Transdisciplinary Communication and Climate Information: Reflections from the Sustainable Management of UK Marine Resources Programme

A report prepared by Co-Opt and Diverse Marine Values, with contribution from all the SMMR projects.

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Executive Summary

The Sustainable Management of UK Marine Resources (SMMR) Strategic Priorities Fund is a £12.4m initiative dedicated to funding marine research to address critical gaps in understanding that UK policy makers have identified.

The programme runs from August 2021 to December 2025. It aims to bring together marine scientists, policy makers, industry representatives, wider actors and the public to build a strong marine research community and, ultimately, bridge the gap between science and policy. In May 2024, two SMMR-funded projects, Diverse Marine Values (DMV) and Resilient Coasts: Optimising Co-benefit Solutions project (Co-Opt) ran a workshop at the SMMR annual conference to investigate and gather the lessons learnt from across the SMMR programme on communicating climate change information.

The SMMR programme is aptly positioned to explore and address a myriad of challenges when communicating climate change information. SMMR members hail from diverse disciplinary backgrounds and work in inter- and transdisciplinary teams that communicate with a broad range of actors using innovative methods and approaches. They are adept at tailoring information for various audiences and for facilitating dialogue between multiple actors from within and beyond the marine research and management community.

Key findings:

- Communication on climate change does not operate in a one-way direction but rather can be seen as a network of discourses between multiple actors.
- Multisectoral interaction requires respect, parity and cognisance of power dynamics. Time is needed to build trust and to establish long-lasting fruitful networks. Agility and adaptability are essential to navigate multiple contrasting demands.
- Tailoring and framing the message according to actor priorities, requirements and structures is crucial to ensuring optimal and impactful communication of climate change information.
- The most common communication methods used by SMMR members are workshops, talks and seminars, and reports.
- Transdisciplinarity and participatory research methods bring diverse groups of people together, promote joint problem-solving and allow for exploration of plural forms of knowledge and values.
- SMMR projects engaged predominantly with academia and research partners, followed by the government and policy sector, with communities ranking closely third.

Section 1 – Introduction

The complexities of climate and environmental challenges that involve natural and human systems require drawing upon multiple disciplines, perspectives and forms of knowledge[1,2]. There is a recognition that broader perspectives and approaches must be incorporated into marine research and management. Calls for transdisciplinary approaches to be more widely applied to the management of ocean and coastal resources proliferate[3] and transdisciplinary capacity development is recognised as a global science priority for the UN Decade of Ocean Science for Sustainable Development (2021-2030)[4].

In response, the Sustainable Management of UK Marine Resources (SMMR) programme was launched to break down barriers between marine research and policy, integrate disciplines and form new marine research teams to support enhanced decision-making within UK waters. Funded by two UK Research and Innovation councils: the Natural Environment Research Council and the Economic and Social Research Council, it recognises that by working together we can improve the management of the UK marine environment and realise sustainable societal and economic benefits for the UK. The programme started in August 2021 and runs until December 2025[*].

The Diverse Marine Values (DMV) project and the Resilient Coasts: Optimising Co-benefit Solutions project (Co-Opt) leading this report, are two of six SMMR projects selected due to their innovative approaches to explore climate and environmental issues of a marine and coastal nature, and their ambition to engage multiple actors from within and outside the marine research and management community.

[1] National Academy Sciences, 2004.
[2] Liu et al. 2007
[3] McKinley et al., 2020.
[4] UNESCO, 2019
[*] i.e. The programme is ongoing at the time of writing this report.

Fig. 1. Projects funded under the Sustainable Management of UK Marine Resources (SMMR) programme.

Communication Challenges

Working across disciplines and building partnerships within and beyond academia requires engaging and communicating effectively with multiple actors and sectors. This presents inherent challenges because different actors often have different logics and languages to frame the same problem,[5] their own informal and formal rules and value systems[6]. Beyond the different values and epistemologies (i.e. the way the knowledge is constructed and which types of knowledge are considered valid), power dynamics can also influence working relationships and desired outcomes. Attention is required to effectively manage relationships to incorporate plural perspectives on equal terms[7].

In addition to mitigating communication impediments between multiple actors, environmental and climate information itself can be hard to comprehend for the non-specialist. Effort within climate services often focuses on providing better data[8] which may result in a disconnect between the information generated and the information that multiple actors care about and need[9].

Although transmission models of communication which depict a linear flow of information from source to destination are contested for prohibiting mutual understanding and shared

[5] Robinson et al., 2008.
[6] Jaeger-Erben et al., 2018.
[7] Reed et al., 2018.
[8] Findlater et al., 2021.
[9] Terrado et al., 2023.

meaning, the proliferation of expert-generated information to the public and policy sector remains a hallmark of climate change and risk communication. This approach positions academia, predominantly science disciplines and empirical research as the source of information to be disseminated to specific audiences in accordance with their requirements.

SMMR projects are uniquely positioned to address these communication challenges. Firstly, being interdisciplinary or transdisciplinary in nature, they enable multidirectional and iterative discourse between multiple actors. Secondly, many SMMR projects involve numerous actors in the co-production of climate information, as we will see in more detail in the Case Studies section of this report. Furthermore, with their increasing use of qualitative, arts-based and participatory methods in generating outputs, artefacts, engagements, data and evidence, they broaden what we define as climate change information in facilitating open, exploratory and purposeful discourse.

Lessons Learnt from SMMR Programme

In May 2024, *Diverse Marine Values* and *Co-Opt* ran a workshop at the third annual SMMR conference to gather lessons learnt from across the programme on communicating climate information. The workshop aimed to elicit the best strategies to communicate and engage with communities about climate change information, particularly coastal protection decisions, and to reflect more broadly on the experiences and expectations of researchers tasked with communicating and disseminating their research. For the purpose of this report, we categorise various groups within the marine and coastal sector as follows: government and policy makers, academia and research, NGOs and charities, other marine practitioners and industry (e.g. consultancy, fishing, energy, tourism, etc) and communities.

This report will provide a summary of the workshop, and the pre-workshop survey which was designed to prime participants for the activities which would follow. This report also includes the contributions elicited from the workshop and the reflections drawn from these collective discussions.

Both the survey and the workshop targeted members of the SMMR programme (i.e. funded projects) and the SMMR-NET (i.e. the interdisciplinary community of researchers and policy

stakeholders open to anybody interested in interdisciplinary working). Additionally, this report also includes case study examples of successful communication strategies and engagement from across the SMMR programme.

Section 2 – Survey

An inherent challenge of climate change research is how to communicate specialist information to non-specialist audiences. Tailoring information for various audiences, including policy makers and members of the public involves utilising a range of methods to ensure that the content is delivered and received effectively. Understanding who members of the SMMR programme are communicating with and how this impacts the method and means of communication is a central topic of inquiry.

Survey Design

The pre-workshop survey was linked to the workshop registration process and distributed via the SMMR network, operating for three weeks. It aimed to form an impression of the SMMR communication landscape by identifying which sectors were communicated with most frequently and the means of communication employed. We anticipated that the following five sectors would feature frequently: communities; government and policy makers; academia and research; NGOs and charities; and other marine practitioners and industry.

We also provided a list of methods of communication which might be employed across the SMMR programme such as focus groups, Q Method, workshops, mapping, datasets, social media, talks and seminars, lectures, reports, participatory action research, storylines and narratives, and arts-based research methods. We acknowledged that both lists were not exhaustive and provided an option for participants to add additional contributions regarding sectors and methods.

The difficulty of selecting a format to elicit information about communication posed a challenge. We opted for a survey as a quick way for participants to respond at the point of registration. However, we acknowledged that participants may prefer different communication styles and approaches and did not want to privilege one method over another. Therefore, we included an option for participants to respond via an online discussion in lieu of the survey, though this option was not selected by any registrants. Also, with the understanding that the workshop would generate detailed and nuanced in-person discussions, a survey seemed to be a logical choice to provide an expeditious foundation for the workshop topics.

Survey Findings

In determining which groups participants engaged with when communicating and disseminating research, the following sectors were ranked highest: academia and research, government and policy, and marine practitioners and industry. However, in terms of which groups were communicated with *most frequently*, communities were ranked third behind government and policy, and academia and research.

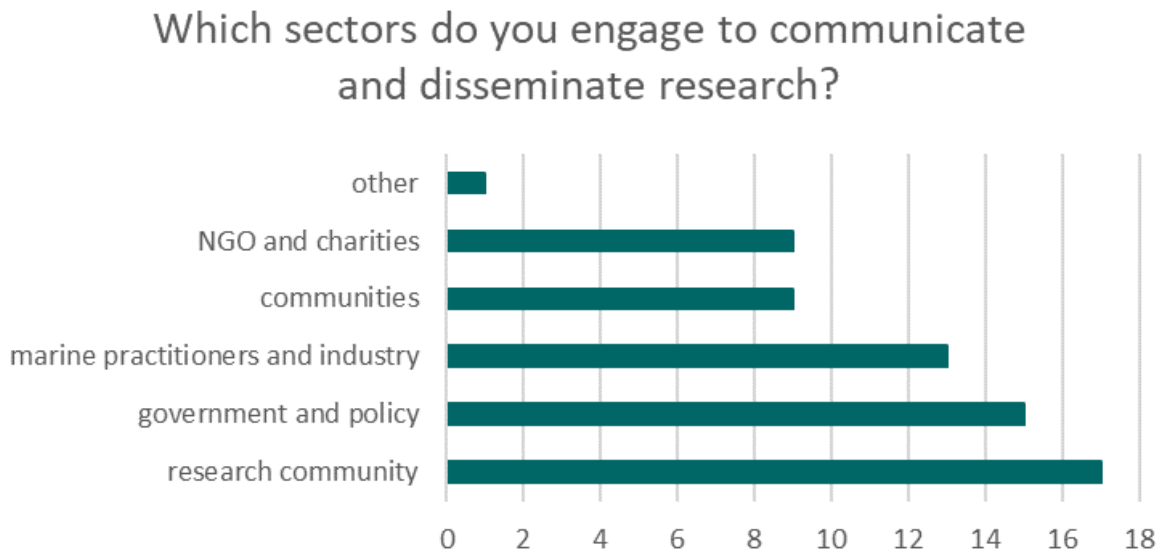

Fig. 2 Bar chart indicating the sectors the researchers in the projects funded by the SMMR UK engage with. Results from the pre-workshop survey.

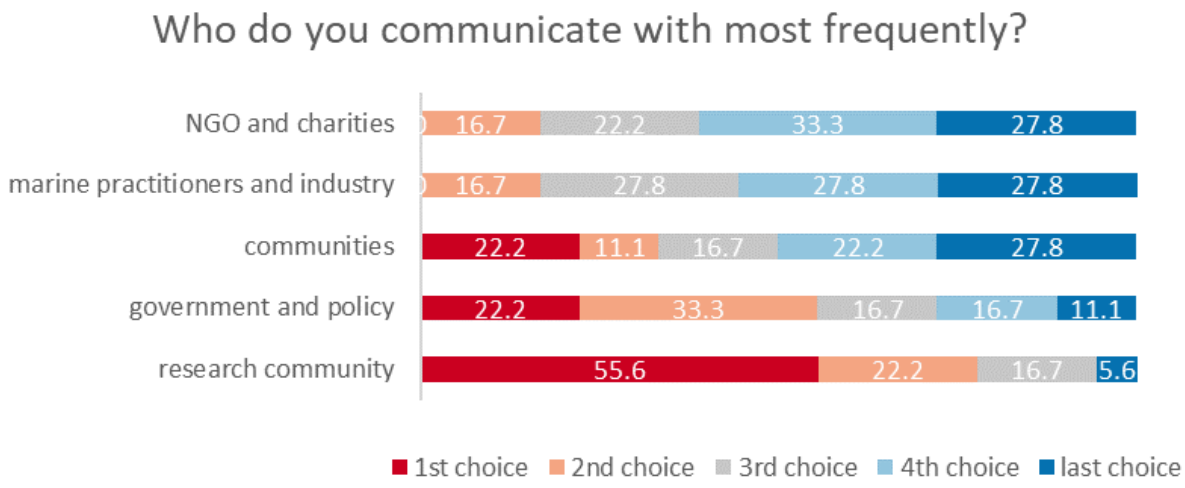

Fig. 3. Bar chart indicating the sectors the researchers in the projects funded by the SMMR UK engaged most frequently with. The research community engage the most amongst themselves followed by government and policy and communities.

In terms of approaches used to communicate with different sectors, talks, seminars and workshops were ranked highest for engaging with communities, while workshops and reports were preferred for government and policy makers, NGO's and charities, and marine practitioners and industry. For academia and research, talks, seminars and reports were most highly ranked. The approaches used the least overall were Q method, participatory action research and arts-based research methods.

Eighteen participants completed the survey, half of whom said they had not facilitated communication between different sectors, while the other half said they had, usually involving at least three sectors. At a local scale, coastal groups and coastal partnerships were highlighted as a 'one stop shop' for communication between all sectors. In addition to the groups listed in the survey, one participant added that they had facilitated communication between 'banking, 'finance, businesses and NGOs.

The last section of the survey invited participants to submit their reflections and thoughts on communicating climate change. One response highlighted the importance of framing the message according to stakeholder priority, while another focused on the need for a holistic interdisciplinary approach whilst championing individual expertise. Other responses focused on the difficulties of navigating multi-stakeholder meetings and on communicating climate

change information to people with no interest in the environment. One response in particular drew a distinction between ‘collecting data' and 'communicating research’, highlighting that the primary purpose of many of the methods listed and employed within marine research and management is to elicit data, which is then used for communication purposes. This raises interesting questions around purpose and intention, the difference between data and modes of communication, which can sometimes be one and the same. Traditional communication approaches are typically centred around written and verbal discourse and data alone may require interpretation and synthesis to be palatable to lay audiences.

Overall, the survey confirmed our expectations regarding the sectors most frequently engaged with by members of the SMMR programme consisting of academia and research, government and policy makers, marine practitioners and communities, as well as the dominance of communication methods such as workshops, talks and seminars and reports.

Section 3 - Workshop

The workshop attracted over thirty participants from across the SMMR programme, including members from each SMMR-funded projects The workshop design followed the chronology of the survey but provided opportunities for facilitated, in-depth discussion. Workshop participants were divided into five groups and asked to make notes of their conversations for whole group feedback.

Workshop Findings

The workshop began by identifying what kinds of climate change information is disseminated by the SMMR community. Participants responded that they shared information about CO_2 levels, blue carbon, changing habitats, invasive species, healthy adaptation, biodiversity and ecosystem service loss, seagrass loss and carbon benefits, sustainability, ocean physics, coastal erosion and geomorphology, coastal hazards, flood risk and modelling, representative concentration pathways, Marine Protected Areas/Highly Protected Marine Areas, physical use of space, historical climate change and future scenarios.

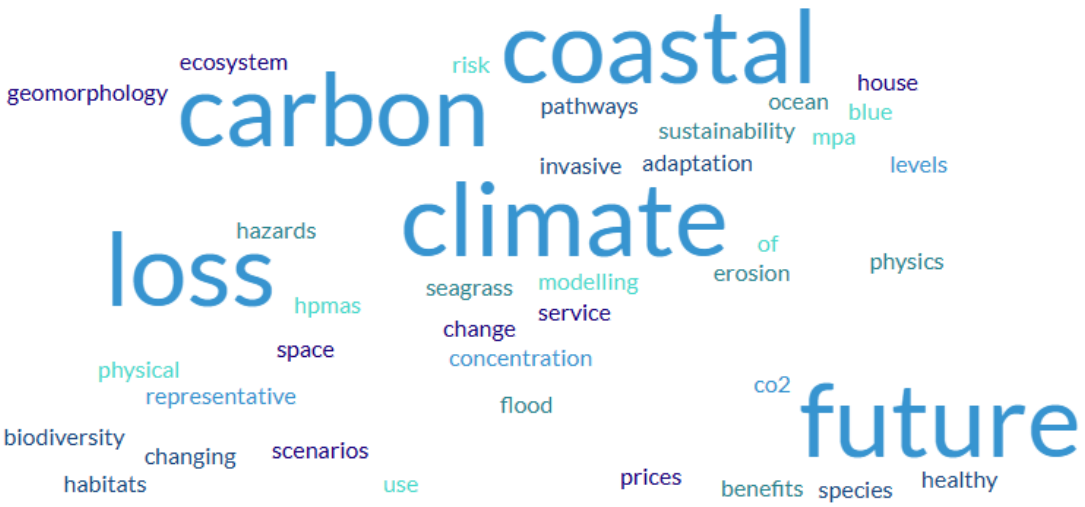

Fig. 4. Word cloud highlighting the types of climate change information disseminated by the SMMR network.

A brief discussion followed outlining which methods and approaches are typically used to communicate this information. This included infographics, reports, mapping, datasets, focus group discussions, storylines, narratives and targeted messages. One group highlighted the

importance of drawing upon peoples' experiences, anecdotal evidence and stories to support various forms of evidence, implying that information is received more effectively when it is packaged in a way that is relatable.

Participants expressed that they engage with a wide variety of sectors, including the same groupings listed in the survey: communities, NGOs and charities, government and policy makers, marine practitioners and researchers and academics, but they also specified that they engage with local councils, fisherfolk, students, businesses and supermarkets. This question prompted participants to consider how they foster and facilitate engagement between different actors and sectors. Comments such as, 'respect other sectors', 'all considered equal otherwise no co-creation', 'to build trust, takes time', emphasised a general inclination to ensure parity throughout multisectoral interaction.

Some groups mapped the communication pathways between sectors which provided a helpful visualisation to track the direction and flow of communication.

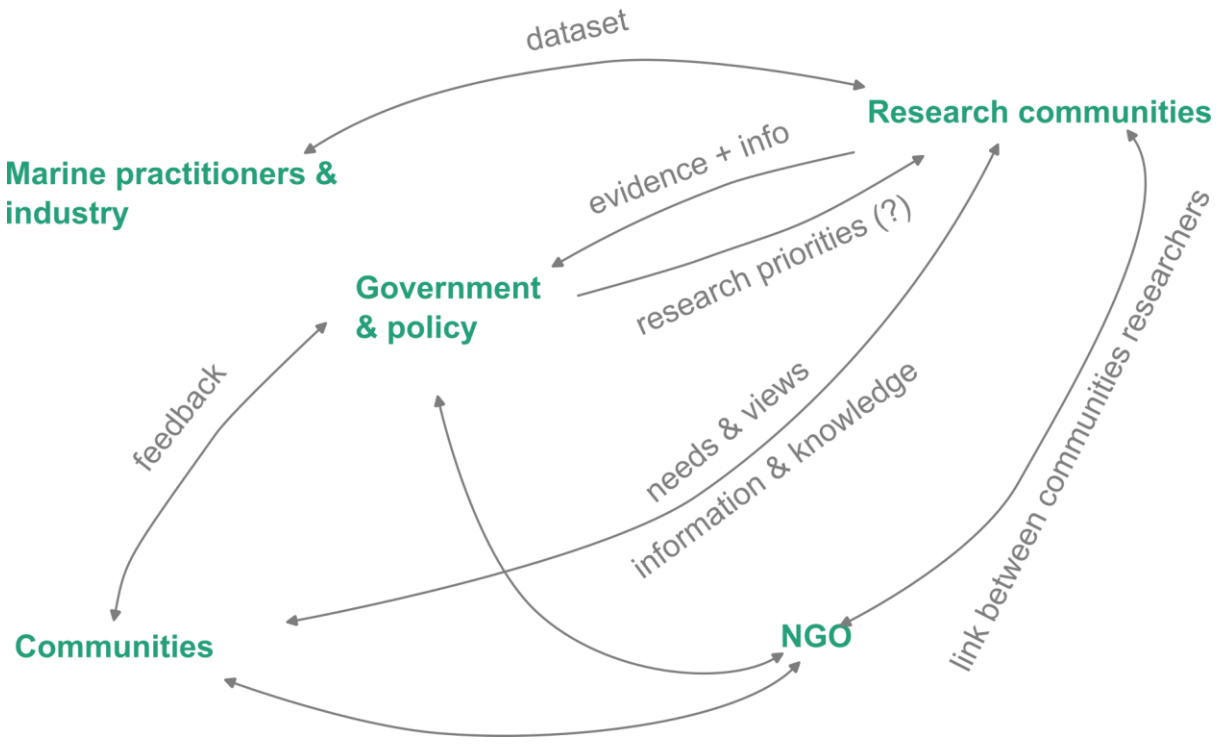

Fig. 5. Communication pathways between sectors identified during the workshop at SMMR conference.

The second stage of the workshop was designed to explore communication approaches for engaging with specific sectors. Groups were assigned one sector and asked to self-select another, so that each group discussed engagement with at least two sectors. The collective findings are as follows:

Academia and Research

When engaging with academia and the research community, interactive methods such as the Q method, focus groups and workshops worked particularly well. Reports, mapping and datasets were also highlighted as effective methods, particularly as information between researchers would induce a similar level of understanding. In addition, forums such as the Marine Alliance for Science and Technology for Scotland's (MASTS) Climate Change Form and the Marine Climate Change Impacts Partnership (MCCIP), along with social media platforms were noted as important spaces where information could be exchanged, in the process of enhancing research culture.

Time constraints were identified as a major hindrance for researchers, impacting the time required for effective communication between actors. Other challenges included implementing interdisciplinarity and bringing multiple actors and sectors together. With regard to the disadvantages of particular methods, reports were highlighted as being closed to feedback and input and not always easy to access, requiring more visibility and signposting.

Government and Policy landscape

Part of this conversation on government and policy landscape involved sketching the government and policy landscape, including the entry points where information can be shared and who to communicate with, such as policy officers who are proximate to ministers and decision-makers. This requires networking and consolidating relationships to identify interests and align priorities in policy and research.

Methods typically used to communicate and convey information were briefing papers, post notes (both emphasised as relying on narrative approaches and often informed by datasets and identification of indices and thresholds) meetings, talks and presentations. Mapping

approaches were identified as providing opportunities for mutual learning and collaboration along with joint authorship of reports, and opportunities for secondments and placements. Innovative funding programmes such as SMMR and the now defunct Shared Prosperity Fund (SPF) were noted for improving transdisciplinary and multisector interaction.

Some of the major challenges discussed were about navigating inherent institutional structures, processes and gatekeepers along with a high staff turnover requiring the frequent formation of new relationships and trust-building. Time constraints on civil servants to attend meetings and digest information which by necessity is truncated, were also outlined as a challenge. Timing mismatches also extended to differences between research and policy sectors regarding ways of working, their needs and delivery; specifically, that evidence needs to be ready and available when issues are pertinent and current.

NGOs and Charities

It was widely accepted that NGOs and charities have specific targets which need to be addressed in specific ways. As they can lobby government and policy actors on the basis of research it is imperative that information is accurate and rigorous. Typically, this can be in the form of, or derived from, reports, lectures, webinars, workshops and participatory action. NGO networks are very well established and can be particularly useful as a pathway to disseminate research to multiple actors and sectors. Seeking clarity regarding how information will be used and for what purpose was a caveat for engagement with NGOs and charities.

Marine Practitioners and Industry

Similarly, one of the advantages of engaging with marine practitioners and industry is that they also have access to wide networks which can benefit the dissemination of research. Engaging an industry champion can help to facilitate access to these networks though this can lead to a filtering of information. Group discussion appeared to focus more on industry rather than marine practitioners, outlining some of the challenges specific to engagement with this group, such as precise targets, narrow focus and financial incentives governing the use and exchange of information. As with the feedback relating to NGOs and charities, clarity about how information will be used generated a discussion about intellectual property,

revealing the anxiety of research being used or implemented without consent or for unintended purposes.

Communities

Much of the discussion for engaging with communities involved identifying the principles required to form effective and meaningful relationships, such as allowing sufficient time to listen and build trust and to avoid parachute research by ensuring that legacy objectives are built into projects and interactions. It was agreed that engaging with communities requires adaptation and flexibility in the way research is conducted and that this involves tailoring information and methods to suit different audiences and actors.

Methods and tools used to engage communities were much more innovative, arts-based and participatory, including photo voice, role play exercises, world cafés peoples' assemblies, community theatre, 3D geo visualisation, stories, interviews, oral histories, mapping scenarios, gaming and seasonal calendars. It was concluded that arts-based methods and participatory arts research can help access multiple actors, reframe issues, build social capital, energise communities to act, and consolidate community identity and agency. Also, arts-based and participatory approaches can help more 'traditional' and empirical approaches to land more effectively, as well as making research more engaging and relatable.

Some of the challenges discussed centred on recruitment and inclusion and the difficulties of overcoming artist and participant self-selection to reach wider cohorts. Other challenges involved how to communicate and engage with such a broad sector and how to tailor approaches to appeal to different levels of interest and capacity. Also discussed was whether arts-based, participatory and co-designed methods lead to better outcomes and how to test the efficacy of these methods.

Section 4 – Case studies

This section of the report focuses on best practice for communicating and disseminating climate information from across the SMMR projects. For each case study we include a brief description of the project and examples of successful engagement.

Case Study 1: Resilience of Coastal Communities

The Resilience of Coastal Communities (ROCC) project is exploring past and present responses to environmental, regulatory and socio-cultural change to help people make better management decisions in the future. This approach will help decision makers find a balance between the marine environment, people's wellbeing, and community resilience, leading to a more sustainable use of marine resources and benefits for people.

One particular example of successful engagement was a Marine Planning Trade-off Analysis pilot (MaPTA) with fishers. ROCC and the CEO of the Plymouth Fishing and Seafood Association co-lead a workshop with fishermen to discuss potential trade-offs arising from changes to management under the Bass Fisheries Management Plan (FMP), with a consideration for climate change. To kick-start discussion, the workshop started with an integrated over-view of the context, which included: i) an introduction to the MaPTA decision-support tool (Matt Fortnam, ROCC social scientist); ii) some background on the Bass FMP (Phil McBryde, Defra); iii) current understanding of the Bass stock status (Kieran Hyder, Cefas), and; iv) climate projections and their implications for bass (Susan Kay, PML + ROCC climate modeller). Participants then deliberated over trade-offs emerging from changes to management and their acceptability.

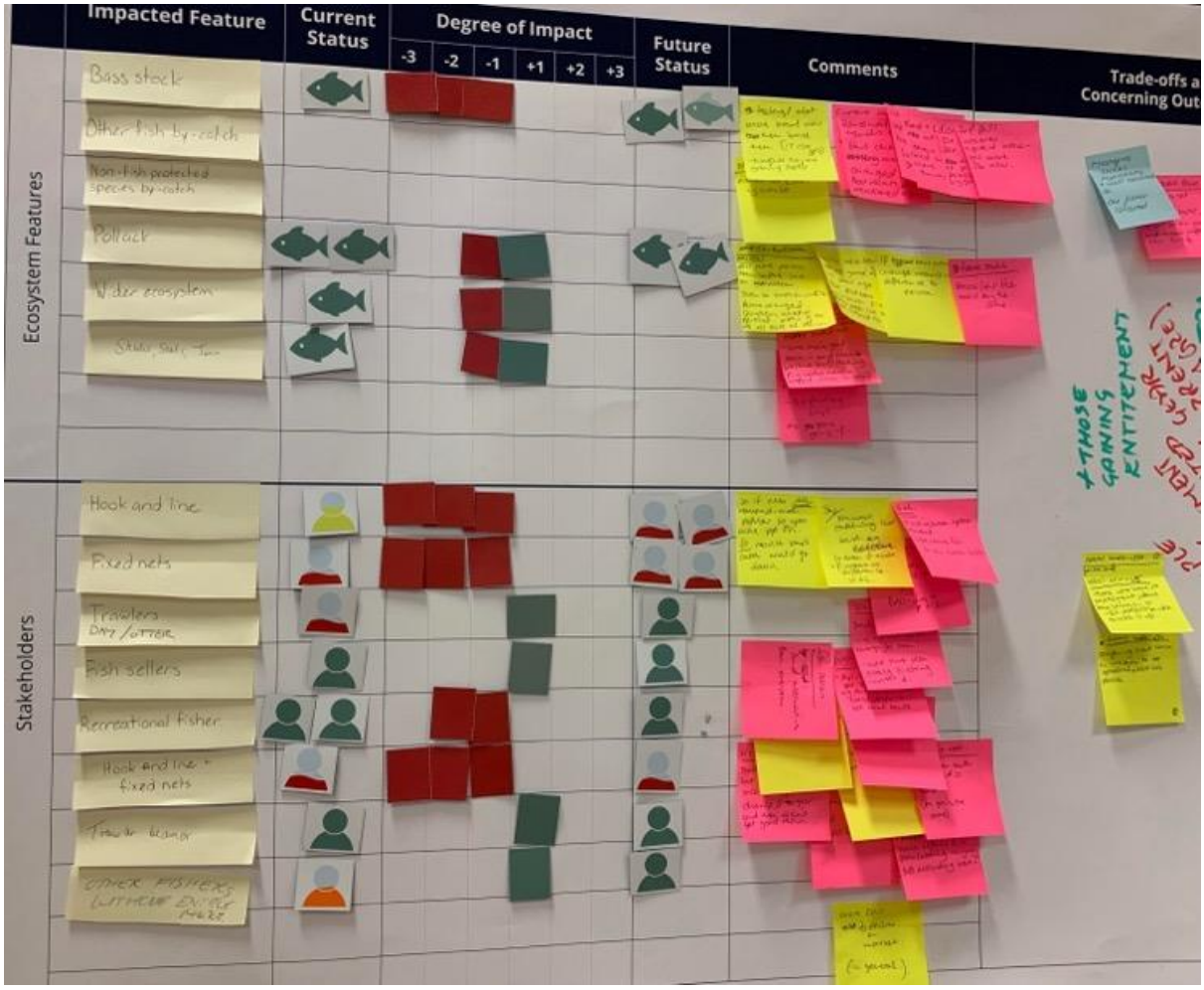

Fig. 6. Example of the Trade-off dashboard populated in the fishermen's deliberations.

The integrated and participatory approach was successful overall in engaging the fisheries stakeholders in dialogue about the future of their fishery. 90% of the participants said they would recommend the MaPTA approach for use in FMP consultations. The climate change information did not necessarily feature prominently in discussion which focused on impacts in 5-10 years' time. It was nevertheless important in terms of the bigger picture for the fishery and its continued viability in the south-west UK given potential changes in the distribution of the fishery under climate change. For further information please see the following policy briefings: Making more just marine trade-off decisions in England; Participatory Trade-off Analysis for UK Fisheries Management Plans.

Another example is the Resilience exhibition drawing on ROCC's oral history collection. The project collected over 60 oral histories from people living in coastal communities in the southwest UK and working now or in the past in marine livelihoods. The oral histories explore how people responded to change events in the past to the present-day. The disturbance data

includes climate and environmental change events. Ten of the Cornish oral histories were then developed into an audio/visual exhibition on the resilience of Cornwall's coastal communities at the National Maritime Museum Cornwall. A central element of the exhibition is a disturbance event graphic which includes environmental events, such as storms and flooding. Our audio also integrates sounds and personal stories of storm events. The collaboration with artists and museum curators is effective in 'bringing to life' events that impact a diverse range of people, which include but are not limited to environmental/climate change and events. The exhibition is expected to reach approximately 100,000 visitors to the museum. Moreover, an invitation-only *launch event* and a subsequent *policy event* have successfully engaged a range of NGO, practitioner and policy audiences alongside publics, artists and academics.

Fig. 7. The All Change graphic depicting quoted oral history data on climate, environmental and other disturbance events facing communities.

Fig. 8. The exhibition space showing the interactive audio buoys and stunning portraits of Cornish oral history participants.

Case Study 2: Diverse Marine Values

The goal of the Diverse Marine Values (DMV) project is to help create a step-change in the transdisciplinary capability of the UK marine policy and research community to use diverse values in marine decision-making. Diverse values encapsulates the idea that marine spaces have instrumental, intrinsic and relational values and that the inclusion of a broader range of values, such as social, cultural, aesthetic and economic values can enhance how we understand marine environments and human-ocean relationships. Working in three very different places in the UK, the waterfront city of Portsmouth, the wild and remote Shetland Islands, and the town of Chepstow and the broader catchment of the River Wye, the project uses a suite of qualitative, quantitative and arts-based research approaches to engage with coastal communities and uncover place-based marine values.

Community Voice Method (CVM) is a well-established, interviewer-led approach for engaging with people and communities and for creating policy-relevant opportunities for engagement and deliberation around values. In this project, CVM was used to engage diverse communities and to create a space to explore community-held marine values. In total over fifty individuals were interviewed about their relationship with the sea and coast and three documentary-style films were produced using a values framework. Over one hundred and fifty people attended the film screenings and accompanying workshops across the test site locations where the film was used to stimulate discussion around community-held marine values. CVM is a particularly effective method to elicit multi-actor perspectives and for communicating plural viewpoints in one output which can be then used to incite further discussion and deliberation. For more information, please see the CVM films: Reddin Values, Watershed and Tides of Change.

Fig. 9. A CVM interview in progress in Shetland. Places of significance to the interviewees were selected as interview locations.

Case Study 3: Pyramids of Life: working with nature

The 'Pyramids of Life' (PoL) approach to a sustainable future captures and helps to communicate complex relationships between different species, human behaviours, and marine ecosystem functions. This work will provide a multidimensional perspective of the value (economic, social, and environmental) of marine ecosystems, so that future management interventions are based squarely on what is sustainable.

The Pyramids of Life team is working with colleagues in Defra to produce a web-based app github.com/CefasRepRes/mizerShiny/ allowing managers, and the broader stakeholder community, to understand the role of species within the Celtic Sea and to assess possible changes in fishing activity. Initial evidence was provided for the MMO-led Celtic Sea Pelagic Fisheries Management Plan (FMP) working group in November 2024, following an initial meeting in Penzance in March 2024, and the team took part in workshops throughout 2025 where stakeholders were able to explore different fishing scenarios (Fig. 10).

Co-development has been important in terms of first allowing users to understand the key ecological processes and the consequences of possibly unrealistic changes, before going on to look at concrete scenarios driven by data on gear and fishing fleets. Moreover, the PoL models offer flexibility to consider a broader range of species, and necessarily include information relevant to the parallel Celtic Sea Demersal FMP- we are making use of these synergies as FMP discussions progress.

Fig. 10. RShiny app which allows end-users to explore the ecological roles of species in the assemblage, and to investigate hypothetical management scenarios.

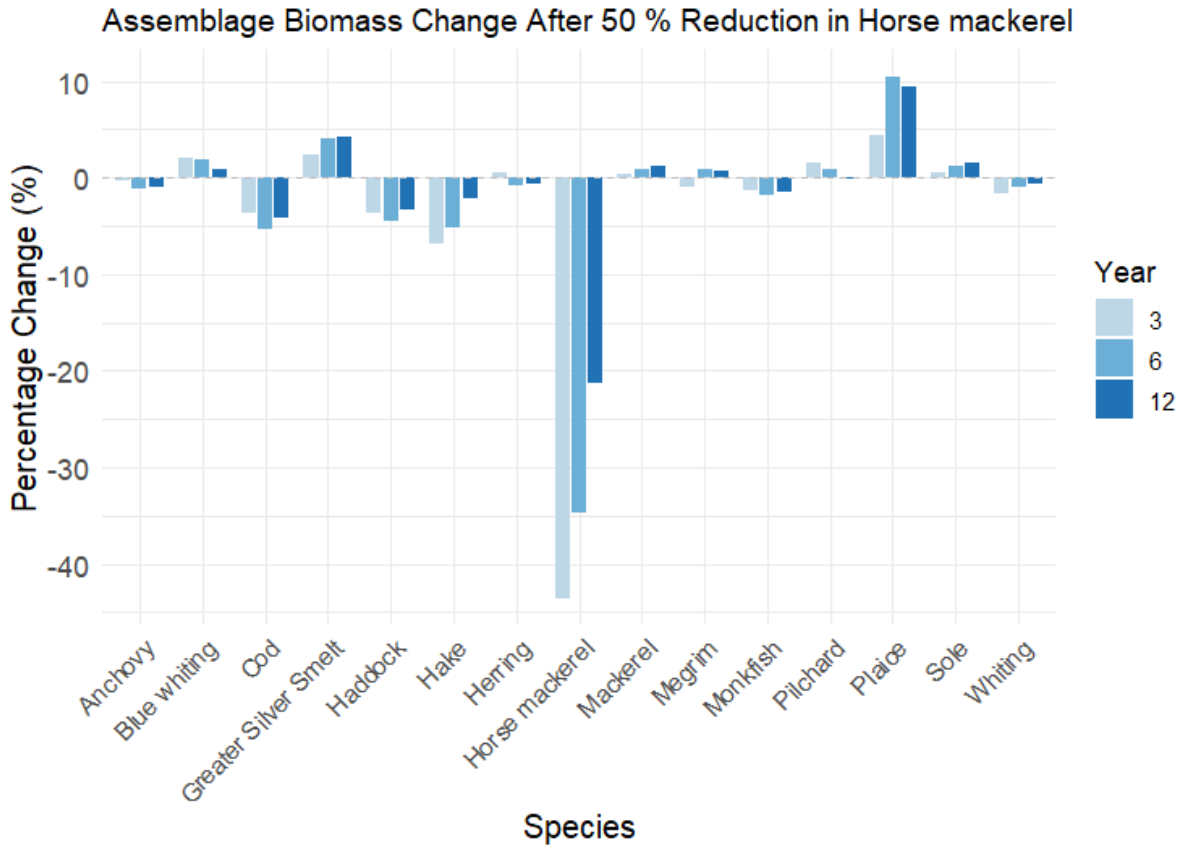

Fig. 11. Example evidence provided to Defra/MMO Celtic Sea pelagic FMP stakeholders. Here the model shows that ecosystem-level tipping points in the Celtic Sea system are unlikely, even under large perturbations to a single species.

PoL's partners within the UK Government (Defra and MMO, with helpful data and insight through Seafish) have been central to the collaboration, and the work ought to be useful for various local stakeholders including fishers, managers, and conservation groups. The team hopes it will be useful in the final delivery of the FMP later in 2025. The tool can be adapted for any ecosystem, see for example the North Sea example in Fig. 11. However, the models can only be as good as the data with which they are driven. The task of collating fishery and ecological datasets is complex, with PoL partner Cefas ideally placed at the nexus of data collection and curation, and the PoL team has developed protocols to do this and to adapt previous models. This work is in progress.

This collaborative work was not explicitly planned in the original funding application, but was facilitated by the diverse and active atmosphere engendered by the SMMR programme. The SMMR conferences were especially valuable here, in attracting a range of delegates which academics (and especially mathematical ecologists) would not normally meet.

Case Study 4: Resilient Coasts: Optimasing Co-benefit Solutions

CO-OPT
Resilient Coasts:
Optimising Co-Benefit Solutions

The Resilient Coasts: Optimasing Co-benefit Solutions (Co-Opt) project is working to deliver a new framework that will support the transition from hard 'grey' defences (e.g. groynes, stepped sea walls, and rip-rap sea walls) to softer 'green' solutions (e.g. managed realignment, restoration of coastal habitats, and sand mega-nourishments) for coastal and shoreline management. This will provide a scalable and adaptive solution to support coastal management and policy development.

The Co-Opt team has succeeded in engaging a wide range of interested parties across key marine and coastal sectors including local authorities, national government agencies and departments, NGOs, industry and consultancies, local farmers and landowners, and local residents. This has been achieved via a series of participatory workshops on Soft Systems Methodology, Fuzzy Cognitive Mapping and Deliberation.

Fig. 12. Image of the deliberative workshop in Falkirk. The workshop counted with representatives of Falkirk council, Airth Parish Community Council, landowners, SEPA, Scottish Government, RSPB, Nature Scot and AECOM and provided a neutral forum to discuss management options for Airth.

These workshops created a space where both project evidence and place-based knowledge came together on an equal footing with bi-directional information flowing between the project team and the relevant groups. The results are novel ways of thinking in terms of determining and exploring options for the study sites and more broadly has cultivated transdisciplinary thinking within the project. The Early Career Researchers (ECRs) have sought to advance insights from the integration of all our approaches and DPSIR+ framework (Drivers-Pressures-State-Impacts-Responses + Worldview and Social Acceptance) to develop a co-produced approach to knowledge production with the relevant parties involved in the deliberative workshops.

Fig. 13 Photos of the group's DPSIR+ frameworks developed during the Hesketh workshop. The image illustrates the visual differences in how the framework was developed by the different groups

The workshops have identified significant disagreements between different groups about the implementation and perception of nature-based solutions. The project provided a new neutral forum, where there were none previously. This was crucial in enabling constructive round-table discussions of conflicts and identification of potential ways forward. The informal feedback from delegates was very positive on this aspect. The project has provided

an essential stepping stone towards activities that would increase resilience of the coastal socio-ecological systems in the two cases. The option “creation of new intertidal habitat in front of the current line of defence” arose from the deliberations at the Co-Opt workshop in Airth. While for the Hesketh-Ribble estuary, we have already shared the findings and lessons learned from the Hesketh Bank workshops with the Our Future Coast project to improve resilience to flooding and coastal erosion in the North West.

Case Study 5: Marine Spatial Planning Addressing Climate Effects

The Marine Spatial Planning Addressing Climate Effects (MSPACE) project aims to drive forward the capability of the four UK nations in designing and implementing economically viable and socially acceptable climate-smart marine spatial plans (MSP). By first assessing climate change effects across the whole UK EEZ, and then exploring the economic and social dimensions of those effects, the project hopes to ensure sustainable management of marine resources and improve the marine environment for the next generation.

MSPACE team have focused much of their resources on engagement with end-users, this began when they first conceptualised the work (before writing grant stage) and continued since, to ensure they were pursuing a work plan that was meeting end-user needs and timelines. This allowed the team to start working on the development of relationships of trust since then, which are needed to ensure the project is indeed co-delivered with end-users. The co-delivery of the research products means that end-users have ownership also of what has been delivered, and that what is delivered meets their needs. This approach has also led to additional requests by end-users for MSPACE data and advice to feed into additional processes, all of which are good indicators of successful engagement.

Case Study 6: Restoration of Seagrass for Ocean Wealth

The Restoration of Seagrass for Ocean Wealth (ReSOW UK) project facilitates informed management and restoration of seagrass for sustainable social, environmental and economic net gains for the UK. This research will aid the development of applied online tools to enable the integration of seagrass into sustainable marine management.

A particularly successful engagement from the ReSOW project was its collaboration with the All-Party Parliamentary Group (APPG) for the Ocean. ReSOW contributed to raising awareness about the critical importance of seagrass management and restoration in the UK through multiple impactful channels. This included inputting into influential reports, providing evidence directly to parliamentarians, and communicating strategic insights with key policymakers, including the then Prime Minister Rishi Sunak. This multi-pronged approach ensured that the project's findings not only reached decision-makers but also shaped discussions on marine restoration, effectively positioning seagrass as a vital nature-based solution for climate action and biodiversity enhancement. The engagement significantly advanced the visibility and policy relevance of seagrass restoration efforts across the UK.

Section 5 – Reflections and Conclusion

Members of the SMMR programme are well placed to reflect upon the communication and dissemination of climate information. Many of them facilitate exchanges between multiple sectors and tailor information to suit the requirements of different audiences. The workshop produced a rich discussion about communication strategies, methods and expectations and provided an opportunity for SMMR members to share experiences and insights. The workshop discussions and the case study examples can be grouped under the following themes:

Sectoral Requirements and Structures

SMMR members are particularly cognisant of institutional and sectoral expectations and structures. This means an awareness of how information should be packaged (in the form of reports, papers, policy briefs, etc.) to meet the requirements of an organisation or institution, where the entry points are for that information to be received effectively, and who to engage with, including identifying gatekeepers and champions. The benefits of tailoring information and engagement to specific audiences and end-users was specifically highlighted in our case study examples as an efficacious way to ensure that communicating key messages and findings was optimal and impactful.

Information supplied to NGOs, government officials and policy makers appears to be overwhelmingly of an empirical nature, adhering to the perception that 'accurate and rigorous' information is predominantly quantitative. Discussions around the efficacy of arts-based and participatory methods suggest a lack of confidence or familiarity with – or about how to justify – academic validity. The trend of filtering this kind of research into artefacts more palatable to government officials and policy makers was challenged but recognised as requiring systemic change at an institutional level.

Information and Message

The difference between supplying climate information and constructing and broadcasting a message has numerous implications regarding the methods selected and actors involved. As interpretation and analysis is often required to draw out meaning from raw data, discussions

ensued around who controls reading, framing and disseminating information. Concerns around authorship and intellectual property suggest that researchers are cautious about how information will be used, particularly as in some cases they are omitted from the communication process. Communication appears to be most successful when it involves the producers of information as either analysts or interpreters, or in collaboration with others responsible for constructing the message. Arts-based approaches were also highlighted for their ability to deliver and frame information in impactful and engaging ways, especially through their use of narratives and rhetoric.

Guiding Principles

Transdisciplinarity and participatory research were championed in the workshop discussion and case study examples as being crucial for bringing diverse groups of people together around a central issue and for exploring plural forms of knowledge and values. Working with collaborators from multiple disciplines, practices and sectors to share information and knowledge requires some key principles[10] . Creating a space where all actors are respected and equal was iterated by SMMR members as being fundamental to transdisciplinarity and co-creation. However, though disciplinary and epistemological parity are regarded as essential, acknowledgement that different forms of knowledge and information are perceived as being more valuable than others in particular contexts continues to impede transdisciplinary working and the production of knowledge artefacts. Time was also highlighted as being crucial for forming effective working relationships and networks and for gaining insight into different knowledge domains. With regard to working with communities, spending time to build trust, to listen and to establish adequate legacy plans was regarded as good practice. Furthermore, qualities such as reflexivity, agility and adaptability were regarded as being essential for working across sectors to navigate multiple needs and expectations of everyone involved.

[10] Beaumont et al., 2020

References

[1] National Academy of Sciences (2004) Facilitating Interdisciplinary Research. The National Academies Press, Washington DC.

[2] Liu, J., Dietz, T., Carpenter, S. R., Alberti, M, Folke, C., Moran, E., Pell, A. N., … & Taylor, W. M. (2007), Complexity of Coupled Human and Natural Systems. Science 317, 1513-1516. DOI: 10.1126/science.1144004

[3] McKinley, E., Acott, T., Yates, K. L. et al. (2020) Marine social sciences: Looking towards a sustainable future. Environmental Science & Policy, Volume 108, 85-92 DOI: 10.1016/j.envsci.2020.03.015

[4] Intergovernmental Oceanographic Commission (2024) Ocean Decade Vision 2030 White Papers: Challenge 9: Skills, knowledge, technology and participatory decision-making for all, Ocean Decade Series 65, IOC/2025/ODS/65

[5] Robinson, J. (2008) Being undisciplined: Transgressions and intersections in academia and beyond, Futures, Volume 40, Issue , Pages 70-86, ISSN 0016-3287, https://doi.org/10.1016/j.futures.2007.06.007.

[6] Jaeger-Erben, M., Kramm, J., Sonnberger, M., Völker, C., Albert, C., Graf, A., ... & Winzer, J. (2018). Building capacities for transdisciplinary research: Challenges and recommendations for early-career researchers. GAIA-Ecological Perspectives for Science and Society, 27(4), 379-386. DOI: 10.14512/gaia.27.4.10

[7] Reed, M.S., Vella, S., Challies, E., de Vente, J., Frewer, L., Hohenwallner-Ries, D., Huber, T., Neumann, R.K., Oughton, E.A., Sidoli del Ceno, J. and van Delden, H. (2018), A theory of participation: what makes stakeholder and public engagement in environmental management work? Restor Ecol, 26: S7-S17. https://doi.org/10.1111/rec.12541

[8] Findlater, K., Webber, S., Kandlikar, M. et al. Climate services promise better decisions but mainly focus on better data. Nat. Clim. Chang. 11, 731–737 (2021). DOI 10.1038/s41558-021-01125-3

[9] Terrado, M., Marcos, R., González-Reviriego, N., Vigo, I., Nicodemou, A., Graça, A., ... & Caboni, F. (2023). Co-production pathway of an end-to-end climate service for improved decision-making in the wine sector. Climate Services, 30, 100347. DOI: 10.1016/j.cliser.2023.100347

[10] Beaumont, N. (ed), (2020) Demystifying Interdisciplinary Working (in Valuing Nature), Valuing Nature Paper VNP25

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