Cromarty Firth Sea the Value Workshop 3

Thursday 21 March 2024 | 10:00-16:00 | Highland Theological College UHI, Dingwall

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Contributions from: Andy van der Schatte Olivier, Kate Gormley, Jeremy Anbleyth-Evans.

The *Sea the Value* project, funded by NERC and ESRC, aims to understand the different values communities hold towards their local marine environment, the diverse benefits it provides, and how nature-based solutions can support and integrate with community development. The project is focussing on two case studies in the UK, the Cromarty Firth in Scotland, and the Solent on the south coast of England. The project outputs will be used to inform wider management and planning of marine biodiversity across the UK.

The University of Aberdeen and the Moray Firth Coastal Partnership facilitated a third and final workshop for the Cromarty Firth community, with the aim to identify how benefits are distributed amongst stakeholders and to support local knowledge on how natural capital measures can be delivered in the Cromarty Firth. The output from this workshop is a series of logic chains which link the features, benefits and beneficiaries within the Cromarty Firth.

Following stakeholder feedback, the third workshop was held at the Highland Theological College UHI in Dingwall. The workshop was attended by 12 stakeholders representing a range of 10 organisations (Table 1). All organisations had previously been represented at the first two *Sea the Value* workshops. A full list of participants and their contact details is provided in Annex 1. In addition, interest in attending the workshop was also shown by the Marine Directorate, Scottish Water, Mossy Earth, Local landowners, the Marine Conservation Society and the Highland Environment Forum, but unfortunately these organisations were unable to attend.

Table 1: Workshop attendees organisations (**organisations were represented at Workshops 1 & 2)**.**

Organisations	
NatureScot**	Black Isle Partnership**
Local Resident**	Highland Council**
University of Aberdeen Lighthouse Station**	RSPB**
Port of Cromarty Firth**	Moray Ocean Community**
Whyte & Mackay (previously represented by SAMS)**	Moray Firth Coastal Partnership**

Welcome and Introductions

Prof. Tavis Potts (University of Aberdeen) welcomed the attendees and thanked them for attending the *Sea the Value* project workshop (Image 1). Tavis introduced the *Sea the Value* project team (Table 2), the *Sea the Value* project and outlined the aims and objectives of the third and final workshop. Tavis summarised the activities and outputs from the first two workshops, recounting how stakeholders identified and mapped the natural features and benefits in the Cromarty Firth (Workshop 1) and reviewed the scenarios assessments undertaken for both managed realignment and native oyster restoration (Workshop 2). All slides presented on the day are included in Annex 2.

Image 1: Tavis Potts welcoming and introducing the *Sea the Value* project workshop.

Table 2: The Project Team.

Name	Organisation	Role
Prof Tavis Potts	University of Aberdeen	Project PI, Facilitator
Dr Daryl Burdon	Daryl Burdon Ltd.	Facilitator
Dr Andy van der Schatte Olivier	University of Portsmouth	Facilitator
Dr Jeremy Anbleyth-Evans	University of Aberdeen	GIS Mapping, Note-taker
Dr Kate Gormley	University of Aberdeen	GIS Mapping, Note-taker
Vicki Paxton	Moray Firth Coastal Partnership	Stakeholder Engagement

Mapping Outputs

Dr Kate Gormley (University of Aberdeen) presented the final mapping outputs to the group, which included: (1) a physical map of the Cromarty Firth features (see Figure 1); (2) an interactive pdf of features and benefits; and (3) a virtual map of the Cromarty Firth using online ESRI mapping software. The participants were asked to think about how they could use the maps within their organisations and what form of maps they would like to receive as outputs from this project. All participants will be provided with a printed copy of the final features map as well as access to all the digital outputs from the three Cromarty Firth workshops. Tavis informed the group that these maps will also be printed and distributed to schools and libraries around the Cromarty Firth with an accompanying note which explains how the maps were generated and how they could be used by the Cromarty Firth community.

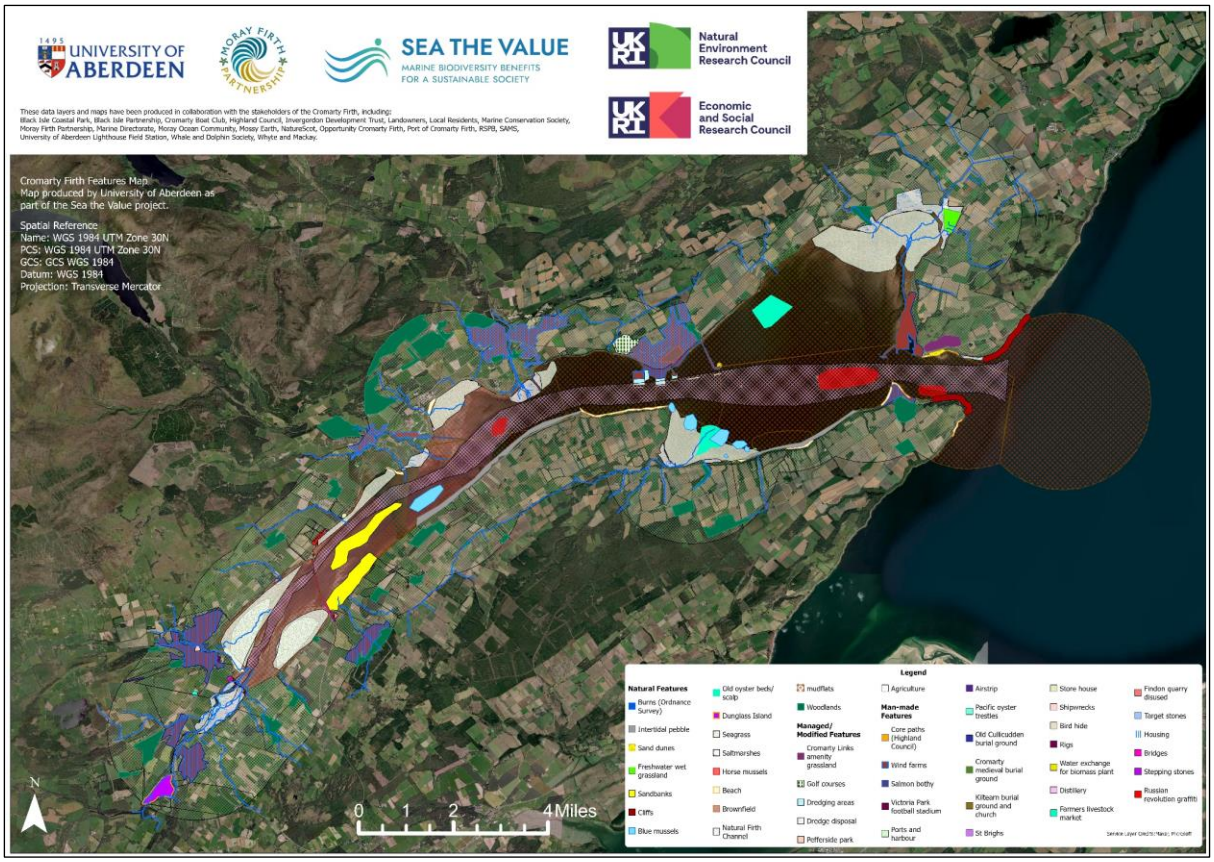


Figure 1: The final features map of the Cromarty Firth.

Introduction to Logic Chains

Daryl Burdon (Daryl Burdon Ltd.) introduced the concept of logic chains and outlined the aims and objectives of the workshop. Whilst examples of logic chains exist within the literature which link natural capital to benefits (Lusardi et al., 2018[1]; Thornton et al., 2019[2]), this workshop aimed to develop these chains further by identifying the stakeholders, termed here as the 'beneficiaries' (Newton and Elliott, 2016[3]), who are reliant or dependent on those benefits. This development allows the logic chain to be viewed through either a natural capital lens (read left to right) focussing on the 'importance' of linkages from natural capital to people or a beneficiaries lens (read right to left) focussing on 'reliance or dependence' of people on natural capital (after Burdon et al., 2022[4]). The schematic logic chain for the Cromarty Firth is presented in Figure 2. All the slides from the presentations are provided in Annex 2.

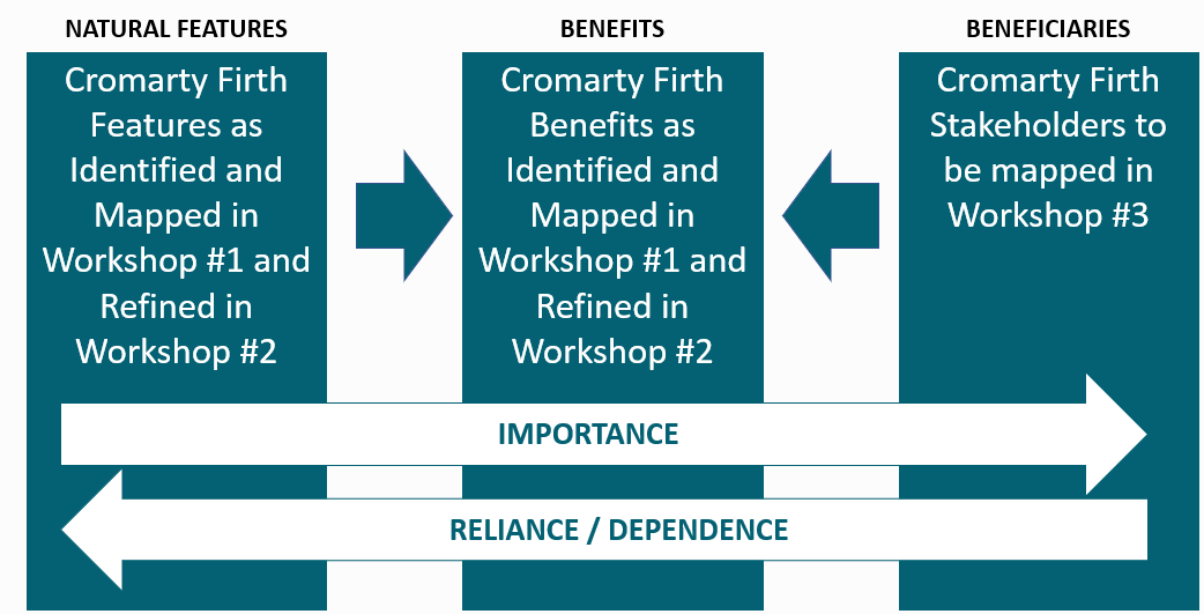


Figure 2: Logic chain structure applied to the Cromarty Firth.

The categories of focus for the Cromarty Firth are illustrated in Figure 3 and comprise 14 natural features and 21 benefits (both were identified by the stakeholders in Workshop 1 and were refined in Workshop 2) and 14 beneficiaries (which are the focus of Workshop 3).

[1] Lusardi, J., Rice, P. Waters, R.D. & Craven J., 2018. Natural Capital Indicators: for defining and measuring change in natural capital. Natural England Research Report, Number 076. http://publications.naturalengland.org.uk/publication/674248036424089

[2] Thornton, A., Luisetti, T., Grilli, G., Donovan, D., Phillips, R. & Hawker, J., 2019. Initial natural capital accounts for the UK marine and coastal environment. Final Report. Report prepared for Defra.

[3] Newton, A., Elliott, M., 2016. A typology of stakeholders and guidelines for engagement in transdisciplinary, participatory processes, 16 November 2016 Front. Mar. Sci. https://doi.org/10.3389/fmars.2016.00230 .

[4] Burdon, D., Potts, T., Barnard, S., Boyes, S.J. & Lannin, A., 2022. Linking natural capital, benefits and beneficiaries: The role of participatory mapping and logic chains for community engagement. *Environmental Science & Policy*, 134, pp. 85-99. https://doi.org/10.1016/j.envsci.2022.04.003

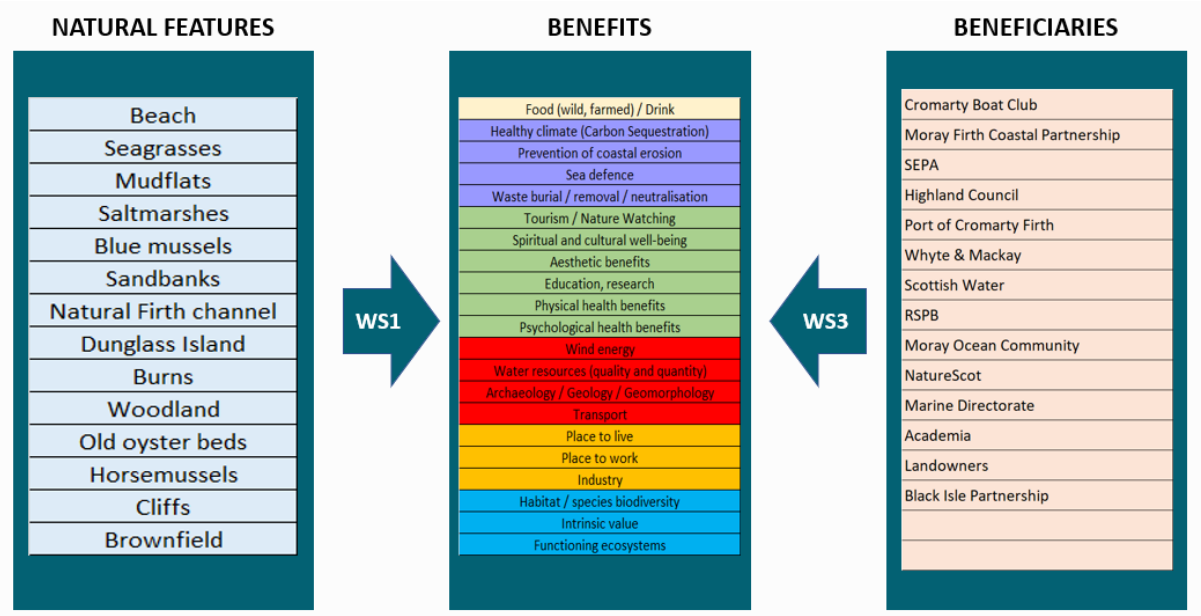


Figure 3: Categories of natural features, benefits and beneficiaries included in the workshop.

Activity One: Identifying links between benefits and beneficiaries.

The first exercise sought to establish where linkages between beneficiaries and benefits existed in the Cromarty Firth. For this, attendees were divided between three tables, each facilitated by members of the project team. A linkage was defined as a stakeholder having a reliance or dependence on a particular benefit known to derive from the Cromarty Firth. The list of benefits was identified by the Cromarty Firth stakeholders in Workshop 1 and was refined (where required) in Workshop 2.

Beneficiaries were identified as those organisations who have attended previous *Sea the Value* workshops or who have engaged in the project outside of the workshops. The list of beneficiaries was therefore not intended to be exhaustive but favoured those organisations who have participated in the *Sea the Value* workshops to date. The methodology, however, could easily be applied to additional organisations in the future.

A list of 14 beneficiaries were identified as the focus during the workshop. This first activity investigated the relationships between these 14 beneficiaries and the benefits but did not include individual perspectives; these were addressed separately in Activity Three. By way of demonstration, the project team completed the exercise for three beneficiaries prior to the workshop: Cromarty Boat Club, Moray Firth Coastal Partnership and the Scottish Environmental Protection Authority (SEPA) (Figure 4). Stakeholders were asked to first sense-check the results from these examples and discuss the linkages made. Stakeholders were asked to focus only on the shading of the cells for the purposes of Activity One; the relative importance of the relationships (i.e. the scores) would be assessed in Activity Two.

	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
Beneficiaries	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	0	1	1	1	1	3	2	2	1	3	3	0	2	1	2	2	2	1	1	3	2
Moray Firth Coastal Partnership	1	2	1	1	1	3	2	1	3	1	1	1	2	1	1	2	3	2	2	2	2
SEPA	1	3	2	3	3	0	0	1	2	1	1	1	3	1	1	1	1	2	3	1	3
Highland Council																					
Port of Cromarty Firth																					
Whyte & Mackay																					
Scottish Water																					
RSPB																					
Moray Ocean Community																					
NatureScot																					
Marine Directorate																					
Academia																					
Landowners																					
Black Isle Partnership																					

Activity One: No linkage; Linkage

Activity Two: 0 No reliance; 1 Low reliance; 2 Moderate reliance; 3 High reliance

Figure 4: Template used to capture relationships and scores during the workshop. The first three rows were used as examples to demonstrate the process.

Once all participants were comfortable with the approach, each table worked systematically to identify the linkages for the remaining 11 beneficiaries. Stakeholders could choose whether they wished to work across the rows, focussing on one organisation at a time, or down the columns, focussing on one benefit at a time. Each table completed the same exercise by highlighting cells to identify linkages on a pre-printed matrix (Figure 4 above). The facilitators took notes, where required, to explain the scores. The order of the beneficiaries was staggered between tables to ensure that all rows were completed by at least two tables; all three tables managed to complete the exercise within time on the day.

The results from each table (T1-T3) are presented in Figure 5. The results show a general agreement between the tables with respect to the identification of linkages. Out of the 294 potential linkages (21 benefits x 14 beneficiaries), 218 linkages (74%) had full agreement across all three tables, whilst the remaining 76 linkages (26%), highlight as bold boxes in Figure 5, had agreement across two tables.

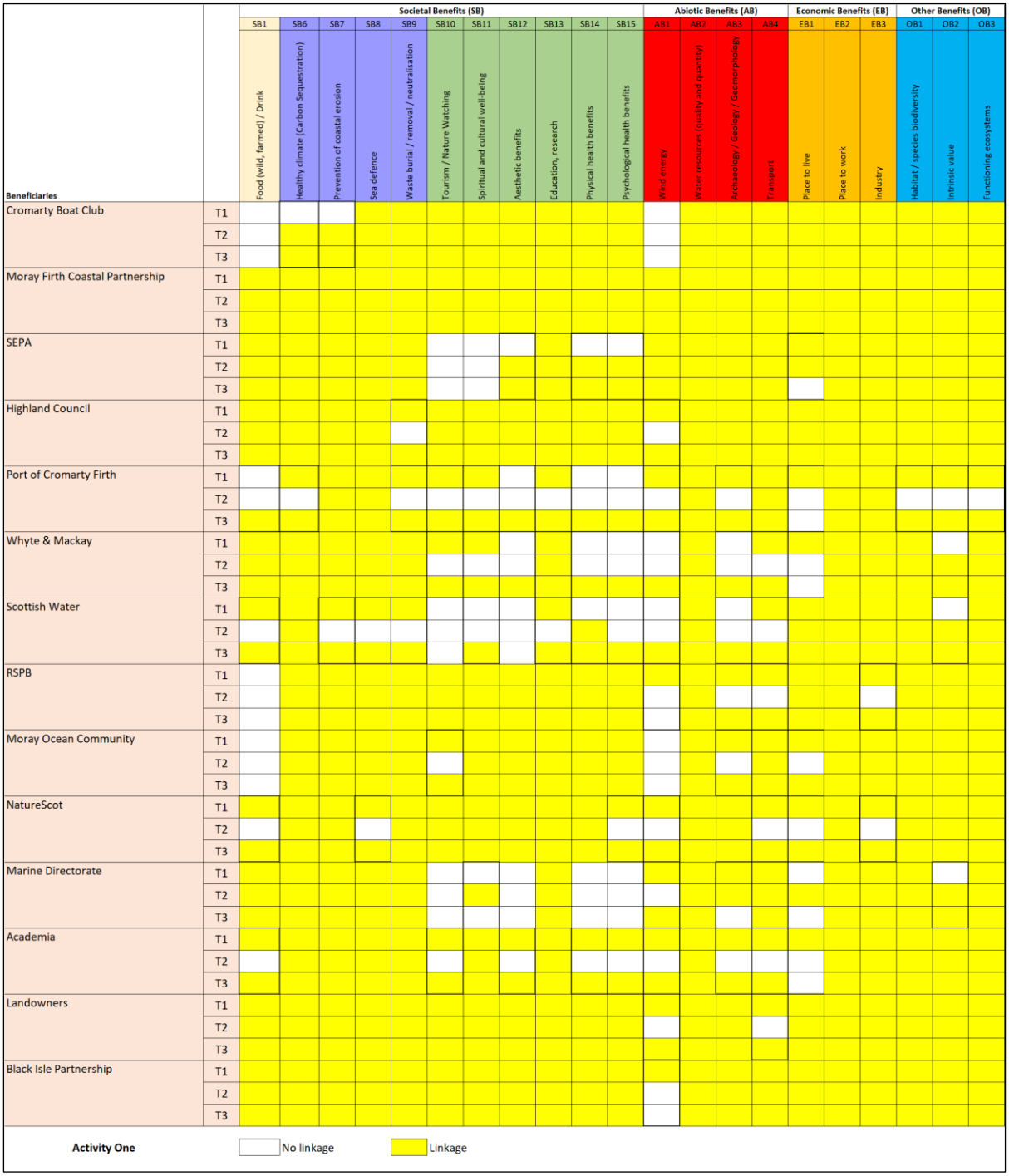


Figure 5: Raw data on the linkages assessment for each table (T1-T3). Bold boxes represent the 76 linkages which did not have full agreement across all three tables.

Activity Two: Scoring links between benefits and beneficiaries.

Building on the outputs from Activity One, Activity Two aimed to score the relative reliance or dependence of the linkages (highlighted as yellow cells). The attendees were reminded that the scores were relative to the other beneficiaries listed. For example, scores for 'Education, Research' should be scored against universities which would score '3' for this category whereas the scores for 'Sea defence' should be scored against SEPA who would score '3' for this category given their major remit for flood protection. The overall scoring system was as follows:

- 0 = No linkage.
- 1 = Low reliance – defined as an indirect linkage.
- 2 = Moderate reliance – defined as an intermediate category between Low and High.
- 3 = High reliance – defined as a direct linkage.

The matrix from Activity One was updated to include relative scores for reliance or dependence on benefits. Participants were allowed to add or remove any linkages that they had identified in the morning session if after reflection they so wished. All highlighted cells have a score (1 = Low, 2 = Moderate, 3 = High) assigned to them, whilst all white cells (i.e. identifying no linkage) score zero. Additional notes were taken on each table by the facilitator, where required.

The raw scoring data from each table are presented in Figure 6. Bold scores identify the organisation being present at the table. To analyse these results, and generate logic chains, mean scores were calculated across the tables. A summary of the mean reliance or dependence of beneficiaries on the benefits and the range of scores across the tables is provide in Figure 7. The results show that of the 294 scores (21 benefits x 14 beneficiaries), 105 scores (36%) had full agreement across the three tables (i.e. a range of 0), 108 scores (37%) were within a range of 1, 61 scores (21%) were within a range of 2 and 20 scores (7%) were within a range of 3. Given that 73% of scores had a range of 1 or less between the tables, we can be relatively confident that there was a good level of understanding of the organisations assessed by those participants within the room.

		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
Beneficiaries		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	T1	0	2	1	1	1	3	2	2	1	3	3	0	2	1	2	2	2	1	1	3	2
	T2	0	1	1	1	1	3	2	2	1	3	3	0	2	1	2	2	2	1	1	3	2
	T3	0	1	2	1	1	3	2	2	1	3	3	0	2	1	2	2	1	1	1	3	1
Moray Firth Coastal Partnership	T1	1	2	1	1	1	3	2	1	3	1	1	1	2	1	1	2	3	2	2	2	2
	T2	1	2	1	1	1	3	2	1	3	1	1	1	2	1	1	2	3	2	2	2	2
	T3	1	2	2	1	1	3	2	1	3	1	1	1	2	1	2	2	2	1	2	2	2
SEPA	T1	1	3	2	3	3	0	0	0	2	0	0	1	3	1	1	1	1	2	3	1	3
	T2	1	3	2	3	3	0	0	1	2	1	1	1	3	1	1	1	1	2	3	1	3
	T3	1	3	3	3	3	0	0	1	2	1	1	1	3	1	2	0	2	2	3	1	3
Highland Council	T1	1	2	2	3	1	2	1	1	3	2	2	2	1	2	3	3	3	2	3	1	3
	T2	1	1	2	2	0	2	1	2	2	3	3	0	2	2	3	3	3	2	2	1	3
	T3	1	3	3	3	2	2	2	2	3	2	2	3	3	2	3	3	2	3	2	2	2
Port of Cromarty Firth	T1	0	1	1	1	1	1	1	0	1	0	0	3	1	2	3	1	3	3	1	1	1
	T2	0	0	1	3	0	0	0	0	0	0	0	0	1	0	2	0	3	3	0	0	0
	T3	1	2	1	3	1	3	2	3	2	2	2	3	1	2	3	0	3	3	1	3	2
Whyte & Mackay	T1	3	1	1	1	2	2	1	0	2	0	0	0	3	0	1	1	3	3	1	0	2
	T2	3	1	1	3	2	0	0	0	2	0	0	0	1	0	0	0	3	3	2	2	2
	T3	3	3	2	1	1	2	3	3	1	2	2	1	3	1	3	0	2	3	1	2	3
Scottish Water	T1	1	1	1	1	3	0	0	0	2	0	0	0	3	0	1	1	1	1	1	0	1
	T2	0	1	0	0	0	0	0	0	0	1	0	0	3	0	0	1	1	3	1	1	1
	T3	3	3	3	3	3	0	1	0	3	2	3	1	3	2	3	2	2	2	2	1	3
RSPB	T1	0	3	2	3	1	3	2	2	3	2	2	2	3	2	1	1	1	1	3	2	3
	T2	0	3	3	1	3	3	1	1	2	1	3	0	3	0	0	1	1	0	3	3	3
	T3	0	3	3	2	1	3	2	3	3	1	3	0	2	2	2	1	2	2	3	2	3
Moray Ocean Community	T1	0	2	1	1	2	3	2	3	3	3	3	0	3	1	1	1	1	1	3	3	3
	T2	0	3	3	1	3	0	1	1	3	3	2	0	3	0	1	0	3	1	3	3	3
	T3	0	3	3	1	1	2	2	2	3	3	3	0	2	2	2	2	3	1	3	3	3
NatureScot	T1	1	3	1	1	2	3	2	3	3	2	2	2	3	3	1	1	1	1	3	2	3
	T2	0	3	3	0	3	1	1	1	1	1	0	0	3	1	0	0	1	0	3	3	3
	T3	2	3	3	3	2	3	3	3	3	3	3	1	3	3	3	1	2	3	3	2	3
Marine Directorate	T1	1	3	1	1	1	0	0	0	2	0	0	3	3	2	1	0	1	3	3	0	3
	T2	1	1	1	1	1	0	1	0	1	0	0	0	2	1	1	1	1	3	2	1	1
	T3	2	3	1	1	1	0	0	0	3	0	0	2	2	0	2	0	1	3	3	1	3
Academia	T1	1	2	1	1	1	2	1	1	3	1	1	3	2	2	1	1	2	2	3	2	3
	T2	0	3	1	1	3	0	1	0	3	0	0	0	2	0	0	0	2	3	3	3	3
	T3	1	2	1	1	1	1	1	1	3	1	1	2	1	2	1	0	2	2	2	2	2
Landowners	T1	2	2	3	3	2	1	2	2	1	1	2	1	2	2	2	3	3	2	2	2	2
	T2	2	2	2	1	1	1	1	2	1	1	1	0	2	2	0	3	3	2	2	1	3
	T3	3	2	3	3	2	2	2	2	2	2	3	2	3	2	3	3	3	3	2	3	3
Black Isle Partnership	T1	1	1	1	1	1	3	2	3	2	2	2	1	1	2	2	1	2	1	2	3	2
	T2	2	1	2	1	1	3	1	2	2	3	3	0	2	2	3	3	3	2	2	1	3
	T3	2	2	2	2	1	3	2	3	2	3	3	0	2	2	3	2	2	2	1	3	2

Activity Two — 0 No reliance; 1 Low reliance; 2 Moderate reliance; 3 High reliance

Figure 6: Raw data for the scores of the linkages based on level of reliance or dependence by each beneficiary on each benefit for each table (T1-T3).

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

Figure 7: Summary data for the relative mean score (0 = No; 1 = Low; 2 = Moderate; 3 = High) and range in scores (0-3) across the three tables.

Logic Chain Analysis and Results

The aim of this workshop series was to demonstrate the multi-directional logic chain sequence between natural features, benefits and beneficiaries of the Cromarty Firth. It is argued here that depending on the narrative, the logic chain can be read from left to right to identify the **importance** of the natural (capital) features providing benefits to beneficiaries, taking natural features as the starting point of the logic chain. Alternatively, the narrative can move from right to left, starting with the beneficiaries, to describe the **reliance or dependence** of beneficiaries on the benefits which are in turn provided by the underlying natural (capital) features.

The data gathered during the participatory mapping workshop series can be investigated in several different ways depending on the specific interests of the Cromarty Firth community. Examples of some of the types of analysis which can be undertaken are presented below, however these are only presented to illustrate how the data can be investigated and are by no means exhaustive.

- **Example 1: Scenario Analysis.** The data gathered during the participatory mapping workshop series can be used when looking at future scenarios analysis. For example, following on from the managed realignment scenario (in Workshop 2) there may be interest in investigating which beneficiaries may gain the most from the benefits delivered under this scenario.
- **Example 2: Benefits Focus.** There may be interest in investigating the data with respect to a specific benefit of interest. Two examples are provided below which focus on carbon sequestration (SB6) and bioremediation of waste (SB9). These benefits are the primary focus of the *Sea the Value* project however the same analysis could be undertaken for any of the benefits which were identified as being delivered by the Cromarty Firth.
- **Example 3: Beneficiary Focus**. As an organisation, the data collected during the workshop series could be used to investigate the reliance or dependence of a specific organisation on the benefits provided by the Cromarty Firth and the underpinning natural features which deliver those benefits. The example presented below is for the RSPB, however the same analysis could be undertaken for any of the beneficiaries assessed during Workshop 3.

Example 1: Scenario Analysis

In Workshop 2, future scenario assessments were undertaken to investigate the trade-offs in benefit delivery under different hypothetical future managed interventions. Workshop 2 focussed on two scenarios (managed realignment and native oyster restoration) and identified how the delivery of benefits would change if the habitat changed from agricultural land to saltmarsh and from mudflat to native oyster beds, respectively. The outputs from Workshop 3 allow these scenarios to be further explored by identifying which beneficiaries may be impacted under the different scenarios. To demonstrate this approach, the managed realignment scenario will be further explored here, with our focus being on the creation of saltmarsh. Given the focus is on a natural feature, then the logic chain would be constructed from left to right.

Natural Features Analysis

Our focus here is on saltmarsh, and therefore need to identify which benefits are delivered by this natural feature. These relationships were identified by the Cromarty Firth stakeholders in Workshop 1 (see Annex 3). A total of 18 out of 21 benefits were identified as being of relevance with respect to saltmarsh (Table 3). Of these 18 benefits, 11 were assessed by Potts et al. (2014) and therefore additional information is available on the relative importance of saltmarsh in providing these benefits and an indication of confidence level of the score (Table 3). This information forms the left-hand side

of the logic chain (Figure 8). For the remaining seven benefits where a linkage has been identified, no relative assessment has been undertaken in the literature and therefore these linkages would be identified as a dashed line in the logic chains.

Table 3: Summary of the benefits derived from saltmarsh identified by Cromarty Firth stakeholders, and the relative importance of saltmarsh in delivering such benefits (after Potts et al., 2014).

Benefits	Relationship with Saltmarsh as identified in Workshop 1	Taken from Potts et al. (2014)	
		Relative Importance	Confidence
Food (wild, farmed) / Drink	X	3	3
Healthy climate (Carbon Sequestration)	X	3	3
Waste burial / removal / neutralisation	X	3	3
Tourism / Nature Watching	X	3	3
Aesthetic benefits	X	3	3
Prevention of coastal erosion	X	2	3
Sea defence	X	2	3
Spiritual and cultural well-being	X	1	1
Education, research	X	1	1
Physical health benefits	X	1	1
Psychological health benefits	X	1	1
Water resources (quality and quantity)	X	Not assessed	
Archaeology / Geology / Geomorphology	X	Not assessed	
Place to work	X	Not assessed	
Industry	X	Not assessed	
Habitat / species biodiversity	X	Not assessed	
Intrinsic value	X	Not assessed	
Functioning ecosystems	X	Not assessed	
Wind energy	0	n/a	n/a
Transport	0	n/a	n/a
Place to live	0	n/a	n/a

KEY

3	High importance
2	Moderate importance
1	Low importance
0	No or neglible importance

3	High confidence
2	Medium confidence
1	Low confidence

Beneficiaries Analysis

Given that saltmarsh provides a wide range of benefits (18 out of 21) from which numerous beneficiaries will be dependent or reliant, the focus here is on those benefits which saltmarsh is highly important for delivery (i.e. which score 3 in Table 3 above). A summary of the reliance or dependence scores for each beneficiary on these five benefits is presented in Table 4. All beneficiaries have some reliance or dependence on at least one of these five benefits; however, it is of note that four beneficiaries are highly reliant or dependent (i.e. soring 3) on healthy climate (carbon sequestration) and tourism/nature watching. For demonstration purposes, it is only the linkages which score 3 which have been reproduced on the right-hand side of the logic chain (Figure 9).

Table 4: Summary of the relative reliance or dependence of beneficiaries on the five most important benefits derived from saltmarsh.

Beneficiary	Food (wild, farmed) / Drink	Healthy climate / Carbon Sequestration	Waste burial / removal / neutralisation	Tourism / Nature Watching	Aesthetic benefits
Cromarty Boat Club	0	1	1	3	2
Moray Firth Coastal Partnership	1	2	1	3	1
SEPA	1	3	3	0	1
Highland Council	1	2	1	2	2
Port of Cromarty Firth	0	1	1	1	1
Whyte & Mackay	3	2	2	1	1
Scottish Water	1	2	2	0	0
RSPB	0	3	2	3	2
Moray Ocean Community	0	3	2	2	2
NatureScot	1	3	2	2	2
Marine Directorate	1	2	1	0	0
Academia	1	2	2	1	1
Landowners	2	2	2	1	2
Black Isle Partnership	2	1	1	3	3

Logic Chain Analysis

A simplified logic chain has been produced which illustrates the relationships between saltmarsh and the benefits it provides in the Cromarty Firth (left-hand side), and which beneficiaries are highly reliant or dependent (right-hand side) on the five highly important benefits provided by saltmarsh (Figure 8). Such illustrations can be used to identify which beneficiaries would likely benefit the most under future managed realignment interventions in the Cromarty Firth.

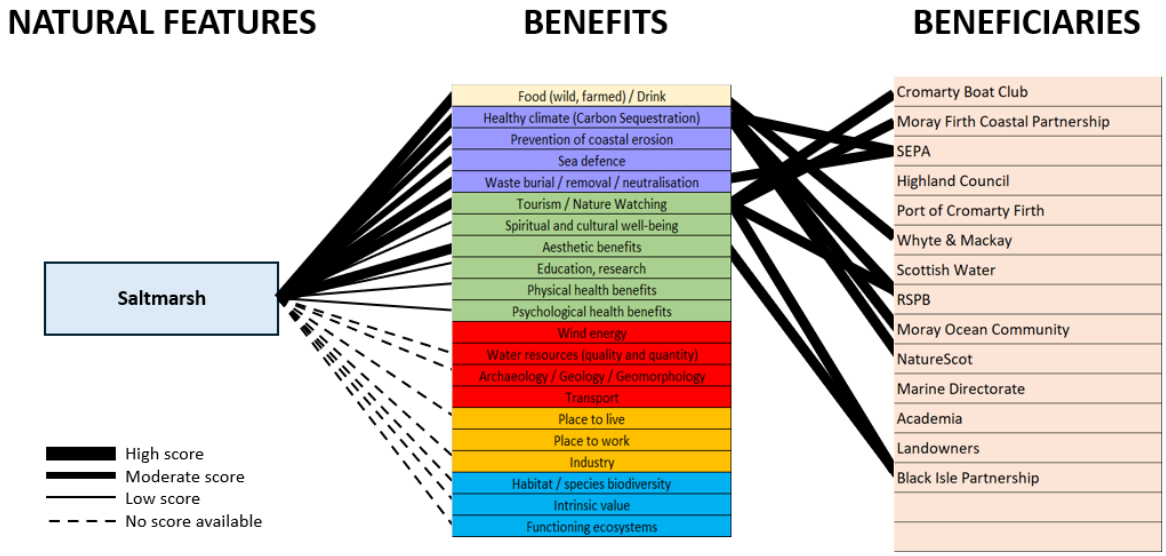


Figure 8: Logic chain identifying the relative importance of the benefits that are delivered by saltmarsh (left-hand side) and the beneficiaries who are highly reliant (i.e. scoring 3) on these benefits (right-hand side).

Example 2: Benefits Focus.

The *Sea the Value* project focus is on carbon sequestration (SB6) and bioremediation of waste (SB9) and therefore these are presented as examples below. However, the same analysis could be undertaken for any of the 21 benefits identified within the Cromarty Firth workshop series.

2.1 Carbon Sequestration (SB6)

Natural Features Analysis

The first step in developing the logic chain sequence is to look at which natural features, identified in Workshop 1, provide some level of carbon sequestration (see Annex 3 for the full matrix of natural features versus benefits). The full list of natural features is presented in Column 1 (Table 5), with the linkages identified by the workshop attendees presented in Column 2 (Table 5). A total of eight natural features were identified as providing a carbon sequestration benefit. The relative importance of natural features in delivering carbon sequestration were assessed by Potts et al. (2014) and therefore these relative scores can be used to make a richer logic chain (see Annex 4). The relative scores, and confidence in those scores, are presented in Column 3 and Column 4 respectively (Table 5). It is of note that two of the natural features identified in the Cromarty Firth were not assessed by Potts et al. (2014) and therefore no scores are available for these natural features. The assessment shows that saltmarsh was the most important natural feature identified in delivering carbon sequestration, seagrasses, mudflats, blue mussels and Horsemussels were of moderate importance, and beach was considered of low importance. These relationships, and their relative scores, form the left-hand side of the logic chain (see Figure 9).

Table 5: Relative importance of natural features in providing the carbon sequestration benefit (adapted from Potts et al., 2014).

Natural features	Relationship with Carbon Sequestration Identified in Workshop 1	Taken from Potts et al. (2014)	
		Relative Importance	Confidence
Saltmarshes	X	3	3
Seagrasses	X	2	2
Mudflats	X	2	3
Blue mussels	X	2	1
Horsemussels	X	2	1
Beach	X	1	2
Natural Firth Channel	X	not assessed	not assessed
Woodland	X	not assessed	not assessed
Sandbanks	0	n/a	n/a
Dunglass Island	0	n/a	n/a
Burns	0	n/a	n/a
Old oyster beds	0	n/a	n/a
Cliffs	0	n/a	n/a
Brownfield	0	n/a	n/a

KEY

3	High importance
2	Moderate importance
1	Low importance
0	No or neglible importance

3	High confidence
2	Medium confidence
1	Low confidence

Beneficiaries Analysis

The focus now turns to the relationships between the carbon sequestration benefit and the beneficiaries identified within Workshop 3. The mean scores and the range of scores between the three tables are presented in Table 6. All beneficiaries were identified as having a reliance or dependence on carbon sequestration (see Figure 7 above), with four beneficiaries (SEPA, RSPB, NatureScot, Moray Ocean Community) identified as being highly reliant or dependent (i.e. a score of 3). It is of note that there was total agreement across all three tables (i.e. a range of 0) that the first three beneficiaries have a high reliance or dependence on this benefit. Seven beneficiaries were identified as having a moderate reliance or dependence on carbon sequestration, whilst three beneficiaries were identified as having a low reliance or dependence. These relationships form the right-hand side of the logic chain (see Figure 9 below).

Table 6: Mean relative reliance or dependence score of Beneficiaries on Carbon Sequestration (SB6) and the Range of scores across three tables (0 = full agreement across the tables).

Beneficiaries	Carbon Sequestration (SB6)	
	Mean Score	Range
SEPA	3.0	0
RSPB	3.0	0
NatureScot	3.0	0
Moray Ocean Community	2.7	1
Marine Directorate	2.3	2
Academia	2.3	1
Moray Firth Coastal Partnership	2.0	0
Highland Council	2.0	2
Landowners	2.0	0
Whyte & Mackay	1.7	2
Scottish Water	1.7	2
Cromarty Boat Club	1.3	1
Black Isle Partnership	1.3	1
Port of Cromarty Firth	1.0	2

Logic Chain Analysis

The logic chain presented in Figure 9 takes the benefit of carbon sequestration as its focus. Reading from the left identifies the relative importance of natural features in delivering this benefit, whilst reading from the right identifies the beneficiaries which are most reliant or dependent on this benefit. Taking only the highest scores (i.e. scores of 3) as an example, then saltmarsh is identified as the most important natural feature in delivering this benefit. With respect to the beneficiaries, SEPA, RSPB, Moray Ocean Community and NatureScot have all been identified as the beneficiaries which are most reliant or dependent on the carbon sequestration benefit in the Cromarty Firth.

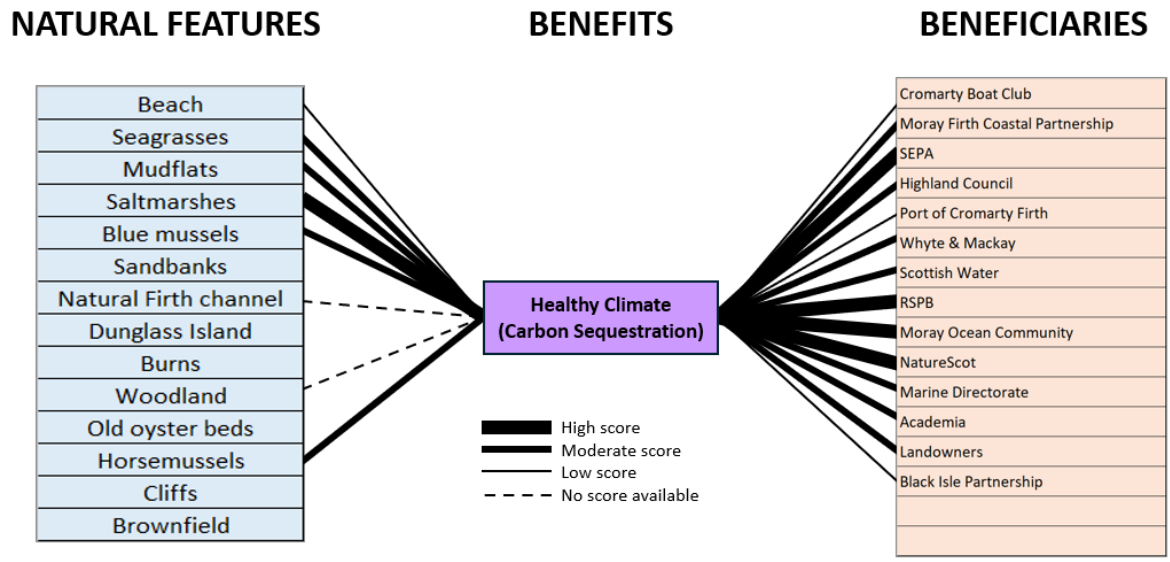


Figure 9: Logic chain identifying the relative importance of natural features in delivering carbon sequestration and the reliance or dependence of beneficiaries on carbon sequestration.

2.2 Bioremediation of Waste (SB9)

Natural Features Analysis

Focussing on the bioremediation of waste benefit (SB9), stakeholders identified six natural features which contribute to the delivery of this benefit within the Cromarty Firth (Table 7, Annex 3). Taking the relative importance scores from the Potts et al. (2014) assessment (see Annex 4), this identifies saltmarsh as being the most important natural feature in delivering this benefit, with moderate contributions from seagrass, mudflats, blue mussels and Horsemussels, whilst beach only provides a low level of this benefit. High confidence scores were associated with the score for saltmarsh and mudflats (being based on UK peer-reviewed evidence), whilst the confidence scores for blue mussels, Horsemussels and sandbanks were all low, being based on expert opinion (after Potts et al., 2014). These six natural features form the left-hand side of the logic chain for bioremediation of waste (see Figure 10 below).

Table 7: Relative importance of natural features in providing the Bioremediation of Waste Benefit (adapted from Potts et al., 2014).

Natural features	Relationship with Bioremediation of Waste Identified in Workshop 1	Taken from Potts et al. (2014)	
		Relative Importance	Confidence
Saltmarshes	X	3	3
Seagrasses	X	2	2
Mudflats	X	2	3
Blue mussels	X	2	1
Horsemussels	X	2	1
Beach	X	1	1
Sandbanks	0	n/a	n/a
Natural Firth Channel	0	n/a	n/a
Dunglass Island	0	n/a	n/a
Burns	0	n/a	n/a
Woodland	0	n/a	n/a
Old oyster beds	0	n/a	n/a
Cliffs	0	n/a	n/a
Brownfield	0	n/a	n/a

KEY

3	High importance	3	High confidence
2	Moderate importance	2	Medium confidence
1	Low importance	1	Low confidence
0	No or neglible importance		

Beneficiaries Analysis

During Workshop 3, stakeholders identified all beneficiaries as having some reliance or dependence on the Cromarty Firth for delivering the bioremediation of waste benefit (Table 8). Given the remit of SEPA, it is not surprising that SEPA scored the highest level of reliance or dependence on this benefit and this score was agreed across all tables (i.e. had a range of 0). Seven beneficiaries were identified as having moderate reliance or dependence on the bioremediation of waste benefit, however the range in scores was much higher (ranging from 1 to 3) and therefore there was less certainty within the room about the relative importance of these relationships. Six beneficiaries were identified as

having low reliance or dependence on this benefit, and there was good agreement amongst the tables for most of these scores. It is of note that the Highland Council had quite a large range of scores with respect to this benefit. The broad ranging remit of the Highland Council may help to explain why there was not more agreement across the tables (range = 2) on the relative importance of this benefit to the organisation and therefore may identify the need for further analysis of the relative reliance or dependence of different departments within the Highland Council. These relationships and relative scores form the right-hand side of the logic chain (see Figure 10 below).

Table 8: Mean relative reliance or dependence score of Beneficiaries on Bioremediation of Waste Benefit and the Range of scores across three tables (0 = full agreement across the tables).

	Bioremediation of Waste (SB9)	
Beneficiaries	**Mean**	**Range**
SEPA	3.0	0
NatureScot	2.3	1
Scottish Water	2.0	3
Moray Ocean Community	2.0	2
Whyte & Mackay	1.7	1
RSPB	1.7	2
Academia	1.7	2
Landowners	1.7	1
Cromarty Boat Club	1.0	0
Moray Firth Coastal Partnership	1.0	0
Highland Council	1.0	2
Marine Directorate	1.0	0
Black Isle Partnership	1.0	0
Port of Cromarty Firth	0.7	1

Logic Chain Analysis

The logic chain for the bioremediation of waste (SB9) benefit provided by the Cromarty Firth is presented in Figure 10. The Cromarty Firth stakeholders considered a smaller number of natural features to deliver this benefit, with saltmarsh being the most important. The logic chain clearly illustrates a cluster of beneficiaries who are all reliant or depend on this benefit at a moderate level, with SEPA having the greatest reliance or dependence on this benefit provided by the Cromarty Firth.

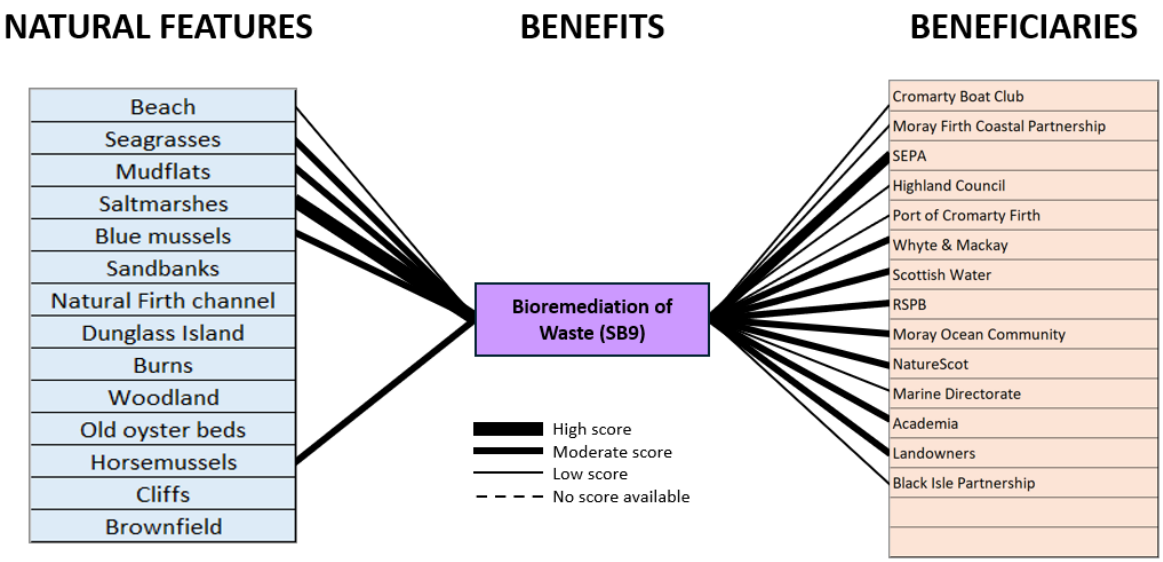


Figure 10: Logic chain identifying the relative importance of natural features in delivering the bioremediation of waste benefit and the reliance or dependence of beneficiaries on this benefit.

Example 3: Beneficiary Focus

The final example presented here takes a beneficiary focus, and for the purposes of demonstration uses the RSPB as an example. Given the focus on the beneficiary, then the logic chain is created from right to left, first identifying the benefits which the RSPB are reliant or dependent on, and then identifying which natural features are important in delivering those benefits.

Beneficiary Analysis

Outputs from the assessments undertaken in Workshop 3 show that the RSPB was identified as being reliant or dependent on 20 out of 21 benefits within the Cromarty Firth (Table 9), with Food/Drink for human consumption being the only benefit that the RSPB are not reliant or dependent on. The assessment shows that RSPB are highly reliant or dependent on eight benefits (score = 3) with the data showing good agreement across the three tables (ranges between 0 and 1). The RSPB was also identified as being moderately reliant or dependent on five benefits (score = 2), with a low score (score = 1) for the remaining seven benefits. In general, there was less agreement between the tables on these moderate and low scores with relatively high ranges in the data (range in score of 2 between the three tables) observed for several benefits. These relative relationships form the right-hand side of the logic chain (see Figure 12 below).

Table 9: Relative reliance or dependence of RSPB on benefits provided by the Cromarty Firth.

Benefits	Mean	Range
Healthy climate (Carbon Sequestration)	3.0	0
Tourism / Nature Watching	3.0	0
Habitat / species biodiversity	3.0	0
Functioning ecosystems	3.0	0
Prevention of coastal erosion	2.7	1
Education, research	2.7	1
Psychological health benefits	2.7	1
Water resources (quality and quantity)	2.7	1
Intrinsic value	2.3	1
Sea defence	2.0	2
Aesthetic benefits	2.0	2
Waste burial / removal / neutralisation	1.7	2
Spiritual and cultural well-being	1.7	1
Physical health benefits	1.3	1
Archaeology / Geology / Geomorphology	1.3	2
Place to work	1.3	1
Transport	1.0	2
Place to live	1.0	0
Industry	1.0	2
Wind energy	0.7	2
Food (wild, farmed) / Drink	0.0	0

Natural Features Analysis

Focussing on the eight benefits which the RSPB is highly reliant or dependent on (Table 10), the data can be further interrogated to investigate which natural features deliver these benefits and how (relatively) important these relationships are. Figure 11 illustrates where there are relationships (represented with a X in a pale green cell) and where available, provides the relative score of the relationship based on the outputs from Potts et al. (2014) (see Annex 4). This information forms the left-hand side of the logic chain (see Figure 12).

Natural features	SB6 Healthy climate (Carbon Sequestration)	SB7 Prevention of coastal erosion	SB10 Tourism / Nature Watching	SB13 Education, research	SB15 Psychological health benefits	AB2 Water resources (quality and quantity)	OB1 Habitat / species biodiversity	OB3 Functioning ecosystems
Beach	1	2	3	1	3	X	X	X
Seagrasses	2	2	2	1	X	X	X	X
Mudflats	2	1	1	1	2	X	X	X
Saltmarshes	3	2	3	1	1	X	X	X
Blue mussels	2	2	2	1	X	X	X	X
Sandbanks			X	1	X			X
Natural Firth channel	X		X	X	X	X	X	X
Dunglass Island			X	X	X			X
Burns			X	X	X	X		X
Woodland	X				X	X	X	X
Old oyster beds				X			X	
Horsemussels	2			1		X	X	X
Cliffs		X	X	X	X		X	X
Brownfield			X	X			X	X

Figure 11: Linkages between natural features and the eight benefits which RSPB are highly reliant or dependent on. Green cells with an X represent that a linkage has been identified, coloured cells illustrate that a relative score is available for that linkage.

Logic Chain Analysis

A simplified logic chain for the RSPB can be produced which focusses on the eight benefits which were identified as those which the RSPB are most reliant or dependent on and can illustrate which natural features are most important in delivering these eight benefits (Figure 12). The relative importance scores were only available for five benefits, with the other linkages represented by dashed lines. Stakeholders identified several other natural features which may deliver these benefits (see Figure 11 above), however given that relative scores were not available then they have not been included in this simplified logic chain.

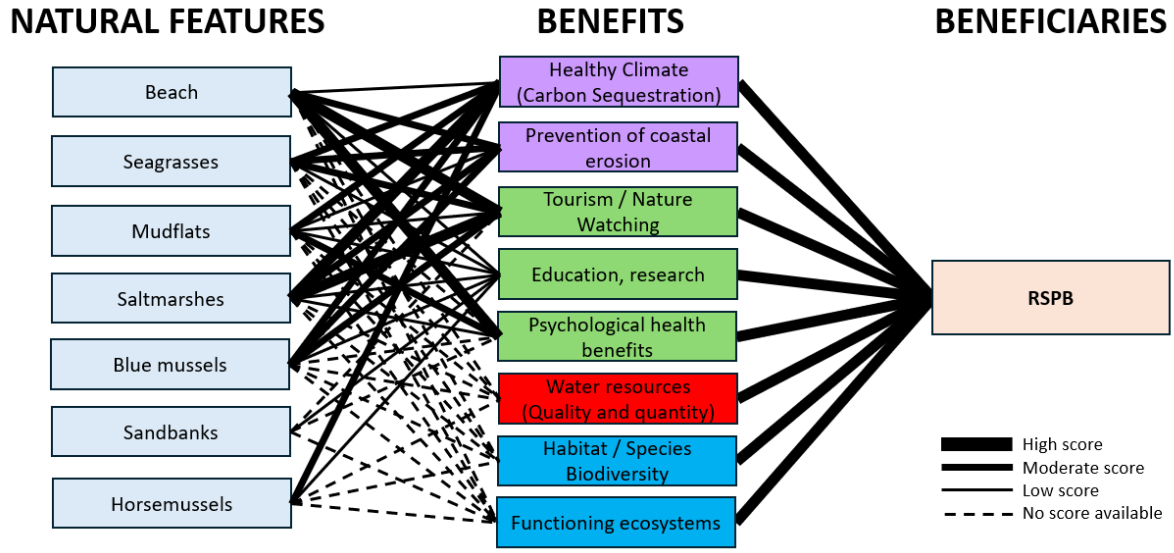


Figure 12: A logic chain focussing on the eight most important benefits which the RSPB is reliant or dependent on and the natural features which provide these benefits.

Logic Chain Discussion

The series of three participatory workshops undertaken with the Cromarty Firth community have generated the data required to populate the logic chain structure as demonstrated above. Generating logic chains in such a way enables the user to identify the importance of linkages between natural features, benefits and beneficiaries when viewed through a natural capital lens from left to right. The logic chains can also be viewed from a beneficiary's perspective when viewed from right to left focussing on the reliance or dependence of beneficiaries on the benefits, and the reliance or dependence of the provision of the benefits by the underlying natural features. Such logic chains can become very complex, with a potential to form 4,116 linkages (14 natural features x 21 benefits x 14 beneficiaries). Scoring the linkages, based on local knowledge or from the available literature, enables us to focus on the linkages which are considered the most important and therefore can remove some of the complexity in the logic chain and by extension, natural capital priorities and interventions. The level of complexity included within logic chains may be dependent on the question of interest. For example, the illustrative logic chains presented in this section have focussed on a single natural feature (Example 1), a single benefit (Example 2) or an individual organisation (Example 3) and where complexity became too great have focussed on the linkages which are considered most important. This recognises the fact that for logic chains to be of use on the ground, the focus and the level of complexity must be tailored accordingly, and the questions must be clear.

The data used to populate the logic chains are specific to the Cromarty Firth, given that the list of features, benefits and beneficiaries, and the relative importance of the links between them were all derived by the Cromarty Firth community. The list of features, benefits and beneficiaries provide a snapshot of the Cromarty Firth, and it is recognised that these lists may need to be refined over time as new features develop and/or are restored, as new benefits are realised and/or as future developments may introduce new beneficiaries into the community. It is hoped that the systematic methods developed and applied in the *Sea the Value* project have provided the community with the skills and knowledge to capture changes in the future. For example, the Cromarty Firth community may wish to expand the number of beneficiaries included in the assessment, to consider changes in the extent or location of features which are present within the Cromarty Firth or to analyse the impact of future management interventions on the delivery of benefits and the individuals and organisations which are impacted (positively or negatively) by such interventions.

Activity Three: Identifying and scoring links between benefits and individual beneficiaries.

The final workshop activity asked attendees to score their own personal and individual relationships with the benefits provided by the Cromarty Firth. The same methodology was applied as that undertaken for Activities One and Two whereby the relationships were first identified and then scored but this time from an individual perspective, rather than that of the organisation that they are representing at the workshop. All data were collected and presented anonymously.

In addition to undertaking the scoring exercise, respondents were asked a few supplementary questions to provide some additional information for further investigation of the data. The questions included:

1. Do you consider yourself to be a local resident of the Cromarty Firth?
2. If so, how long have you lived around the Cromarty Firth?
3. Which Community Council do you reside in (e.g. Cromarty, Dingwall, Alness, etc.)?
4. Can you see the Cromarty Firth from your house?
5. Have you taken part in any of the following recreational activities in or around the Cromarty Firth in the last 12 months? If so how often?

The results for the individual exercise are presented in Figure 13 with a summary of the supporting data provided in Table 3. It is clear from the data that individuals valued cultural benefits the most (scores = 3), with respect to psychological health benefits (83% of respondents), aesthetic benefits (75% of respondents) and physical health benefits (75% of respondents). Other benefits, which include habitat/species biodiversity, intrinsic value and functioning ecosystems were also scored highly (scores = 3) by many respondents (75%, 67%, 67%, respectively). For some benefits, there was much less connection with individuals, for example 50% of respondents reported having no connection with wind energy from the Cromarty Firth, and 25% having no connection with food / drink and archaeology / geology / geomorphology. Tourism / nature watching scored relatively highly, with 92% of respondents identifying a moderate or high reliance on this benefit; this is further analysed below.

	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
Beneficiaries	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
1	0	1	2	3	0	3	3	3	1	3	3	0	1	3	2	3	1	0	2	2	2
2	2	2	1	1	1	2	3	3	2	1	2	1	2	2	2	0	2	1	2	3	2
3	2	2	3	3	1	0	3	3	0	1	3	0	1	0	1	0	3	0	3	3	3
4	0	3	2	0	0	3	3	3	2	3	3	0	0	0	3	0	3	3	3	3	3
5	3	2	3	3	2	2	3	3	3	3	3	1	2	1	3	3	3	1	2	3	2
6	2	3	3	2	2	3	2	3	3	3	3	2	3	2	2	3	3	2	3	3	3
7	2	3	3	3	3	3	3	3	2	3	3	0	3	2	2	3	1	0	3	3	3
8	0	0	0	0	0	2	0	2	0	1	1	0	0	0	1	0	3	0	3	2	3
9	1	2	1	1	1	2	2	2	2	3	3	1	3	2	3	3	3	3	2	2	2
10	1	3	3	2	3	3	3	3	3	3	3	0	3	2	2	3	3	1	3	3	3
11	1	2	1	1	2	2	2	1	2	3	3	1	1	1	1	2	2	1	3	3	3
12	1	2	2	2	3	2	2	3	3	3	3	1	3	2	1	1	2	1	3	3	3
Activity Three	0 No reliance				1 Low reliance				2 Moderate reliance					3 High reliance							

Figure 13: Raw data from the individual perspective analysis (n=12).

Table 11: Summary data of the relative importance of each of the benefits to individuals (n=12).

Code	Benefit	No (%)	Low (%)	Mod. (%)	High (%)
SB15	Psychological health benefits	0	8	8	83
SB12	Aesthetic benefits	0	8	17	75
SB14	Physical health benefits	0	25	0	75
OB2	Intrinsic value	0	0	25	75
OB1	Habitat / species biodiversity	0	0	33	67
OB3	Functioning ecosystems	0	0	33	67
SB11	Spiritual and cultural well-being	8	0	33	58
EB2	Place to work	0	17	25	58
EB1	Place to live	33	8	8	50
SB7	Prevention of coastal erosion	8	25	25	42
SB10	Tourism / Nature Watching	8	0	50	42
AB2	Water resources (quality and quantity)	17	25	17	42
SB6	Healthy climate (Carbon Sequestration)	8	8	50	33
SB8	Sea defence	17	25	25	33
SB13	Education, research	17	8	42	33
SB9	Waste burial / removal / neutralisation	25	25	25	25
AB4	Transport	0	33	42	25
EB3	Industry	33	42	8	17
SB1	Food (wild, farmed) / Drink	25	33	33	8
AB3	Archaeology / Geology / Geomorphology	25	17	50	8
AB1	Wind energy	50	42	8	0

Some basic socio-demographic data were collected which may be used to support some of the data observed in Figure 8. A summary of these data is provided in Annex 5, and show that of the 12 respondents, 50% considered themselves to be local to the Cromarty Firth, with five of these having lived in the area for over 10 years. Respondents lived in a range of community council districts, with locals in Cromarty and Inverness being the most representative within the sample. Only 3 respondents have a view of the Cromarty Firth from their house.

With respect to tourism / nature watching, respondents were also asked about which activities they have participated in over the last 12 months, and how often the have participated. The initial list of activities was those identified as subcategories of tourism / nature watching by the Cromarty Firth stakeholders in Workshop 1. Respondents were also given the option to add 'Other' activities if they wished. The data obtained from this exercise are summarised in Table 12. A broad range of activities were undertaken by respondents in the Cromarty Firth (10 in total), with wildlife watching being the most popular, with 11 out of 12 respondents participating in this activity. Frequency of undertaking wildlife watching varies amongst the group ranging from daily (3 respondents), to weekly (4 respondents), monthly (2 respondents) and quarterly (2 respondents) within the last 12 months. Cycling and swimming were also popular activities, with 9 and 7 respondents respectively undertaking these activities in the last 12 months. No respondents participated in wildfowling or cruise ships in the last 12 months. With respect to 'Other' categories, individuals identified three additional activities, namely walking, running and research. Data for these categories have been included in the results, however it must be noted that as these were not on the original list of activities then we assumed individuals did not participate in these activities unless they stated otherwise. It is however recognised that participation rates in these activities may have been higher if they were included in the original list of activities for all respondents and therefore all non-responses for these categories have been represented in brackets in Table 12.

Although the sample size was relatively small for this activity (n = 12), the methodology developed, and the data gathered could be considered as a pilot study and form a baseline of data for how individuals within the Cromarty Firth community use and value the benefits provided by the Cromarty Firth.

Table 12: Summary data from Activity 3 (Question 5) (n=12). Scores in brackets are assumed for the 'Other' categories as all participants did not answer these questions.

Activity	Participation		Frequency					
	Yes	No	Daily	Weekly	Monthly	Quarterly	Annually	Other
a. Wildlife watching (birds/marine mammals)	11	1	3	4	2	2	0	0
h. Cycling	9	3	0	1	6	1	1	0
f. Swimming	7	5	1	0	3	1	2	0
c. Cruising / boat trips	5	7	0	0	0	1	3	1
b. Rowing / kayaking / paddleboarding	3	9	0	2	0	1	0	0
g. Other (Walking)	3	(9)	2	(0)	(0)	1	(0)	(0)
e. Sailing / windsurfing	2	10	0	0	0	0	2	0
g. Other (Research)	2	(10)	1	1	(0)	(0)	(0)	(0)
d. Recreational fishing	1	11	0	0	0	0	1	0
g. Other (Running)	1	(11)	(0)	1	(0)	(0)	(0)	(0)
g. Wildfowling	0	12	0	0	0	0	0	0
i. Cruise ships	0	12	0	0	0	0	0	0

Future Opportunities in the Cromarty Firth

Sea the Value reporting timeframe

Daryl Burdon informed participants about the remaining timeframe for the *Sea the Value* project. It is hoped that the report will be circulated to all participants by the end of April 2024 and that the final maps will be printed and distributed to participants shortly after that. Although this will mark the end of the participatory mapping part of the *Sea the Value* project, Daryl informed the group that the project will run until the end of July 2025 and therefore the project team are keen to remain engaged with the group moving forwards. Contact details for the project team are included at the end of the workshop slides (Annex 2) and therefore please contact us to discuss any future opportunities for us to engage in the Cromarty Firth or elsewhere within your region.

Participants suggested that it would be valuable if a non-technical briefing document could be produced to share within their own organisations and with other organisations that they work closely with who have not engaged thus far with the *Sea the Value* project team. Daryl and Tavis agreed to produce a short summary of the work undertaken by the *Sea the Value* project team in the Cromarty Firth and once drafted will circulate this around the group for comment before wider dissemination.

Future *Sea the Value* research

Jeremy introduced some further research that he would like to undertake in the Cromarty Firth over the next 12 months within the scope of the *Sea the Value* project (see slides in Annex 2). Jeremy is keen to explore both the photo voice and walking interview methods in the Cromarty Firth. The photo voice method helps reveal perceptions of both tangible and intangible aspects of projects and could provide a way for local perceptions of value to be recorded and shared within and outside of the community. Walking interviews can be undertaken with groups or individuals and are useful in capturing data relating to people's understanding of place including exploring some of the linkages around cultural benefits such as intrinsic values and cultural wellbeing. Jeremy hopes to develop a local competition for best photos with an exhibition to be presented somewhere around the Cromarty Firth. If anyone is interested in taking part in this research, please contact Jeremy directly (jeremy.anbleyth-evans@abdn.ac.uk).

Daryl and Tavis also informed the group that there is currently research ongoing within the *Sea the Value* project which focusses on economic valuation of benefits and green finance initiatives. These aspects of the project are being led by Plymouth Marine Laboratory and eftec. If people wish to be kept informed of progress within these workstreams or to engage with the researchers directly then please let the project team know and we can put you in touch with the specific researchers.

Cromarty Network

Stakeholder feedback obtained through the *Sea the Value* workshops recognises that one of the great outcomes of the process has been getting different stakeholders around the same table and developing a shared understanding of the features, benefits and beneficiaries associated with the Cromarty Firth that could potentially support future interventions. It would be a great legacy for the *Sea the Value* project if the network of stakeholders which have engaged during the process continues beyond the timeframe of the project and into the future. There was clear support by the participants for this to happen however it was recognised that further investigation of the feasibility of such a group would be required. For example, clarification is needed on who would administer the group and where funding could be secured from. The Moray Firth Coastal Partnership stated that they would be keen to support the group in any way they could.

Project Recommendations

Having worked closely with the Cromarty Firth community during the workshop series for the *Sea the Value* project, the Project Team have made four project recommendations for further consideration by the Cromarty Firth community:

1. Explore the structure and support for a continuing Cromarty Firth Natural Capital Forum that engages with the opportunities in restoration and conservation including the potential for a Cromarty Natural Capital Strategy.
2. Explore the potential for engaging with other parts of the *Sea the Value* project that are exploring valuation of natural capital, finance for nature restoration, and engagement with Dr Anbleyth-Evans research on photo voice and walking interviews.
3. Champion the use of the participatory mapping outputs to inform key local strategies such as place-based and community led plans, environmental education, marine conservation and restoration activities and marine planning.
4. Support further engagement and practical opportunities for enhancement of local biodiversity in partnership with stakeholders such as the Green Freeport, Whyte and Mackay and local community partners such as the Black Isle Partnership and Moray Ocean Community.

Workshop Feedback

Feedback from participants was obtained using a short questionnaire which was distributed at the end of Workshop 3. This feedback is important to the Project Team as it enables reporting on how the workshops have been received by the Cromarty Firth community and helps to identify what future improvements could be made to the methodology. A summary of the feedback is provided in Table 13, with the data presented graphically for each question in Annex 6. Feedback was received from all the participants who attended the workshop (n=12). Overall, the feedback was very positive with most participants scoring the sessions, the workshop materials and the workshop delivery as 'Very Useful' or 'Extremely Useful'. Feedback was also very positive on the new venue and the new catering supplier, with all participants scoring these as 'Good' or 'Very Good'.

Table 13: Summary feedback from Cromarty Firth Workshop 3.

	Missing Data	Not useful at all	Slightly Useful	Moderately useful	Very Useful	Extremely Useful	Total
Session One: Introduction	1	0	0	0	8	3	12
Session Two: Mapping Outputs	1	0	0	1	7	3	12
Session Three: Linkages between benefits and beneficiairies	0	0	0	1	7	4	12
Session Four: Scoring links between benefits and beneficiairies	0	0	0	1	6	5	12
Session Five: Scoring links for individuals	0	0	1	1	7	3	12
Sesion Six: Future opportunities for the Cromarty Firth	1	0	0	2	6	3	12
	Missing Data	Not useful at all	Slightly Useful	Moderately useful	Very Useful	Extremely Useful	Total
Workshop materials	0	0	0	0	7	5	12
Workshop delivery	0	0	0	0	4	8	12
	Missing Data	Not useful at all	Slightly Useful	Moderately useful	Very Useful	Extremely Useful	Total
Overall, how useful did you find the workshop	0	0	0	0	9	3	12
	Missing Data	Very Poor	Poor	Average	Good	Very Good	Total
The venue	0	0	0	0	5	7	12
The catering	0	0	0	0	5	7	12

In addition, respondents were also asked whether participating in the *Sea the Value* project workshops has increased their understanding of the relationships between features, benefits and beneficiaries and whether they have gained confidence in using participatory mapping within their own organisation. A summary of the feedback is presented in Table 14. The feedback was very positive,

with all participants having an increased understanding of the participatory mapping approach and the links between features, benefits and beneficiaries as a result of attending the workshops.

Table 14: Summary of the impact of the Sea the Value project.

Has the Sea the Value Project...	Yes, significantly	Yes, slightly	No	Not sure	Missing data	Total
Increased your understanding of the participatory mapping approach?	9	3	0	0	0	12
Increased your understanding of the links between features and benefits?	5	7	0	0	0	12
Increased your understanding of the links between benefits and beneficiaries?	6	6	0	0	0	12
Given you more confidence in using participatory mapping within your own organisation?	5	4	0	1	2	12

Finally, workshop participants were asked a series of open-ended questions where they could provide further detailed responses. A summary of responses is provided below.

What did you find most useful about the workshops?

- *"Thinking outside the box."*
- *"Meeting other organisations involved in the Firth that I don't usually have contact with."*
- *"Common understanding of important features."*
- *"Meeting the people from different organisations and the different points of views."*
- *"Scoring the benefits as part of the group work – interesting to learn about connections and scores."*
- *"Learning about different stakeholders and potential future uses from the outputs."*
- *"Link between organisations and the benefits."*
- *"Networking, linking different groups e.g. industry and nature-based."*
- *"Hearing diverse views."*
- *"Meeting others and making connections."*
- *"Considering opportunities for future joint working."*
- *"Getting local stakeholders around the same table – great connections made for future projects / partnerships."*

How could future workshops be improved?

- *"Having more stakeholders so a wider range of interests were present."*
- *"Include more corporate organisations to group projects/work being done or opportunities for projects."*
- *"Wider range of stakeholders."*
- *"Struggled to define a few of the 'scoring' categories (physical and psychological benefits)."*
- *"Clearer definitions of parameters e.g. sometimes there was lengthy discussions about interpreting benefits, although this was actually interesting in itself."*
- *"Keep it as it is!"*

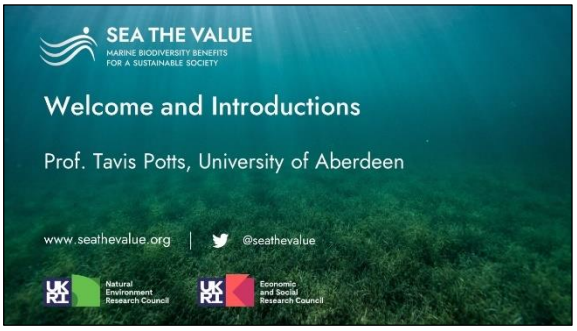
Will your organisation use the methods or outputs from the workshops in the future? If so, in what way?

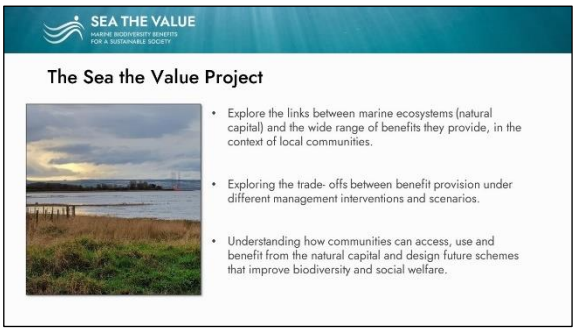
- *"Create interest in aspects of the marine environment that were not common knowledge."*
- *"Generate interest in the Cromarty Firth by showing that community groups and academia have studied its real potential."*
- *"Will share with colleagues within my organisation and the student field courses we have come."*
- *"Think the interactive maps could be a useful teaching aid."*
- *"I am interested in circulation of the map to others at the port."*
- *"I think the Free Port will be interested in the interactive map of the area."*
- *"The map is a good tool for showing the links between community and the environment."*
- *"Personally, would be interested in attending one of the photo walks that were discussed."*
- *"The understanding /process will definitely be of benefit to us and the link to the usages."*
- *"Identifying opportunities for marine enhancement and linking with other partners."*
- *"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."*
- *"Will be aiming to get the maps into schools and potentially the participatory mapping process itself as well – think it would be useful to demonstrate the links between features, benefits and beneficiaries."*
- *"Would be interested in using the process elsewhere in our region in the future."*
- *"Thanks, you for your time, help and expertise in making these workshops so informative and fun!"*

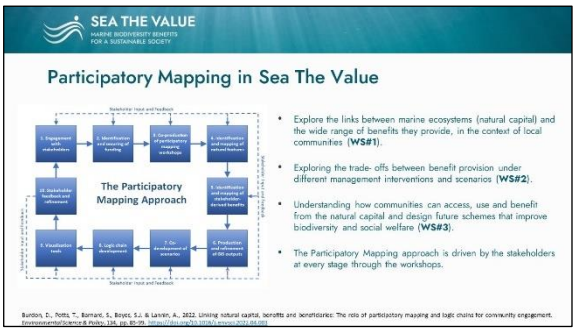
Annex 1: Workshop 3 Participants

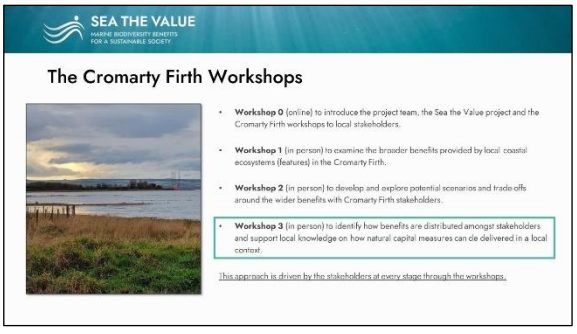
Name	Organisation
Andrew Goldie	Port of Cromarty Firth
Ben Leyshon	NatureScot
Francis Williams	Moray Ocean Community
Hannah Swanson	University of Aberdeen Lighthouse Station
Jennifer Bruce	Highland Council
Julien Paren	Black Isle Partnership
Mike Kendal	Local resident / marine ecologist
Rachael Clark	Whyte & Mackay
Rebecca Hewitt	University of Aberdeen Lighthouse Station
Steph Elliott	RSPB
Terri Sawyer	Moray Ocean Community
Vicki Paxton	Moray Firth Coastal Partnership

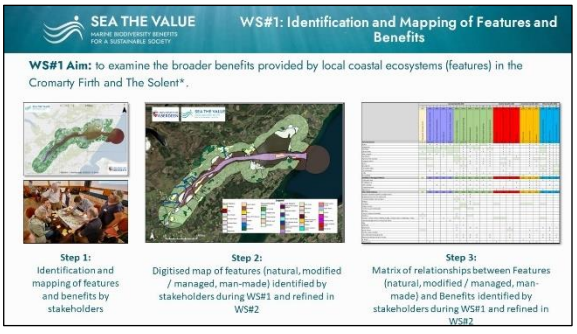
Annex 2: Workshop 3 Presentations

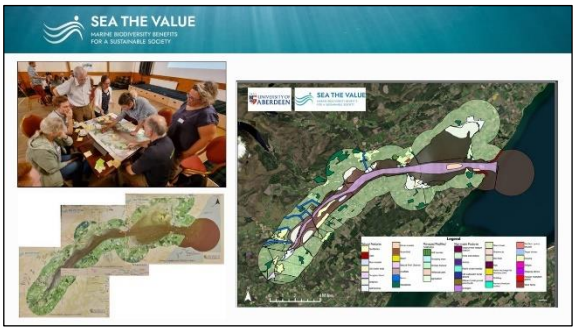


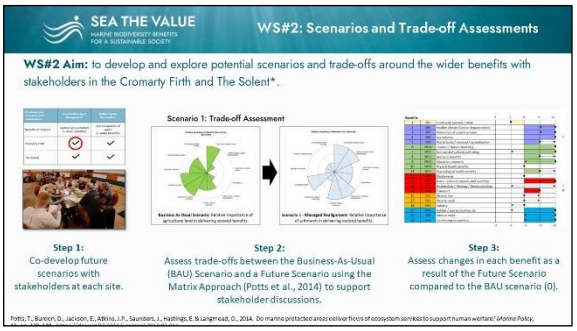


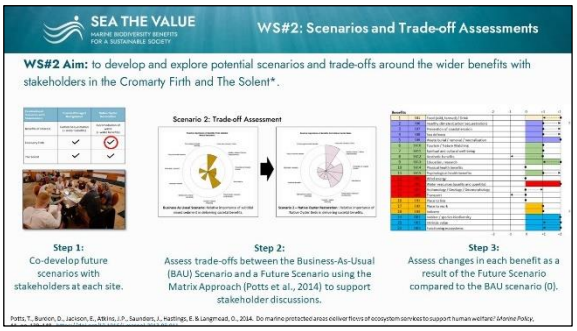







SEA THE VALUE
MARINE BIODIVERSITY BENEFITS FOR A SUSTAINABLE SOCIETY


SEA THE VALUE
WS#2: Scenarios and Trade-off Assessments
WS#2 Aim: to develop and explore potential scenarios and trade-offs around the wider benefits with stakeholders in the Cromarty Firth and The Solent*.
Scenario 1: Trade-off Assessment
Step 1:
Co-develop future scenarios with stakeholders at each site.
Step 2:
Assess trade-offs between the Business-As-Usual (BAU) Scenario and a Future Scenario using the Matrix Approach (Potts et al., 2014) to support stakeholder discussions.
Step 3:
Assess changes in each benefit as a result of the Future Scenario compared to the BAU scenario (0).


SEA THE VALUE
WS#2: Scenarios and Trade-off Assessments
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Scenario 2: Trade-off Assessment
Step 1:
Co-develop future scenarios with stakeholders at each site.
Step 2:
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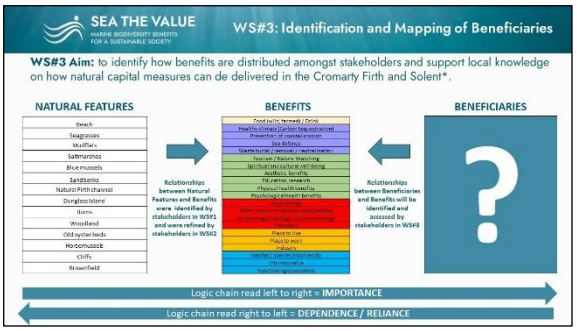
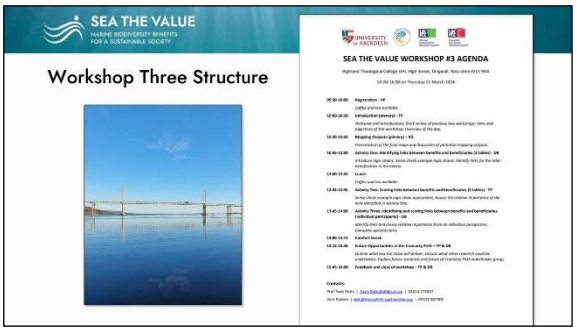
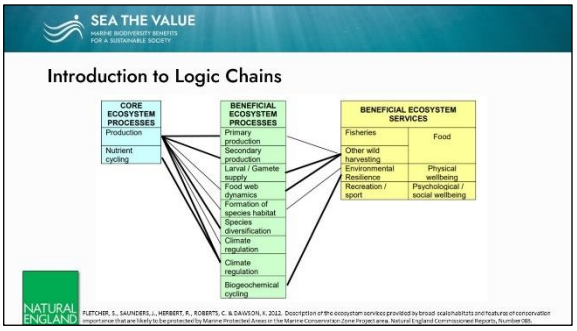
Step 3:
Assess changes in each benefit as a result of the Future Scenario compared to the BAU scenario (0).

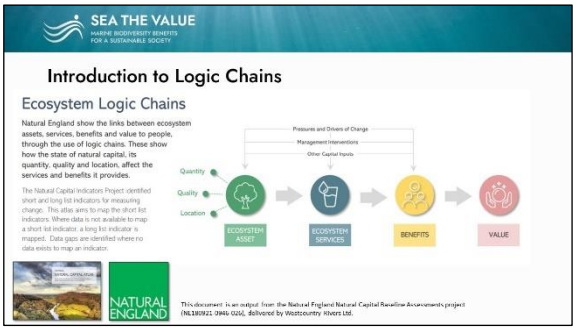

SEA THE VALUE
WS#3: Identification and Mapping of Beneficiaries
WS#3 Aim: to identify how benefits are distributed amongst stakeholders and support local knowledge on how natural capital measures can de delivered in the Cromarty Firth and Solent*.
NATURAL FEATURES
BENEFITS
BENEFICIARIES
Relationships between Natural Features and Benefits were identified by stakeholders in WS#1 and were refined by stakeholders in WS#2
Relationships between Beneficiaries and Benefits will be identified and assessed by stakeholders in WS#3
Logic chain read left to right = IMPORTANCE
Logic chain read right to left = DEPENDENCE / RELIANCE

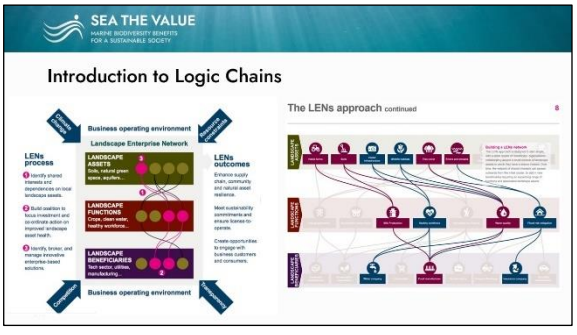

SEA THE VALUE
Workshop Three Structure
SEA THE VALUE WORKSHOP #3 AGENDA

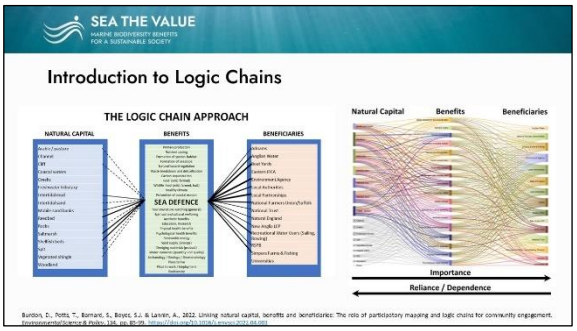
SEA THE VALUE
MARINE BIODIVERSITY BENEFITS FOR A SUSTAINABLE SOCIETY
Mapping Outputs
Dr Kate Gormley, University of Aberdeen
www.seathevalue.org
@seathevalue
Natural Environment Research Council
Economic and Social Research Council

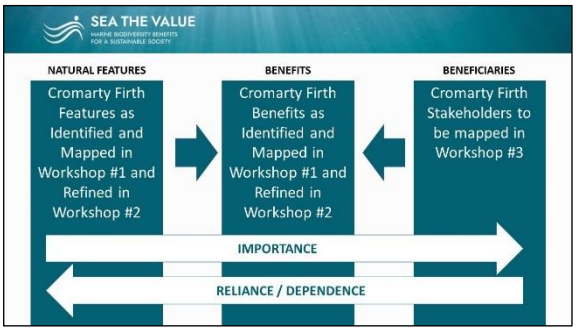
SEA THE VALUE
MARINE BIODIVERSITY BENEFITS FOR A SUSTAINABLE SOCIETY
Activity One: Identifying links between benefits and beneficiaries
Dr Daryl Burdon, Daryl Burdon Ltd.
www.seathevalue.org
@seathevalue
Natural Environment Research Council
Economic and Social Research Council

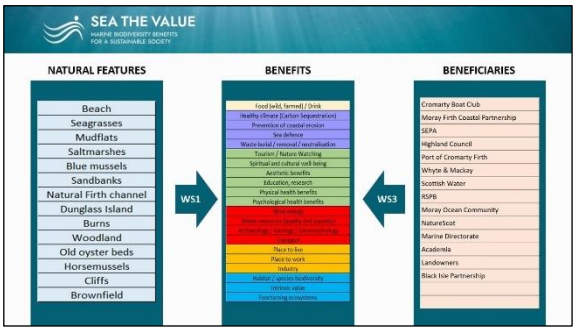

SEA THE VALUE
Introduction to Logic Chains
CORE ECOSYSTEM PROCESSES
Production
Nutrient cycling
BENEFICIAL ECOSYSTEM PROCESSES
Primary production
Secondary production
Larval / Gamete supply
Food web dynamics
Formation of species habitat
Species diversification
Climate regulation
Climate regulation
Biogeochemical cycling
BENEFICIAL ECOSYSTEM SERVICES
Fisheries
Food
Other wild harvesting
Environmental Resilience
Physical wellbeing
Recreation / sport
Psychological / social wellbeing
NATURAL ENGLAND

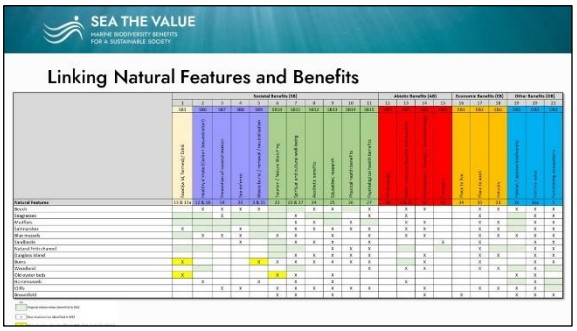

SEA THE VALUE
Introduction to Logic Chains
Ecosystem Logic Chains
Natural England show the links between ecosystem assets, services, benefits and value to people, through the use of logic chains. These show how the state of natural capital, its quantity, quality and location, affect the services and benefits it provides.
ECOSYSTEM ASSET
ECOSYSTEM SERVICES
BENEFITS
VALUE
NATURAL ENGLAND

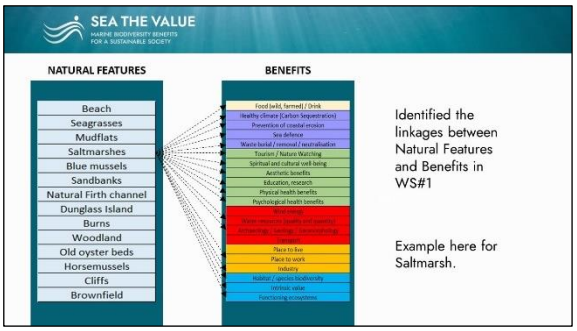

SEA THE VALUE
Introduction to Logic Chains
Business operating environment
Landscape Enterprise Network
LENs process
LENs outcomes
LANDSCAPE ASSETS
LANDSCAPE FUNCTIONS
LANDSCAPE BENEFICIARIES
The LENs approach continued

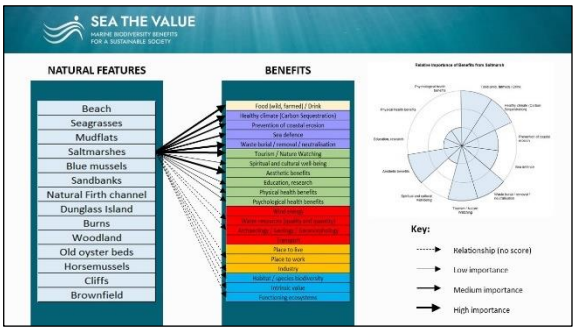

SEA THE VALUE
MARINE BIODIVERSITY BENEFITS FOR A SUSTAINABLE SOCIETY
Introduction to Logic Chains
THE LOGIC CHAIN APPROACH
NATURAL CAPITAL
BENEFITS
BENEFICIARIES
SEA DEFENCE
Natural Capital
Benefits
Beneficiaries
Importance
Reliance / Dependence

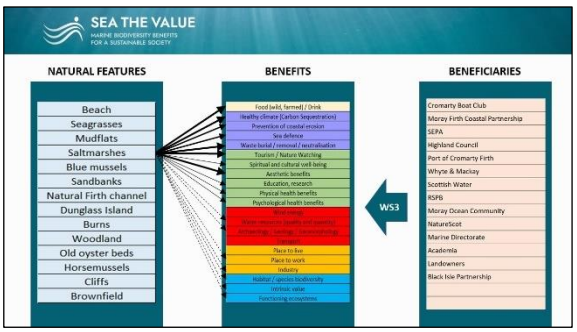

SEA THE VALUE
MARINE BIODIVERSITY BENEFITS FOR A SUSTAINABLE SOCIETY
NATURAL FEATURES
BENEFITS
BENEFICIARIES
Cromarty Firth Features as Identified and Mapped in Workshop #1 and Refined in Workshop #2
Cromarty Firth Benefits as Identified and Mapped in Workshop #1 and Refined in Workshop #2
Cromarty Firth Stakeholders to be mapped in Workshop #3
IMPORTANCE
RELIANCE / DEPENDENCE

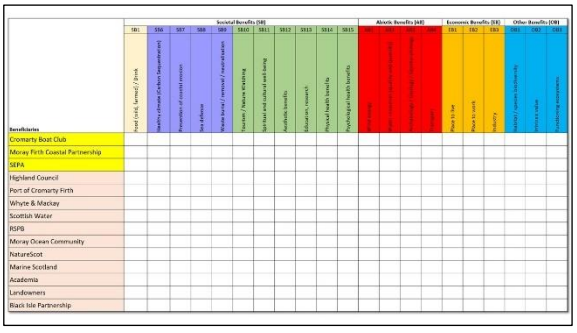

SEA THE VALUE
MARINE BIODIVERSITY BENEFITS FOR A SUSTAINABLE SOCIETY
NATURAL FEATURES
BENEFITS
BENEFICIARIES
Beach
Seagrasses
Mudflats
Saltmarshes
Blue mussels
Sandbanks
Natural Firth channel
Dunglass Island
Burns
Woodland
Old oyster beds
Horsemussels
Cliffs
Brownfield
WS1
WS3
Cromarty Boat Club
Moray Firth Coastal Partnership
SEPA
Highland Council
Port of Cromarty Firth
Whyte & Mackay
Scottish Water
RSPB
Moray Ocean Community
NatureScot
Marine Directorate
Academia
Landowners
Black Isle Partnership

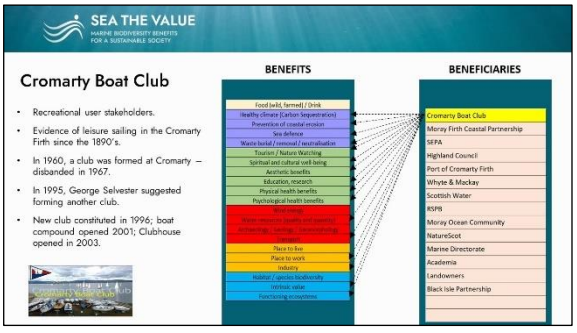

SEA THE VALUE
MARINE BIODIVERSITY BENEFITS FOR A SUSTAINABLE SOCIETY
Linking Natural Features and Benefits


SEA THE VALUE
MARINE BIODIVERSITY BENEFITS FOR A SUSTAINABLE SOCIETY
NATURAL FEATURES
BENEFITS
Identified the linkages between Natural Features and Benefits in WS#1
Example here for Saltmarsh.


SEA THE VALUE
MARINE BIODIVERSITY BENEFITS FOR A SUSTAINABLE SOCIETY
NATURAL FEATURES
BENEFITS
Key:
Relationship (no score)
Low importance
Medium importance
High importance


SEA THE VALUE
MARINE BIODIVERSITY BENEFITS FOR A SUSTAINABLE SOCIETY
NATURAL FEATURES
BENEFITS
BENEFICIARIES
WS3

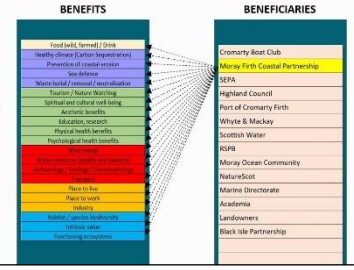



SEA THE VALUE
MARINE BIODIVERSITY BENEFITS FOR A SUSTAINABLE SOCIETY
Cromarty Boat Club
Recreational user stakeholders.
Evidence of leisure sailing in the Cromarty Firth since the 1890's.
In 1960, a club was formed at Cromarty – disbanded in 1967.
In 1995, George Selvester suggested forming another club.
New club constituted in 1996; boat compound opened 2001; Clubhouse opened in 2003.
BENEFITS
BENEFICIARIES

SEA THE VALUE
MARINE BIODIVERSITY BENEFITS FOR A SUSTAINABLE SOCIETY

Moray Firth Coastal Partnership

- Non-Governmental Organisation.
- Vision to be the most sustainable marine region in Scotland by 2030.
- Independent charity, promoting & facilitating sustainable solutions to the marine and coastal challenges faced by the Moray Firth and its communities.
- Current work includes:
  - Marine and coastal litter
  - Regional Marine Planning
  - SAC Management Group



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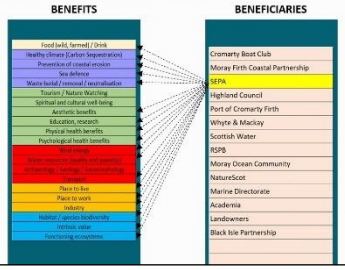
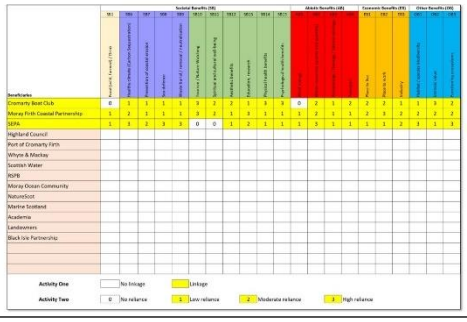
SEPA

- Government Agency.
- To help protect and maintain Scotland's vital environmental resources focussing on:
  - Environmental regulation.
  - Mitigating and adapting to climate change.
  - Monitoring and reporting on state of the environment.
  - Raising awareness of environmental issues.
  - Engaging the public through citizens science projects.
  - Resolving environmental harms.

sepa





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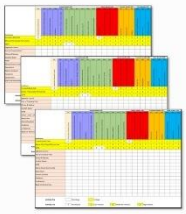
MARINE BIODIVERSITY BENEFITS FOR A SUSTAINABLE SOCIETY

Activity 1: Identifying Links Between Benefits and Beneficiaries



- 60 minutes for this activity.
- Working on 3 tables – each table needs to complete the full matrix.
- Complete matrix in terms of the primary function(s) of each organisation – not you as an individual local resident.
- Sense check the 3 examples provided.
- Identify using a highlighter pen the linkages for the other beneficiaries.
- Only highlight the linkages – not scoring the relationships (Activity 2).
- Each table to complete 1 x A3 template – facilitators will take notes.
- We will address local residents later in the day!

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Lunch 12:00-12:45

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Activity Two: Assessing links between benefits and beneficiaries

Prof Tavis Potts, University of Aberdeen

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Activity 2: Scoring links between benefits and beneficiaries

- Focus on the cells which you highlighted in Activity 1.
- We are interested in the **relative importance** of the link between benefits and beneficiaries.
- Use the following scoring system below.

Activity One: No linkage | Linkage

Activity Two: 0 No reliance | 1 Low reliance | 2 Moderate reliance | 3 High reliance

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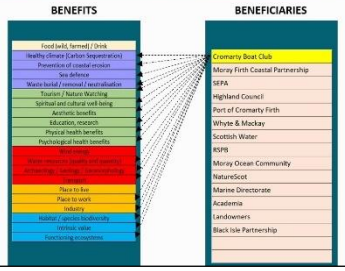
Cromarty Boat Club

- Recreational user stakeholders.
- Evidence of leisure sailing in the Cromarty Firth since the 1890's.
- In 1960, a club was formed at Cromarty – disbanded in 1967.
- In 1995, George Selvester suggested forming another club.
- New club constituted in 1996; boat compound opened 2001; Clubhouse opened in 2003.



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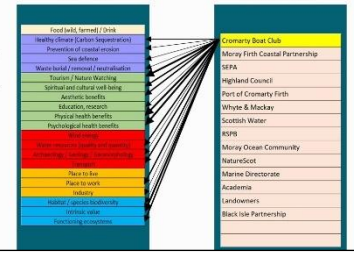
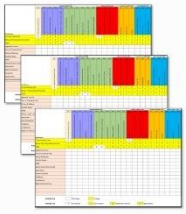


SEA THE VALUE
MARINE BIODIVERSITY BENEFITS FOR A SUSTAINABLE SOCIETY

Activity 2: Scoring Links Between Benefits and Beneficiaries



- 60 minutes for this task.
- Working on 3 tables – each table needs to complete the full matrix.
- Sense check the 3 scored examples provided.
- For each cell highlighted (in Activity 1) write in the relative score within each cell.
- Each table to complete 1 x A3 template – facilitators will take notes.
- We will address individual perspectives later in the day!

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Activity Three: Assessing links between benefits and beneficiaries – Individual Perspectives!

Dr Daryl Burdon, Daryl Burdon Ltd.

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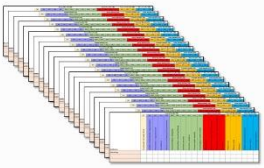
Activity 3: Individual Perspectives



- 15 minutes for this task.
- Same method as you have previously employed.
- Highlight the cells of relevance and then score them as per Activity 1 and Activity 2.
- Complete the matrix individually – not in relation to your organisation.
- Do not discuss with others on the table.
- Once completed, please answer the additional questions on the sheet.
- All data are anonymised!

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Comfort Break 14:00-14:15

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Future Opportunities in Cromarty Firth

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Future Opportunities in Cromarty Firth

- Next steps in Sea the Value project – DB
- Future research within Sea the Value – JA-E
- Further Possible Discussion Points
  - Future Scenarios?
  - Future Workshops?
  - Future of Cromarty Firth Stakeholder Group?
  - Green Finance Initiatives?

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Exploring Photo Voice and walking interview methods

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PHOTO VOICE METHOD

- physical data in coastal planning is arguably more advanced than understanding public attitudes, values and behaviours
- Participatory evaluation methods, such as Photovoice, help reveal perceptions of both tangible and intangible aspects of projects and their concerns
- provide a way for local perceptions of values to be recorded shared within and outside of communities.

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1.Taking photos about the benefits and features

- Photograph benefits including heritage, bioremediation, carbon sequestration, wellbeing, connection to place, livelihoods, ecological interventions, access issues, future threats to benefits
- Develop three zones for the photos - should these relate to west centre and east or too the respective coastal communities? If so where do people think?
- Should these be linked to an interactive map?

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2.Walking interviews

- Group or individual interview useful in capturing data relating to people's understanding of place;
- the relationship between what people say and where they say it;
- qualitative and quantitative differences between data generated by walking and sedentary interviews, can be linked to other methods.

Pierce, J., & Lawhon, M. (2015). Walking as method: Toward methodological forthrightness and comparability in urban geographical research. *The professional geographer*, *67*(1), 655-662.

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3. Photo voice Interviews

- Each photo will be discussed with participants to understand what the photo contains and why it was taken and organised into coded themes
- Photos can be surveyed more widely around the community in terms of educational, cultural, mental, physical and spiritual health benefits in workshop setting

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4.Small / large group discussion

- 10 – 20 people - local focus groups to determine future threats opportunities, weaknesses and strengths
- Wildlife watching boat trip
- Future planning decisions around ecological benefits of less understood habitats, local risks of climate change, future co-management strategies

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5.Develop a local competition for best photos

- Winning photos to be selected according to benefits / future challenges themes
- Gallery of photos to be presented in the Cromarty Firth / Inverness Portsmouth / Plymouth / Aberdeen Qatar campus

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Questions? Reflections?

Jeremy.anbleyth-evans@abdn.ac.uk

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Future Opportunities in Cromarty Firth

- Next steps in Sea the Value project – DB
- Future research within Sea the Value – JA-E
- Further Possible Discussion Points
  - Future Scenarios?
  - Future Workshops?
  - Future of Cromarty Firth Stakeholder Group?
  - Green Finance Initiatives?

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Feedback and Close of Workshop

THANK YOU!

SEA THE VALUE
MARINE BIODIVERSITY BENEFITS FOR A SUSTAINABLE SOCIETY

Project Contact Details:

Prof Tavis Potts	Tavis.Potts@abdn.ac.uk
Vicki Paxton	vicki@morayfirth-partnership.org
Dr Daryl Burdon	darylburdon@gmail.com

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Annex 3: Natural Features versus Benefits Matrix

	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
Natural Features	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

Annex 4: Relative Importance Scores for Natural Features (from Potts et al., 2014)

	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
Natural Features	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	1	2	3	3	1	1	1	3	1	3	3										
Seagrasses	3	2	2	2	2	2	1	2	1												
Mudflats	3	3	3	3	3	1	1	1	1	1	1										
Saltmarshes	3	3	3	3	3	3	1	3	1	1	1										
Blue mussels	2	1	1	1	1	1	1		1												
Sandbanks	2		3	3	1		1		1												
Natural Firth channel	Not assessed by Potts et al. (2014)											Not assessed by Potts et al. (2014)									
Dunglass Island	Not assessed by Potts et al. (2014)																				
Burns	Not assessed by Potts et al. (2014)																				
Woodland	Not assessed by Potts et al. (2014)																				
Old oyster beds	Not assessed by Potts et al. (2014)																				
Horsemussels	1	1	1	1	1	1	1	1	1												
Cliffs	Not assessed by Potts et al. (2014)																				
Brownfield	Not assessed by Potts et al. (2014)																				

Scale of ecosystem service supplied relative to other features

- # Significant contribution
- # Moderate contribution
- # Low contribution
- # No or negligible ESP
- Not assessed

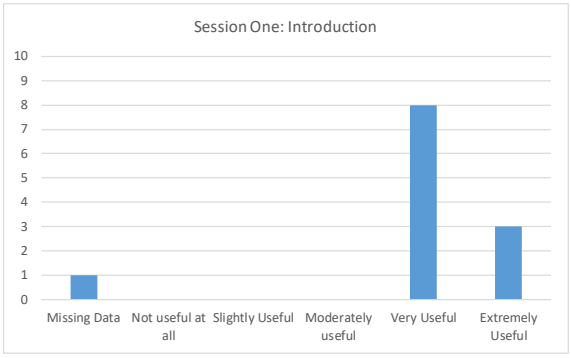
Confidence in evidence

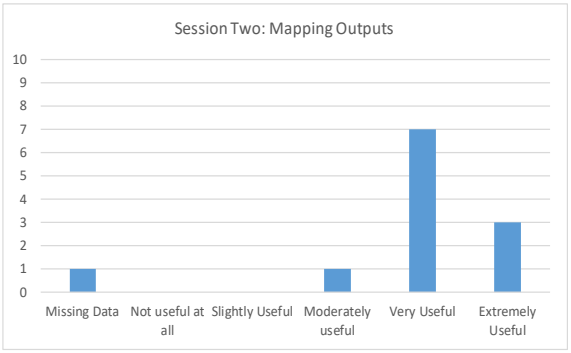
- 3 UK-related, peer-reviewed literature
- 2 Grey or overseas literature
- 1 Expert opinion or Obvious
- Not assessed

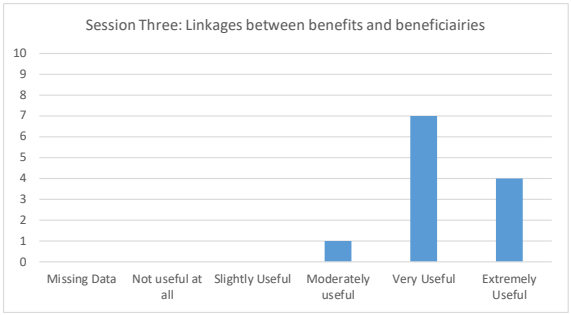
Annex 5: Summary data from Activity Three (Questions 1-4) (n=12).

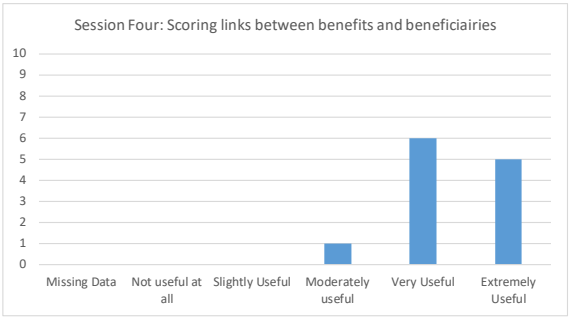
Question	Category	Frequency
Do you consider yourself to be a local resident of the Cromarty Firth?	Yes No	6 6
If so, how long have you lived around the Cromarty Firth?	<10 Years 10-20 Years 21-30 Years >30 years n/a	1 2 3 0 6
Which Community Council do you reside in?	Cromarty Dingwall Fortrose Inverness Knockbain Nairn n/a	3 1 1 3 1 1 2
Can you see the Cromarty Firth from your house?	Yes No	3 9

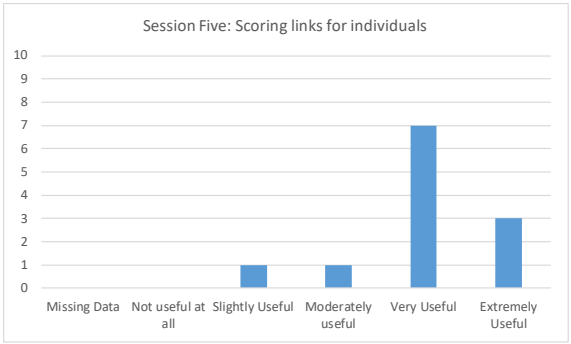
Annex 6: Summary of Workshop 3 Feedback (n=12)

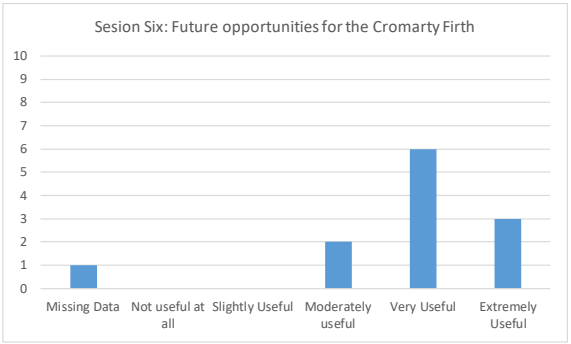


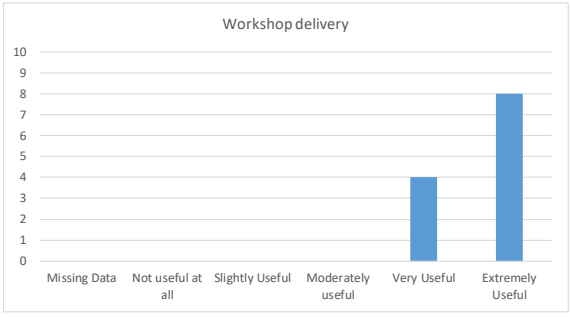


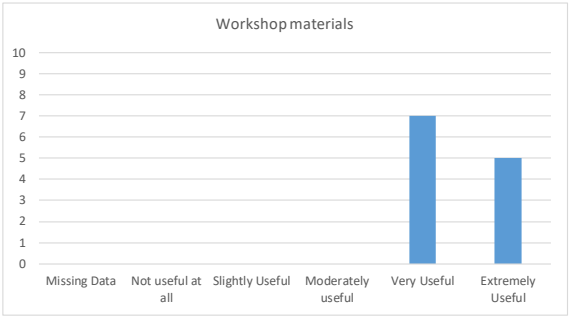


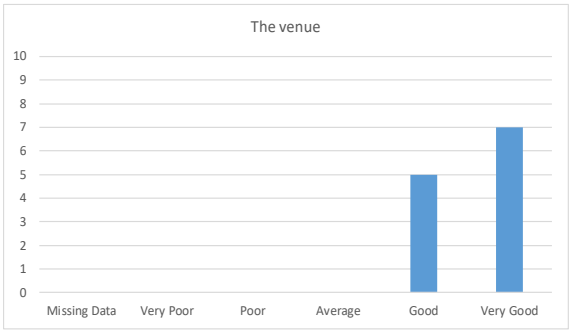


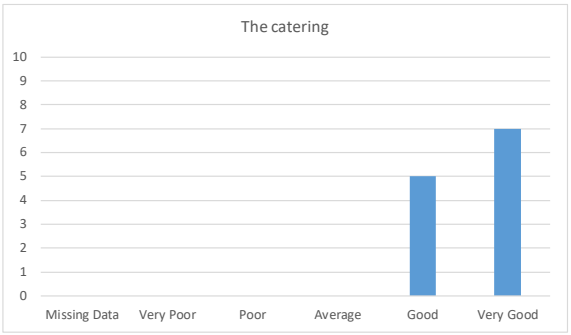


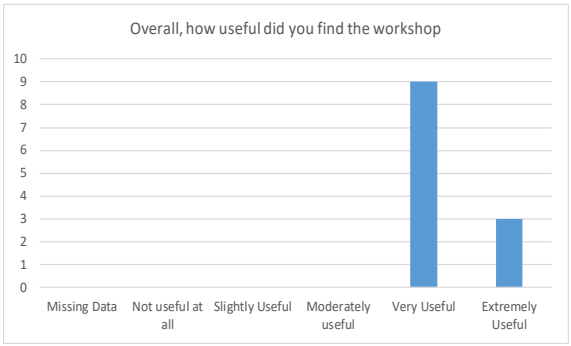


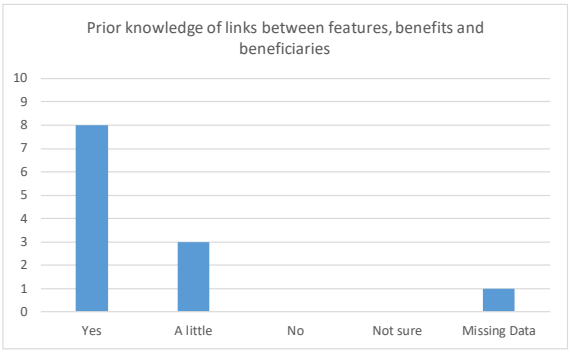


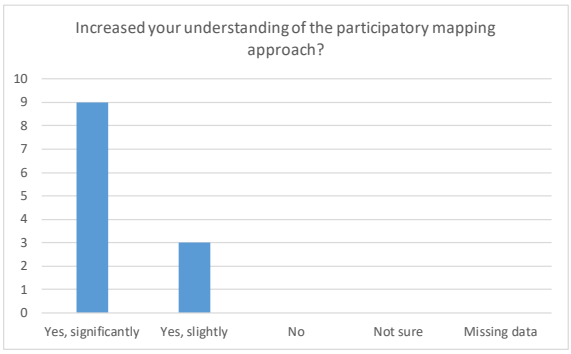


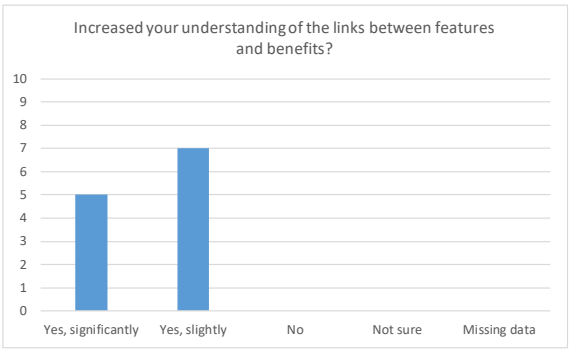

The venue
10
9
8
7
6
5
4
3
2
1
0
Missing Data
Very Poor
Poor
Average
Good
Very Good

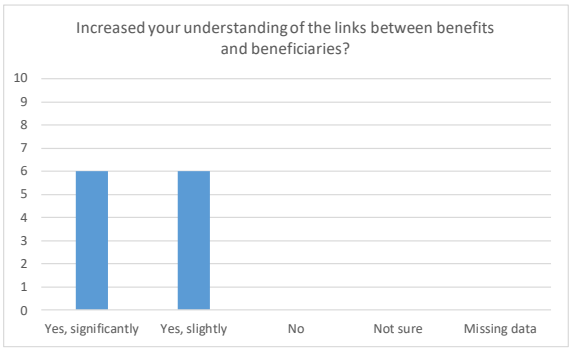

The catering
10
9
8
7
6
5
4
3
2
1
0
Missing Data
Very Poor
Poor
Average
Good
Very Good

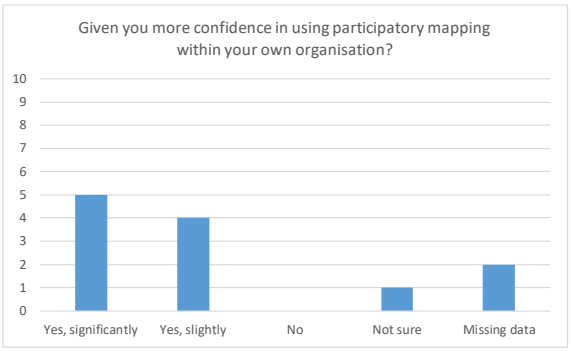

Overall, how useful did you find the workshop
10
9
8
7
6
5
4
3
2
1
0
Missing Data
Not useful at all
Slightly Useful
Moderately useful
Very Useful
Extremely Useful


Prior knowledge of links between features, benefits and beneficiaries
10
9
8
7
6
5
4
3
2
1
0
Yes
A little
No
Not sure
Missing Data


Increased your understanding of the participatory mapping approach?
10
9
8
7
6
5
4
3
2
1
0
Yes, significantly
Yes, slightly
No
Not sure
Missing data


Increased your understanding of the links between features and benefits?
10
9
8
7
6
5
4
3
2
1
0
Yes, significantly
Yes, slightly
No
Not sure
Missing data


Increased your understanding of the links between benefits and beneficiaries?
10
9
8
7
6
5
4
3
2
1
0
Yes, significantly
Yes, slightly
No
Not sure
Missing data


Given you more confidence in using participatory mapping within your own organisation?
10
9
8
7
6
5
4
3
2
1
0
Yes, significantly
Yes, slightly
No
Not sure
Missing data