SEA THE VALUE

MARINE BIODIVERSITY BENEFITS
FOR A SUSTAINABLE SOCIETY

Supporting Coastal Communities '*Sea the Value*' of Marine Restoration Initiatives

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ReMeMaRe Conference, Scarborough Spa, 10-11 July 2024

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UKRI Natural Environment Research Council

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DB Daryl Burdon Ltd.
Marine Research, Teaching & Consultancy

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Sea the Value Aims & Project Team

- **Quantify the interlinkages between marine biodiversity, natural capital, and ecosystem services**, taking quantity & quality into consideration.
- **Determine the economic and social values associated with the benefits of carbon sequestration and bioremediation of waste** and apply these values to support natural capital accounting and community benefits.
- **Connect the ecological, economic, and social values of biodiversity to decision-making** through co-design and supporting of green investment to enhance biodiversity.

The Cromarty Firth

Photo: D. Burdon

The Solent

Photo: A. Van Der Schatte Olivier

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1495 UNIVERSITY OF ABERDEEN

UNIVERSITY OF PORTSMOUTH CENTRE FOR BLUE GOVERNANCE

PML Plymouth Marine Laboratory

eftec economics for the environment

MORAY FIRTH COASTAL PARTNERSHIP

Coastal Partnerships Network

THE SOLENT FORUM
Working in partnership for the future

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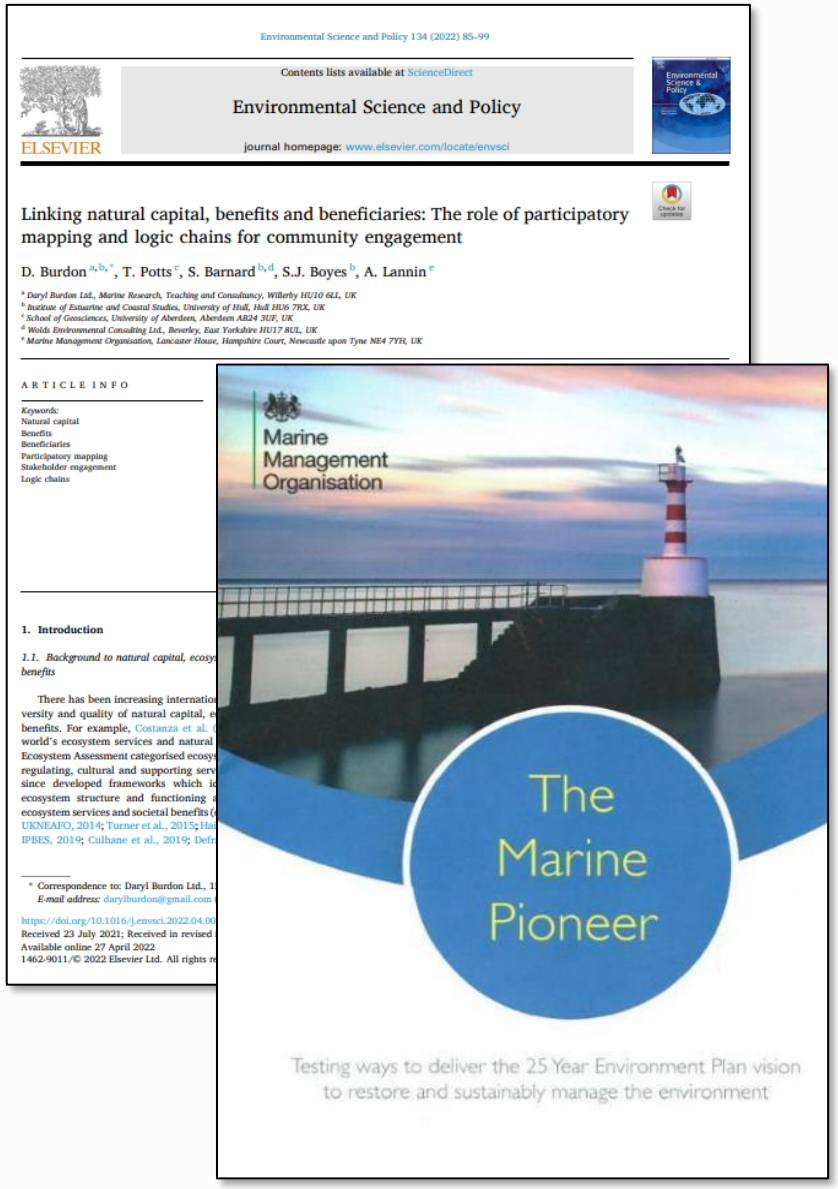
Participatory Mapping Method



- The Participatory Mapping approach is driven by the stakeholders at every stage through the workshops.
- Identifies and maps features and benefits (Workshop #1).
- Explores the trade-offs between benefit provision under different management scenarios (Workshop #2).
- Identifies and scores linkages between beneficiaries and benefits (Workshop #3).

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Participatory Mapping Outputs

NATURAL FEATURES

Features as Identified and Mapped in Workshop #1 and Refined in Workshop #2

BENEFITS

Benefits as Identified and Mapped in Workshop #1 and Refined in Workshop #2

BENEFICIARIES

Stakeholder relationships with benefits mapped and assessed in Workshop #3

IMPORTANCE (‘Natural Capital Lens’)

RELIANCE / DEPENDENCE (‘Beneficiaries lens’)

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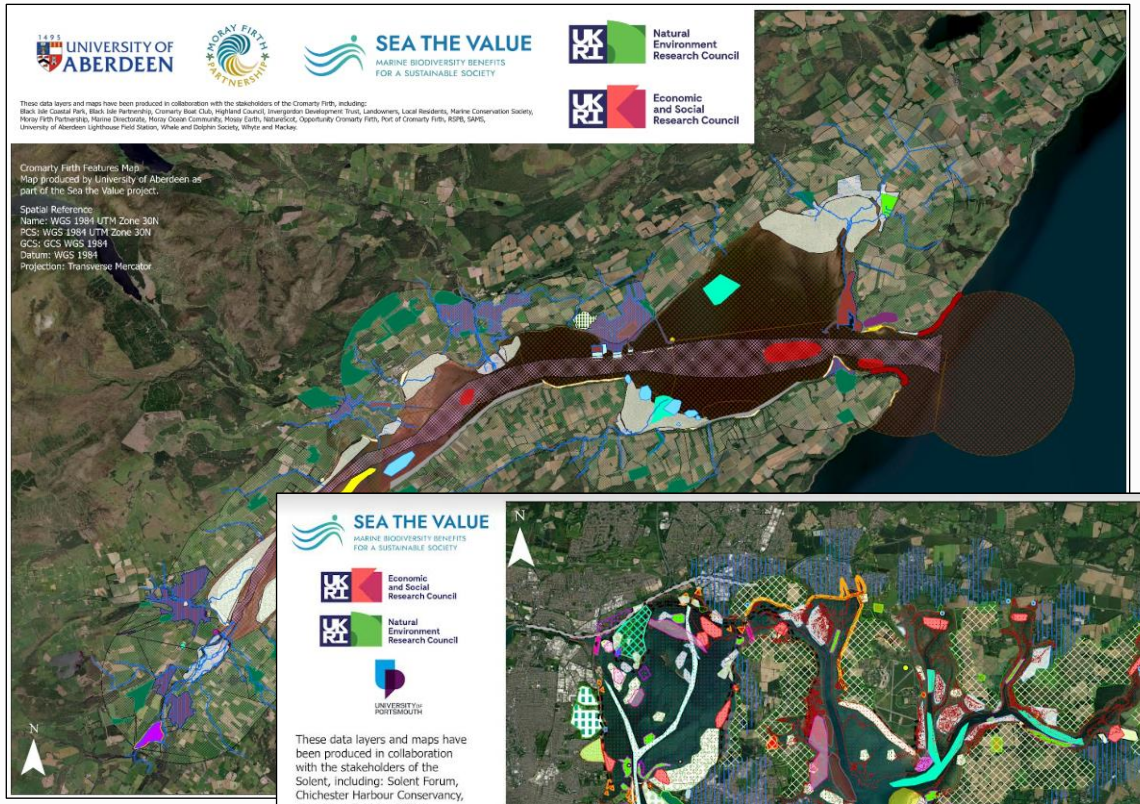
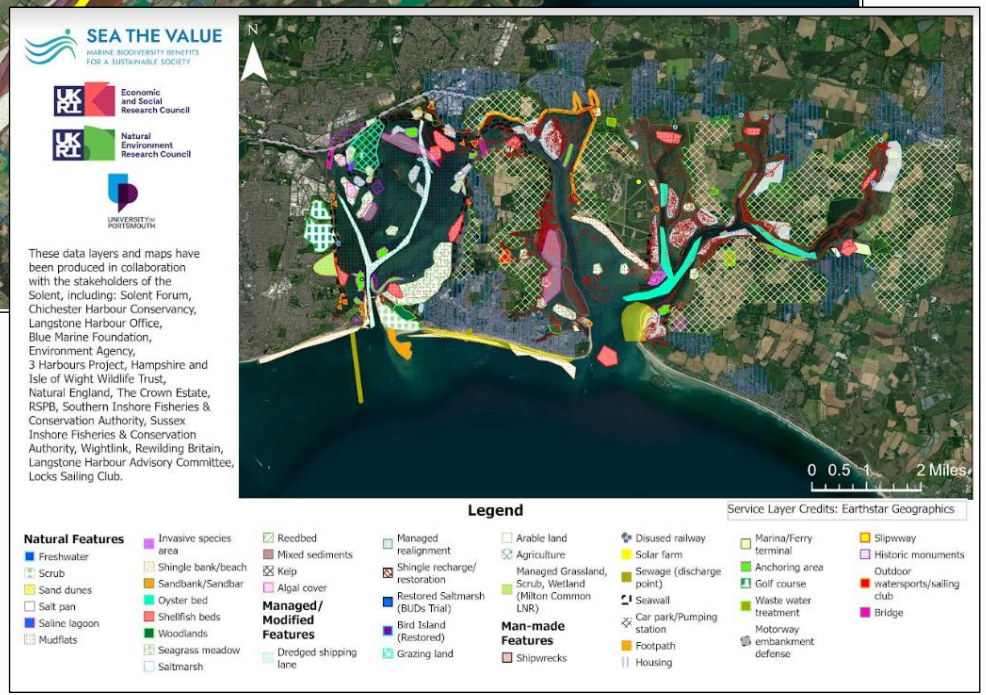
Participatory Mapping Outputs

Features Maps





Cromarty Outputs ↔

Natural Features	Societal Benefits (SB)											Abiotic Benefits (AB)				Economic Benefits (EB)			Other Benefits (OB)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	SB1	SB6	SB7	SB8	SB9	SB10	SB11	SB12	SB13	SB14	SB15	AB1	AB2	AB3	AB4	EB1	EB2	EB3	OB1	OB2	OB3
	Food (wild, farmed) / Drink	Healthy climate (Carbon Sequestration)	Prevention of coastal erosion	Sea defence	Waste burial / removal / neutralisation	Tourism / Nature Watching	Spiritual and cultural well-being	Aesthetic benefits	Education, research	Physical health benefits	Psychological health benefits	Wind energy	Water resources (quality and quantity)	Archaeology / Geology / Geomorphology	Transport	Place to live	Place to work	Industry	Habitat / species biodiversity	Intrinsic value	Functioning ecosystems
Beach		X	X	X	X	X	X	X	X	X	X		X	X			X	X	X	X	X
Seagrasses	X	X	X	X	X	X	X	X	X		X		X				X		X	X	X
Mudflats	X	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X	X	X
Saltmarshes	X	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X	X	X
Blue mussels	X	X	X	X	X	X	X		X		X		X	X			X	X	X	X	X
Sandbanks				X		X	X	X	X		X				X		X			X	X
Natural Firth channel	X	X				X	X		X	X	X		X		X		X	X	X	X	X
Dunglass Island						X	X	X	X	X	X			X			X	X		X	X
Burns						X	X	X	X	X	X		X	X			X			X	X
Woodland		X					X				X		X	X			X	X		X	
Old oyster beds							X		X										X	X	
Horsemussels		X			X		X		X				X							X	
Cliffs			X	X		X	X	X	X	X	X			X			X	X	X	X	
Brownfield						X	X		X					X		X			X	X	X

Solent Outputs ↔

Natural Features	Societal Benefits (SB)															Abiotic Benefits (AB)				Economic Benefits (EB)			Other Benefits (OB)			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
	SB1	SB2	SB3	SB4	SB5	SB6	SB7	SB8	SB9	SB10	SB11	SB12	SB13	SB14	SB15	AB1	AB2	AB3	AB4	AB5	EB1	EB2	EB3	OB1	OB2	OB3	OB4
	Food (wild, farmed) / Drink	Medicines and blue biotechnology	Healthy climate (Carbon Sequestration)	Prevention of coastal erosion	Sea defence	Waste burial / removal / neutralisation	Tourism / Nature Watching	Spiritual and cultural well-being	Aesthetic benefits	Education, research	Physical health benefits	Psychological health benefits	Water resources (quality and quantity)	transport	Place to live	Place to work	Industry	Connectivity	Biodiversity	Sense of space	Intrinsic Value
Saltmarsh												X	X		X	X	X				
Seagrass meadow/Zostera marina												X	X			X	X				
Sand dunes			X														X				
Sandbank/Sand spit (Billy Line)	X		X				X	X	X	X	X	X					X				
Saline lagoons			X				X	X	X	X	X	X					X				
Sandflats	X		X												X	X	X				
Shellfish beds/Shellfish dredge												X				X	X	X			
Mudflats	X	X					X	X	X	X	X	X	X			X	X	X			
Vegetated Shingle						X										X	X		X		
Gravel and shell beach						X	X	X	X	X	X	X				X	X		X		
Sub tidal mixed sediments	X	X								X						X	X	X	X		
Scrub																			X		
Fresh water input			X	X				X	X	X		X	X						X	X	X
Oysters		X											X			X	X	X	X		
Reed bed		X											X			X			X		
Algal cover			X					X									X	X			
Woodland/Mixed Woodland/Ancient woodland																X	X	X	X		
salt pans			X		X	X	X	X		X		X					X	X	X		
Shingle banks							X	X		X							X		X		
Kelp												X					X		X		
Invasive plant species (R. cugosa)																	X	X	X		
Clams/cockles (Hand gathered)												X					X	X	X	X	X
Shingle beach/Shingle and Sand/Shingle and Shell							X	X	X	X	X	X						X	X	X	X

Features vs Benefits Matrices

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Participatory Mapping Outputs

Beneficiaries Mapping

Beneficiaries		Societal Benefits (SB)											Abiotic Benefits (AB)				Economic Benefits (EB)			Other Benefits (OB)		
		SB1	SB6	SB7	SB8	SB9	SB10	SB11	SB12	SB13	SB14	SB15	AB1	AB2	AB3	AB4	EB1	EB2	EB3	OB1	OB2	OB3
		Food (wild, farmed) / Drink	Healthy climate (Carbon Sequestration)	Prevention of coastal erosion	Sea defence	Waste burial / removal / neutralisation	Tourism / Nature Watching	Spiritual and cultural well-being	Aesthetic benefits	Education, research	Physical health benefits	Psychological health benefits	Wind energy	Water resources (quality and quantity)	Archaeology / Geology / Geomorphology	Transport	Place to live	Place to work	Industry	Habitat / species biodiversity	Intrinsic value	Functioning ecosystems
Cromarty Boat Club	Mean	0	1	1	1	1	3	2	2	1	3	3	0	2	1	2	2	2	1	1	3	2
	Range	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Moray Firth Coastal Partnership	Mean	1	2	1	1	1	3	2	1	3	1	1	1	2	1	1	2	3	2	2	2	2
	Range	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0
SEPA	Mean	1	3	2	3	3	0	0	1	2	1	1	1	3	1	1	1	1	2	3	1	3
	Range	0	0	1	0	0	0	0	1	0	1	1	0	0	0	1	1	1	0	0	0	0
Highland Council	Mean	1	2	2	3	1	2	1	2	3	2	2	2	2	2	3	3	3	2	2	1	3
	Range	0	2	1	1	2	0	1	1	1	1	1	3	2	0	0	0	1	1	1	1	1
Port of Cromarty Firth	Mean	0	1	1	2	1	1	1	1	1	1	1	2	1	1	3	0	3	3	1	1	1
	Range	1	2	0	2	1	2	2	3	2	2	2	3	0	2	1	1	0	0	1	2	2
Whyte & Mackay	Mean	3	2	1	2	2	1	1	1	2	1	1	0	2	0	1	0	3	3	1	1	2
	Range	0	2	1	2	1	2	3	3	1	2	2	1	2	1	3	1	1	0	1	2	1
Scottish Water	Mean	1	2	1	1	2	0	0	0	2	1	1	0	3	1	1	1	1	2	1	1	2
	Range	3	2	3	3	3	0	1	0	3	2	3	1	0	2	3	1	1	2	1	1	2
RSPB	Mean	0	3	3	2	2	3	2	2	3	1	3	1	3	1	1	1	1	1	3	2	3
	Range	0	0	1	2	2	0	1	2	1	1	1	2	1	2	2	0	1	2	0	1	0
Moray Ocean Community	Mean	0	3	2	1	2	2	2	2	3	3	3	0	3	1	1	1	2	1	3	3	3
	Range	0	1	2	0	2	3	1	2	0	0	1	0	1	2	1	2	2	0	0	0	0
NatureScot	Mean	1	3	2	1	2	2	2	2	2	2	2	1	3	2	1	1	1	1	3	2	3
	Range	2	0	2	3	1	2	2	2	2	2	3	2	0	2	2	1	1	3	0	1	0
Marine Directorate	Mean	1	2	1	1	1	0	0	0	2	0	0	2	2	1	1	0	1	3	3	1	2
	Range	1	2	0	0	0	0	1	0	2	0	0	3	1	2	1	1	0	0	1	1	2
Academia	Mean	1	2	1	1	2	1	1	1	3	1	1	2	2	1	1	0	2	2	3	2	3
	Range	1	1	0	0	2	2	0	1	0	1	1	3	1	2	1	1	0	1	1	1	1
Landowners	Mean	2	2	3	2	2	1	2	2	1	1	2	1	2	2	2	3	3	2	2	2	3
	Range	1	0	1	2	1	1	1	0	1	1	2	2	1	0	3	0	0	1	0	2	1
Black Isle Partnership	Mean	2	1	2	1	1	3	2	3	2	3	3	0	2	2	3	2	2	2	2	2	2
	Range	1	1	1	1	0	0	1	1	0	1	1	1	1	0	1	2	1	1	1	2	1

Key					
	Mean	0	1	2	3
	Range	0	1	2	3

		1	2	3.0	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
		SB1	SB5	SB6	SB7	SB8	SB9	SB10	SB11	SB12	SB13	SB14	SB15	AB2	AB3	EB1	EB2	EB3	OB1	OB2	OB3	OB4
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Locks Sailing Club	Mean	0	0	1	2	2	1	3	3	2	2	3	3	3	2	1	1	0	1	1	3	3
	Range	0	0	1	2	0	2	1	1	1	2	0	0	0	0	1	0	1	1	0	0	0
Chichester Harbour Conservancy	Mean	2	0	3	3	3	2	3	2	3	3	1	2	3	3	1	3	2	3	3	3	2
	Range	1	0	0	0	1	1	0	1	0	0	1	0	0	1	1	0	1	0	0	0	1
Environment Agency	Mean	1	1	3	3	3	3	2	1	1	3	1	1	3	1	1	2	1	3	3	1	1
	Range	0	0	0	1	0	0	0	0	1	0	0	0	0	2	2	1	1	1	0	0	0
Blue Marine Foundation	Mean	1	0	3	2	1	2	2	2	2	3	2	2	3	0	1	1	2	3	3	3	3
	Range	0	1	0	1	2	1	2	1	2	0	2	1	1	1	1	0	1	1	0	1	0
Langstone Harbour Office	Mean	1	0	2	3	2	1	3	2	2	2	2	1	3	3	1	2	2	2	2	2	3
	Range	1	0	1	1	2	2	1	2	2	3	1	2	0	1	0	2	2	0	2	3	1
Hampshire and Isle of Wight Wildlife Trust	Mean	1	0	3	2	2	2	3	2	2	3	2	3	3	1	1	1	1	3	3	3	3
	Range	1	1	0	2	2	1	0	1	1	0	2	1	1	0	0	1	1	1	0	0	0
Natural England	Mean	1	0	3	3	3	2	2	2	1	3	2	2	3	1	1	2	1	3	3	2	3
	Range	1	1	0	0	1	1	1	1	1	0	1	1	1	1	2	2	1	0	0	2	1
The Crown Estate	Mean	1	1	2	2	2	2	1	0	1	2	1	1	2	1	1	2	3	2	2	1	2
	Range	1	2	3	3	3	1	2	1	1	1	1	1	1	3	2	1	0	2	1	1	1
Royal Society for the Protection of Birds	Mean	2	0	3	3	3	2	3	2	2	3	2	3	2	1	1	2	2	3	3	3	3
	Range	2	1	0	1	1	2	0	1	1	0	2	1	1	1	1	1	1	0	0	0	0
IFCAs	Mean	3	1	2	1	1	2	2	1	1	2	1	1	3	1	0	2	3	2	2	1	1
	Range	0	2	2	2	2	2	1	3	1	1	1	2	0	2	1	1	0	2	2	1	2
Rewilding Britain	Mean	2	0	2	2	1	2	3	2	2	3	1	2	3	0	1	1	2	3	3	3	3
	Range	2	1	3	1	2	1	0	1	2	0	1	0	1	0	1	2	1	1	0	0	0
Academia	Mean	1	2	2	1	1	1	1	1	1	3	2	2	2	1	1	2	1	2	2	1	2
	Range	2	3	1	1	1	1	2	1	1	0	1	1	1	2	2	1	2	3	3	2	3
Landowners	Mean	2	0	2	2	2	1	1	3	3	1	2	3	2	2	3	2	2	2	2	2	2
	Range	1	0	3	1	1	3	2	1	1	2	2	1	3	3	1	1	0	1	1	0	1
Hampshire County Council	Mean	0	0	3	2	2	2	1	1	1	2	1	1	2	2	3	2	2	1	2	2	2
	Range	1	1	1	3	1	1	2	2	2	1	2	2	0	2	0	2	2	2	1	2	2

Key					
	Mean	0	1	2	3
	Range	0	1	2	3

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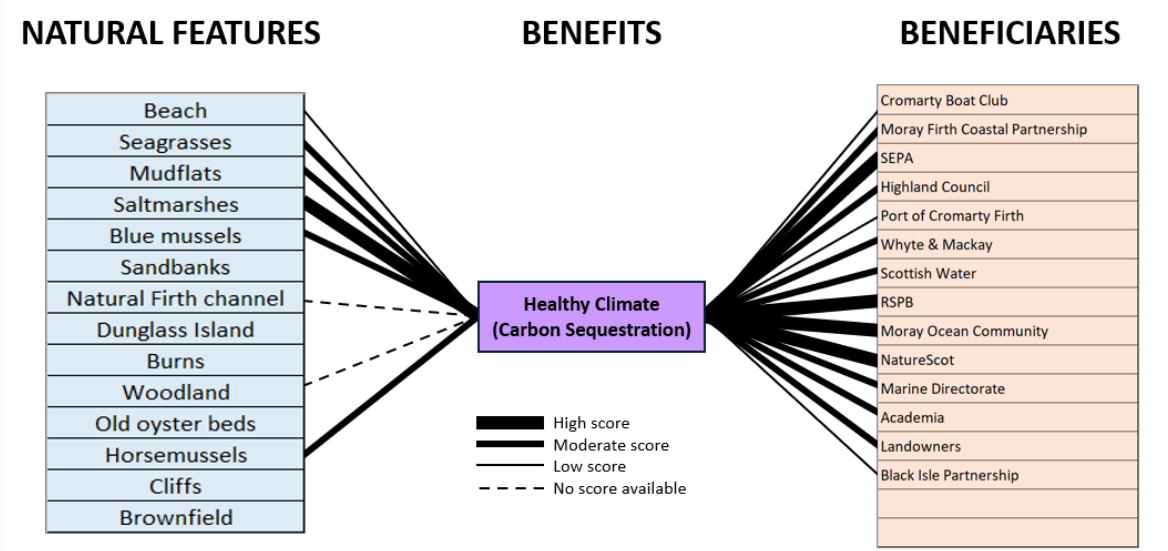
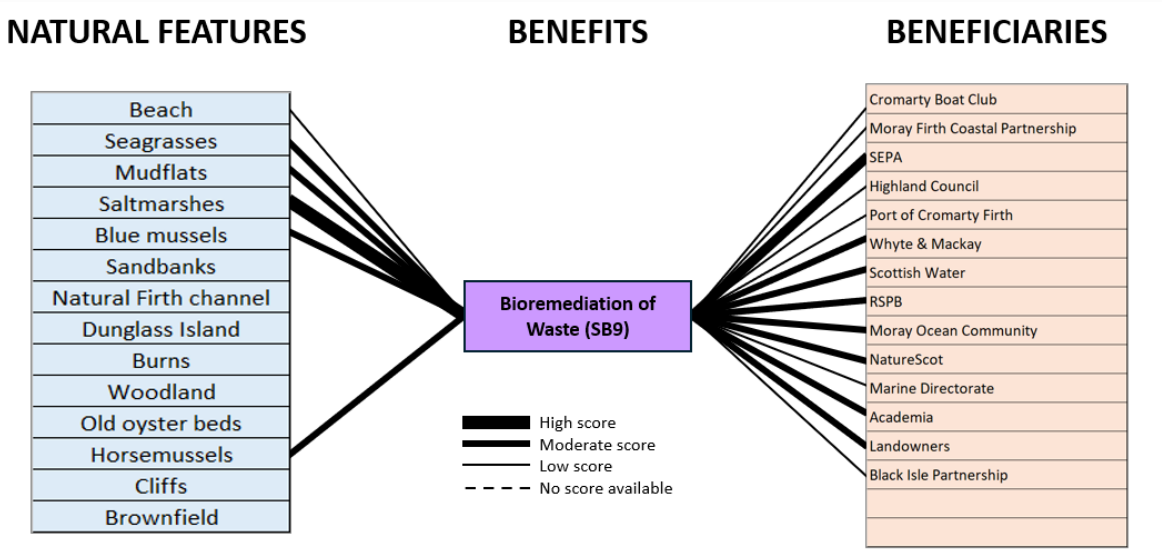
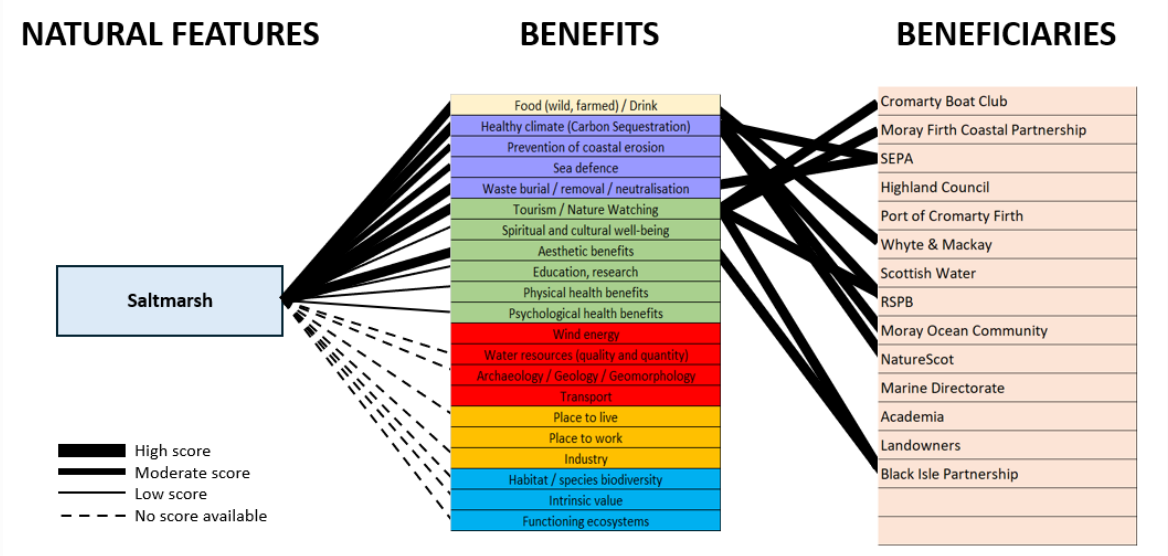
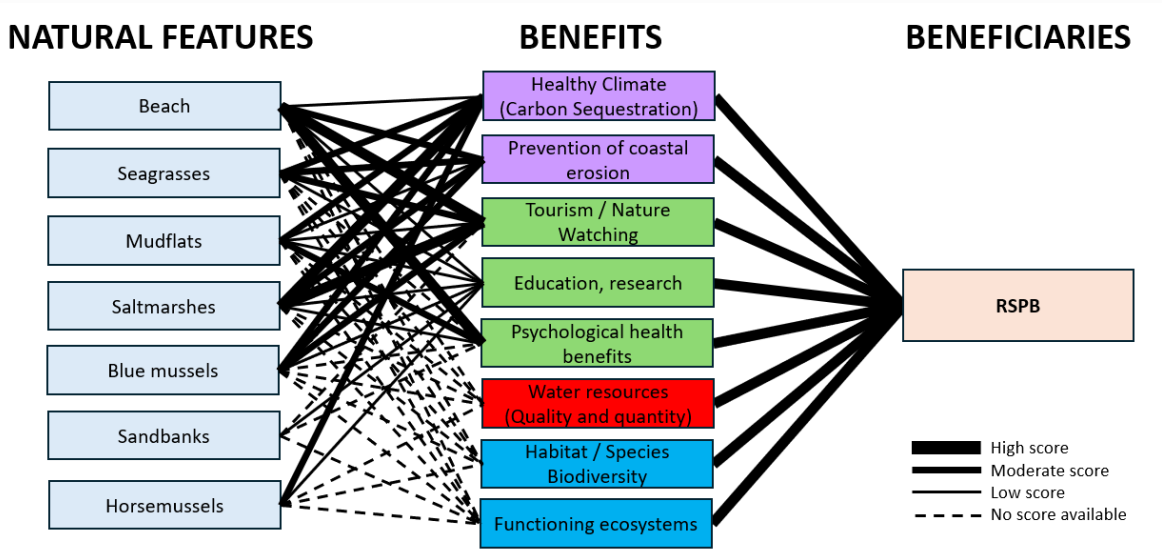
Participatory Mapping Outputs









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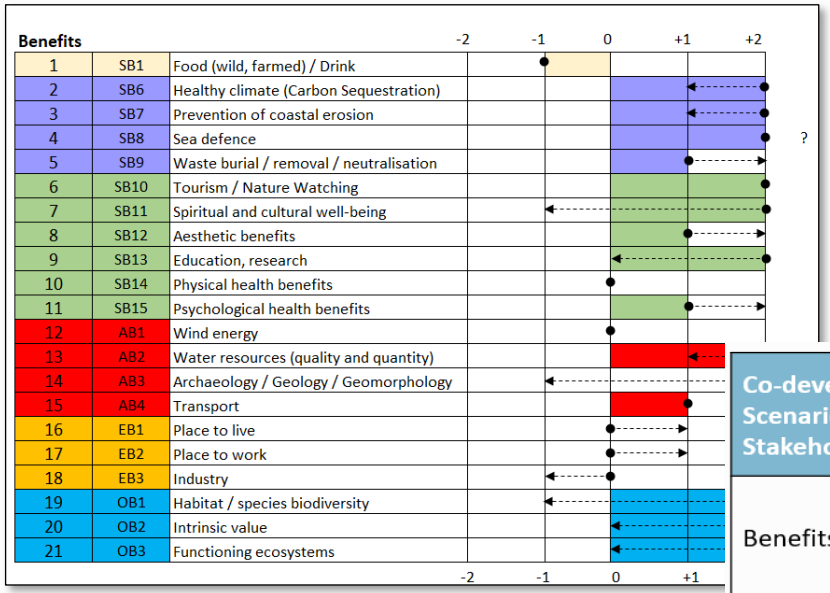
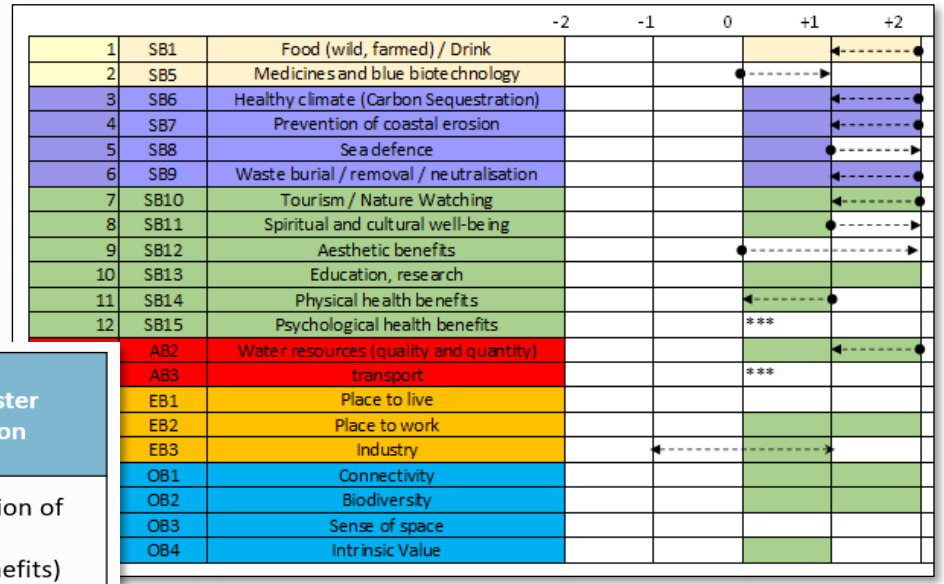
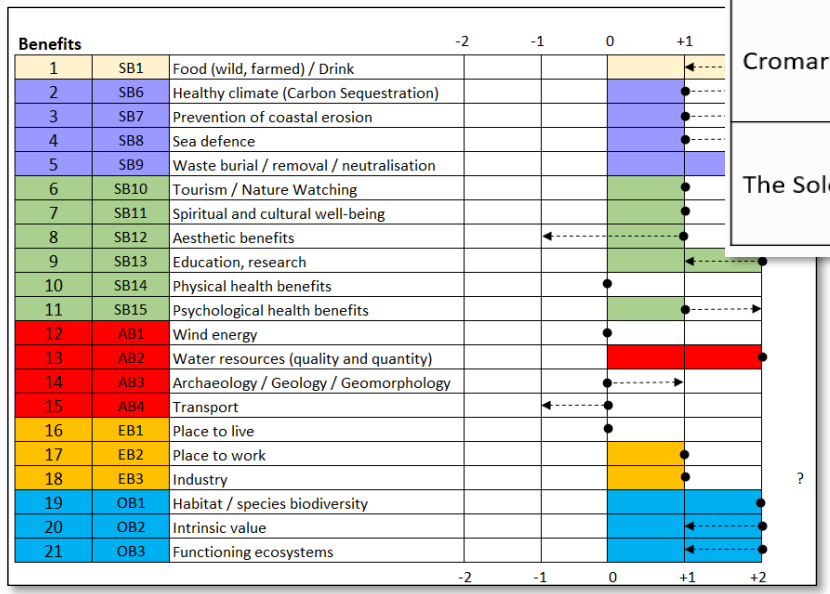
Participatory Mapping Outputs

Future scenarios assessments: Trade-offs

Co-developed Scenarios with Stakeholders	Coastal Managed Realignment	Native Oyster Restoration
Benefits of Interest	Carbon Sequestration (+ wider benefits)	Bioremediation of waste (+ wider benefits)
Cromarty Firth	✓	✓
The Solent	✓	✓

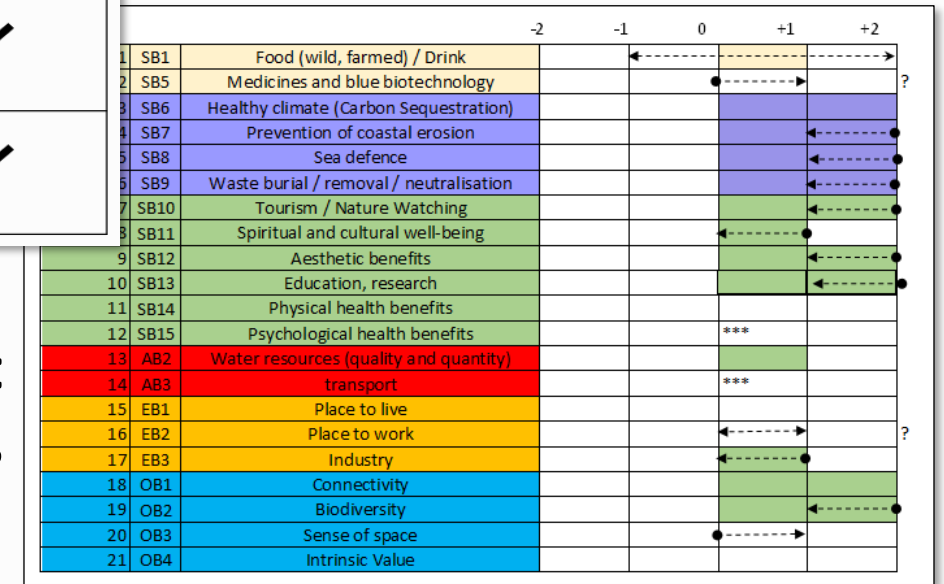






Cromarty Outputs ←

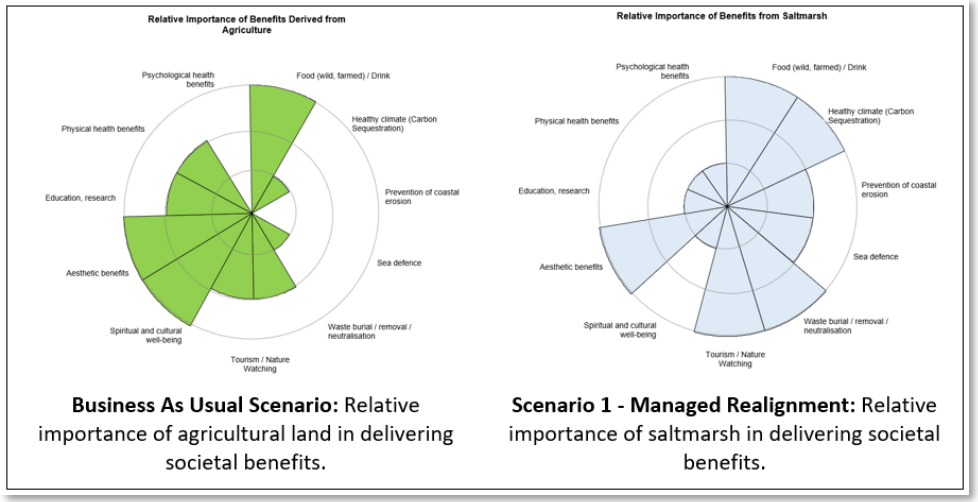
Solent Outputs →



Participatory Mapping Outputs

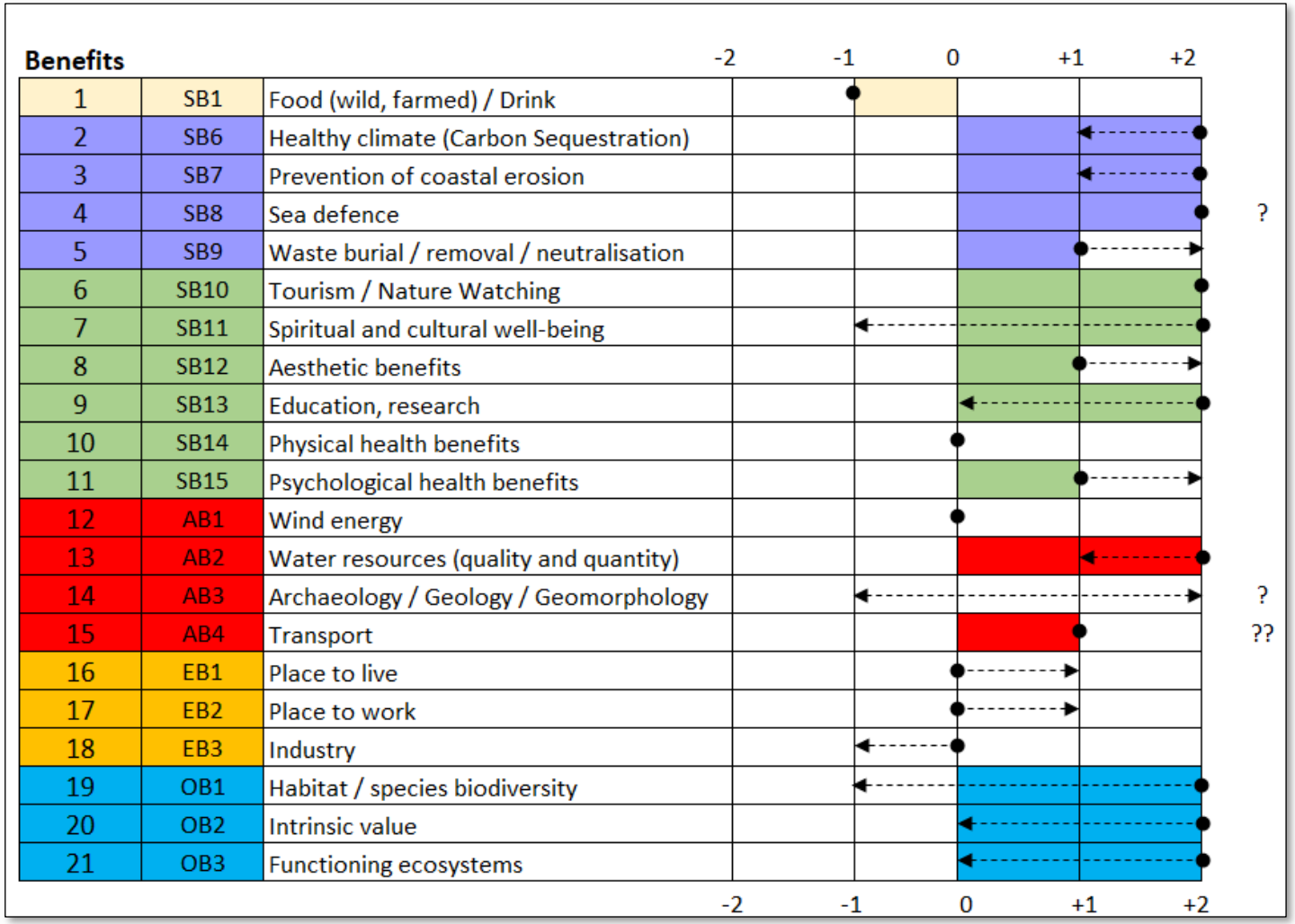
Scenario 1: Managed Realignment in Cromarty Firth

- A nature-based intervention whereby existing sea walls are breached to allow tidal inundation.
- Can be used for flood and erosion management, habitat compensation and/or habitat restoration.
- It can be seen as a triple-win for the environment, society and the economy.



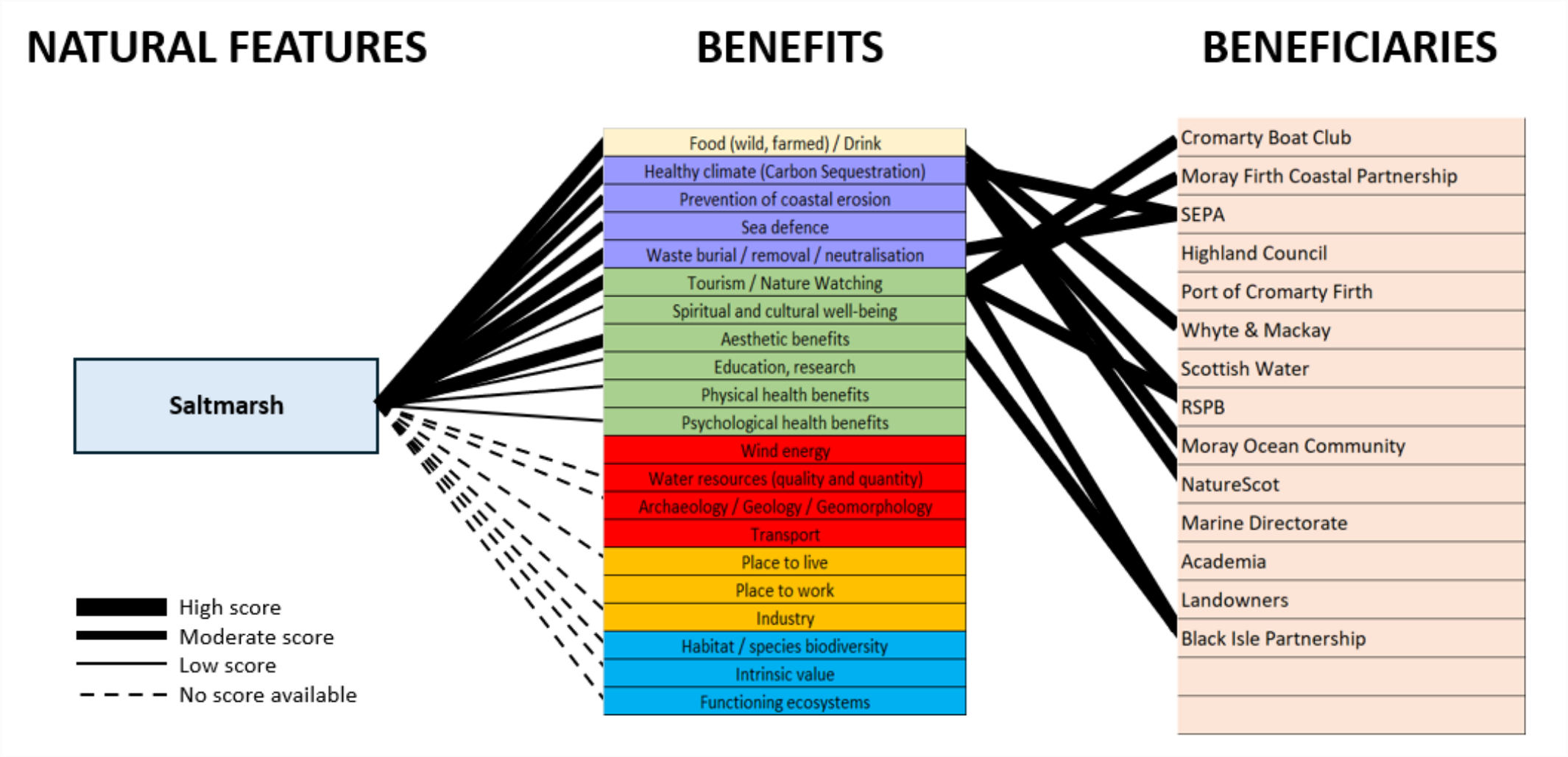
Business As Usual Scenario: Relative importance of agricultural land in delivering societal benefits.

Scenario 1 - Managed Realignment: Relative importance of saltmarsh in delivering societal benefits.



Participatory Mapping Outputs

Scenario 1: Managed Realignment in the Cromarty Firth



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Why use Participatory Approaches in Estuarine and Coastal Restoration Projects?

- Driven by stakeholders at all stages of the process.
- Creates a shared common language.
- Captures local knowledge and generates digital data.
- Generates outputs which can be used by coastal communities.
- Improves understanding of the links between natural features and benefits.
- Allows organisations to assess their own reliance on natural capital features.
- Identifies shared reliance on natural capital features and their benefits.

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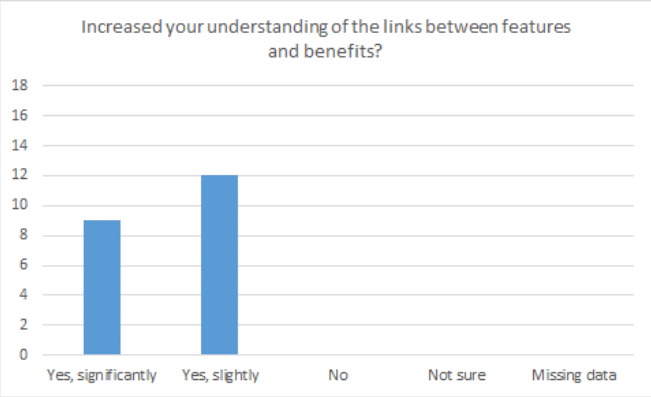
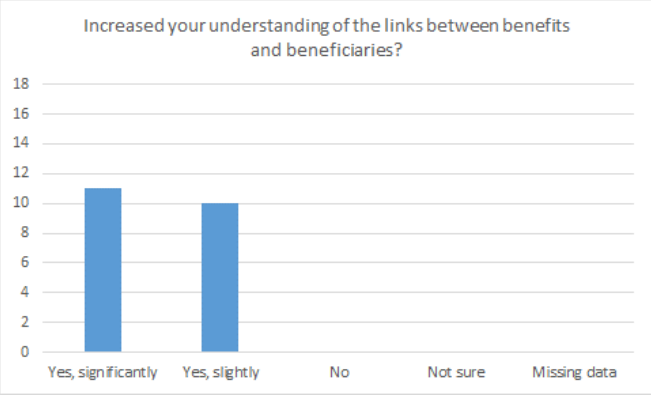
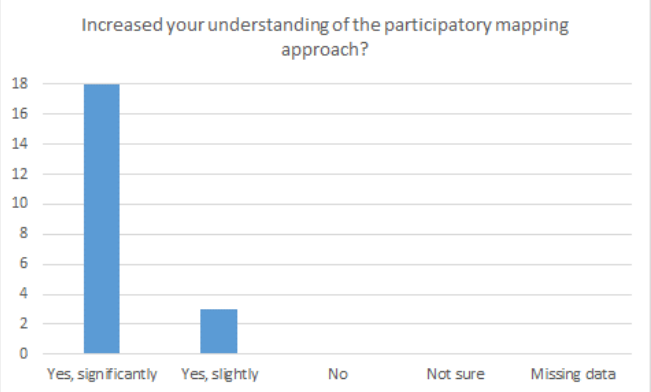
Participatory Mapping Feedback







"The map is a good tool for showing the links between community and the environment."

"Mapping outputs will be really useful to demonstrate to other parties about the features and benefits and the impacts change can have on all of the different beneficiaries."

"Identifying opportunities for marine enhancement and linking with other partners."

"Getting local stakeholders around the same table – great connections made for future projects / partnerships."

"Meeting people from different organisations and the different points of views."

"Thanks, you for your time, help and expertise in making these workshops so informative and fun!"

Other *Sea the Value* Workstreams

PML | Plymouth Marine Laboratory

i. The integration of participatory mapping workshop outputs with other data sources to create **asset and risk registers** for both case study sites (lead PML);

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ii. Linking this information to the effects of habitat quality / biodiversity on nutrient bioremediation and carbon sequestration to **quantify ecosystem services** (lead Portsmouth University);

PML | Plymouth Marine Laboratory

iii. Valuing the quantified ecosystem services and understanding how these values should be used, alongside other data, in economic appraisal and natural capital accounting (lead PML), and

eftec economics for the environment

iv. Using project data to outline and **test green finance approaches** for marine ecosystems (eftec).

CPN Workshop Series

WS0: '*Sea The Value*' Introductory Workshop (Tuesday 12 March)

WS1: Natural Capital & Understanding Value (Wednesday 5 June)

WS2: Interlinkages Between Biodiversity & Natural Capital (Wednesday 12 June)

WS3: Participatory Mapping (Wednesday 19 June)

WS4: Funding Nature's Needs (Wednesday 26 June)

Coastal Partnerships Network

SEA THE VALUE

MARINE BIODIVERSITY BENEFITS
FOR A SUSTAINABLE SOCIETY

Thank you for listening – any questions?

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