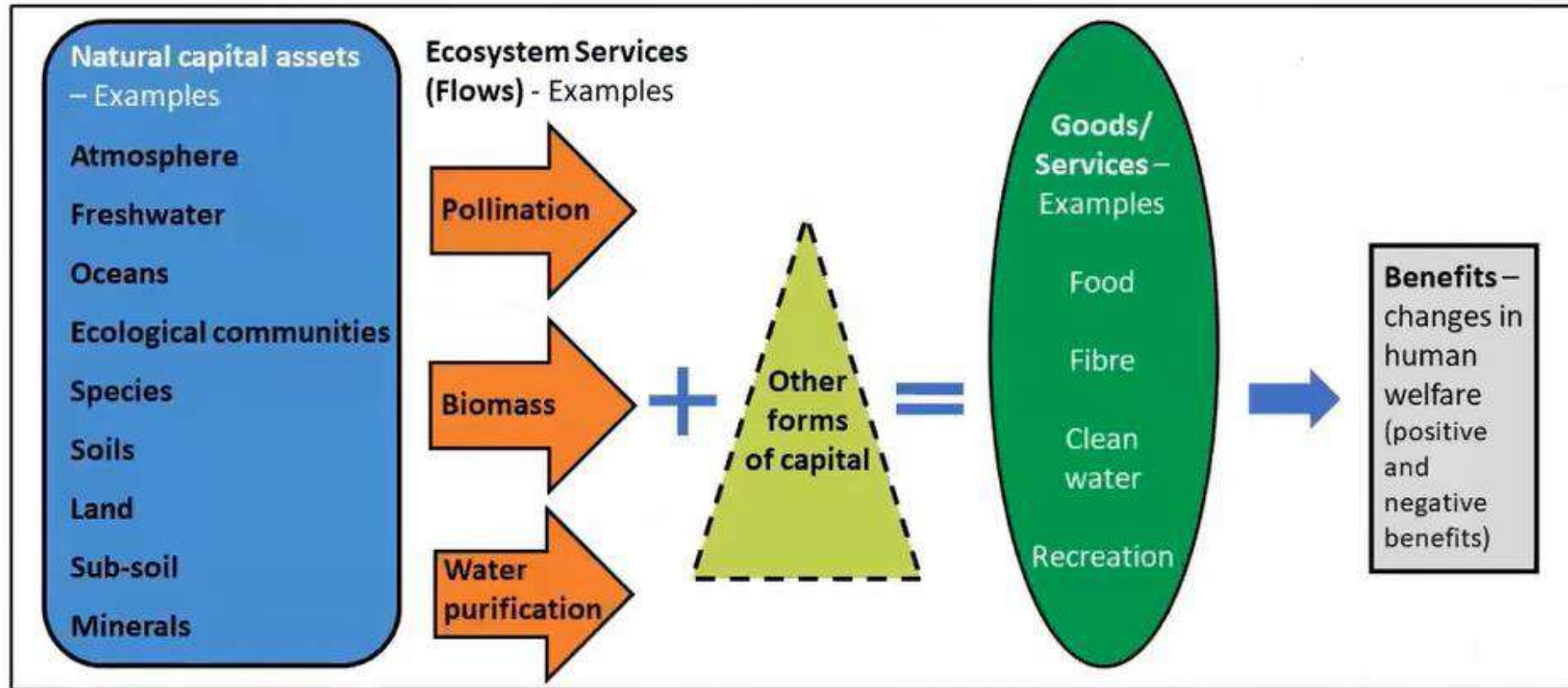
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- ➔ Marine Net Gain interventions should be targeted to restoration/recovery priorities;
- ➔ Strategically planned approaches will deliver better environmental outcomes;
- ➔ Natural Capital Approach can inform BNG prioritisation; and
- ➔ Focused monitoring and review should be implemented.



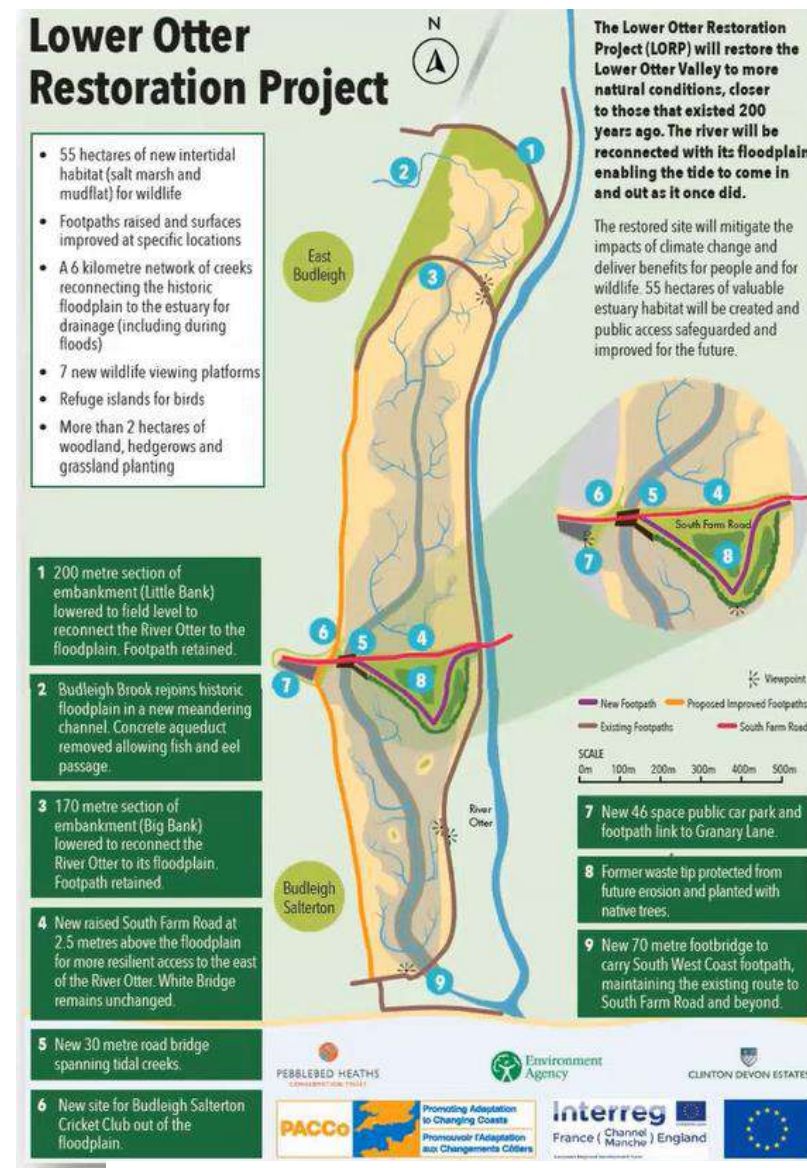
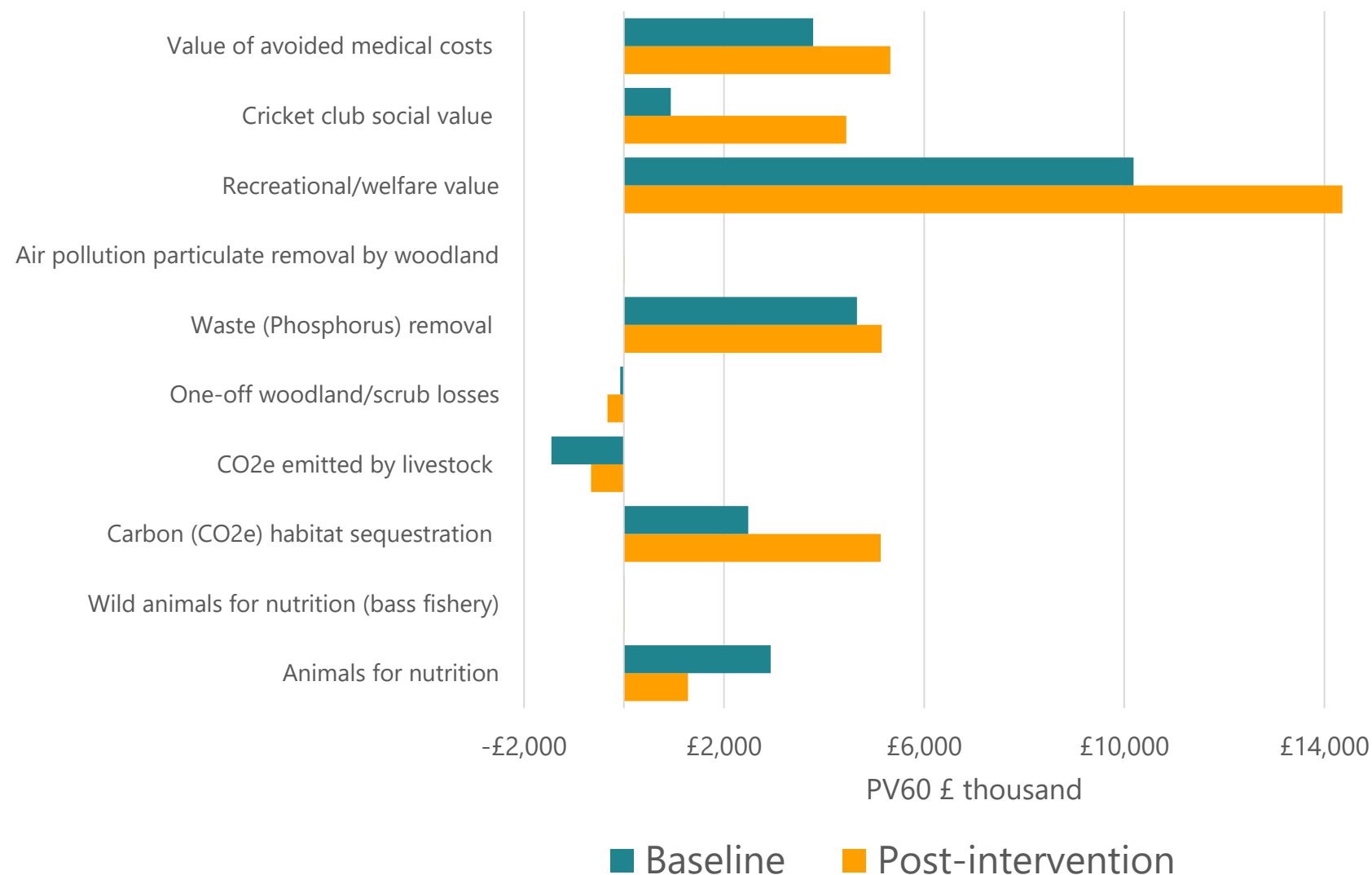
# Natural Capital Approach

**Natural Capital:** the stock of natural assets which produce ecosystem services that provide benefits to people





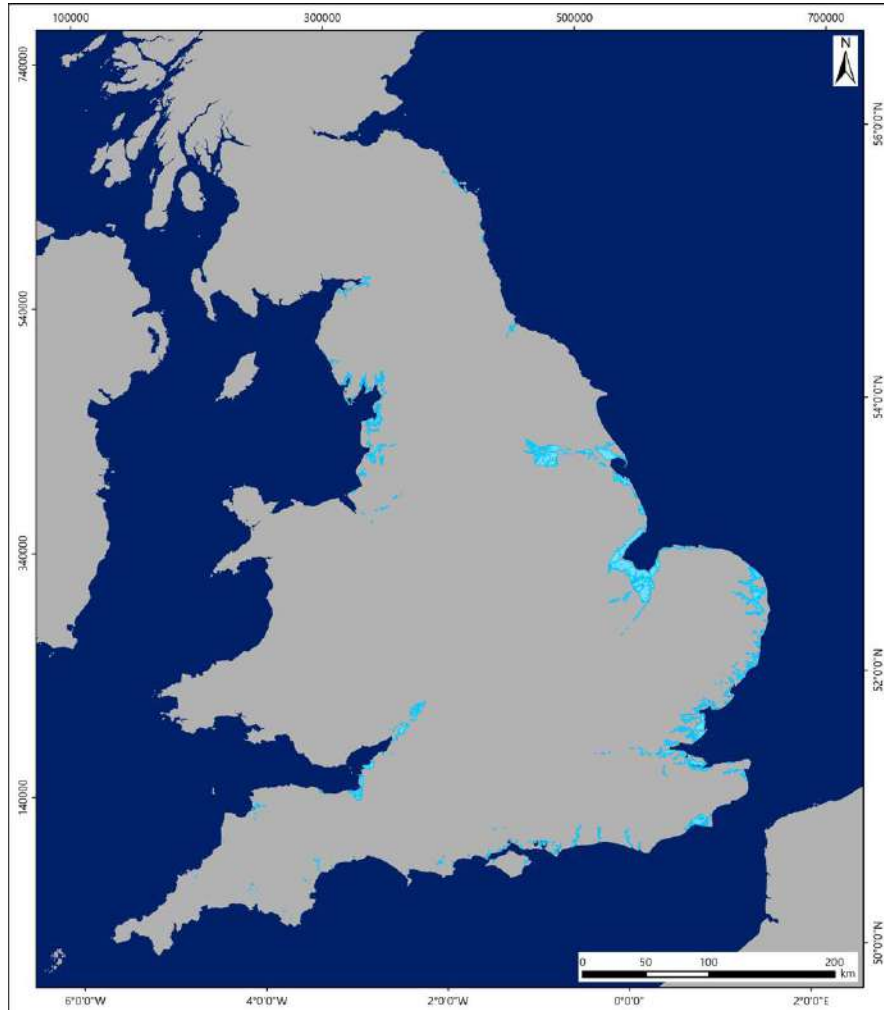
# Lower Otter Restoration Project



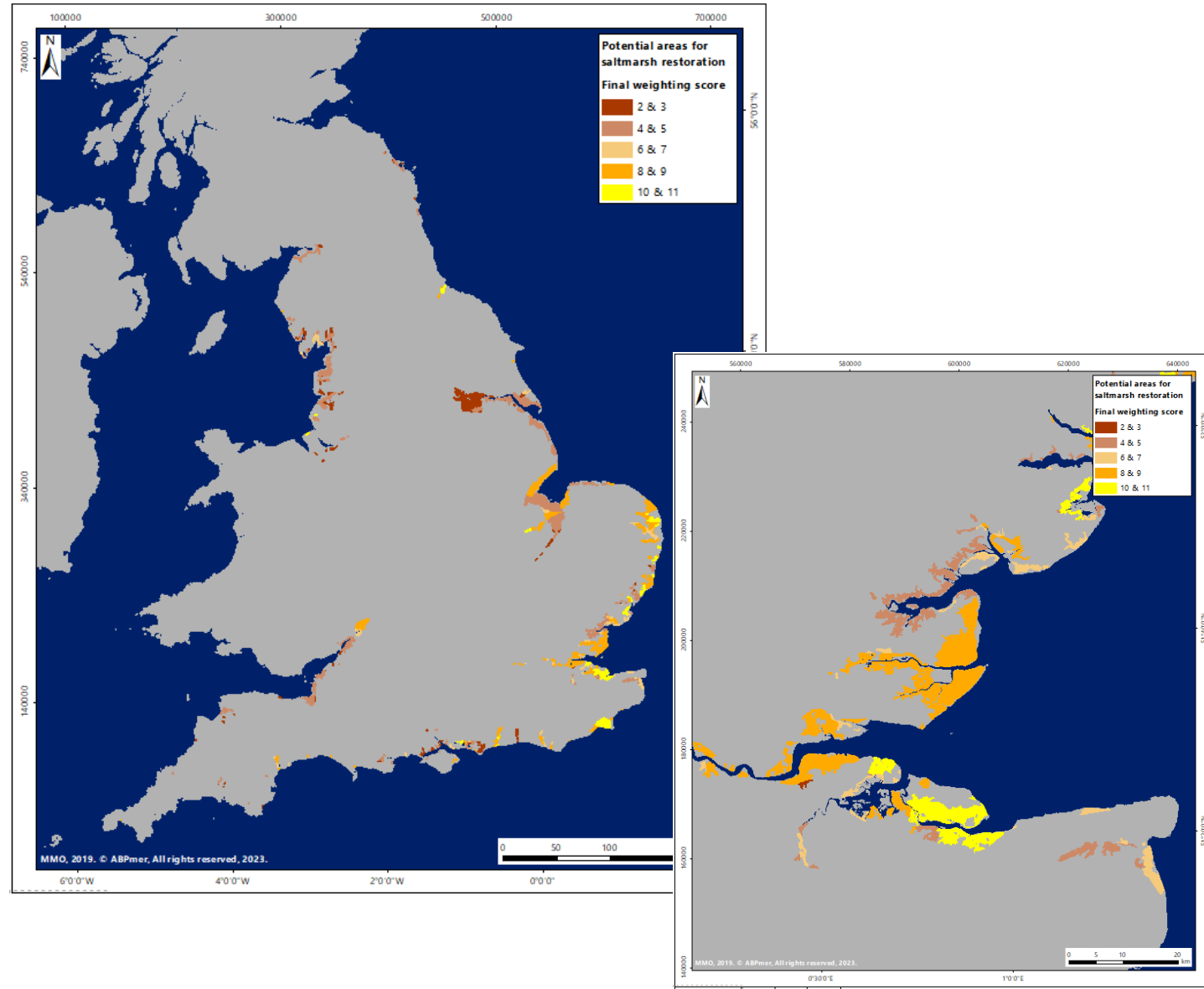
Copyright: LORP project partners

# Net Gain and Natural Capital

## Potential areas for saltmarsh restoration



## Prioritised areas for saltmarsh restoration

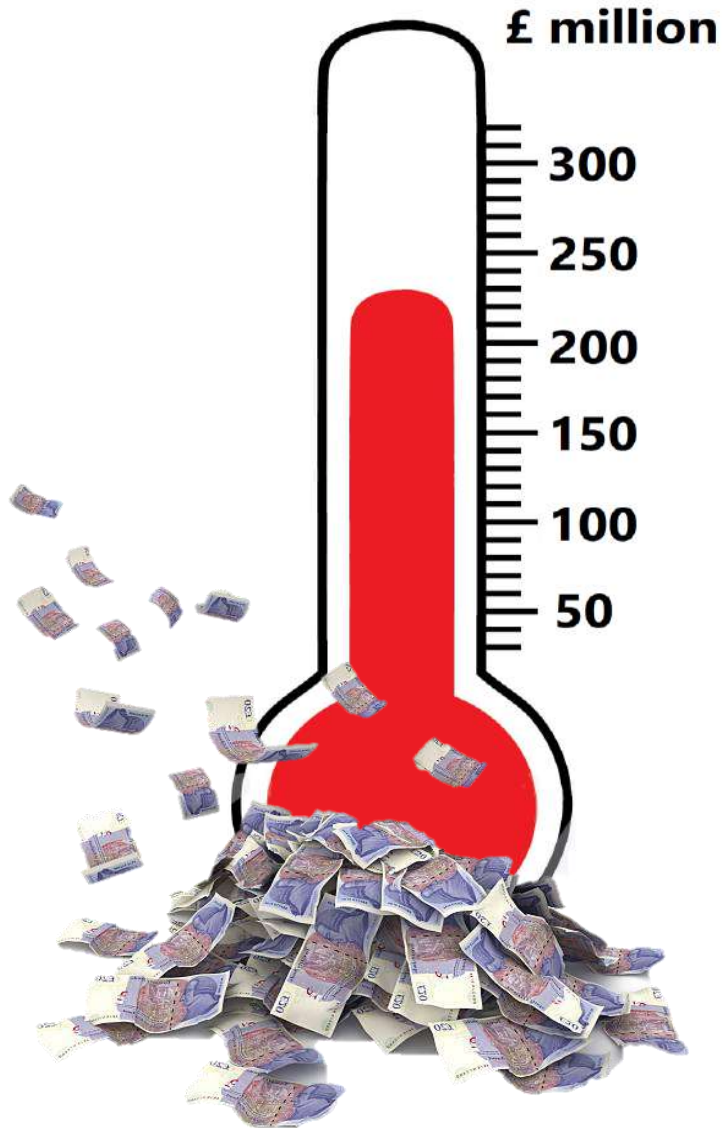


Environment Agency's Estuarine and Coastal Monitoring and Assessment Service. Available at: <https://environment.data.gov.uk/>



# Continuing cost of inaction

---



The slow progress towards BNG implementation is denying the marine environment millions in investment that could be contributing to ocean recovery



# Thank you for your attention

Vicky West

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+44 (0) 7816 545685



Marine Environmental Net Gain

Innovative thinking, sustainable solutions





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# SESSION 2a

## **DELIVERING MARINE RESTORATION: Net Gain, Blue Carbon, Restoration and Re-Wilding**

**Daniel Crockett,  
Blue Marine Foundation**

*How to make blue carbon markets work  
for people and the ocean*

25th & 26th January, 2023 | Royal Geographical Society, London & online



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BLUE MARINE  
FOUNDATION

*Blue Carbon Markets*  
*2023 Overview – Coastal Futures*



# Blue Marine Foundation Units

We have developed specialist units to scale our impact. Each operates as a think tank, supporting our projects and each other.

Blue Media



Blue Climate



Blue Investigations



Blue Economics



Blue Education



Blue Science



Blue Legal



Blue Policy





*Blue Climate is a specialist unit dedicated to understanding and valuing the ocean as a climate change solution, within our projects and beyond.*

*We use cutting-edge science, innovative technology and economics to enable trustworthy, robust and evidence-backed sustainable finance initiatives that support marine conservation and restoration.*



BLUE MARINE  
FOUNDATION



# *Funding (or lack of it)*

- *Ocean critically underfunded*
- *0.01% of SDG funding to Goal 14*
- *Under 1% of all philanthropic funding since 2009.*
- *Philanthropic grant cycles are short*
- *Enormous funding gap, project scale limited*
- *Markets could create sustainable finance opportunity at scale*
- *Huge employment and just transition potential*

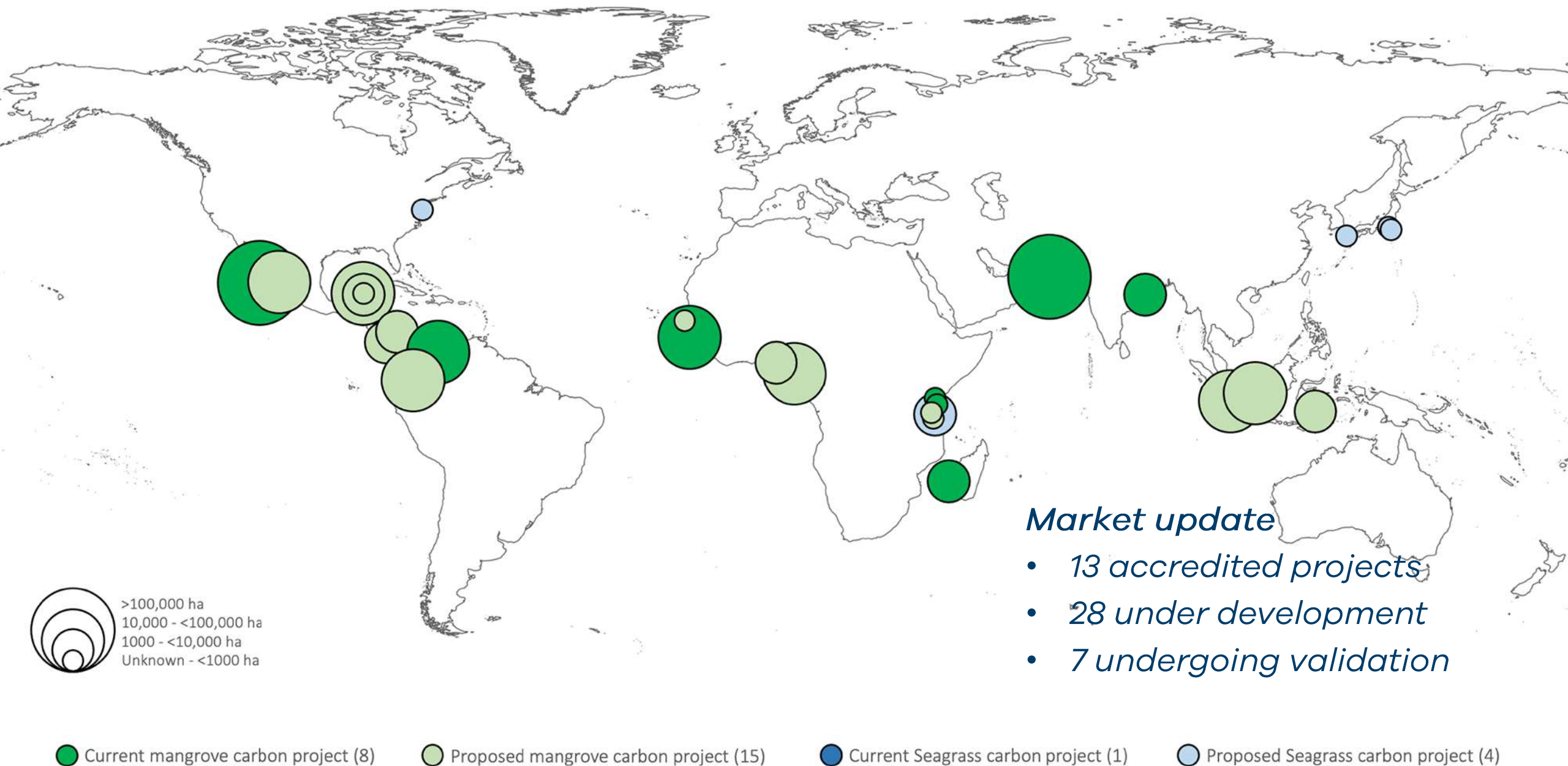




# *How conservationists (we) see carbon markets*

- *Suspicion about exploitation of nature for profit*
- *This isn't wrong! Offsets as a fig leaf*
- *But the market is happening, it is not going away*
- *Philosophical shift needed in the way we see value*
- *Needs involvement and participation from "us"*
- *Risk of low quality projects*
- *Risk of single focus on carbon*
- *Reality check: conservation as usual isn't really working*
- *All major metrics show decline in UK blue carbon habitats*







# *Market reality check*

- *Actual market is tiny, whole concept is fragile and emerging*
- *Massive supply demand imbalance*
- *Investors need educating*
- *Different stakeholder groups don't communicate at all*
- *Project scale vs costs of MRV*
- *Economic viability with current methodologies lacking*
- *Regulatory confusion – ARTICLE 6*

*Photo by Manu St Felix*



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# *What does high quality mean?*

High quality projects should:

- Ensure additionality
- Ensure permanence
- Avoid double counting
- Consider leakage
- Be transparent and accurate around GHG accounting
- Focus on community engagement
- Ensure social equity





# Pricing

- Blue carbon credits typically priced at \$10-15
- Prices as low as \$3 or as high as \$45
- Japanese kelp carbon credits at \$500!
- Prices higher than terrestrial credits due to smaller scale, cost and complexity, and potential to deliver significant co-benefits.

Blue-carbon projects lag in scale compared with other types of nature-based solutions on voluntary carbon markets.

Carbon credits issued or retired for nature-based solutions (NBS), MtCO<sub>2</sub><sup>1</sup>

■ Blue-carbon projects (credits issued)  
■ Green (terrestrial) carbon projects (credits retired)

**New guidance for blue-carbon projects**  
First methodology for conserving blue carbon approved under any major greenhouse-gas program released in September 2020 by Verra.

**Blue carbon attracts scientific attention**  
"Blue carbon" coined in 2009; research into coastal-carbon inventories and sequestration methods increases in the following years



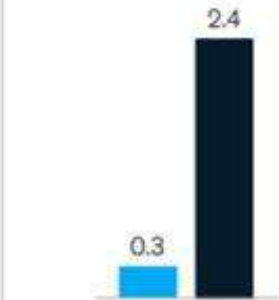
<sup>1</sup>Metric megatons carbon dioxide. One metric megaton = one million metric tons.

Source: American Carbon Registry, Catherine E. Lunneflock and Carlos M. Duarte, 2019, Climate Action Reserve, The Gold Standard, Plan Vivo, Verra

Average size or credits per project, MtCO<sub>2</sub>

■ Blue-carbon projects  
■ Other NBS

Blue-carbon projects are individually smaller than other types of NBS projects



Blue carbon: based on 11 projects registered or under development with Verified Carbon Standard (Verra) and Plan Vivo

All other NBS: based on 82 projects. Total cumulative credits issued divided by # of projects; includes projects that might still issue credits in coming years



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An underwater photograph showing a dense field of brown and green seaweed or kelp. The blades of the seaweed are long and ribbon-like, swaying in the water. The background is a clear, light blue, suggesting the water's surface is not far away. The overall lighting is soft and natural, typical of an underwater environment.

## Alternative routes and future trends

- Jersey project creating frameworks that government can use
- Tech and modelling creating new levels of data
- Recognition of integrated values provided by marine environment
- Seascape restoration at scale (Solent)
- Data generation with bespoke frameworks – corporate appetite
- Contribution claim credits, carbon plus
- Biodiversity credits
- Potential for large scale incentive for protection and restoration



# UK Blue Carbon Forum and quality market process

- Set up by Blue, WWF, Wildlife Trusts
  - Over 40 research institutions, government agencies and other NGOs
  - Aim to break down silos, channel funding and raise ambition.
  - Chaired by Professor Hilary Kennedy
  - Plan to support the Defra evidence needs assessment
  - Markets working group
- 
- New process starting this year convened by Finance Earth and Pollination
  - Developing a High Quality Marine Natural Capital Market for the UK
  - Roadmap agreed and launched ahead of COP28
  - Stakeholders from all groups welcome



# Thank you



BLUE MARINE  
FOUNDATION

Dan Crockett

Director, Ocean and Climate  
[dan@bluemarinefoundation.com](mailto:dan@bluemarinefoundation.com)



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# PANEL DEBATE

## DELIVERING MARINE RESTORATION: Net gain, blue carbon, restoration and re-wilding

*Do we have the right policy and  
technical solution to deliver  
environmental restoration?*

### CHAIR

Roger Proudfoot, Environment Agency

Alexis Perry, Environment Bank

Vicki Castro-Spokes and Dr Lewis White, Defra

Vicky West, ABPmer

Daniel Crockett, Blue Marine Foundation



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# Q&A

**[www.slido.com](https://www.slido.com)**

**For online and in-person delegates**

**Enter code: 3390463**

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# SESSION 2b

## **DELIVERING MARINE RESTORATION: Net Gain, Blue Carbon, Restoration and Re-Wilding**

**Tom Brook, WWF-UK**

*The Blue Carbon Mapping Project –  
Establishing a baseline to inform policy and  
management*

25th & 26th January, 2023 | Royal Geographical Society, London & online



[www.coastal-futures.net](http://www.coastal-futures.net)



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# BLUE CARBON MAPPING

Establishing a baseline to inform  
policy and management in the UK

Tom Brook - WWF

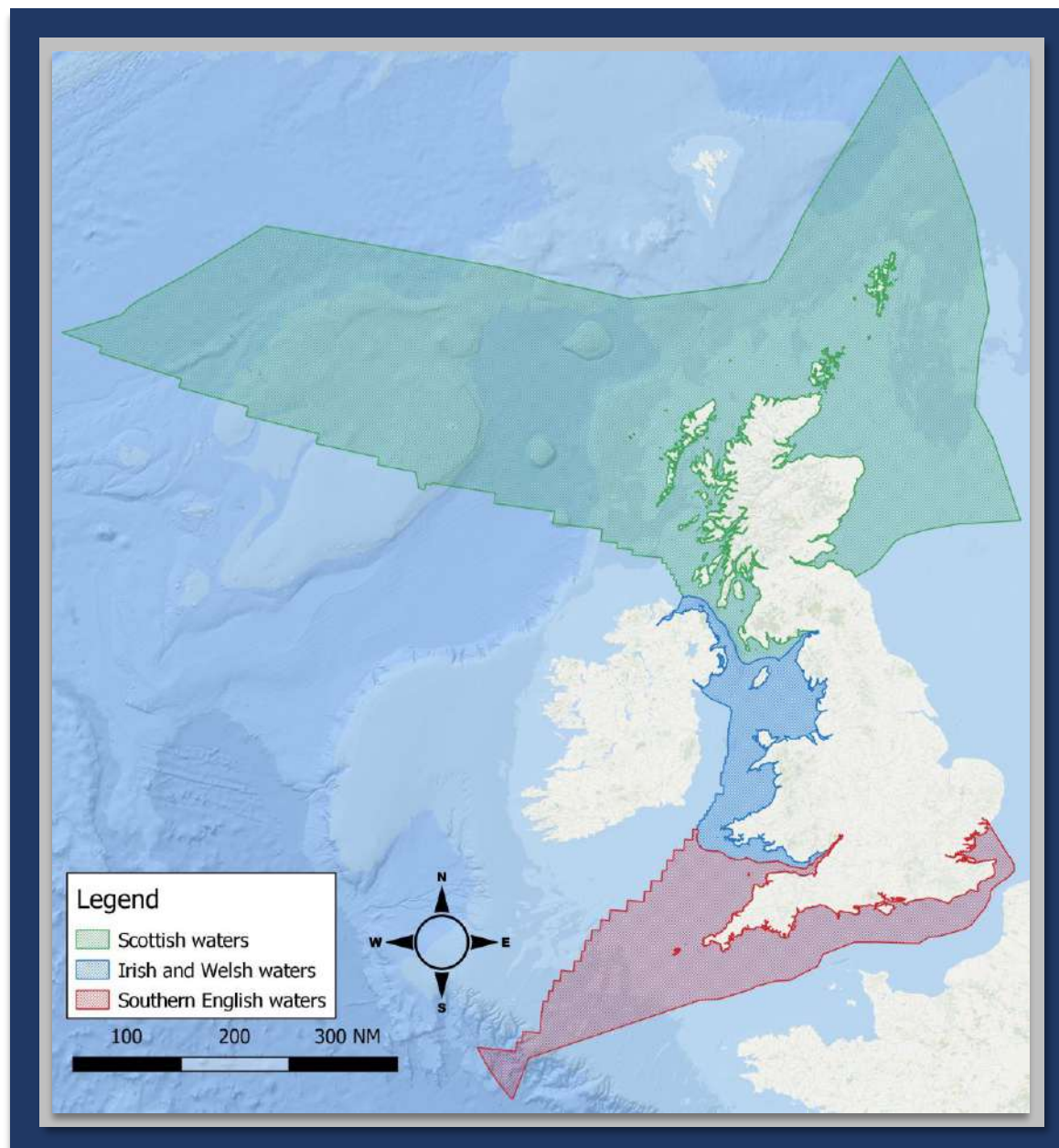


Coastal Futures 2023



# UK-wide blue carbon inventory





“

More than two thirds of the UK is under the sea, yet carbon accounting stops on land, creating a substantial blind spot around the carbon storage capacity of UK seas.”





1

Review current extent and distribution of blue carbon habitats

2

Assessment of carbon storage/sequestration rates by habitat type, regional sea area and within Marine Protected Areas

3

Risks from pressures with estimates of direction and magnitude of changes by habitat

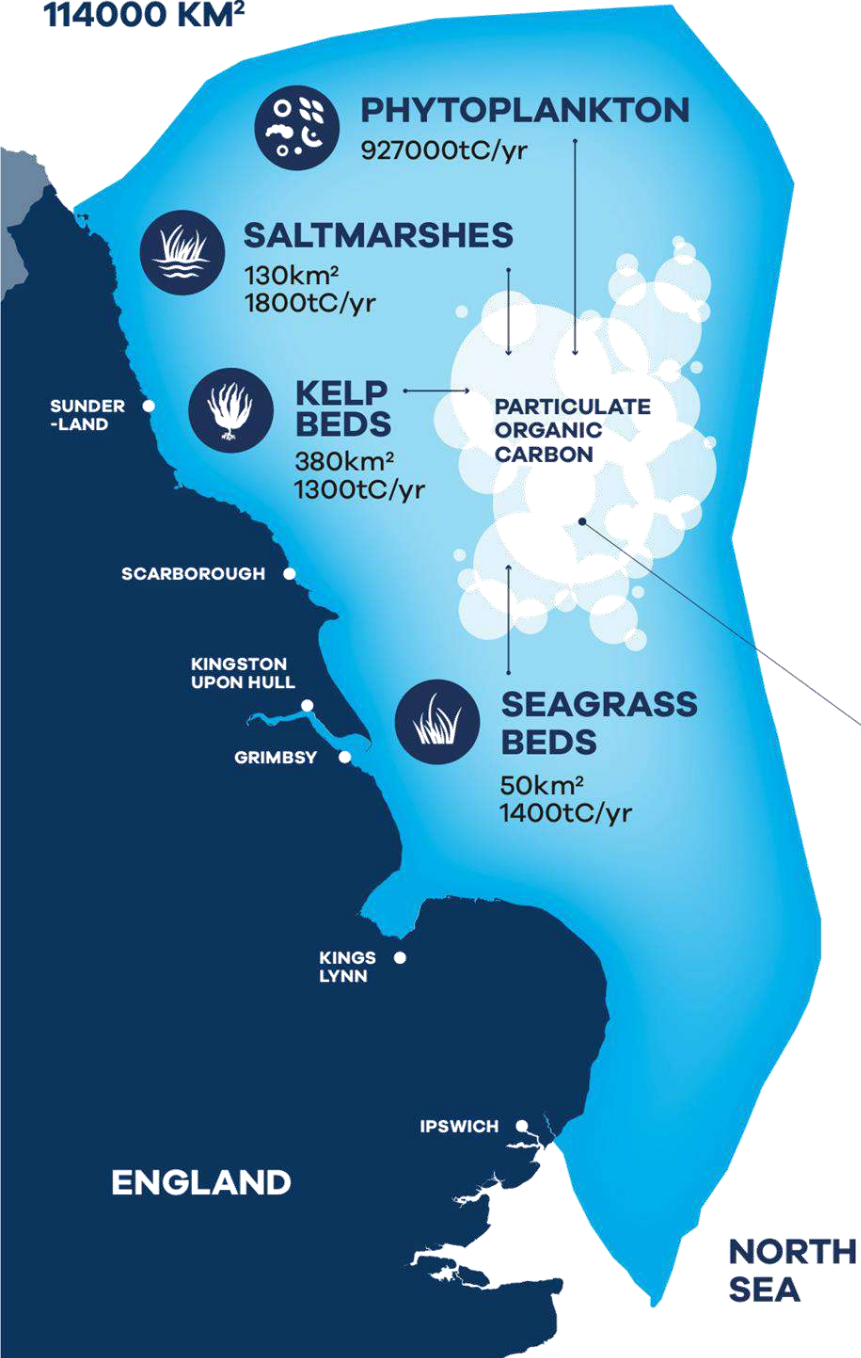
4

A case study for each regional sea area to provide more detailed information on specific areas

“

From vibrant seagrass meadows to cold water corals, our marine environment is not only rich in wildlife but vitally important for storing carbon and tackling climate change.”

PROJECT AREA  
114000 KM<sup>2</sup>



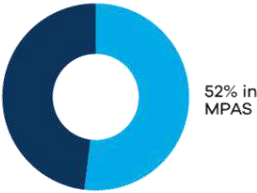
KEY

tC/yr  
Organic carbon  
accumulation  
(tonnes per year)

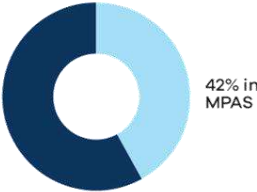
MtC  
Million tonnes  
carbon

CARBON  
STORES

ORGANIC CARBON  
37 MtC



INORGANIC CARBON  
63 MtC



**ASSESSMENT OF CARBON CAPTURE AND STORAGE IN NATURAL SYSTEMS WITHIN THE ENGLISH NORTH SEA**  
(INCLUDING WITHIN MARINE PROTECTED AREAS)

This report was written by:  
SAMS, Cefas, Newcastle University, University of St Andrews

This research was co-funded by:  
North Sea, Blue Baring Foundation, skyU, giving nature a home

Consultants Professor Dan Laffoley and Professor John M Boxer guided this process and provided their expertise.

**“The results of this study could be a major asset to decision-makers in the UK in seeing how an investment in our network of MPAs will benefit both our iconic wildlife and keep greenhouse gasses locked up.”**

**rspb**  
ASSESSMENT OF CARBON CAPTURE AND STORAGE IN NATURAL SYSTEMS WITHIN THE ENGLISH NORTH SEA (INCLUDING WITHIN MARINE PROTECTED AREAS)



**Let's see the results!**

# Let's see the results!

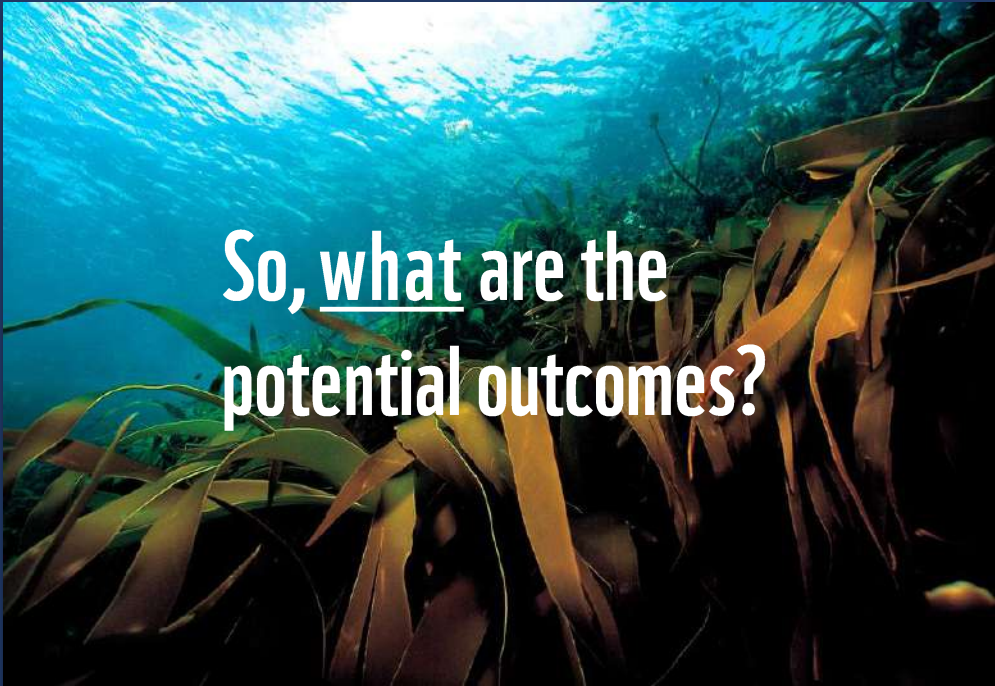


(coming June 2023)



how

who



So, what are the  
potential outcomes?

where

why

## Science

Centralised information on scientific/data gaps, and a harmonised approach on how we can address these



So, what are the potential outcomes?

who

where

why



## Science

Centralised information on scientific/data gaps, and a harmonised approach on how we can address these

who

## Policy

Policy frameworks where blue carbon is integrated into spatial planning (e.g., MPAs and management measures)

why



So, what are the potential outcomes?

## Science

Centralised information on scientific/data gaps, and a harmonised approach on how we can address these

who



So, what are the potential outcomes?

## Policy

Policy frameworks where blue carbon is integrated into spatial planning (e.g., MPAs and management measures)

## Advocacy

Increased advocacy to emphasise why blue carbon is important in climate change mitigation



## Science

Centralised information on scientific/data gaps, and a harmonised approach on how we can address these

## Outreach

Effective engagement and collaboration with stakeholders who interact with blue carbon on local, regional, and national scales




So, what are the potential outcomes?

## Policy

Policy frameworks where blue carbon is integrated into spatial planning (e.g., MPAs and management measures)

## Advocacy

Increased advocacy to emphasise why blue carbon is important in climate change mitigation



**WHEN = NOW**



A vertical strip on the left side of the slide showing a close-up of green seagrass blades underwater against a light blue background.

**Thank you**

**Tom Brook**

**Blue Carbon Technical Officer**

 **tbrook@wwf.org.uk**





# #CoastalFutures23

Livestream & London

25-26 January 2023







30th annual conference

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# SESSION 2b

## **DELIVERING MARINE RESTORATION: Net Gain, Blue Carbon, Restoration and Re-Wilding**

**Dr Benjamin Green, Environment  
Agency**

*ReMeMaRe: spatial prioritisation to develop  
a national estuarine and coastal restoration  
strategy*

25th & 26th January, 2023 | Royal Geographical Society, London & online



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# Spatial prioritisation to develop a national estuarine and coastal restoration strategy



**Dr Benjamin Green – Environment Agency, Estuaries and Coast Planning**

[ben.green@environment-agency.gov.uk](mailto:ben.green@environment-agency.gov.uk) / @saltmarshben

**Coastal Futures, January 2023**

**ReMeMaRe**





# Restoration Potential Layers



Saltmarsh



Vegetated shingle



Seagrass



Sand dunes



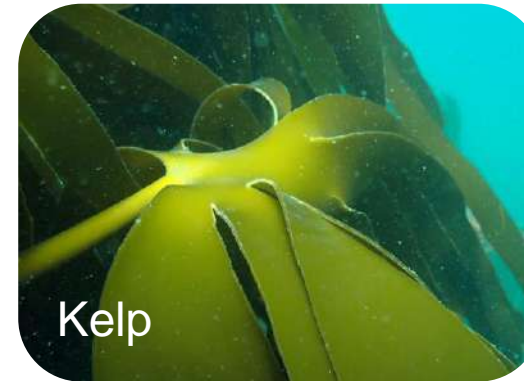
Native oyster beds



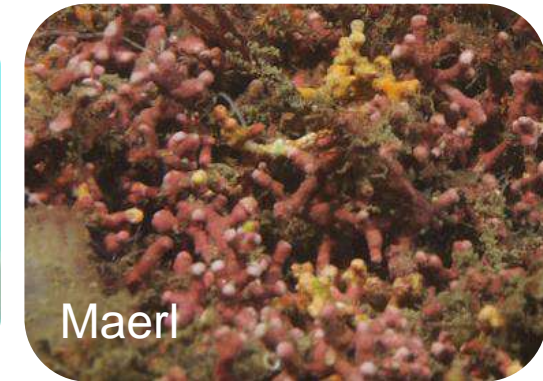
Sea pen habitat



*Modiolus* reefs



Kelp



Maerl

**Natural England**  
Potential Mapping

**Marine Restoration Potential (MaRePo)**

Natural England / Environment Agency  
Crown Estate OWEC-funded project

**ReMeMaRe**  
Restoration Potential Maps



# Restoration Potential Layers



Saltmarsh



Vegetated shingle



Seagrass



Sand dunes



Native oyster beds

**Natural England**  
Potential Mapping

**ReMeMaRe**  
Restoration Potential Maps



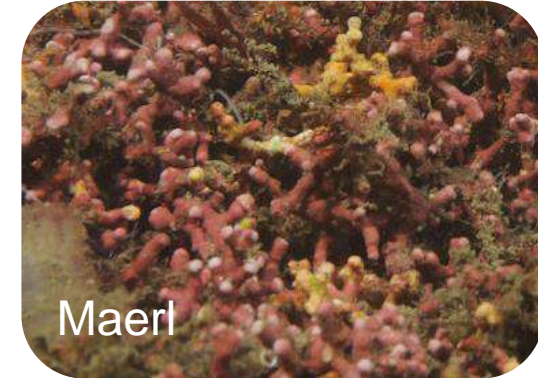
Sea pen habitat



*Modiolus* reefs



Kelp



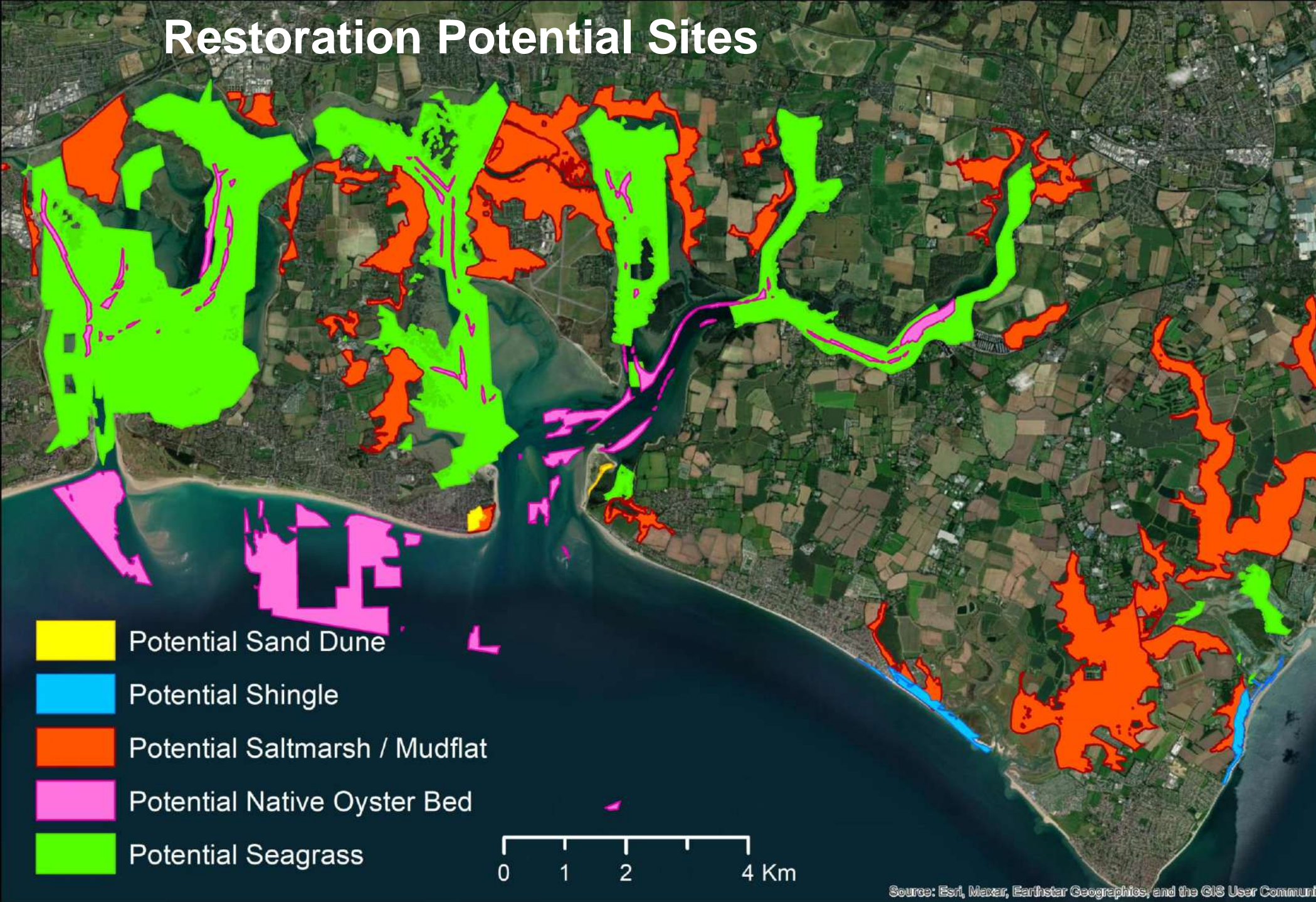
Maerl

**Marine Restoration Potential (MaRePo)**

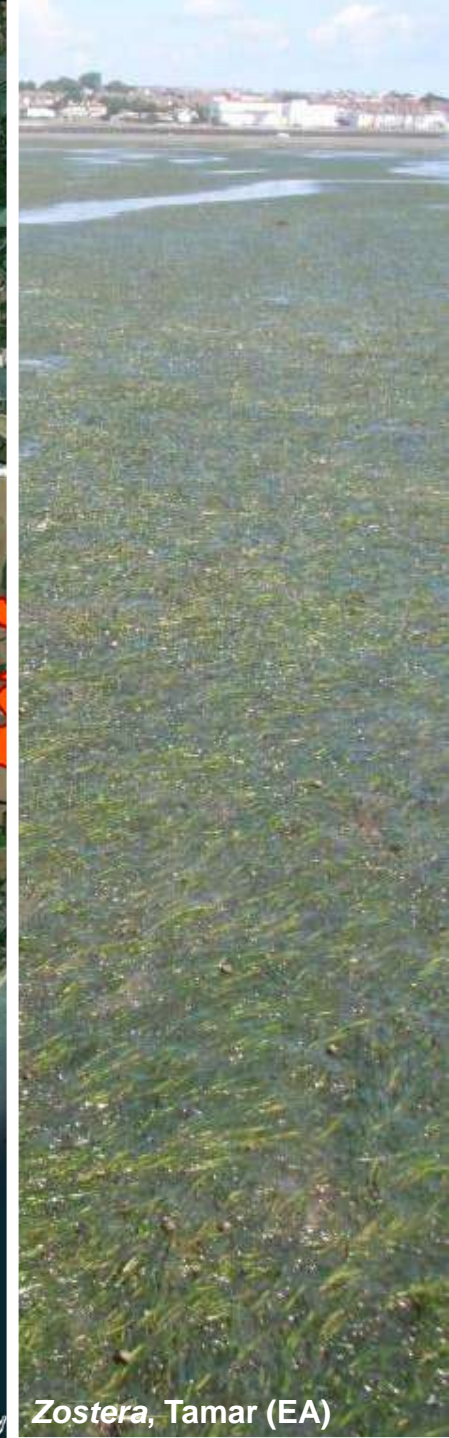
Natural England / Environment Agency  
Crown Estate OWEC-funded project



# Restoration Potential Sites



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

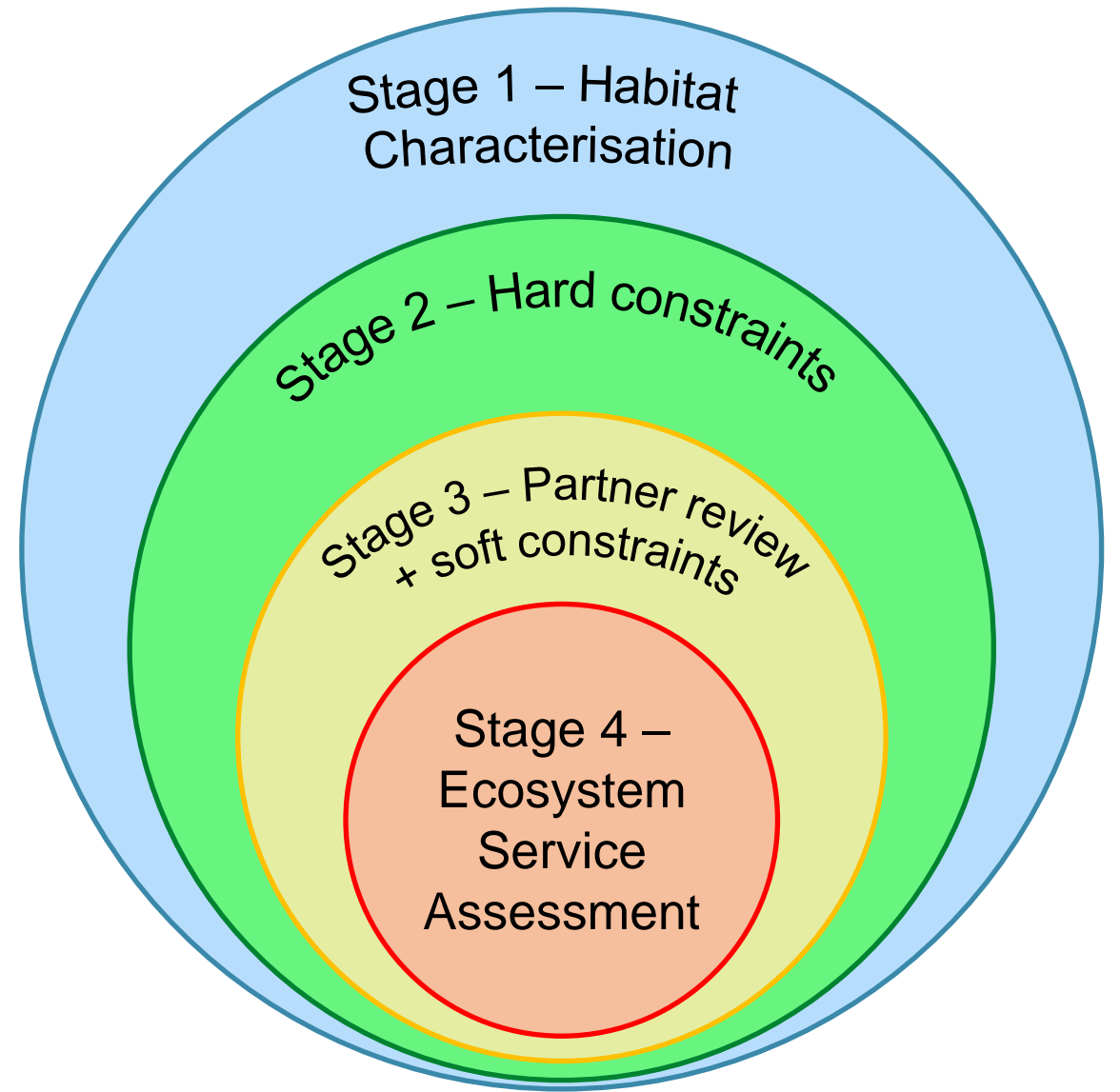


*Zostera*, Tamar (EA)



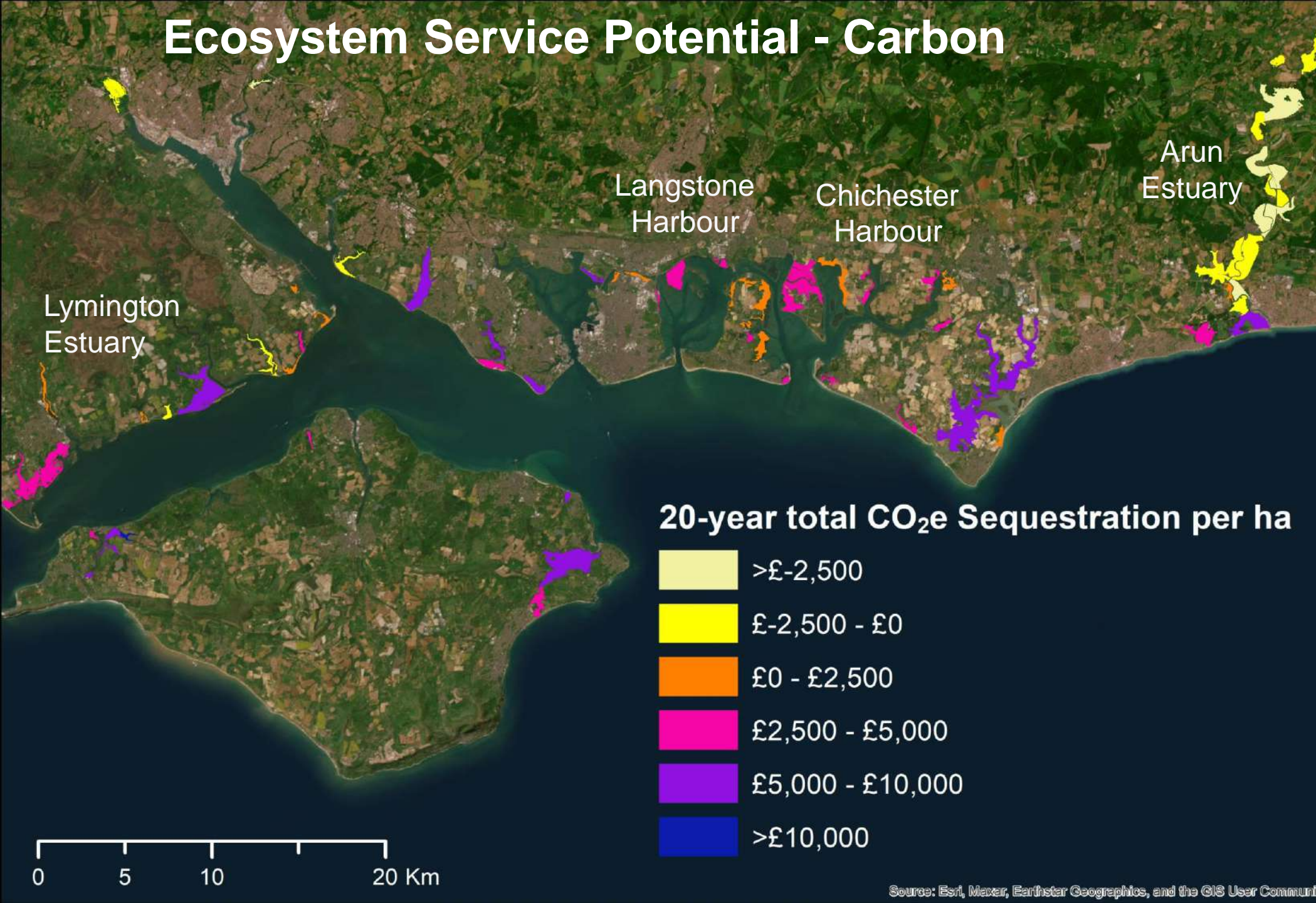
# Restoration Prioritisation

- National strategic approach required.
- Shortlist of 50-100 sites per habitat
- ReMeMaRe and local partner inputs to identify potential conflicts





# Ecosystem Service Potential - Carbon



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

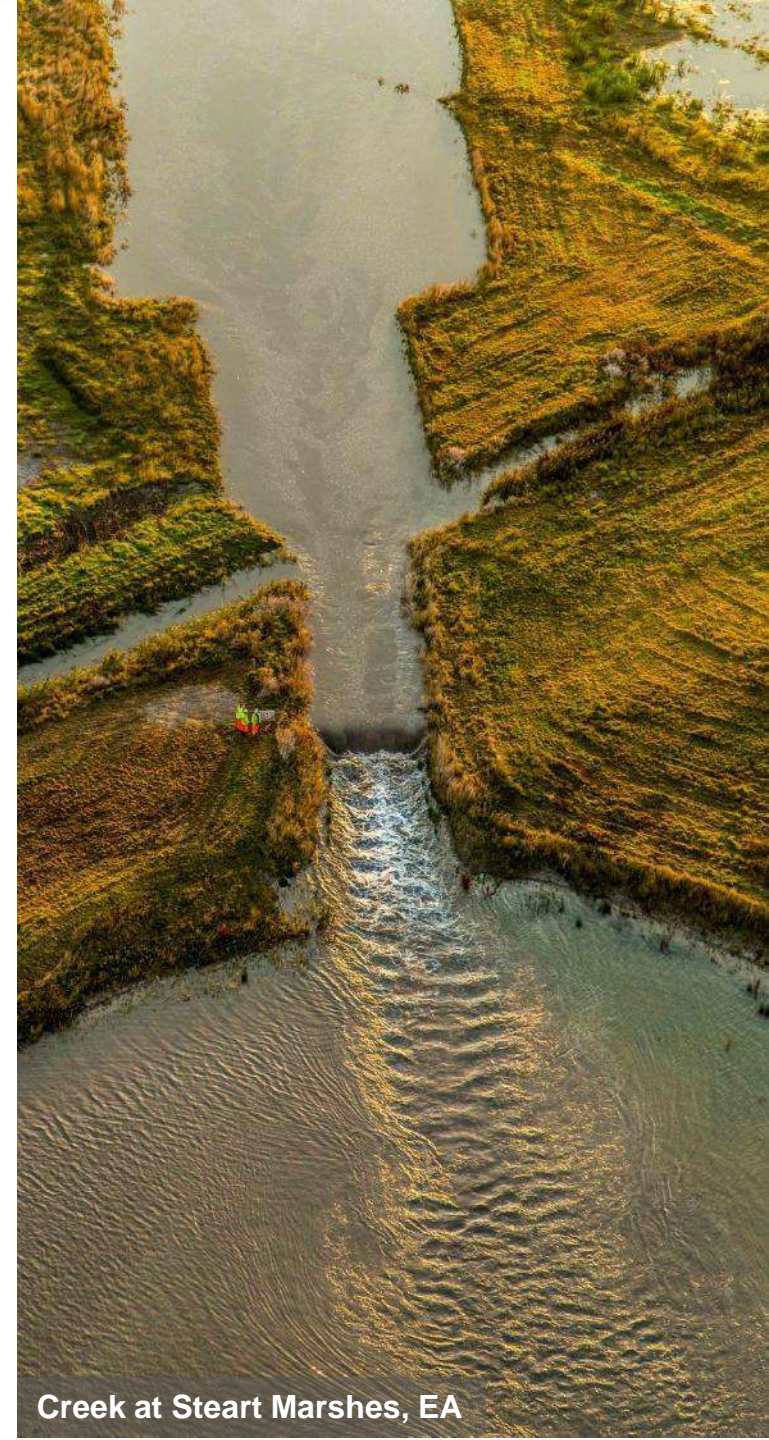


Greatham Creek (EA)



# Key Messages:

- **Restoration potential areas:** where new habitat **creation** could be the most successful
- **National strategic approach to restoration** required to support local delivery.
- **Prioritisation** will create a shortlist based on ecosystem services & delivery potential.
- **Will provide direction / influence** for policy and planning.





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### 25-26 January 2023







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# SESSION 2b

## **DELIVERING MARINE RESTORATION: Net Gain, Blue Carbon, Restoration and Re-Wilding**

**Dr James Robinson, WWT**

*Restoration at Scale: from local to global*

25th & 26th January, 2023 | Royal Geographical Society, London & online



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# Restoration at scale: from local to global

Dr. James Robinson, Director of Conservation, WWT



WWT

Wednesday 25 January 2023

# Local

---

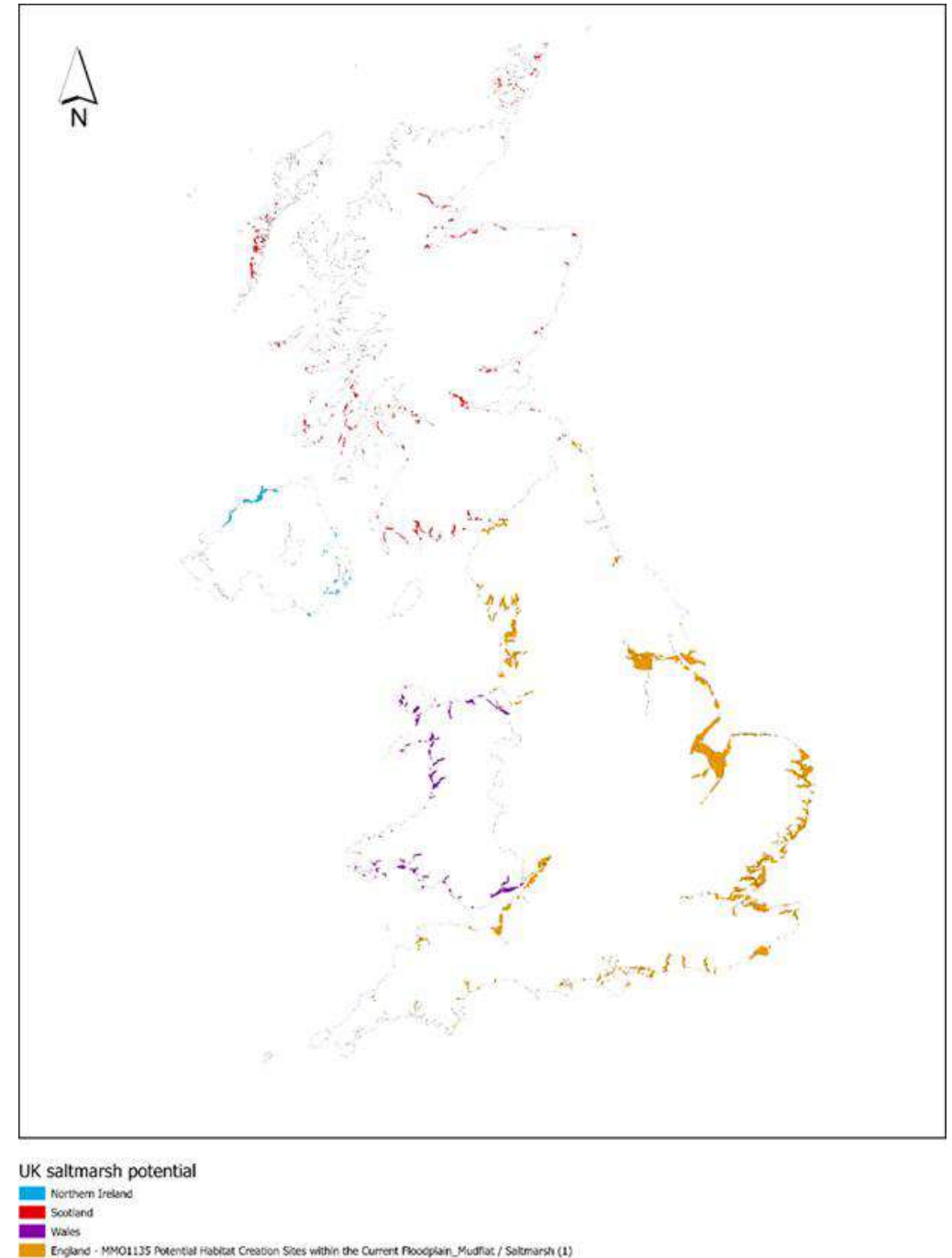




# The opportunity

---

- The Natural Capital Committee found a strong economic case for the creation of 22,000 hectares of saltmarsh around the English coastline
- Our opportunity mapping identifies 306,688 hectares of saltmarsh creation potential across the entire UK



# Three main ingredients

---

- **PROCESS** (inc. direct delivery, capacity building and community engagement)
- **PARTNERSHIP** (need involvement of national and local governments, the investment and know-how of businesses, and a process of co-creation with landowners and local communities)
- **POLICY** (need policies that provide the necessary information, plans and funding)





# Top 3 policy changes that will create change at scale

---

1. By 2025, the UK Government needs to incorporate coastal wetland creation as a nature-based solution into the UK's **Nationally Determined Contribution (NDC)** and to include it in the UK **Greenhouse Gas Inventory**
2. By 2025, we need to see the UK Government and devolved administrations support a nationally recognised **Saltmarsh Carbon Code** that sets clear standards for best practice in saltmarsh creation, restoration and maintenance
3. We are calling on the UK Government to put the **funding mechanisms** in place to facilitate the creation and restoration of coastal wetlands for carbon sequestration through government and private investment by 2025 (using existing initiatives that are well placed to do so).

# **Wetlands for Carbon Storage** Creating and managing saltmarshes to store blue carbon in the UK

---

## **A Route Map**



Find out more about how to create saltmarshes at scale at: <https://www.wwt.org.uk/our-work/projects/blue-recovery>



# Global

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# Global

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- A World Coastal Forum was officially launched at Ramsar COP14 in Geneva last year
- The WCF is foreseen to be an international, multi-stakeholder platform to **catalyse, facilitate and upscale local and national coastal conservation efforts**
- Find out more at [www.worldcoastalforum.org](http://www.worldcoastalforum.org)





# Summary

---

- We need urgent action to plan and establish projects that create and restore saltmarsh, to deliver a range of co-benefits
- This will require public and private investment, and a blend of the two, to deliver at the scale required. We need to build the capacity of stakeholders to create these habitats, primarily through managed realignment
- Engaging with communities to co-create projects at all stages will be crucial to the creation of saltmarshes for carbon and co-benefits that sit at the heart of community life
- **We need to act now.**





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# SESSION 2b

## **DELIVERING MARINE RESTORATION: Net Gain, Blue Carbon, Restoration and Re-Wilding**

**Dr Joanne Preston, Portsmouth  
University**

*Moving towards seascape restoration in the  
marine environment*

25th & 26th January, 2023 | Royal Geographical Society, London & online



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# SESSION 2b

## **DELIVERING MARINE RESTORATION: Net Gain, Blue Carbon, Restoration and Re-Wilding**

**Keith Cooper, Cefas**

*One Benthic: New insights using big data*

25th & 26th January, 2023 | Royal Geographical Society, London & online



[www.coastal-futures.net](http://www.coastal-futures.net)



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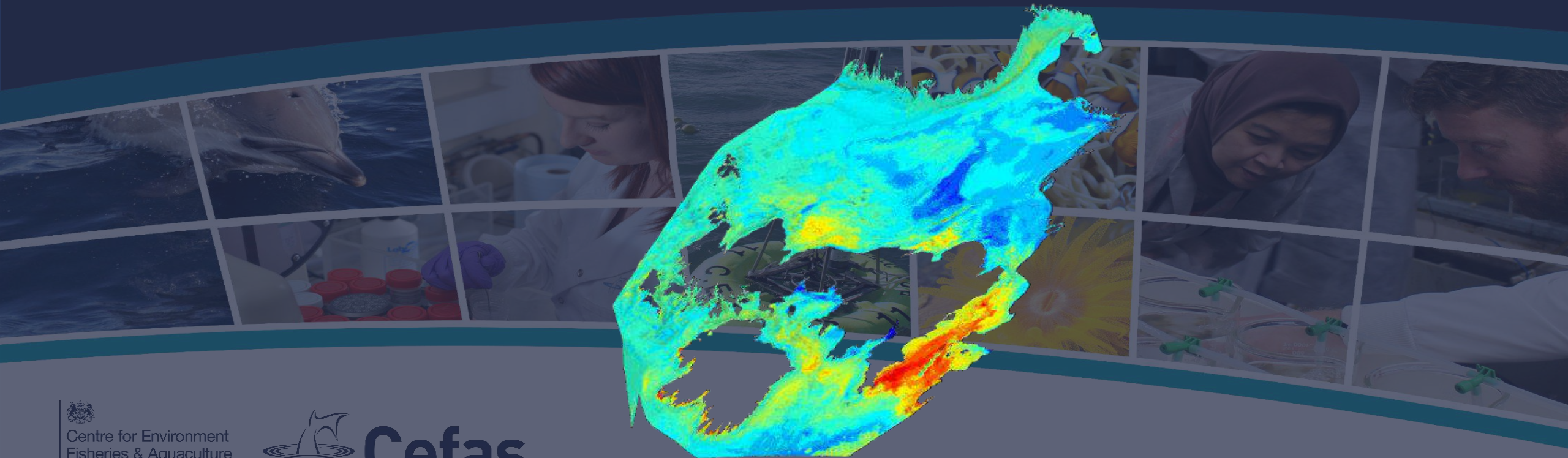


#CoastalFutures23



# New insights using big data

Keith Cooper | Marine Ecologist/Data Scientist | Cefas





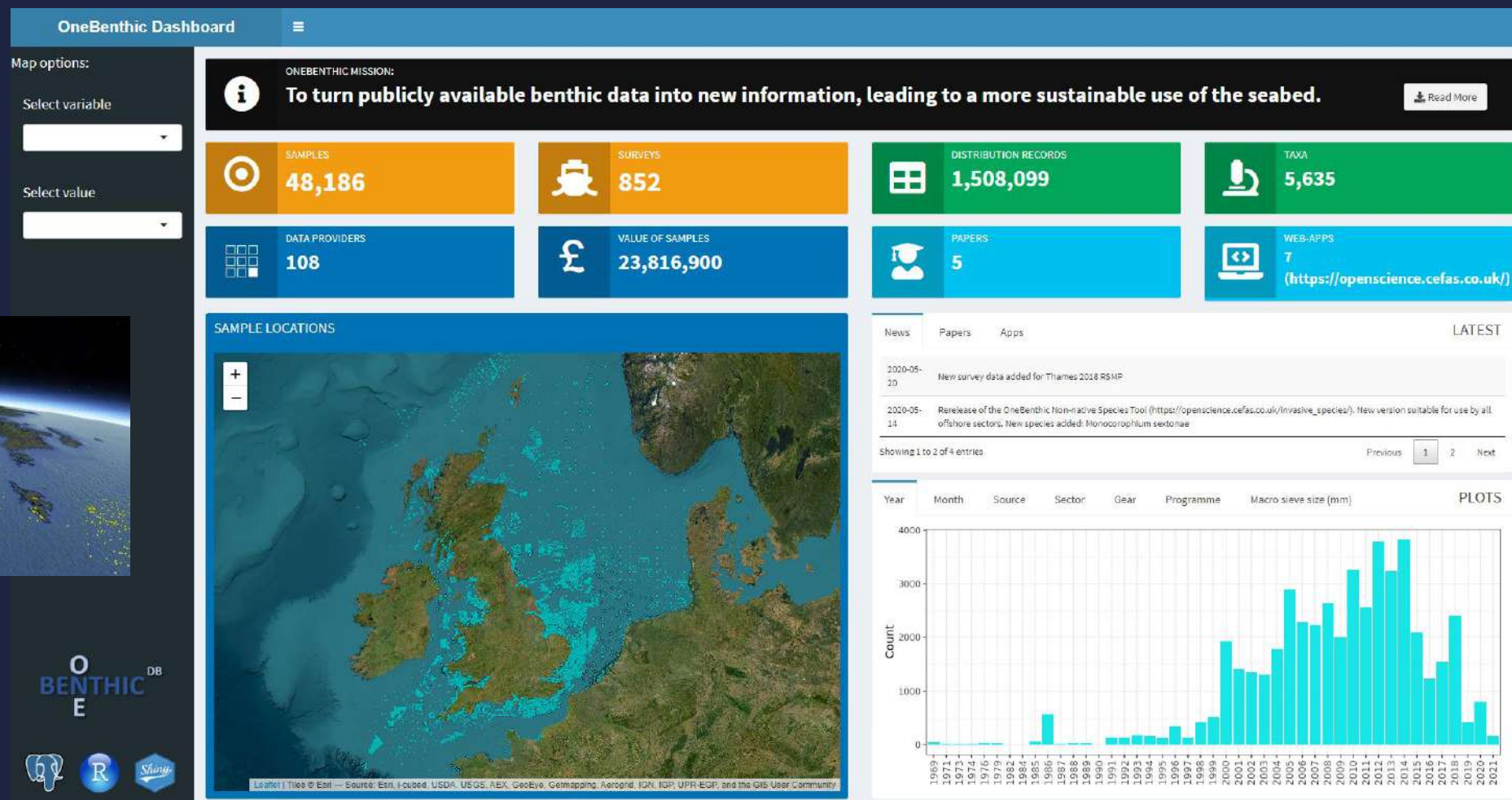


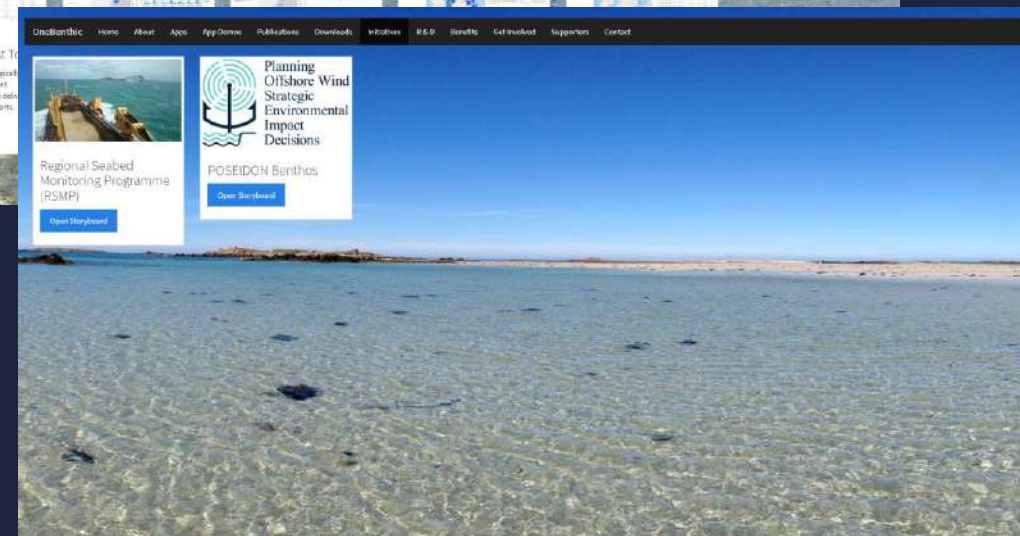
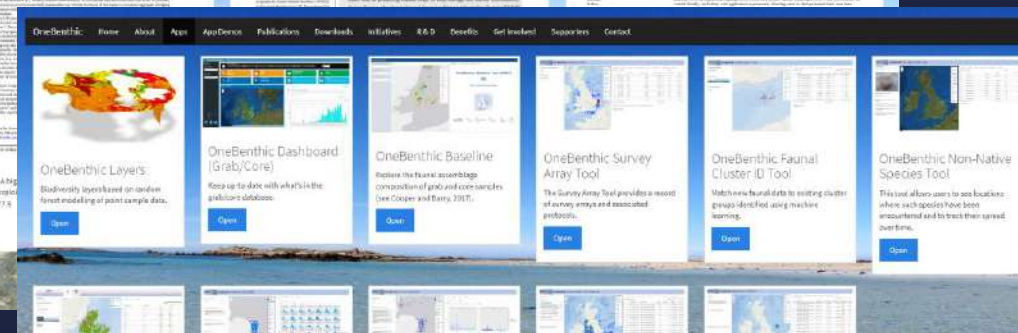
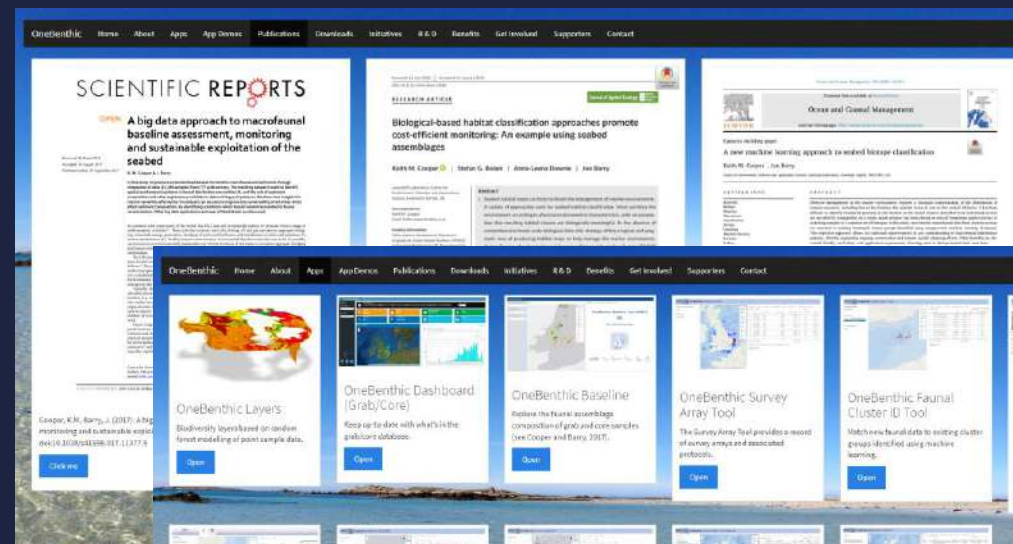
*'Big data reveals new, stark pictures of the state of our environments. It also reveals 'bright spots' amongst the broad pattern of decline and—crucially—the key conditions for these cases. Big data analyses could benefit the planet if tightly coupled with ongoing sustainability efforts.'*

Runting et al. (2020)





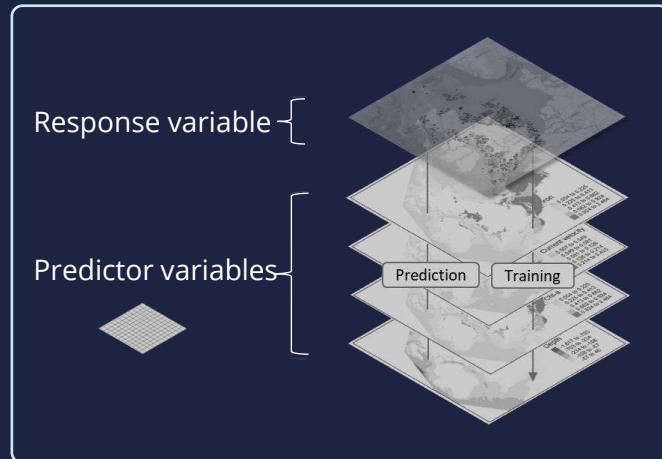




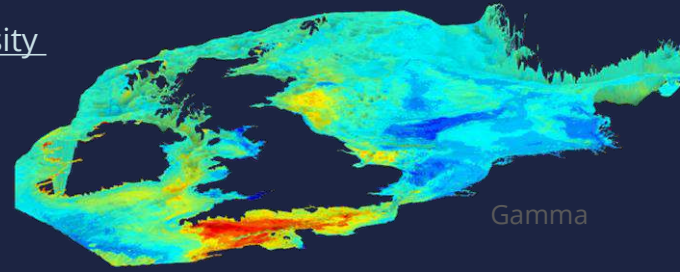


# How are the data being used?

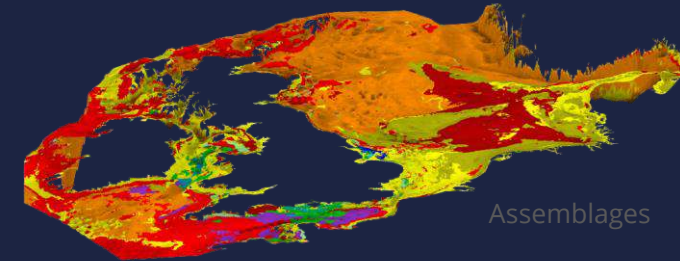
# 1. Modelling Biodiversity



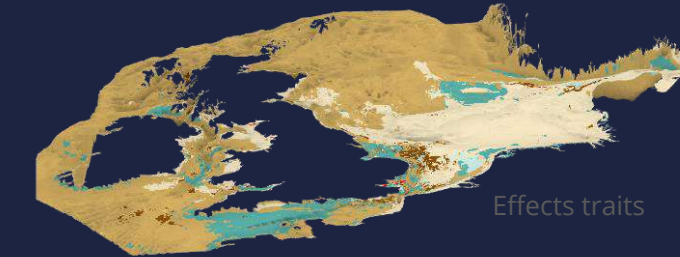
Biodiversity  
metrics



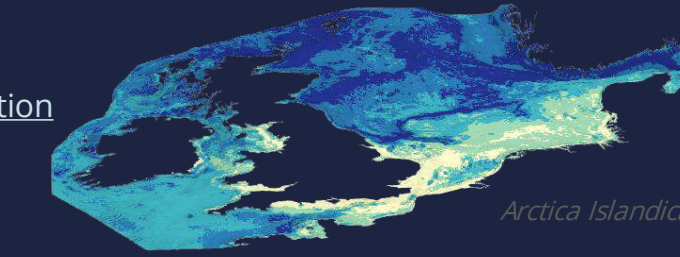
Structure



Traits



Species  
Distribution



Received: 13 July 2018 | Accepted: 21 January 2019  
DOI: 10.1111/1365-3113.12581

RESEARCH ARTICLE

Journal of Applied Ecology 2019, 56, 1–12

## Biological-based habitat classification approaches promote cost-efficient monitoring: An example using seabed assemblages

Keith M. Cooper | Stefan G. Bolam | Anna-Leena Downie | Jon Barry

Leeds University, Centre for  
Environment, Planning and Architecture,  
Leeds, UK

Correspondence  
Keith M. Cooper  
Email: keith.cooper@leeds.ac.uk

Funding information  
UK Natural Environment Research  
Council, Grant/Award Number: NE/L010056/1  
Biological Monitoring UK Continental Shelf  
Environment Fund and Natural Environment  
Research Council, Grant/Award Number: NE/L010056/1  
Leeds University, Research Fund

### Abstract

1. Seabed habitat maps can help facilitate the management of marine environments. A variety of approaches exist for seabed habitat classification. Most partition the environment according to physical environmental characteristics, with an assumption that resulting habitat classes are biologically meaningful. In the absence of comprehensive broad-scale biological data, this strategy offers a logical and pragmatic way of producing habitat maps to help manage the marine environment. Across Europe, the physical-based European Nature Information System (EUNIS) classification has gained wide acceptance, with maps used to classify broad-scale habitats within Marine Protected Areas and to inform monitoring programmes. An alternative approach to habitat classification, made possible by increasing quantities of data, is to use the biology to identify meaningful habitats. With such contrasting approaches, the question arises as to which provides the most robust and efficient basis for biological monitoring.

2. To investigate, we compared variability in macrofaunal assemblages across different EUNIS sediment classes to those of two new habitat classification approaches developed in this study. The first of these (PHY) is based on a wide suite of physical variables known to influence the fauna. The second (BIO) uses the fauna to identify meaningful habitats. Both classifications were produced using a training dataset (N&V grab samples) and employing k-means clustering and Random Forest Modelling. Power analysis of test set data (A125 samples) was used to assess the number of samples required to detect a 20% change in taxon richness and total abundance across all classes of each classification approach.

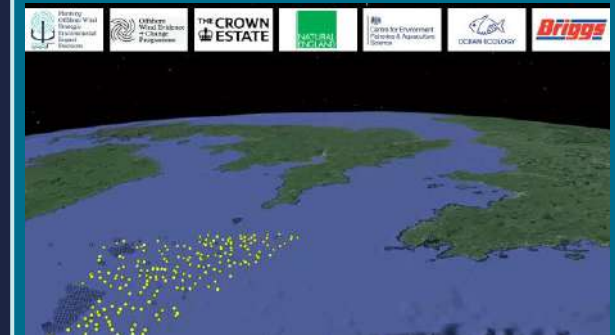
3. Results showed that across all habitat classes, the BIO classification required 49% and 33% fewer samples to detect the change in richness and abundance than EUNIS level 4. Whilst offering some improvement on EUNIS, PHY still required many more samples than BIO.

4. Synthesis and applications: Habitat maps based on biological data have generally lower within-habitat variability in community metrics than those produced using

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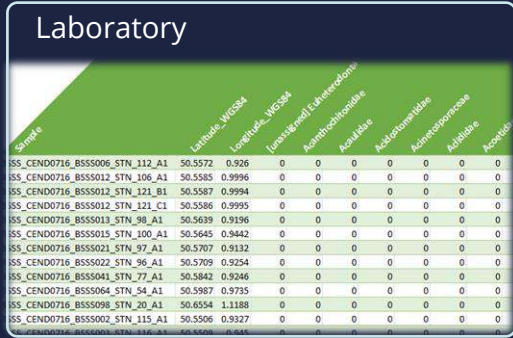

J. Appl. Ecol. 2019, 56, 1–12. doi:10.1111/1365-3113.12581

© 2019 Crown copyright. Journal of Applied Ecology © 2019 British Ecological Society





## Field



OneBenthic Faunal Cluster ID Tool

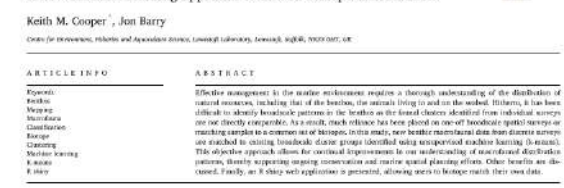
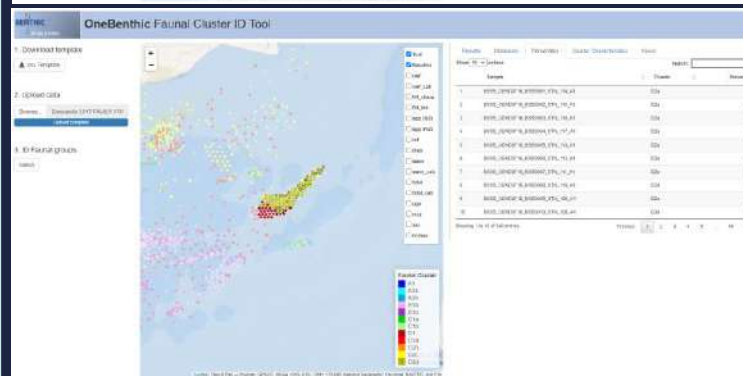
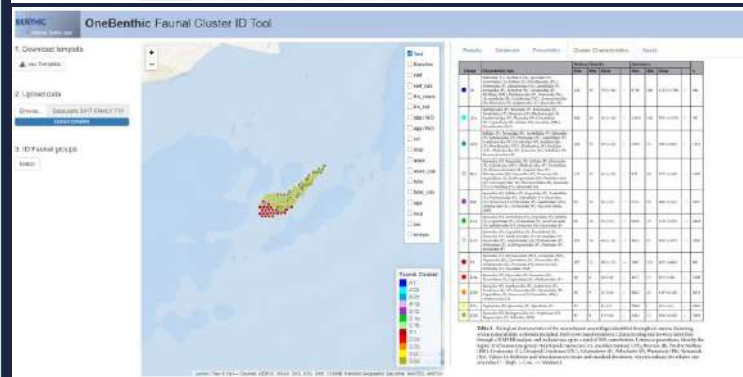
Download template  
Upload Sample  
Upload Data  
Download OTU Table  
Download OTU Table  
Download OTU Table  
Download OTU Table  
Download OTU Table

Map

Results

Sample	Species	Count
1	ONEBENTHIC_FAL_CLUSTER_1	1
2	ONEBENTHIC_FAL_CLUSTER_1	1
3	ONEBENTHIC_FAL_CLUSTER_1	1
4	ONEBENTHIC_FAL_CLUSTER_1	1
5	ONEBENTHIC_FAL_CLUSTER_1	1
6	ONEBENTHIC_FAL_CLUSTER_1	1
7	ONEBENTHIC_FAL_CLUSTER_1	1
8	ONEBENTHIC_FAL_CLUSTER_1	1
9	ONEBENTHIC_FAL_CLUSTER_1	1
10	ONEBENTHIC_FAL_CLUSTER_1	1

OneBenthic Faunal Cluster ID Tool



\* Corresponding author.  
E-mail address: kishu.singh@univie.ac.at (K.M. Singh).

<https://doi.org/10.1016/j.sbspro.2020.103261>  
Received 18 October 2019; Received in revised form 15 August 2020; Accepted 26 August 2020  
Available online 18 September 2020  
0964-5691/© 2020 Elsevier B.V. All rights reserved.

0964-5691/© 2020 Elsevier B.V. All rights reserved. This is an open access article under the Open Government License (OGL).

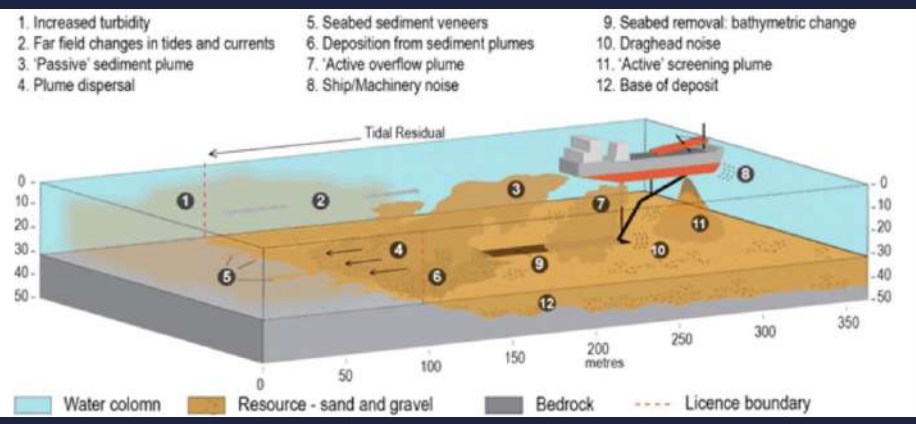
- Uses all the data
- Provides instant results
- Can be used for characterisation and monitoring

# 3. Regional Seabed Monitoring Programme

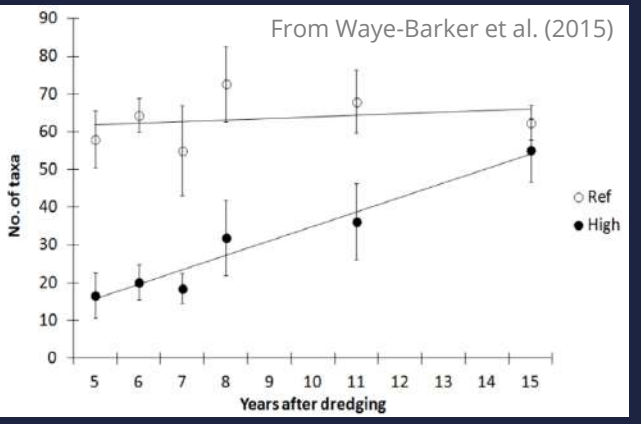
## Marine Aggregates Industry



## Effects



## Recovery



## Restoration

- Active restoration possible, but expensive and likely only partially successful.
- Need represents a failure of monitoring



## Licence condition

A standard licence condition requires developers to leave the seabed in a 'similar condition' post dredging.

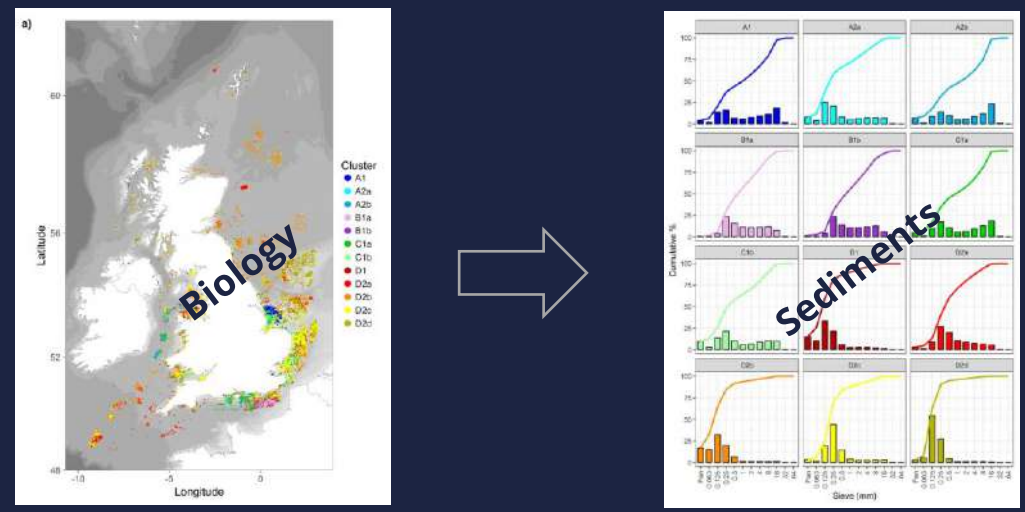
## Question

What constitutes 'similar'?



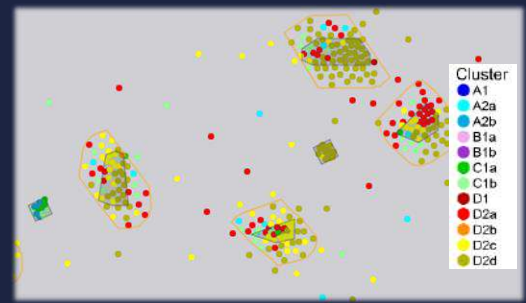
# 3. Regional Seabed Monitoring Programme (cont'd)

Use dataset to understand the relationship between biology and sediments



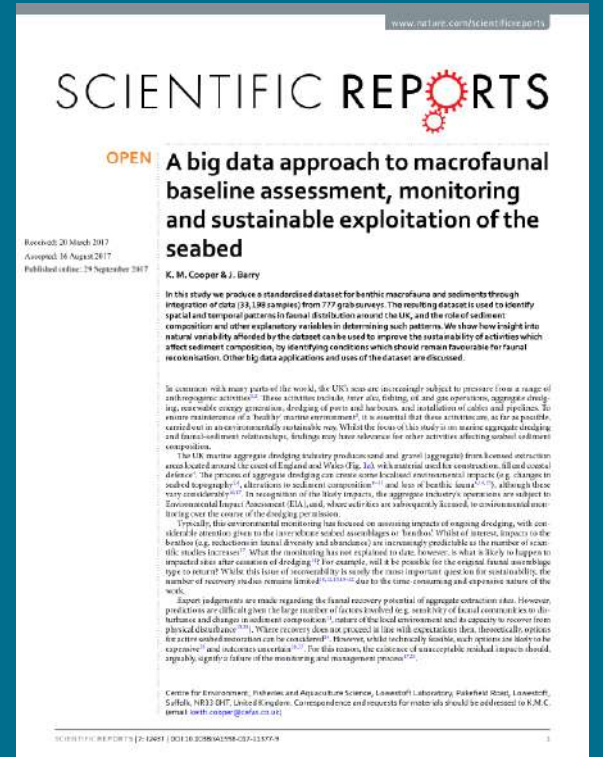
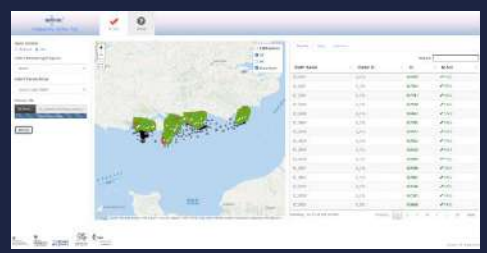
Baseline

- Establish what faunal communities exist before dredging



Monitoring

- Check sediments remain suitable for recolonisation
- Data analysed using a suite of web apps (see RSMP Storyboard for more details)



Benefits:

- Improved environmental protection
- 50% Lower costs (BMAPA, 2014)
- Allows for adaptive management



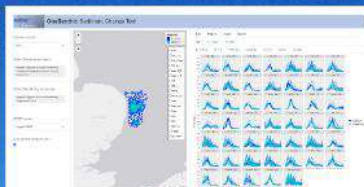




## Share your data

Your data will be visible in the apps

You'll be contributing to research and decision making



## Use Apps & Outputs

Turn your data into useful information

Improved understanding leads to better decisions



## Contribute to Core Funding Support

Infrastructure maintenance

Continue data harvesting



## Join the OneBenthic Forum

Stay up-to-date with developments

Help shape future direction

Work with stakeholders and other sectors on issues of common interest



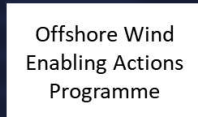
## Fund Further Research

New insights

Potential new ways of working (see 'Initiatives' tab)



## Funders:



## Data Providers:



## Colleagues:

Roi Martinez, Jon Barry, Claire Mason, Matthew Curtis, Stefan Bolam, Anna Downie, Jon Hawes, Murray Thompson...



[https://rconnect.cefas.co.uk/onebenthic\\_portal/](https://rconnect.cefas.co.uk/onebenthic_portal/)  
or via <https://openscience.cefas.co.uk/>



@OneBenthic



@onebenthic6170

# Thanks for listening!

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# SESSION 2b

## **DELIVERING MARINE RESTORATION: Net Gain, Blue Carbon, Restoration and Re-Wilding**

**Dr Richard Lilley, Project Seagrass**

*Becoming #GenerationRestoration:  
Innovation and ambition in seagrass  
conservation*

25th & 26th January, 2023 | Royal Geographical Society, London & online



[www.coastal-futures.net](http://www.coastal-futures.net)



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# Becoming #GenerationRestoration:

Innovation and ambition in seagrass conservation



UNITED NATIONS DECADE ON  
**ECOSYSTEM  
RESTORATION**  
2021-2030



*Zostera marina*



*Zostera noltii*



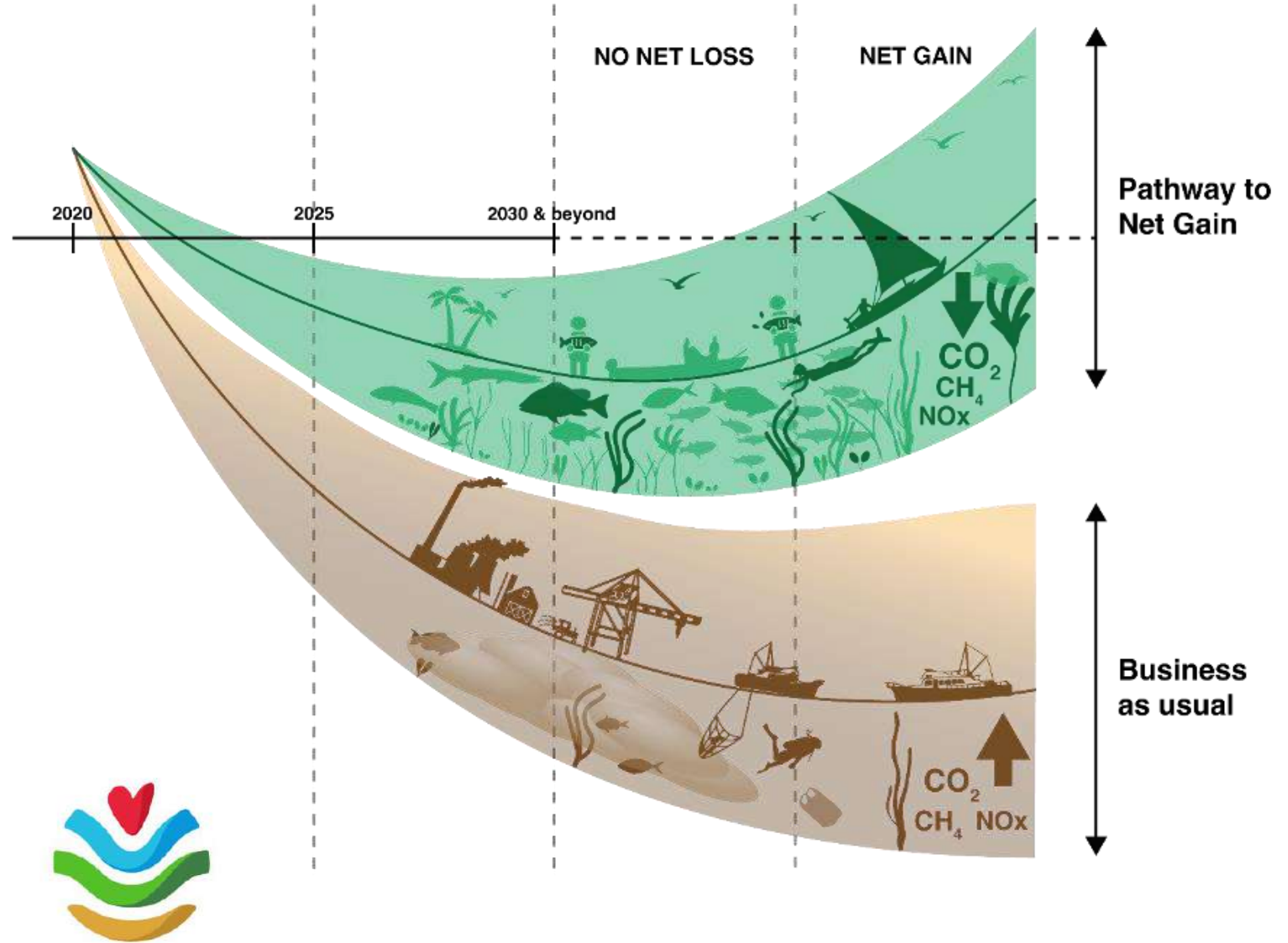


**1. Process**

**2. People**

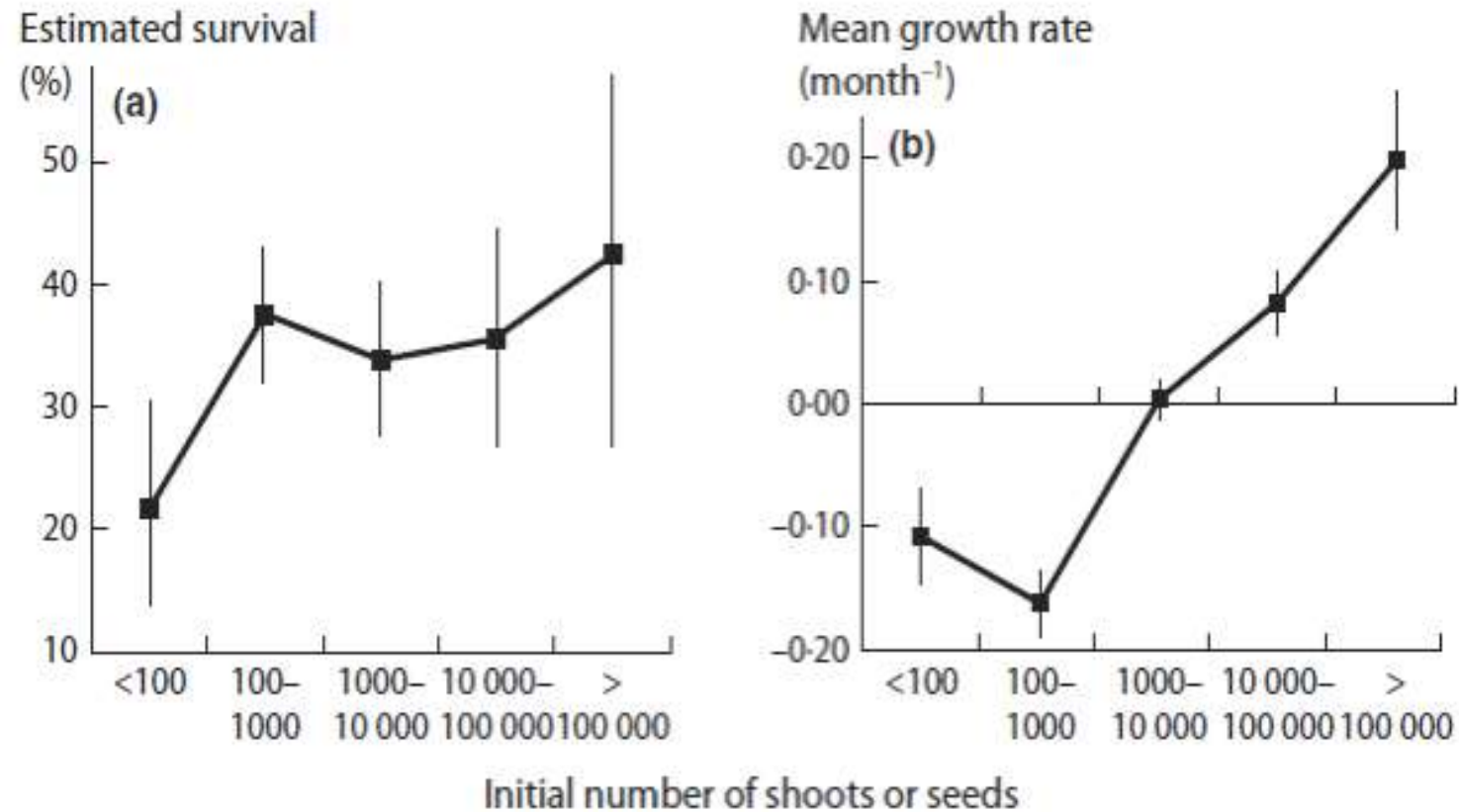
**3. Passion**





# #GenerationRestoration

## Global analysis of seagrass restoration: the importance of large-scale planting









An underwater scene featuring vibrant green seagrass blades and brown, feathery seaweed. The background is a clear blue sky with wispy white clouds, suggesting a transparent water environment. The word "Process" is overlaid in a large, white, sans-serif font.

# Process

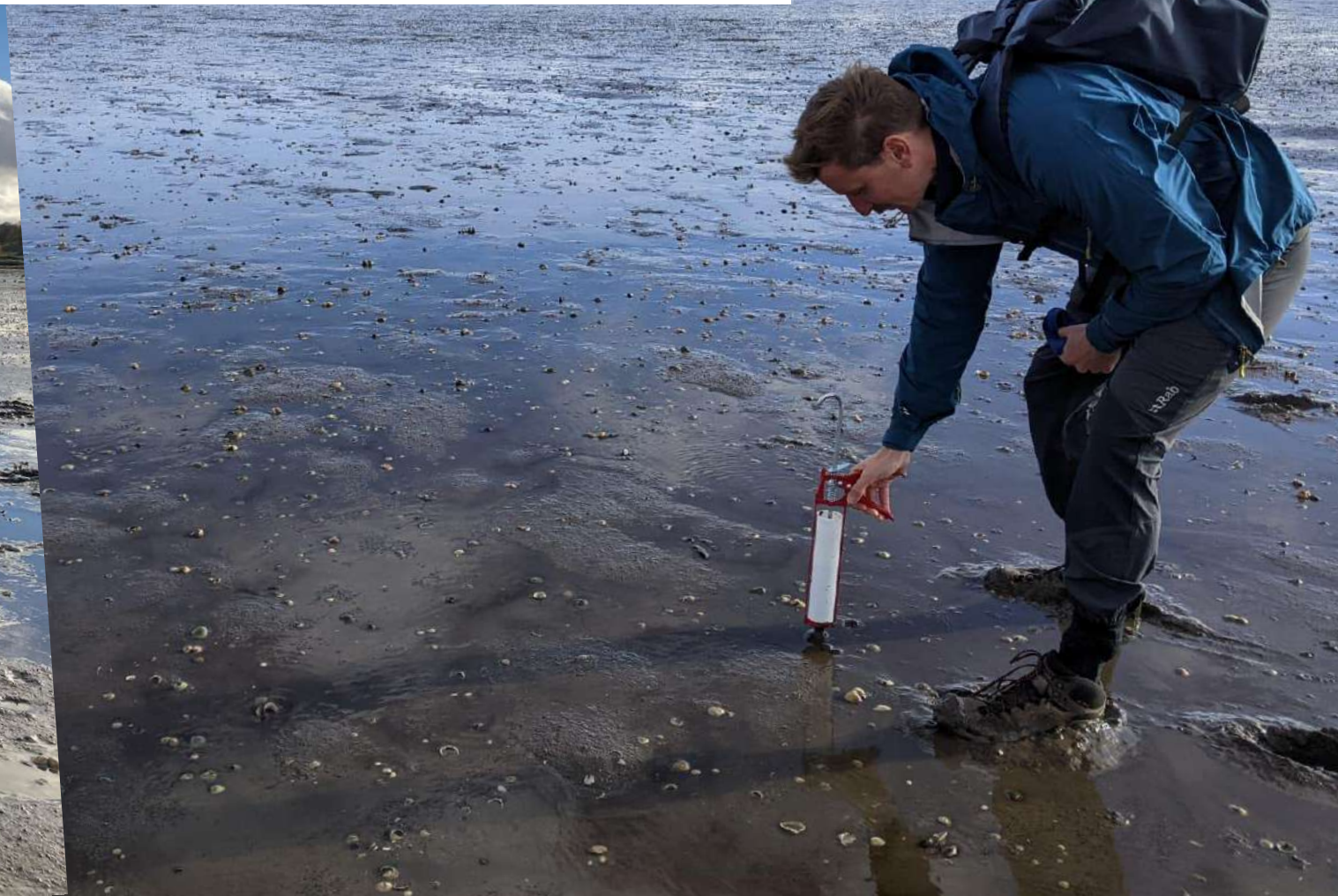


PRACTICE AND TECHNICAL ARTICLE |  Open Access |  

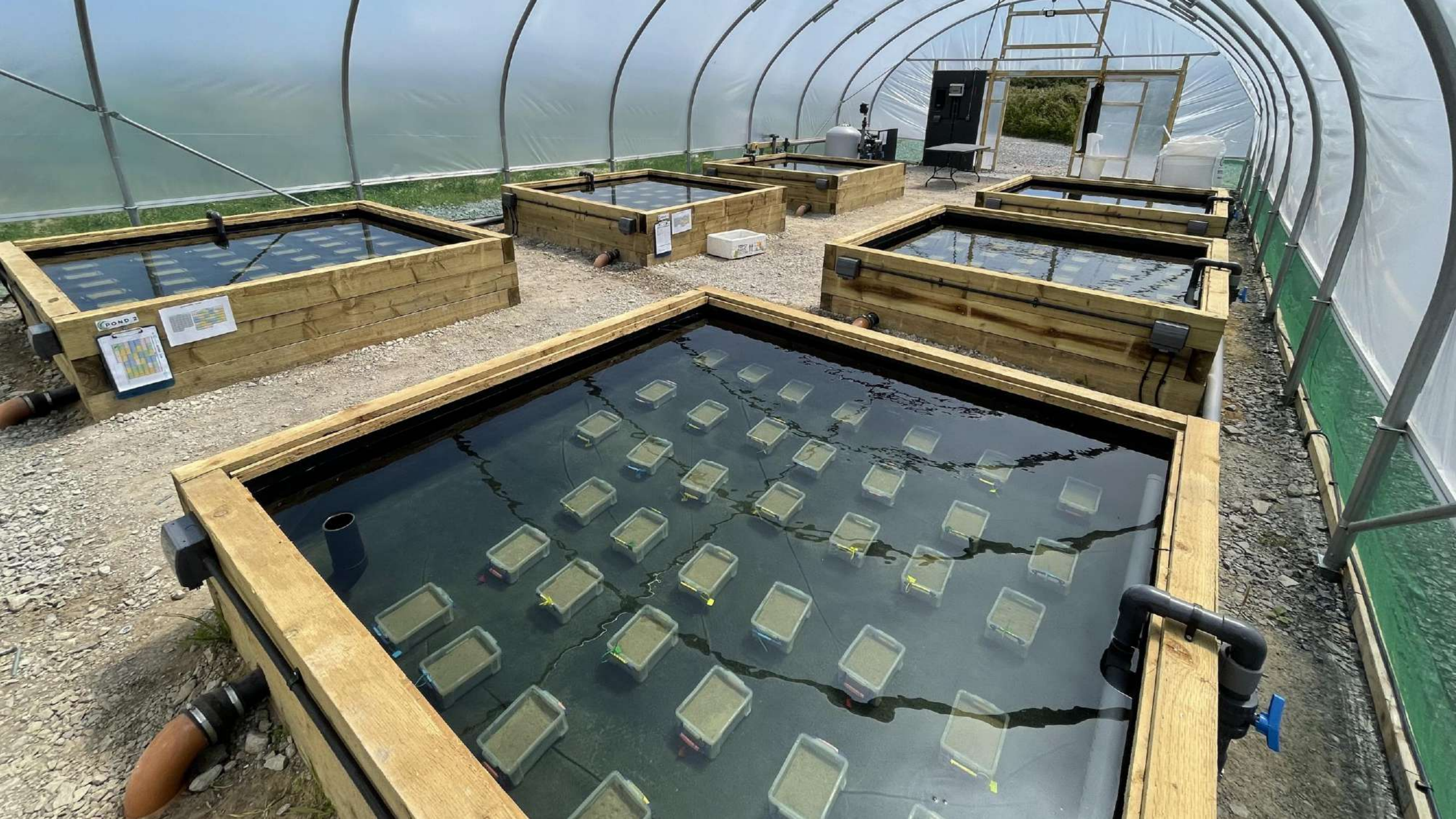
# Optimizing seed injection as a seagrass restoration method

Max L. E. Gräfnings , Jannes H. T. Heusinkveld, Dieuwke J. J. Hoeijmakers, Quirin Smeele, Henk Wiersema, Maarten Zwarts, Tjisse van der Heide, Laura L. Govers

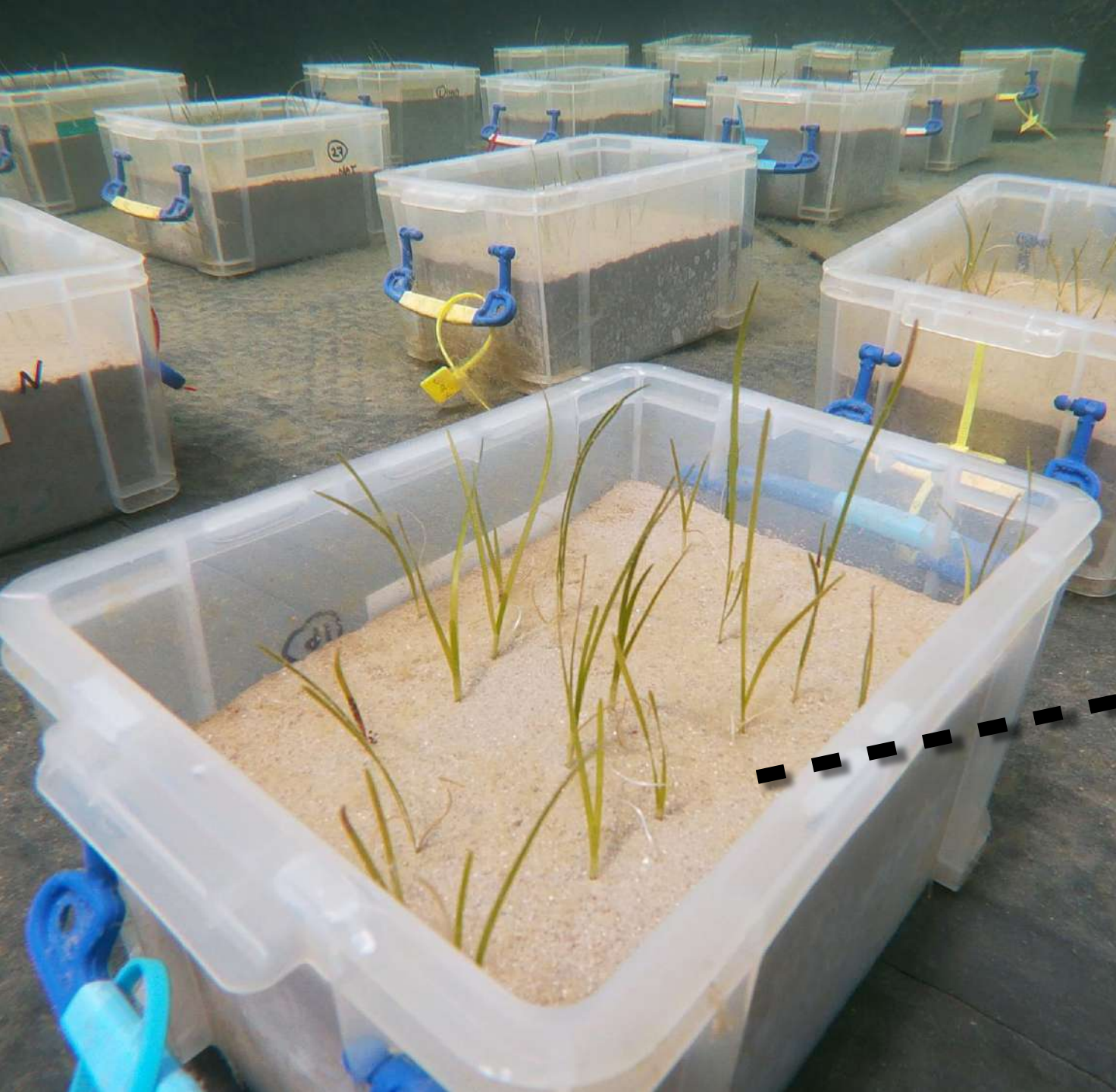
First published: 14 December 2022 | <https://doi.org/10.1111/rec.13851>





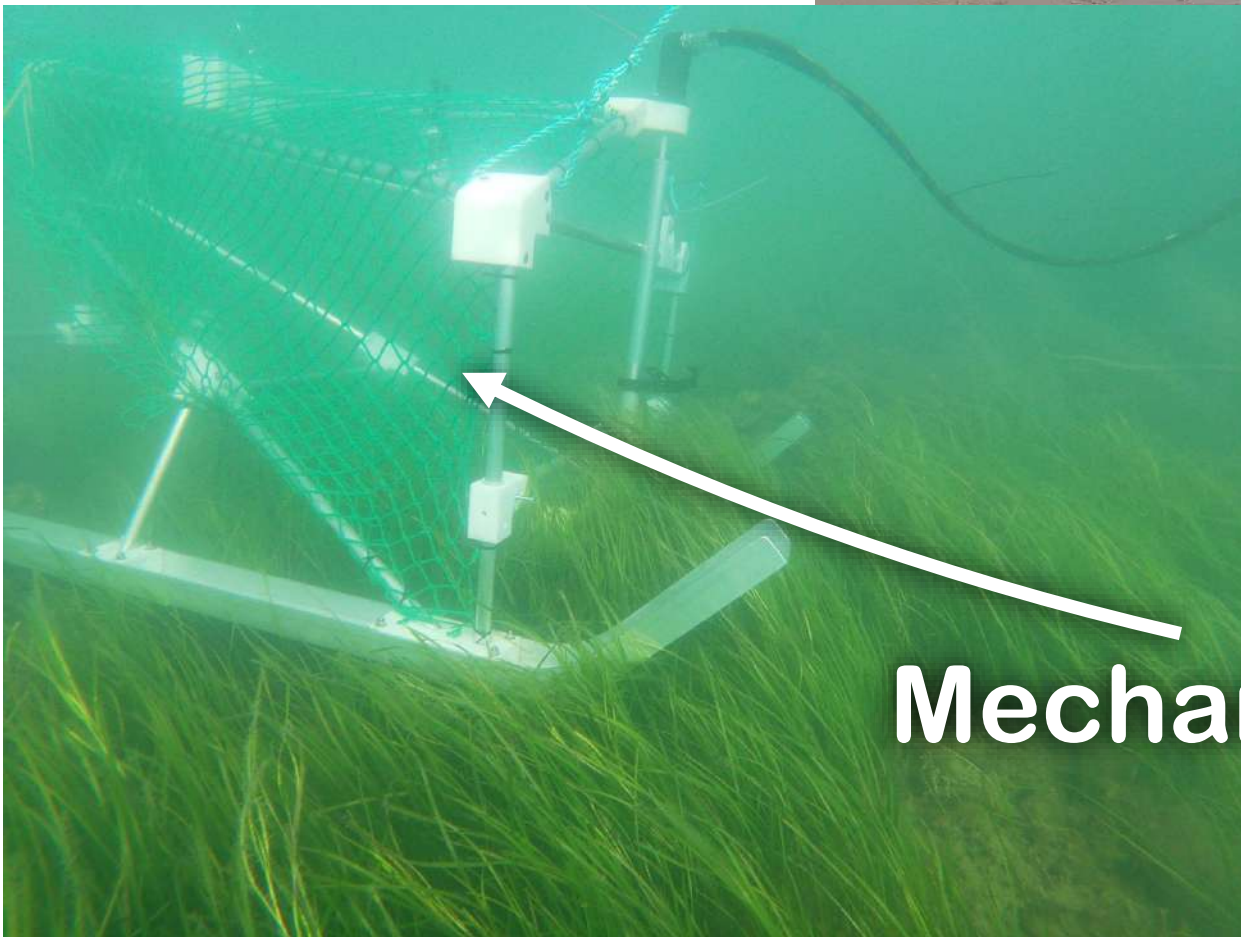









# Mechanical Seed Planter



# Mechanical Seed Harvester





650ha already  
restored in  
Wadden Sea  
(over 5 years)



0:01 / 2:02



HD





# Feedbacks

“the enhancing or amplification of an effect by its own influence on the process which gives rise to it.”

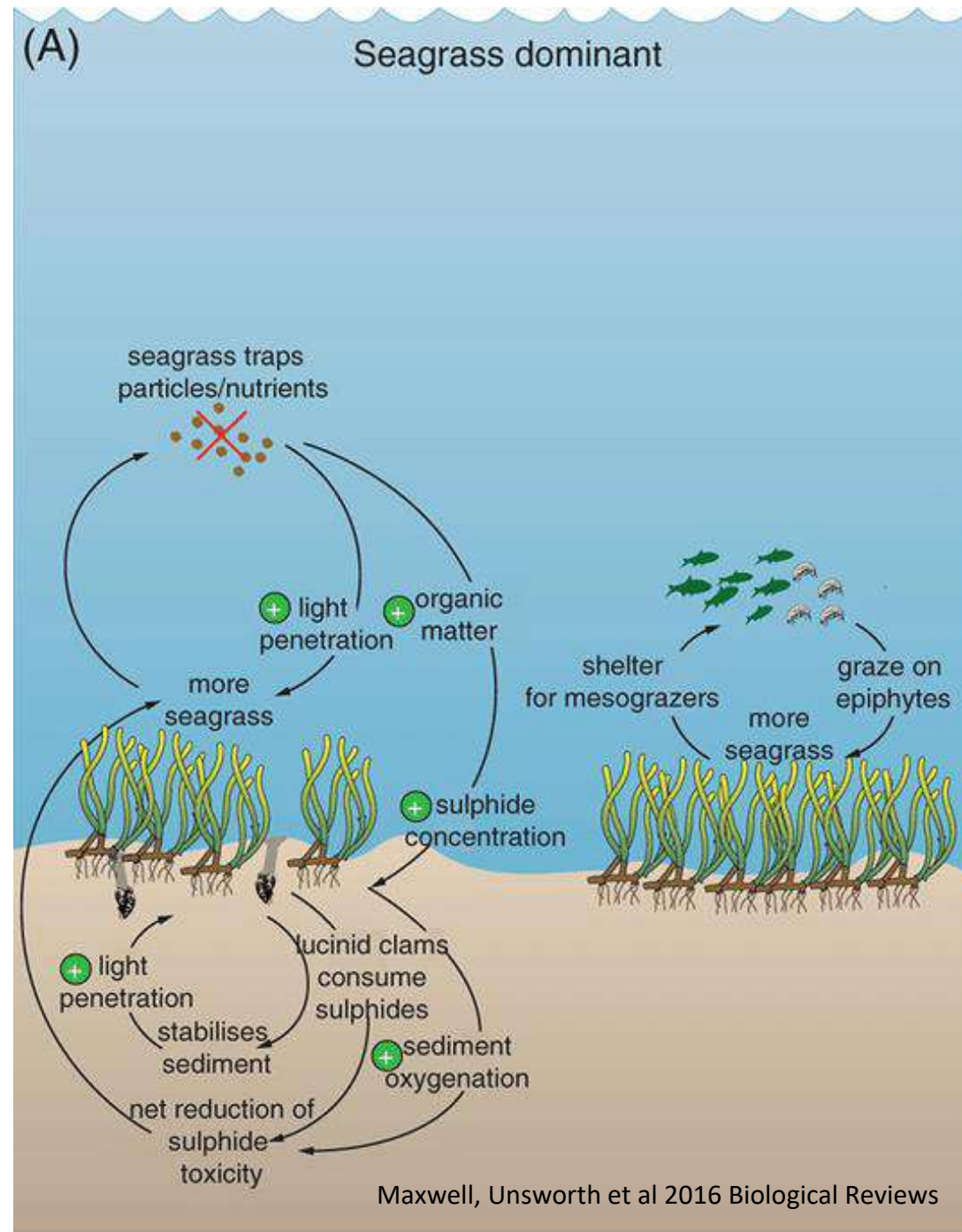
We want...

- More of:

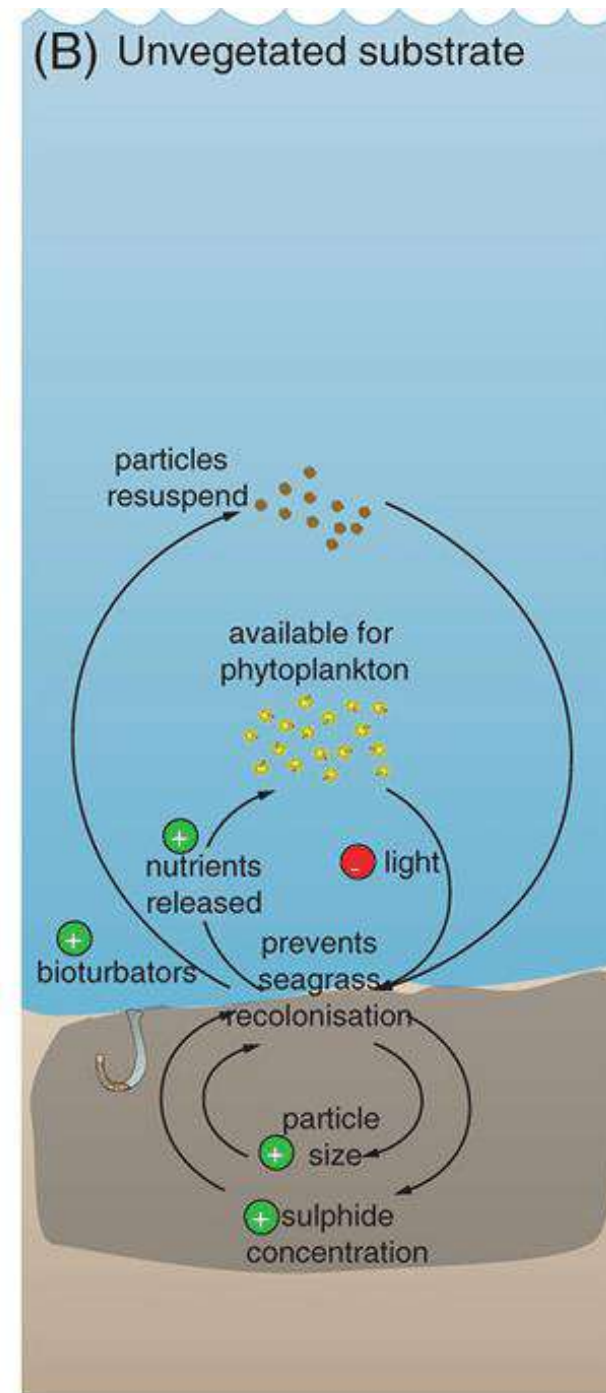
(A) – Seagrass dominant

- Less of:

(B) Unvegetated substrate



Maxwell, Unsworth et al 2016 Biological Reviews





A low-angle photograph looking up at tall, vibrant green grasses that fill the frame. The grass blades are long and thin, creating a dense, textured appearance. Above the grass, a clear blue sky with wispy white clouds is visible. The word "People" is superimposed in the center of the image in a large, white, sans-serif font.

People











# SEAGRASS RESTORATION HANDBOOK

UK & IRELAND

NOVEMBER 2021

Editors: Celine Gamble, Chiara Bertelli,  
Alison Debney, Azra Glover, Ian Hendy, Richard Lilley,  
Hanna Nuuttila, Maria Potouroglou, Federica Ragazzola,  
Richard Unsworth, Joanne Preston.



Global Seagrass Nursery Network



Collaboration is key!



A low-angle photograph looking up through a dense field of tall, vibrant green grass. The grass blades are long and slender, reaching towards a bright blue sky filled with soft, white clouds. The perspective creates a sense of height and growth. In the foreground, some brown, dried-out plant matter is visible, contrasting with the fresh green above. The word "Passion" is written in a large, white, sans-serif font across the middle of the image, partially obscuring the grass and sky.

Passion



# SEA WILDING

S C O T L A N D

A film by  
LEWIS MICHAEL JEFFERIES



Scottish Government  
Riaghaltas na h-Alba  
gov.scot



UNITED NATIONS DECADE ON  
ECOSYSTEM  
RESTORATION  
2021-2030



# #CoastalFutures23

## Livestream & London

### 25-26 January 2023





# PANEL DEBATE

## TACKLING THE CLIMATE CHALLENGE: Working Together for our ocean and coasts

*Do we have the right policy and  
technical solution to deliver  
environmental restoration?*

**CHAIR:** Roger Proudfoot, Environment Agency

Tom Brook, WWF-UK

Dr Benjamin Green, Environment Agency

Dr James Robinson, WWT

Dr Joanne Preston, Portsmouth University

Keith Cooper, Cefas

Dr Richard Lilley, Project Seagrass



30th annual conference

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# Q&A

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# **REFRESHMENTS**

## **14:30 – 15:30**

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