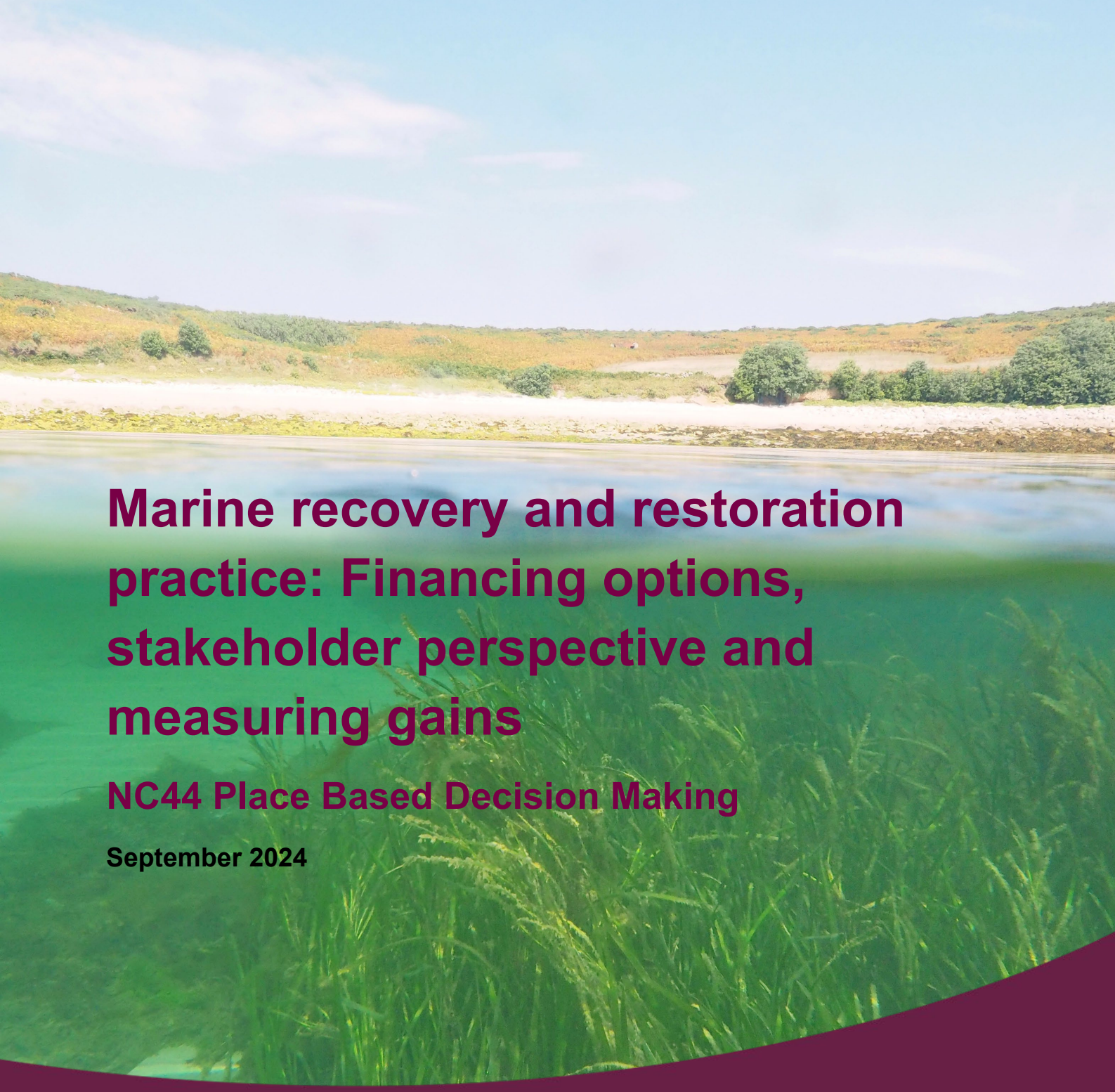

Marine recovery and restoration practice: Financing options, stakeholder perspective and measuring gains

NC44 Place Based Decision Making

September 2024

www.gov.uk/natural-england

NATURAL ENGLAND

When referencing this publication, please cite as:

Natural England (2023). Marine recovery and restoration practice: Financing options, stakeholder perspective and measuring gains. A report produced for the Department for Environment, Food and Rural Affairs, Natural England Project No: NC44 Place Based Decision Making, March 2023

Project funded by:

This project was funded by the Department for Environment, Food and Rural Affairs (Defra) as part of the marine arm of the Natural Capital and Ecosystem Assessment (NCEA) programme. Marine (m)NCEA is delivering evidence, tools, and guidance to integrate natural capital approaches into policy and decision making for marine and coastal environments. This work was part of project NC44: *Using the natural capital approach in practice for place-based decision making at different scales*. Find out more at https://www.gov.uk/government/publications/natural-capital-and-ecosystem-assessment-programme.

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Project title: Using the natural capital approach in practice for place-based decision making at different scales

Project lead/SRO: Dr Tara Hooper

Project start and end dates: 01 April 2022 – 31 March 2023

Work package (WP): WP1: Prioritising sites for marine net gain and nature

Total cost: £55,912

Acknowledgements

We would like to thank all the participants who gave up their time to contribute to this research.

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Summary

- Momentum has been growing both internationally and domestically to improve the condition and quality of marine environments (see UN Sustainability Goal 14, UN High Seas Treaty, 25 Year Environment Plan and Environmental Improvement Plan). Through the Environment Act 2021 the UK government has set ambitious legally binding targets to deliver marine nature recovery that are underpinned by an appreciation of natural capital and associated approaches.
- In response to policy targets there has been an increase in research and development for, and practical implementation of, active interventions to restore key marine habitats, particularly seagrass meadows, oyster and other bivalve reefs, and macroalgae (particularly kelp forests). At present this is focused on a small proportion of the ocean's habitats and species.
- This is occurring in parallel to the emergence of a range of innovative public sector initiatives and strategies (i.e. Marine Net Gain, strategic compensation, and the development of ecosystem service markets) that will interact and once operational have potential to increase dramatically the amount of public and private finance channelled into marine nature restoration and recovery. Increasing the scale and speed at which change can be delivered.
- Behind the targets, policies and strategies lies delivery. A collective approach, working collaboratively and in partnership at an ecosystem scale to enhance nature and human wellbeing, is fundamental to achieving healthy and productive marine environments and central to the natural capital approach.
- This research was conducted with the aim of exploring how funding for marine nature recovery and restoration is prioritised and allocated, taking a stakeholder perspective to understand the ways in which recovery and restoration is delivered. This included assessing the extent to which natural capital approaches are applied and the associated challenges, and their role in supporting emerging strategies such as Marine Net Gain.
- The research adopted a mixed-method approach integrating empirical qualitative research (surveys and in-depth interviews) with desk-based scoping and evidence reviews.
- Reflecting the aims of the research, this report is divided into four parts:

  Part 1: Funding marine nature recovery and restoration: provides a snapshot of the current UK funding landscape for marine nature recovery and restoration. The research identifies the primary policy and funding drivers of marine restoration and recovery, the mechanisms through which funding is channelled, and explores some of the key challenges in accessing funding to support marine conservation. The review highlights that funding is concentrated on promoting active recovery in the intertidal zone directed towards trialing methods to advance the recovery and the restoration of a limited number of habitats and species where outcomes and success are typically uncertain.

Part 2: Delivering restoration - Projects and perceptions: identifies marine recovery and restoration projects being undertaken in English waters and takes a stakeholder perspective to explore the opportunities and practical challenges of delivery on the ground. The research found that all the projects were adopting aspects of the natural capital approach to support their work and illustrates how this can be a valuable tool in marine spatial planning and a key mechanism for raising awareness and interest in conservation work. Incorporation of natural capital approaches strengthens the business case for marine nature restoration and recovery projects. Projects adopted limited aspects of the approach, principally asset quantity and quality identification. Key challenges to the delivery of marine nature recovery and restoration include 1) obtaining funding to initiate projects, 2) identifying and obtaining access to appropriate sites for recovery and restoration delivery, 3) obtaining regulatory approvals, 4) engaging and maintaining stakeholder interest and 5) support and securing funds to enable comprehensive monitoring and support for projects to scale-up.

Part 3: Payments for recovery: compiles examples of how marine recovery funds have been used to reduce existing pressures, particularly those from commercial fishing and litter. It argues that project-based payments can be targeted to reduce key pressures that have potential to provide significant passive habitat recovery (i.e. where the environment recovers without active intervention beyond the removal of impacts). Funding can be used to support commercial fishing interventions that promote passive recovery although there is a need to increase fisheries engagement and uptake of funding. A role is identified for new funds that take a more proactive approach in defining the types of projects that will be supported to promote wider passive recovery. New funds must, however, integrate with wider fisheries objectives and take into consideration the socio-economic dynamics associated with passive recovery.

Part 4: Using Natural Capital to measure loses and gains: considers how the value of natural capital assets could be determined to support the development of mechanisms to assess losses and benefits in the context of Marine Net Gain. This section argues that, in practice, this would require significant investment in new primary data, as the potential to apply the existing evidence base is limited. The natural capital approach could be applied in a broader sense to consider other measures of value such as the relative importance of assets to (i) conservation criteria and (ii) the provision of ecosystem services.

- The four integrated components of the research all add a specific dimension that contributes to our understanding of how marine nature recovery and restoration is occurring and the role natural capital can play in achieving healthy, productive seas that enhance human wellbeing. Evidence has culminated in a series of integrated policy recommendations. The recommendations are intended to increase support for practical marine nature recovery initiatives and emerging policy initiatives including Marine Net Gain. The report makes 10 key recommendations:

1. **Improve public funding coordination**: Enhance coordination and clarity in public funding by integrating marine nature recovery support and providing clear guidance on funding integration.
2. **Establish clear governance for public accountability**: Ecosystem marketization risks environmental harm and investor dominance, requiring clear governance for equitable nature recovery investment.
3. **Recognise marine and terrestrial environments as integrated systems**: To integrate marine and terrestrial policy, funding must increase, bridging marine and terrestrial projects and supporting subtidal restoration.
4. **Public investment to support innovation**: Early subtidal habitat restoration projects are uncertain; government support is vital for testing and learning from failures.
5. **Increase emphasis on payments for passive recovery**: Active restoration receives more support than passive recovery through the removal of marine pressures, highlighting the need for a proactive funding approach, to integrate with wider fisheries objectives and take into consideration socio-economic dynamics associated with passive recovery.
6. **Reform licencing for marine nature recovery and restoration**: Tailored licensing, improved agency coordination, and regulatory flexibility are needed for effective marine restoration projects.
7. **Increase recognition of the role of collaborative partnerships in marine nature recovery**: Collaborative partnerships, strategic facilitation, and dedicated funding are crucial for successful marine recovery and restoration projects.
8. **Standardise, expand, and resource monitoring and evaluation**: Biodiversity monitoring is undervalued; increased funding is needed for comprehensive data capture and integration of social sciences.
9. **Encourage best practice in applying a natural capital approach**: Support is needed to embed natural capital approaches in marine nature recovery projects, including best practice guidance, case studies, and community networks.
10. **Gather more primary data to support natural capital assessments of project-level impacts**: The limited evidence base of monetary values for UK marine assets may not suffice to address project-level environmental impacts. It may be more appropriate to use the natural capital approach in considering environmental value more broadly, in terms of scoring assets for their importance in providing ecosystem services that are of benefit to society.

Background

Marine environments generate critical ecosystem services providing habitats, food, climate regulation and employment. Awareness of the degree to which coastal and marine habitats have declined over recent decades, coupled with sea level rise and threats from coastal erosion, has highlighted the extent of the challenges faced by the marine ecosystem, and there is growing international and domestic political will to reverse this decline. Internationally, the United Nations Sustainable Development Goals call for restoration of marine and coastal ecosystems (Goal 14) (UN 2015) and member states at the UN biodiversity conference in December 2022 pledged to protect 30% of land and sea for biodiversity by 2030. The landmark UN High Seas Treaty agreement provides a legal framework for the protection of international waters, ensuring that member states are held to account for the sustainable use of marine resources and underpinning the creation of large marine protected areas.

Domestically, marine nature recovery is a key feature of the UK Government's 25 Year Environment Plan (25YEP) with legally binding environmental targets that require the restoration of 70% of designated features in MPAs to a favourable condition by 2042, with the rest in a recovering condition. The recently published Environment Improvement Plan (EIP) which is the first revision of the 25YEP, strengthens this by stating *"Defra will lead a practical initiative to restore estuarine and coastal habitats (ReMeMaRe (Restoring Meadow, Marsh and Reef)), which will restore 15% of our priority habitats along the English coast by 2043"*.

Delivery on these domestic and international ambitions requires the practical undertaking of marine restoration and recovery activities on the ground. This requires the support of a range of actors, but also appropriate funding. However, funding for marine nature recovery is complex: funders can struggle to imagine what is under the water; practical action can be very expensive due to higher costs compared to work on land; and changes can take a long time to occur. Political changes prompted by the UK's withdrawal from the European Union have also changed the UK's marine nature recovery funding landscape and has reduced levels of funding.

Despite this, there are exciting new opportunities to facilitate marine nature recovery including several new financing mechanisms that are emerging. There are a growing number of public sector initiatives that seek to secure financial contributions from the private sector to support nature recovery in marine areas. In the UK, these include the Scottish Marine Environmental Enhancement Fund (SMEEF)[1], and the Marine Recovery

[1] https://smeef.scot/

Fund[2] being developed as part of the Offshore Wind Environmental Improvement Package under the British Energy Security Strategy, which will offer developers the opportunity to pay into a fund to discharge their obligations for environmental compensation. The consultation on the principles of Marine Net Gain[3] also proposed prioritising a contributions-based approach that would operate like a levy and be used to fund priority environmental enhancement or restoration.

Such national funds are perceived by stakeholders as a mechanism for enabling a more strategic approach (Evans, 2017), which in turn can secure better outcomes by balancing impacts and delivering results in a co-ordinated way across multiple projects (Samuel, 2020). Regional approaches to spatial conservation planning provide the opportunity to take a more ecosystem-based perspective and move away from siloed, project-by-project delivery (Dickie et al., 2013; Jacob et al., 2020). Strategic approaches to monitoring also improve data consistency, quality, and availability, as well as allowing for combined efforts and so reduced costs (Hermans et al., 2020). Projects themselves may be more cost-effective if delivered in line with strategic objectives (Habib et al., 2013).

Whether implemented at project or strategic level, there remains the question of how to allocate the funds received to secure the best outcomes for nature recovery. There are two potential pathways for restoring and improving the condition of the marine environment: (i) active intervention in which direct action is taken to enhance the population of a particular species or the conditions in which species can thrive; and (ii) the removal of the pressures that currently cause environmental damage (known as passive recovery measures).

Recent years have seen an increase in research and development for, and practical implementation of, active interventions to restore key marine habitats, particularly seagrass meadows, oyster and other bivalve reefs, and macroalgae (particularly kelp forests). In Europe, macroalgae restoration has received less attention than other habitats, although is better advanced in California and Japan (Morris et al., 2020, Eger et al., 2021). Similarly, restoration of the European oyster is less well understood than for species native to the United States, although successful trials have been undertaken across Europe since the late 1990s, with an increase in recent research and development (Smaal et al., 2015). Studies on the restoration of seagrass have been undertaken since at least 1939 (Boudouresque et al., 2021), and so, as with oysters, restoration methods are relatively well understood. For mobile species, active management to increase seabird productivity and/or survival includes provision of nest platforms and eradication of mammalian predators at nest sites (Furness et al., 2013). Opportunities to support populations of fish, crab and lobster include the deployment of artificial habitats and the potential for

[2] https://www.gov.uk/government/publications/energy-security-bill-factsheets/energy-security-bill-factsheet-offshore-wind-environmental-improvement-package
[3] https://consult.defra.gov.uk/defra-net-gain-consultation-team/consultation-on-the-principles-of-marine-net-gain/

restocking with juveniles (Rozemeijer and van de Wolfshaar, 2018; Hermans et al., 2020; Groen, 2019; Prusina et al., 2020).

Figure 1. Seagrass surveying in the Fleet Lagoon. Community Seagrass Initiative, Chesil & Fleet MPA. Credits Keith Hiscock.

Given the rate and increased political and societal impetus for change, it is timely to explore how the funding landscape is developing and understand how this will contribute to the ambitious biodiversity targets set domestically and internationally. It also prompts us to understand the complexities and challenges of delivering marine recovery and restoration from the perspective of the actors involved in collaborative partnerships to deliver marine environmental improvement. Taking a stakeholder perspective enables the opportunity to explore how societal buy in and the cultural and the social values people place on nature could overcome some of the current barriers to restoring healthy functioning ecosystems.

An appreciation of the stakeholders involved in delivery and of the wider value of nature is also central to the Natural Capital approach. This approach places importance on collaborative partnership working for nature recovery, recognising that this will lead to improvements to nature and human wellbeing. Increasing adoption of this approach has been identified as central to achieving the UK governments environmental ambitions (Natural England, 2021).

This report summarises four integrated projects that have been undertaken as part of the mNCEA programme (within the project NC44 *Using the natural capital approach in practice for place-based decision making at different scales*, led by Natural England). The research aims to provide an overview of the funding landscape for marine nature recovery and restoration to understand how funding is prioritised and allocated. It also provides initial evidence on how marine restoration projects are being implemented and the societal benefits arising, from both a funding and stakeholder perspective to support developing policy around marine nature recovery. Additionally, it assesses the role of natural capital approaches in supporting emerging strategies such as Marine Net Gain.

The report is structured into four parts:

- **Part 1: Funding marine nature recovery and restoration:** Provides an overview of the current UK funding landscape for marine nature recovery and restoration.
- **Part 2: Delivering restoration - Projects and perceptions:** Identifies marine recovery and restoration projects being undertaken in English waters and reports on interviews with stakeholders on the opportunities and practical challenges.
- **Part 3: Payments for recovery**: Uses a desk-based review to provide further insight on the use of marine recovery funds for wider-scale passive nature recovery.
- **Part 4: Using Natural Capital to measure loses and gains:** Delivers a brief assessment of the role of the natural capital approach in evaluating change.

In response to the increased political importance placed on protecting and reversing the decline of marine environments, Part 1 provides a snapshot of the current UK funding landscape for marine nature recovery and restoration. It identifies the primary policy and funding drivers of marine restoration and recovery, and the mechanisms through which funding is channelled. It broadly explores some of the key challenges facing marine nature recovery and restoration projects when accessing funding to support marine conservation.

Taking a stakeholder perspective in Part 2 provides valuable insights into the motivations and drivers of engagement with the conservation of marine ecosystems and the practical challenges associated with the delivery of marine nature recovery and restoration projects. It further aids understanding of what leads to a successful nature recovery project as well as identifying key barriers that hinder marine conservation.

The purpose of Part 3 is to compile additional examples on the how marine recovery funds have been used to reduce existing pressures, and hence how they might be used to secure further partnership-led interventions for wider-scale nature recovery, with a particular focus on reducing the impacts of fishing and marine litter.

Part 4 considers how the value of natural capital assets could be determined to support the development of mechanisms to assess losses and benefits in the context of Marine Net Gain.

The report combines the insights from across the four parts of the research to provide joint recommendations to support developing policy around marine nature recovery.

Part 1: Funding marine nature recovery and restoration

The success and extent to which marine nature recovery and restoration can be delivered is contingent on funding. There are a range of public sector funds that provide finance to support the delivery of marine nature recovery and restoration and considering significant political developments (i.e. UK withdrawal from the EU, the introduction of the Environment Act, 2021 and associated targets) this is a highly dynamic and evolving landscape. In addition to public support there is growing recognition of the role and responsibility for nature restoration played by the private sector (Reed et al., 2022) and a growing number of schemes that aim to attract investment from the private sector to further marine protection and conservation aims. This review aims to provide a snapshot of the existing and emerging funding schemes for marine nature conservation projects and elicit information on programme governance structures and project selection and evaluation criteria from the perspective of the funding award body.

This research is focused on understanding the key large-scale funding programmes and initiatives through which funding currently flows, or initiatives that have the potential to be transformative in terms of the potential values of funding that could be realised. The review does not include the many smaller scale funds that support marine nature recovery such as funding from local and regional ENGO's or philanthropic sources, or transactions that are occurring between private investors and delivery partners. These were deemed out of scope of the current review although could represent an interesting area for future research. Fisheries certification schemes, on which there is already a considerable literature, were also not within scope.

Methods

A desk based online scoping review was undertaken in September 2022, with the aim to identify funding streams available for projects seeking to provide marine nature restoration and recovery in the UK. The review was primarily focused on identifying funding mechanisms that enable the delivery of marine nature restoration and recovery by community organisations, to allow improved understanding of the opportunities for this sector. Programmes that were in the scope of the review included those with the aim of:

- restoring key habitats (including saltmarsh, seagrass meadows, kelp forests and sediment) and/or the species which depend on them,
- providing compensatory habitat restoration associated with development in the marine space whilst ensuring that changes to coastal infrastructure do no harm or compensate for any losses,
- supporting increased coordination between marine stakeholders to support strategic spatial management of marine environments,

- developing ecosystem service markets.

A starting point for the identification of available funding was to examine work conducted in Part 2, specifically the data generated by the marine nature recovery project mapping exercise, to begin to build a picture of how existing marine nature recovery projects were currently funded. Whilst the focus was on identifying funds available across the UK nations, programmes in England and Scotland predominated. This information was supplemented with data from online searches and informal expert interviews with actors involved in the design and delivery of schemes (n=9, see Table 1). Interview participants were identified through existing networks and snowball sampling recruitment approaches.

Table 1: Expert interviewee summary

Participant number	Organisation	Funding programme
1	Environment Agency	Natural Environment Investment Readiness Fund (NEIRF), Green Recovery Challenge Fund,
2	Environment Agency	Natural Environment Investment Readiness Fund (NEIRF), Championing Coastal Coordination (3C's), Flooding, Coastal Erosion, Risk Management
3	Environment Agency	Flood and Coastal Erosion Risks Management Strategy (FCERM) Flood and Coastal resilience Innovation Programme (FCRIP)
4	Natural England	Natural England Marine External Funding Group
5	Natural England	Natural England Marine External Funding Group
6	Natural England	3C's, Environment Agency Regional Habitat Compensation Programme (RHCP)
7	Natural England	Green Finance
8	MMO	3Cs
9	Defra	Blue Finance

The online review generated a range of information about the schemes that was used as the basis for comparison between different programmes and to help answer the questions guiding the analysis. Data extracted from each of the schemes were recorded in an Excel spreadsheet to aid comparison. The schemes did not all make the same level of information available publicly. Gaps in information were recorded and, where possible, key stakeholders identified through the scoping process were contacted via email to

supplement our understanding of the funding programmes and provide deeper insights into background aims and objectives of schemes, how funding award decisions are made and elicit perspectives on the challenges and strategic direction of the funding landscape, (see Appendix 1 for the questions used to guide discussion). The results presented represent a combination of web-based research and expert opinion.

Findings

In total, 22 funding programmes and initiatives were identified that currently underpin how marine nature recovery funding is being directed domestically to achieve the ambitious nature recovery targets or contribute more widely to conservation goals. Information available online about the respective programmes was reviewed to understand the level of funding available, key programme objectives and the decision-making criteria used to assess proposals and award funding (see Appendix 2).

High-level policy and management objectives

These funding opportunities grouped around 11 themes that represented the high-level policy and management objectives that underpin the strategic direction of (i) marine nature recovery and (ii) developing alternative markets, and hence are influencing how funding is directed. These themes are shown in Table 2, which also includes a summary of the key objective of each policy/management theme and the associated funding programmes through which funding is being directed.

Table 2: Strategic drivers of marine nature recovery funding

Policy/ management theme	Objective	Funding programme(s)
Environmental Land Management (ELMs)	Support for the rural economy whilst contributing to the aims of the 25YEP funding land managers and owners to deliver activities that support nature recovery and local environmental priorities including restoration, and management of inter-tidal and saline habitats (saltmarsh).	Local Nature Recovery Landscape Recovery
Local Nature Recovery strategies (LNRS)/Nature Recovery Network (NRN)	A strengthened legal duty for public bodies to conserve and enhance biodiversity including new biodiversity reporting requirements for local authorities, and mandatory spatial strategies for nature via Local Nature Recovery Strategies or 'LNRS'.	-

Policy/ management theme	Objective	Funding programme(s)
Offshore wind environmental improvement package	Accelerate the transition away from oil and gas towards renewables by fast-tracking the deployment of offshore wind whilst avoiding, reducing, or mitigating (through compensation) associated environmental impacts.	Offshore Wind Environmental Improvement Package (OWEIP) Offshore wind evidence and change programme (OWEC)
Strategic compensation	Ensuring that flood and coastal erosion protection measures are consistent with the requirements of the EU Birds and Habitats Directive.	The Regional Habitat Compensation Programme (RHCP)
Net Gain (biodiversity and marine net gain)	Under the Environment Act 2021 all planning permissions will be required to deliver at least 10% biodiversity net gain from November 2023. Consulting on the extension of net gain to marine developments. Embedding environmental improvement into coastal infrastructure planning to ensure that development achieved 'net gain' for the environment by protecting, restoring, or creating environmental features that are of greater ecological value to wildlife, habitats or people than any losses associated with the project.	No explicit funding programme. Developers may choose to fulfil their obligation through e.g. the purchase of Biodiversity Units through habitat banks that result in payments to third parties for appropriate environmental land management.
Flooding and Coastal Erosion Risk management	Ensuring national readiness and resilience to flooding and coastal change.	Flooding, Coastal Erosion Risk Management Strategy (FCERM) Flood and Coastal Resilience Innovation Programme (FCRIP)

Policy/ management theme	Objective	Funding programme(s)
Government and ALB restoration objectives	Delivering against the specific objectives of the government ALBs including Natural England (NE), The Environment Agency (EA), Marine Management Organisation (MMO), Centre for Environment, Fisheries, and Aquaculture Science (CEFAS)	Green Recovery Challenge Fund Scottish Government Nature restoration Fund Scottish Marine Environmental Enhancement Fund (SMEEF) Marine Natural Capital and Ecosystem Assessment (mNCEA) Marine Pioneer
Revised approaches commercial fisheries management	Revision of the management of commercial fisheries operating in European Marine Sites to ensure compliance with EU Birds and Habitats directive and ensure that sites receive the requisite level of protection of the marine environment and promote sustainable fishing.	Fisheries and Seafood Scheme (FaSS) Fisheries Industry Science Partnerships (FISP) UK Seafood Fund UK Seafood Innovation Fund
Coastal coordination	Enhance and progress the coordination of coastal management, to address challenges associated with diverse coastal ownership structures, governance arrangements and public and private stakeholder issues.	Championing, Coastal, Coordination (3C's)

Policy/ management theme	Objective	Funding programme(s)
Culture and Heritage	Protection of cultural assets, traditions and heritage associated with coastal communities.	National Lottery Heritage fund UKRI resilient UK coastal communities and seas
Blue Finance (i.e. ecosystem markets and carbon sequestration)	Recognising the importance of marine habitats in climate mitigation, supporting restoration approaches, the development of measurement, reporting and validation protocols and stimulating private investment and market-based mechanisms that improve and safeguard these environments.	Natural Environment Investment Readiness Fund (NEIRF) Big Nature Impact Fund (BNIF)

Cross-cutting issues

There is a clear connection between the policy/management themes and the strategic goals and targets of the 25YEP with some cutting across multiple goals of the government's environment plan. Marine nature recovery actions are specifically focused on addressing the following 25YEP objectives, *mitigating and adapting to climate change*, *thriving plants and wildlife*, *using natures resources more sustainably and efficiently* and *ensuring clean and plentiful water*. Some schemes directly address the challenges in the marine sector that in turn will help to improve the sectors response to the goals and targets of the 25YEP.

Most of the policy/management themes, and hence the available funding programmes, had central focus on enhancing and increasing the resilience of marine environments predominantly through active restoration. However, there are often wider ambitions, of achieving conservation objectives whilst also addressing other key challenges i.e., the transition away from fossil fuels, sustainability and resilience of the agriculture and fisheries sectors, enabling development, reducing flooding and coastal erosion risks, increasing public engagement with cultural and heritage assets. Funding is also available to support pilot projects connected to the development of new markets and innovative financing mechanisms to increase the sustainability of nature recovery funding.

There is variation in the extent to which the high-level policy/management objectives are supported by funding programmes accessible to projects on the ground. Whilst some are

actively financing nature recovery there are several key drivers including Marine Net Gain, markets for ecosystem services and strategic compensation initiatives that are emerging and in the development stages. Although the contributions that these initiatives make to marine nature recovery are limited at present, these emerging initiatives could provide significant future funding and be critical future drivers of marine nature restoration and recovery.

There has been growing interest in the practical application of natural capital approaches. In the marine context there has been a drive to demonstrate the value of the approach to understand who benefits and how from marine assets, and the value (pecuniary and non-pecuniary) that can be attributed to the benefits derived from the ecosystem services generated by blue spaces. This interest is evident in the UK government's funding of the Marine Pioneer and latterly the Marine Natural Capital and Ecosystem Assessment (mNCEA). Development of natural capital approaches is intended to measure the linkages between ecosystems, economic and human activities, and support understanding of the condition of marine assets, their contribution and how they are best managed to ensure the continuation of benefits and service provision in the future including the complementarity of the approach to emerging ecosystem markets. This stream of work has also usefully supported consideration of how the natural capital approach will support strategic initiatives including Marine Net Gain.

Further details of individual themes

The need for coordinated and strategic landscape scale responses to nature recovery are recognised via nationwide initiatives such as Local Nature Recovery Strategies (LNRS) which aim to deliver nature recovery at landscape scale by strengthening the legal duty of responsible authorities to deliver spatial plans for nature recovery. The central aim of LNRS is to create a national nature recovery network (NRN) of nature rich places and address the twin challenges of biodiversity loss and climate change. This represents a key strategic spatial strategy and is a major commitment of the 25 Year Environment plan, although the statutory regulations and guidance on the process for preparing and publishing a LNRS are yet to be defined. LNRS provide the opportunity to improve the linkages between marine and terrestrial environments within nature recovery planning, although (beyond opportunities for upstream solutions to e.g. water quality issues) they extend only into intertidal, rather than fully marine, areas. Similarly, the third tier of the Environmental Land Management scheme (ELMs) 'Landscape Recovery' aims to support coordinated large, landscape-scale nature recovery and incorporates intertidal habitats.

Recognising the contribution of marine habitats to climate mitigation and adaption is a further driver. This sits alongside the growing need for the private sector to consider ways of offsetting their CO_2 emissions and recognition of the role and responsibility played by private sectors in the management of marine assets. This has increased interest in the establishment of voluntary offset markets with both the public and private sectors providing significant funding to support the establishment voluntary ecosystem service markets. This is also reflected in several programmes that are focused on integrating ('blending') private investment in nature recovery (i.e. SMEEF, NEIRF, BNIF) as well as supporting actions

that improve intertidal and subtidal habitats (i.e. saltmarsh, seagrass meadows, kelp forests, intertidal mud) in preparedness for ecosystem services markets for the trade of these assets.

Figure 2. Snake pipefish in kelp forest. Credits Shannon Moran.

Habitat compensation approaches exist in response to flood and coastal erosion risk alleviation. Coastal flood and erosion protection measures are required to meet the requirements of the Habitats Regulations and deliver compensatory habitats proportional to the impacts of a development. The move away from fossil fuels towards renewable energy in response to climate change is prompting the acceleration of offshore wind development, which is also required to comply with the Habitats Regulations. This is driving the emergence of similar strategic compensation schemes, including the development of the Marine Recovery Fund under the Energy Act 2023. Payments can be made into this fund to discharge a compensation condition, and payments out to support practical measures to compensate for environmental impacts resulting from offshore wind activities.

Similar principles underpin biodiversity Net Gain and the proposed extension of this to Marine Net Gain which aims to embed the environment at the heart of marine development, enabling development whilst simultaneously ensuring that it occurs in a way

that mitigates damage and leads to net gains for the environment. Marine Net Gain especially is likely to be a significant driver of marine nature recovery with potential to divert significant finance toward recovery and restoration activities. In a recent sector analysis commissioned and published by Defra (ABPmer and eftec, 2022), modelling and evidence-based assumptions about the level of future marine development activities indicates '*That for 1% capital expenditure contributions for works below MLWS [Mean Low Water Springs] (and alternative approach suggested for marine aggregates) could potentially raise around £50m p.a. for MNG [Marine Net Gain] projects over the period to 2050'.*

Revisions to policy approaches to the management of commercial fisheries in European Marine Sites in 2014 including potential Special Protection Areas (pSPAs) and possible Special Areas of Conservation (pSACs) to ensure compliance with Article 6 of EU Habitats Directive 92/43/EEC (1992) contributes significantly to Defra's policy objectives of conserving and enhancing marine environments alongside increasing the resilience and sustainability of the fishing sector. This recognition of the role played by commercial sea users in the protection and enhancement of marine environments has subsequently led to a range of programmes that aim to balance commercial and environmental objectives. These programmes support projects that provide innovative approaches that benefit the sustainability and productivity of the marine sector and enhance the marine environment.

There is recognition of the cultural and heritage significance of coastal assets and communities. Funds are available to connect people to national, regional, and local marine heritage and enhance the resilience via the National Lottery Heritage Fund. Here the emphasis is on improving the connection of people to Heritage assets, the focus therefore is not entirely on recovery or restoration although the fund does aid projects that include nature recovery as part of wider heritage improvement aims. The health and wellbeing of UK coastal communities and seas is the focus of a new UK Research and Innovation (UKRI) fund which will support transdisciplinary research projects adopting natural capital approaches and that apply place-based approaches to transform our understanding of UK coastal communities and seas. The need for improved coordination between coastal stakeholders, required to enhance and progress coastal management and deliver comprehensive environmental action, is also recognised, and was a key driver for the Environment Agency led Championing Coastal Coordination (3C's) programme.

In parallel, there is also a drive to support the development of certification standards that are required to increase confidence and stimulate private investment in voluntary carbon markets. The creation of rigorous certifications standards increases investor confidence that the climate benefits traded are real, quantifiable, additional, and permanent (Black et al., 2022). The Natural Environment Investment Readiness Fund (NEIRF) is currently supporting work to develop the UK's first Saltmarsh Carbon Code which will enable UK saltmarsh carbon to be marketed and traded as carbon offsets providing financing for restoration projects whilst also addressing national net zero goals (UK Centre for Ecology and Hydrology, 2022).

Who funds marine nature improvements and how is funding allocated?

The programmes described above connect to different high-level policy/management aims and each has individual aims and objectives. However, there are five main mechanisms through which programme funding is allocated to recipients. These are via 1) legal obligation, 2) competitive open-calls, 3) voluntary engagement, 4) discretionary funding, and 5) blended finance approaches.

Legal obligation

The Habitats Regulations require developers to avoid or, if that is not possible, mitigate environmental impacts. Where unavoidable residual impacts remain, developers are required to compensate for those impacts. Compensation requirements are usually defined through individual project impact assessments, although the strategic compensation approach for offshore wind is seeking to enable a more co-ordinated approach that allows the compensation for multiple projects to be delivered at the same time. Compensation can be delivered on- or off-site, and funded directly by developers supporting environmental improvement activity or indirectly via the Marine Recovery Fund.

Avoidance, mitigation and compensation should ensure that there is no net environmental loss. Biodiversity Net Gain (and, potentially, Marine Net Gain) goes further in seeking to deliver a measurable gain for the environment, increasing the availability of funding for recovery and restoration projects. Biodiversity Net Gain came into effect in February 2024 and will apply to all developments in the Town and Country Planning Act 1990, with some exemptions. The previous (2019 to 2024 Johnson/Sunak Conservative) government committed to seeking to bring forward legislation and developing a mandatory approach to marine net gain, depending on the outcome of a consultation on the costs and benefits of the policy. Marine net gain policy is not yet fully developed and its scope may be revised under the new administration.

Competitive open calls

These typically fund research and development projects and invite individuals or collaborative groups to apply for funding. Open calls are usually time limited and require project proposals to directly address the strategic goals of the programme. Where programmes have multiple rounds, criteria are often specific to individual funding rounds. Examples of open call funding programmes include The Natural Environment Investment Readiness Fund (NEIRF), Scottish Government Nature Restoration Fund, Green Recovery Challenge Fund, FCRIP, 3Cs. Proposals were also required to meet several other criteria, common across all the competitive funding calls. Projects proposals need to:

- Promote collaboration between marine stakeholders i.e. ENGOs, marine industry actors, local authorities, and research institutions
- Be additional to already committed actions
- Include proportionate monitoring and communications plan

- Have appropriate licences and permissions in place
- Ensure the permanence of benefits obtained by the projects beyond the life of funding.
- Emphasise how funding will help to create and retain jobs.

Whilst competitive calls fund a range of objectives, very few required projects to demonstrate wider societal benefits associated with their activities. Of the programmes reviewed, the Scottish Marine Environmental Enhancement Fund (SMEEF) required projects to combine ecological outcomes with measures of broader social benefits.

Submissions were typically reviewed by expert panels comprised of independent assessors who score proposals against how well proposals met the call criteria. The level of scrutiny applied to the assessment criteria was proportional to the level of funding applied for. For example, for National Lottery Heritage projects over £250,000 award decisions were made by the board of trustees or panels dedicated by the board, decisions on grants awards under this value were where made at the local level.

Programmes would not fund the same projects twice but would consider funding subsequent phases of the same project. Additionally, programmes were looking to fund the most innovative projects and usually did not place geographical or sector quotas on the number of projects that could be funded. The Scottish Government Nature Restoration Fund provided development funding intended to support preparatory activity and act as a project pipeline, enabling emerging projects to submit fully developed delivery phase funding applications and move swiftly to implementation when funding is secured. Although, this route did not guarantee subsequent research and development funding. Similarly, NEIRF is acting as a project pipeline for further investment from the Big Nature Impact Fund, although additional funding is not guaranteed. At present this programme is only focused on supporting terrestrial projects.

Voluntary

Unlike competitive open calls, voluntary programmes are non-competitive and encourage voluntary participation. Through financial incentives and targeted landowner agreements the proposed first two tiers of ELMs (Sustainable Farming Incentive and Local Nature Recovery) reward the delivery of locally targeted actions by landowners, making space for nature alongside food production. Options for which landowners may be paid are still under development but are likely to include the creation, restoration, and management of intertidal and saline habitats (saltmarsh). ELMs recognise the dynamic nature of coastal habitats and supporting natural rollback.

Discretionary funding

Governments and their ALBs receive funding through the spending review process which sets government spending levels for each government department for the following three years. Through the 2021 settlement process Defra departments saw a positive uplift in funding (£1.4bn by 2024/25). This coupled with the publication of statutory environmental improvement targets laid out by the Environmental Improvement Plan (2023) represented

a step change in funding in support of the delivery of the 25YEP goals. This funding also gives discretionary powers to Defra and its ALBs to allocate funding to projects that seek to address issues pertinent to their core agendas. For example, the mNCEA and Marine Pioneer programmes have been funded through this mechanism. Discretionary funding may also be allocated via competitive open calls, for example the 3Cs and FCRIP funding originates from the Defra settlement process but is allocated through a competitive tendering process.

Blended finance models

Reflecting the need to incorporate private sector investment in nature recovery to ensure delivery at the speed and scale at which recovery is needed, several funding programmes are looking at ways of blending public and private investment to ensure long-term outcomes for nature recovery. For example, SMEEF is a voluntary donation-based scheme that encourages users of the maritime environment (i.e. oil and gas companies, fisheries sector) to voluntarily re-invest in the health and condition of the sea. The fund is used to support projects that restore, recover, or enhance marine environments or conduct research to this aim and provide return on investment through enhanced ecosystem services. ELMs Landscape Recovery tier uses a blended framework, providing project development funding for the first two years during which period projects are required to attract private investment to progress to implementation. Other tiers of ELMs are also looking to ensure that participation does not preclude access to private funding. The Big Nature Impact Fund represents Defra's flagship blended finance mechanism, with Defra providing £30 million seed funding to kick start and de-risk private investment. The Fund is being managed by private investment fund managers Federation Hermes and UK- based environmental impact investment advisor Finance Earth, and Defra will retain an active role in defining the objectives of the scheme and supporting its governance. It is unclear at this stage whether financing of marine based nature recovery and restoration projects will be supported.

Challenges to funding of marine nature recovery and restoration

Through the initial interviews (see Table 1), two central challenges that impact the landscape for marine nature recovery and restoration were identified. These related specifically to 1) the failures to see land and sea as integrated systems and 2) the practicalities of marine recovery and restoration delivery. The views of the expert interviewees are summarised below.

The marine environment represents a complex set of issues, with marine conservation, recovery and restoration noted to have a lower profile than the same set of issues in terrestrial environments. The failure to recognise land and sea as an integrated system results in inequity of funding. Whilst the review identifies several programmes that fund projects delivering recovery and restoration of marine and terrestrial environments, this is

often limited to conservation and protection of intertidal habitats, with subtidal environments often underrepresented.

The lack of visibility of marine environments makes the extent of the degradation of these environments less visible and any changes less tangible for funders and public. In a policy context, structural divides in governmental departments and its arm's length bodies (ALBs) reinforce divisions between terrestrial and marine environments and their management and perpetuates funding challenges. The structure of the 25 YEP highlights this siloed thinking, separating the sea from land in the overall vision for safeguarding the environment. At the time of interviewing, the EIP had not been published, however, the same challenges are evident within the revised plan. There is therefore a need for policy to recognise land and sea as integrated systems and this be reflected operationally within departments and the structuring of ALB's and cascade through to funding.

The delivery of marine recovery and restoration activities are impacted by the large number of stakeholder interests in coastal environments, which are often represented by many small bodies. It can be challenging to coordinate these stakeholders to deliver comprehensive management or to lobby for and influence the direction of funding. Collectively the marine sector is not as powerful as its terrestrial counterparts in terms of the numbers or the capacity of the organisations working towards its protection and the collective voice of the sector was often not well represented to funders.

Practically, the cost of delivering marine nature recovery and restoration interventions can be prohibitively expensive and influenced by external factors including the weather and seasonality. A systematic review identified the median cost for restoration of one hectare of marine and coastal habitat varying between US$80,000 and US$1,600,000 (depending on the habitat) at 2010 prices, although the true costs estimated to be up to four times higher and seagrass was among the most expensive ecosystems to restore (Bayraktarov et al 2016). Comparatively it was argued that funding of nature recovery extended further in terrestrial environments (Hooper, 2021) with change associated with conservation activities often more visible and tangible. The cost associated with marine recovery and restoration has been attributed to the inaccessibility of the environment and argued to contribute to fewer opportunities for community and volunteer-based projects (Bayraktarov et al., 2016).

Established methods for the recovery and restoration of marine systems are limited to a small proportion of marine habitats and species, with most practical interventions in the early stages of development and considerable uncertainty surrounding their long-term effectiveness and the benefits that they will achieve. Therefore, there needs to be increased support for methodological innovation, piloting and monitoring to develop evidence-based approaches. This is of critical value to emerging ecosystem service markets and for net gain as establishment in the absence of adequate support for piloting, risks failure of the projects behind offsetting markets and this will have consequences for the success and feasibility of those markets.

Discussion

This review has focused on identifying key funding mechanisms for marine nature recovery and restoration in the UK. The review illustrates an active landscape for marine recovery and restoration although this is very much in exploratory phase and predominantly focused around advancing methods, via piloting at a small scale to demonstrate ecological success. A review conducted to explore priorities and motivations of marine and coastal restoration research confirms this, arguing that marine recovery and restoration research is not yet widely aiming to maximise biodiversity or ecosystem services but is instead motivated by methodological development (Bayraktarov et al (2020). This was shown to differ from motivations for terrestrial recovery and restoration where biodiversity enhancement, offsetting and improving water quality were central motivations for research and development (Hagger et al 2017).

Whilst in this research phase there needs to be increased funding support for methodological innovation, piloting, and monitoring to develop evidence-based approaches. There is an important role for public institutions to fund innovation where outcomes are uncertain to help to expand the knowledge base and support learning. This is of critical value to emerging ecosystem service markets and for Marine Net Gain. Establishment in the absence of adequate support for piloting, risks failure of the projects that sit behind offsetting markets, with consequences for the success and feasibility of those markets. In the context of Marine Net Gain, Hooper, et al (2021) argue that there are clear policy ambitions for Marine Net Gain despite the concept being untested and unevaluated in practice or their being robust indications of how much contribution the policy can make to the required significant restoration and improvement of nature.

Restoration is also limited to a small number of marine habitats and species, with funds predominantly channelled towards activities in the intertidal zone. There is a recognised need to increase investment to support the improvement of restoration practices but also transition from small scale to seascape scale restoration (Bayraktarov et al 2016). Most of the funding identified through the review supports active restoration through management interventions including transplanting, planting seeds or seedlings or constructing artificial habitats. Some funding is available for passive recovery via funds associated with the revisions to commercial fisheries management (i.e. Fisheries and Seafood Scheme (FaSS), Fisheries Industry Science Partnerships (FISP), UK Seafood Fund and the UK Seafood Innovation Fund). However, the importance of removing pressure and the impact this could have for increasing the scale of marine nature recovery needs to be given more widespread recognition across the funding landscape. This contribution of payments for pressure removal will be considered in more detail in Part 3.

Conservation of the marine environment is predominantly publicly funded but there are emerging financing mechanisms that seek to increase and/or integrate private investment in marine nature recovery and restoration (i.e. through the development of ecosystem service markets and strategic compensation mechanisms including Marine Net Gain and blended finance initiatives). Increasing the diversification of financing options will enable

wider adoption and scaling-up of marine coastal restoration and this will contribute to meeting ambitious recent targets. However, funding must support the full development and testing of standards required to standardise and increase investor confidence. Whilst NEIRF funding has been successful in initiating the development of marine based carbon codes, there needs to be financial and policy support to ensure they get to market and are operational.

The review highlights that that there is significant activity being undertaken to improve nature, evidenced by the wide-ranging drivers for marine nature recovery and the volume of funding opportunities that seek to facilitate delivery. There is a need for coordination and strategic oversight of different funding approaches to ensure the appropriate use of public resources and ensure maximum outcomes for nature. Specifically in relation to Net Gain, Hooper et al (2021) recognise that it cannot occur independently of fisheries, and extensive public engagement and stakeholder co-production is required to develop the necessary collaborative solutions. There is also a need for clarity relating to how different funding mechanisms will interact with one another and how benefits might be staked. This has started to emerge to support Biodiversity Net Gain and nutrient mitigation (see Defra, 2023 and Wessex Water 2023) although further work is required to develop or adapt these for emerging marine ecosystem service markets.

Finally, as recognised within the marine recovery and restoration sphere there is a disproportionate focus on ecological research and limited emphasis placed on social and economic insights. In a systematic review of 235 papers of marine coastal restoration projects, it was found that most studies advocated for greater inclusion of social, economic, and cultural factors in assessing the effectiveness of ecological restoration (Bayraktarov, et al., 2020). This is also recognised by Hooper et al (2021) in relation to Marine Net Gain, observing that societal implications should also be better addressed. This supports arguments for increased integration of social sciences in marine conservation both via the establishment of independent funds but also through increased integration with ecological work. The need for this is starting to gain traction evidenced by the announcement of forthcoming UKRI funding to improve the resilience of coastal communities and seas (UKRI, 2023) and the requirement within SMEEF for projects to combine ecological outcomes with measures of broader social benefits.

Part 2 Delivering restoration - Projects and perceptions

Introduction

Part 1 of the research was focused on understanding the funding landscape for marine nature recovery and restoration. Building on this, Part 2 sought to locate where marine recovery and restoration projects are occurring and take a stakeholder perspective to

understand how marine nature conservation is implemented on the ground and explore the associated challenges. Part 2 was divided into two stages. Stage 1 aimed to map current levels of project activity through the identification of active sub- and intertidal marine nature recovery projects in English waters. This process was useful in generating insights into the types of actors that are involved in the delivery of projects, the geographical location of conservation activities, the species and habitats that are the focus of recovery and restoration efforts, the scale of delivery, and the projected restoration costs associated with conservation activity. In addition to providing an overview of the level of marine nature recovery occurring, the mapping exercise provided a sampling framework for Stage 2. Whilst there are numerous international and domestic goals for marine nature recovery, Bayraktarov et al (2020) argue that there is limited research that seeks to explore the motives of individuals and organisations that undertake marine recovery and restoration. Stage 2 aimed to explore the motivations of actors involved in partnerships that are actively delivering marine recovery and restoration projects, specifically to understand how projects are adopting and applying natural capital approaches and the practical challenges experienced in the delivery of marine conservation.

Method

Stage 1: Mapping of current marine nature recovery projects

Individuals involved in local initiatives to recover marine habitats were invited to complete a self-administered online survey to map marine nature recovery projects occurring in English waters. A convenience sampling approach was adopted, and the survey was distributed through national Marine Protected Area and Coastal Protection Networks and the Natural England senior adviser network. Members of the networks were invited to submit the details of recovery and restoration projects in which they were involved. In addition, they were asked to share details of the survey with their wider networks and encourage participation from others known to be delivering marine nature recovery and restoration (i.e. snowball sampling). The focus of the survey was to collect data on the partnerships involved in marine subtidal nature recovery, although responses also identified several projects focused on intertidal habitat nature recovery. Ethical approval was sought from Natural England's ethics committee prior to commencing data collection. The survey was designed to be short, taking no longer than 10 minutes to complete and to generate data relating to the following:

- The name of the nature recovery project
- The habitats and/or species that were targeted for recovery
- The project location
- The list of organisations involved in the project
- The stage the project was at (proposed, ongoing or completed)
- The start and planned completion date
- An estimate of the scale of habitat hoped to be restored

- The cost of the project
- How the project will be financed

Further projects were identified through reviewing the websites of marine organisations (e.g. Blue Marine Foundation) and marine habitat networks (e.g. native oyster network) and through additional data collected by the Crown Estate and the Environment Agency.

In total 31 marine nature recovery projects were identified (Table 3). Projects typically focused on the recovery and restoration of more than one species or habitats. Seagrass (n=17), saltmarsh (n=11) and native oysters (n=11) and kelp (n=5) were the habitats most frequently reported to be part of or the whole focus of the project.

Projects were located across England, but with the concentration of projects on the south coast, reflecting the body of marine recovery and restoration work that is being undertaken in the Solent. Half of the projects were ongoing while the remainder were currently proposals without associated funding.

Table 3: Project categorisation summary

Category	Sub-category	Projects N= 31
Habitats/Species covered by the projects*	Kelp	5
	Seagrass	17
	Saltmarsh	11
	Subtidal mud (including brittle star beds) (Creel)	1
	Native oyster	11
	Mudflat	5
	Maerl	1
	Reef	1
	Freshwater/rivers	2
	Sand dune	2
	Reedbed	1
	Seabirds	2
	Building biodiversity into coastal infrastructure	1
Geographical region	Northeast	9
	Northwest	2

Category	Sub-category	Projects N= 31
	Southwest	7
	Southern	13
	East	2
Project status	Proposal	11
	Ongoing	12

*Habitats/species totals more than n=31 reflecting that projects often had multiple species and habitat restoration focus.

Most of the projects identified through this survey had an element of active restoration rather than a focus on alleviating pressures. Participants of the survey were asked to indicate their willingness to participate in a follow up interview and this formed the basis of recruitment in Stage 2.

Stage 2: In-depth interviews with project stakeholders

Qualitative interviews were chosen for their ability to explore in detail the experiences and perspectives of participants who were active in delivering marine nature recovery on the ground. Semi-structured interviews were chosen as a means of guiding discussions around the defined topics of interest. A discussion guide was developed and refined in consultation with marine natural capital experts. The discussion guide (see Appendix 3) contained five question areas, within which questions aimed specifically at exploring:

1. The key drivers of marine restoration and recovery projects
2. The challenges faced in initiating and delivering projects
3. Level of stakeholder engagement
4. How projects conceptualise and use natural capital approaches
5. Beyond the direct restoration and recovery of habitats and species, what additional benefits have accrued (i.e. social)
6. How the success of projects is measured and evaluated

The interviews were designed to be conducted virtually and take no longer than an hour to complete. Participants were identified using convenience sampling and were comprised of respondents of the marine nature recovery mapping task who had indicated their willingness to be contacted for follow up interview. Participants were invited to participate in the interview via email which included an introduction to the project, and information relating to the participation procedures and informed consent (See Appendix 4). All interviews were conducted virtually over MS Teams and, with participant consent, interviews were recorded to aid with transcription and subsequent analysis.

The research provides detailed insights from the perspectives of those actively involved in marine nature recovery with n=19 representatives of 14 projects from the 31 identified in Stage 1. This is recognised to be a relatively small sample size which limits the ability to generalise findings and the extent to which it was possible to explore in detail the differences between projects with different restoration focuses. Nonetheless, it is representative of the projects identified through the mapping exercise and contributes valuable insights into the application of natural capital approaches as well as identifying the universal challenges faced by projects in the practical delivery of marine nature recovery and restoration.

Data analysis

Data from the interviews were analysed using qualitative analysis tool NVivo (QSR International, V1.6). The analysis was guided by the following process. First, all interviews were transcribed verbatim, in the second stage the transcripts were read by the research team as a means of increasing familiarisation with the data. The research aims, were identified *a priori* and used to frame the analysis and subsequent presentation of the research findings.

The questions were used as a means of interrogating the data and provided a framework for coding. After all transcripts had been coded it was possible to explore differences in response according to the key project categories i.e. organisation, restoration focus, geographical location, and project status. The findings are supported by illustrative quotes from the participants.

Results

Nineteen interviews were conducted by three individual interviewers (IF, SB and HK) between June and September 2022. Multiple stakeholders from the same projects were interviewed in some cases, with n=14 individual marine nature recovery projects represented. Projects were underpinned by different ideologies around how nature should be restored and recovered and were taking different approaches to achieve this.

- Three projects were focused on the removal of environmental pressures in their marine environments (passive recovery). This included pressures from both commercial or recreational sea users by seeking to remove or restrict levels of damaging activities.
- The remaining n=9 projects (active restoration) were delivering recovery through interventions on habitats or species and included the reintroduction of native species of oysters, kelp forests, seagrass meadows and restoration of saltmarsh ecosystems.
- Two final projects had developed management partnerships with the aim of improving wider marine ecosystem and were proposing to implement a combination

of measures to remove or reduce environmental pressures as well as deliver active restoration to habitats and species where decline was identified. Whilst partnerships had been formed, they were yet to undertake active restoration or recovery work with projects at the proposal stage and partnerships actively seeking funding to enable the proposed recovery and restoration activities to be delivered across the whole site.

Marine recovery and restoration projects included in the sample were primarily delivered by environmental non-government organisations (ENGO, n=10). Other actors interviewed, included public sector actors (i.e. local authorities, n=4) and government and its arms-length bodies (n=3), and projects that were initiated by stakeholder-led marine management partnerships (n=2). Within the sample there were no privately initiated marine recovery and restoration projects or projects that were blending finance from public and private sources, although one project had received private sector funding with delivery channelled via an ENGO.

Table 4 provides a summary of the individual characteristics of the participants interviewed, information relating to the project they represented, and provides an indicator assigned to each respondent to aid the interpretation of the results.

Table 4: Sample characteristics and participant identification (grouped by project)

	Project name	Organisation type	Project focus	Passive/ active restoration	Project aim	Region	Project status	Individual/ stakeholder in the same project	Participant ref.
1	Sussex Kelp Restoration	ENGO	Kelp	Passive – pressure removal	Marine rewilding project to restore approx. 200km^2 of Kelp Forest on the Sussex Coast. Underpinned by the Sussex Nearshore Trawling Byelaw (2021)	Southern	Ongoing	Participants 1-4 stakeholders in the same Kelp restoration project.	KelpS1
2	Sussex Kelp Restoration	Public sector	Kelp			Southern	Ongoing		KelpS2
3	Sussex Kelp Restoration	ENGO	Kelp			Southern	Ongoing		KelpS3
4	Sussex Kelp Restoration	ENGO	Kelp			Southern	Ongoing		KelpS4
5	Solent Oyster Restoration	ENGO	Oysters	Active restoration	Restoring native oyster populations via installing broodstock oyster cages under marina pontoons to kick start larvae production.	Southern	Ongoing	Participants 5 & 6 stakeholders in the same native oyster restoration project.	OystersS5
6	Solent Oyster Restoration	ENGO	Oysters			Southern	Ongoing		OysterS6

	Project name	Organisation type	Project focus	Passive/ active restoration	Project aim	Region	Project status	Individual/ stakeholder in the same project	Participant ref.
7	Solway Firth Partnership	Marine management partnership	Wider marine ecosystem	Passive – pressure removal and active restoration	Coordinated spatial management of the Solway Firth.	Northwest	proposal	Participants 7 & 8 part of the same marine ecology proposal.	WMENW8
8	Solway Firth Partnership	Public Sector (Council/ IFCA)	Wider marine ecosystem	Passive – pressure removal and active restoration	Coordinated spatial management of the Solway Firth.	Northwest	Proposal		WMENW9
9	Essex Native oyster restoration	ENGO	Oysters	Active restoration	2km^2 restoration including restoration of hard substrate for juvenile oysters to settle, re-introducing adult oysters and trialling traditional harrowing techniques	Southern	Ongoing	Individual	OysterS7

	Project name	Organisation type	Project focus	Passive/ active restoration	Project aim	Region	Project status	Individual/ stakeholder in the same project	Participant ref.
10	Tees River Trust: Native seagrass, oyster restoration	ENGO	Seagrass	Active restoration	Restoration of seagrass to historic levels and create a seagrass seedbank	Northeast	Ongoing	Individual	Seagrass NE10
11	Seagrass restoration Cornwall	ENGO	Seagrass	Active restoration	Trial of techniques to restore coverage of native seagrass at Fal-Ruan nature reserve with extension to new beds in the Tamar and Fal.	Southwest	Ongoing	individual	Seagrass SW11
12	Revitalising our estuaries	ENGO	Saltmarsh	Active restoration	Four saltmarsh restoration sites on the Tyne estuary.	Northeast	Ongoing	Individual	Seagrass NE12
13	Wareham Coastal Change -	ALB/ Government	Costal erosion protection	Active restoration	Compensatory habitat creation in response to large	Southwest	Ongoing	Individual	CEPSW13

	Project name	Organisation type	Project focus	Passive/ active restoration	Project aim	Region	Project status	Individual/ stakeholder in the same project	Participant ref.
	The Moors at Arne				scale costal re-alignment.				
14	Poole Harbour Seagrass Restoration	ALB/ Government	Seagrass	Active restoration	Early stages of seagrass habitat restoration in Poole Harbour to address regional bioremediation and water quality issues.	Southern	Ongoing	Individual	Seagrass S14
15	REMEDIES seagrass	ALB/ Government	Seagrass	Active restoration	EU Life funded project to protect and restore seagrass meadows in 5 Special Areas of Conservation (SAC's) across Southern England.	Southern	Ongoing	Individual	Seagrass S15

	Project name	Organisation type	Project focus	Passive/ active restoration	Project aim	Region	Project status	Individual/ stakeholder in the same project	Participant ref.
16	Cumbrian Creel Project	ENGO	Creel	Pressure removal	Project working with local fishermen to support the diversification away from destructive bottom-towed trawling to more sustainable fishing methods.	Northwest	Ongoing	Individual	CreelNW16
17	Holes Bay Saltmarsh regeneration project	Public sector (council/ IFCA)	Saltmarsh	Active restoration	Trialling the regeneration of mudflats and saltmarsh through the reuse of dredged material.	Southern	Ongoing	Individual	Saltmarsh SW17
18	Chichester Harbour Protection & Recovery of Nature	Public sector (council/ IFCA)	Wider marine ecosystem	Passive – pressure removal and active restoration	Marine partnership developed to address decline issues raised in	Southern	Proposal stage	Individual	WMES18

	Project name	Organisation type	Project focus	Passive/ active restoration	Project aim	Region	Project status	Individual/ stakeholder in the same project	Participant ref.
					Natural England's Chichester Harbour sites Condition review (2021)				
19	Studland Bay Marine Partnership	Marine management partnership	Seagrass	Pressure removal	Partnership development to implement eco-moorings in Studland Bay and replant seagrass.	Southern	Ongoing	Individual	Seagrass S19

Background, objectives, and ambition of individual projects

In line with best practice guidance for natural capital approaches (see Rice et al., 2021), all projects were working in partnership with a range of local, regional, and national stakeholders to deliver their marine nature recovery objectives. Collaborations were typically built on existing partnerships and projects often represented one element of a wider portfolio of marine restoration and recovery work. For example, both projects located in the Northeast represented aspects of a wider suite of estuary improvement activities that were being undertaken by the partnership. Restoration priorities were informed by reviewing the existing evidence base relating to the condition of habitats and species, the availability of funding to deliver projects that were identified as priorities for restoration or recovery or were obligated in response to coastal squeeze.

Recovery and restoration typically focused on a single habitat/species, although this often was strategically identified to contribute to the wider nature recovery and restoration aims of the area. The tight focus on a single habitat or species highlights the challenges associated with obtaining funding for larger landscape scale recovery and restoration projects. It also highlights that restoration techniques are currently limited to a small number of species. Although, given the scale of the nature recovery challenge this approach helped to focus efforts strategically and avoided activities becoming too *'overwhelming'* (KelpS4). It also helped to highlight how the methods adopted to restore that habitat/species were stimulating interest in the project from other stakeholders and motivating others to trial the approaches and/or develop new methods. This recognition that marine ecosystems are connected prompted ambitions to increase the scale of delivery through further collaboration:

> *'it's proven to be quite an engaging initiative. Then that is prompting a thought about thinking, OK, well, what about the oyster beds that used to be here and let's link this with restoring the salt marsh upstream, that will start reducing the sediment levels, which will help the kelp recover as well' (*KelpS4*)*

For partnerships that were focused on improving the wider marine ecosystem of a whole site, the emphasis was on scoping requirements and developing a suite of projects to address the challenges of the wider area. Most active projects were at the very early stages of development, piloting innovative approaches to nature recovery and yet to see if their restoration activities had been successful. All participants were realistic that the results of any interventions would likely take years to observe and there are considerable uncertainties around the likely success of activities.

Projects could be differentiated by their approach to recovery and restoration. Some (n=3) were adopting a passive approach by removing commercial and recreational pressures and monitoring the impact of this on habitats and species. Here the emphasis was on removing environmental pressure and allowing time to observe how the habitats or species recover naturally without further intervention. This approach required recreational

and commercial sea users to change behaviours. Different approaches to incentivise the necessary behavioural changes were observed across the sample. Some had sought to enforce behaviour change through legal means and the introduction of byelaws. For example, the Sussex Kelp recovery project was facilitated by the introduction of the Sussex Nearshore Trawling Byelaw (March 2021) which created an exclusion zone and protects the nearshore seabed from bottom-towed trawling gears.

> *'Nothing has happened and then eventually it fell on the right ears and IFCA mobilized to…they saw how they could create a byelaw that did so much more than manage fish and fisheries'* (KelpS3)

Others sought to provide alternative solutions for activities that were damaging the marine environment. For example, in Studland Bay, Dorset, through the introduction of eco-moorings to reduce damage to seagrass rather than enforcing mooring restrictions. Finally, the Cumbrian Creel project offered financial incentives to fishermen to enable them to trial alternative, less environmentally damaging and more economically sustainable fishing techniques. The remaining projects were taking or proposing steps to actively restore habitats and species through a range of innovative methods.

Drivers of marine recovery and restoration projects

Projects were all principally motivated by trialling novel approaches to improve or halt the decline of nature in marine environments, although the specific drivers for the activities being undertaken to do this varied across the sample. For some this was the opportunity to trial novel approaches that had been demonstrated to be successful in one location and apply these in an alternative context. For example, the Tees River Trust native seagrass and oyster restoration project provided an opportunity to trial approaches to seagrass restoration that had been developed and were being piloted in the South of England. Similarly, techniques for Native Oyster restoration were being trialled in multiple locations on the South Coast (Solent and Essex) by the same ENGO. This finding is consistent with those of a recent systematic review that sought to understand the priorities and motivations for marine and coastal restoration research. The review found that scientists globally engaged in marine coastal restoration were motivated by experimental reasons, to improve the restoration approach and/or answer ecological questions (Bayraktarov et al 2020). The results were considered to represent a lag in the field whereby the methods for restoration and recovery are in proof-of-concept phase and not yet at the seascape scale or aiming to maximize biodiversity or the provision of ecosystem services.

For the Cumbrian Creel project, motivation came from looking at ways in which commercial fishing could co-exist with conservation management measures to reduce the social and economic impacts of a conservation zone designation whilst protecting the environment. The project aimed to actively demonstrate the effectiveness and economic viability of Creel fishing as an alternative to prohibited, damaging commercial fishing practices and garner support amongst local fishing communities, enabling the continuation of commercial fishing in the area. The Essex native oyster restoration project was

delivering active restoration with the long-term aim of being able to re-establish, sustainably, oyster fisheries which had been lost because of a range of factors, including over exploitation that had depleted the stocks.

Most projects were motivated by the identification of an immediate conservation challenge or need around which key stakeholders could coalesce. Recovery and restoration were centred around four main objectives 1) to provide an alternative solution to regulatory prohibition (i.e. the introduction of no-take zones or no-anchor zones), 2) to improve marine habitats via the removal of pressures (i.e. recreational, commercial or social), and/or 3) to deliver active restoration aimed at improving habitats or re-introducing native species to increase abundance, and 4) creating compensatory habitats in response to coastal squeeze. Focusing on a specific challenge was also used by projects to create an emotive narrative around which stakeholder interest and support was built.

> *'The key hook that seemed to capture wider public interest and imagination was kelp, it became like the panda of the sea, so I think having that hook was very important. It was quite clear, simple story, even though we knew there was kind of wider complexity and wider things we were trying to do here.'* (KelpS2)

Specifically, where projects were looking to remove pressures, behavioural change and action was underpinned by the review and implementation of byelaws, which formalised partnership action and maximised the effectiveness of interventions by providing a legal basis upon which to enforce behaviour change (KelpS1-4, SeagrassS19).

Whilst projects had a narrow restoration focus, they also addressed wider environmental and social challenges, for example, improving water quality and/or providing solutions for climate mitigation. For example, in Dorset, recreational boating pressures were identified as the most immediate threat to the condition of seagrass meadows that provide essential habitat for Spiny seahorses. A marine partnership led by the National Trust was formed to develop solutions to promote sustainable recreation motivated by the need to improve seagrass habitats, store carbon, and as an alternative to the implementation of a no-anchor zone. Where partnerships were formed, projects were often part of wider ambitions to deliver marine nature recovery at a landscape scale and the project undertaken provided either a gateway to deliver wider project restoration and recovery objectives in the future or formed part of a wider suite of ongoing initiatives. Particularly for the Kelp and Seagrass restoration projects the activities undertaken represented the first steps in positioning themselves to engage with emerging financial markets for ecosystem services, specifically, blue carbon markets.

> *'So that's our focus at the moment, but actually the partnership where we're building here and formalizing is [a] pretty good for first base…we wanna go beyond that to looking at the whole of the MCZ with the idea of more inspiring vision, rather than dealing with the problem of anchoring and mooring actually come up with a really positive vision for nature recovery.'* (SeagrassS19)

The Wareham Coastal Change - The Moors at Arne project was driven directly by flood risk management and coastal protection policy and was obligated to deliver compensatory habitat for loss associated with the coastal realignment development. The availability of private investment provided the catalyst for another project to pilot approaches to seagrass restoration, although, engaging with private finance to deliver marine nature recovery was not typical of the sample (SeagrassSW11).

Natural Capital

Participants recognised that natural capital approaches had been popularised within nature recovery and had become a *'buzzword'* which despite its popularity was of critical importance to nature recovery, aligning with the *'idea that we've lost something that was a real value and we would like to get it back again.'* (SeagrassSW11). Most participants were familiar with the term natural capital and were using aspects of the approach to underpin their nature recovery work.

Participants understanding of natural capital was broadly consistent with the definition provided in the NE Natural Capital Evidence Handbook (Rice et al., 2021), with participants making references to key terms including, 'assets', 'ecosystem services', 'benefits' and 'value'. Emphasis was placed on the approach being used to recognise the *'value'* of the services provided by nature and the *'benefits'* that these services provide to people. Central to this was the recognition of the '*range of different natural functions'* (SeagrassS19) that habitats can provide and the multiple benefits that flow from these, all of which have a value that is desirable to a range of different beneficiaries. Taking a natural capital approach was highlighted to support the identification of assets and provide an understanding and quantification of the range of benefits that habitats provide in both pecuniary and non-pecuniary terms.

> *'People need to put a value on something, that's not always about monetary value. So it's making that connection with the whole kind of value of you know, providing that evidence that these habitats are valued, they have benefits to people and also nature. So, it's making that connection.'* (SeagrassS15)

Multiple advantages to marine restoration and recovery projects were recognised to be associated with the adoption of a natural capital approach to support their nature recovery aims. The approach was viewed as an effective mechanism to support marine spatial planning and a valuable tool that gives credibility and raises awareness and interest in their work.

> *'I think fundamentally we're all kind of conservationists, but we kind of we see this as an opportunity to find different ways of promoting the benefits of restoring habitats'* (KelpS1)

The primary benefit identified was to bring more financial investment into marine conservation work. Using a natural capital approach was believed to strengthen the

business case for marine nature restoration and recovery projects, increasing their ability to unlock funding, provide ongoing stability to their work and critically enable projects to deliver more. All of which was valued for increasing the impact of marine nature recovery and restoration projects.

> *'It seems rather vulgar to reduce wildlife to monetary terms, however… marine restoration does not come cheap and at the moment the only way that anybody in the UK is doing it… is through charities and philanthropic donations. It's not sustainable, it's very expensive. There's no way we can restore the whole of the marine habitat or even the parts of it that we truly need to just rely in on funders. We just can't do that. And so I see natural capital, so developing stack credit schemes, for example, as being a way to create a self-financing circle so that restoration can continue'*
> (OysterS6)

All projects were working collaboratively in partnership to deliver outcomes for nature. Beyond this, the extent to which participants articulated the application of natural capital principles and tools varied across the sample. All had coalesced around a central issue and had developed a shared vision for the project, which in some cases was part of a wider vision for the landscape (WMENW8-9, WMES18).

The REMEDIES seagrass restoration and the Sussex Kelp Restoration projects reported having commissioned full natural capital assessments early in the project development stages to help strategically design their marine nature recovery work. The Studland Bay Marine Partnership, Solent and Essex native oyster restoration, and the revitalising our estuaries projects had drawn on their wider project networks and engaged with collaborators that had conducted natural capital assessments for the wider area and used this to inform their work. The remaining projects, whilst not conducting full natural capital assessments, had conducted some form of opportunity mapping that included asset identification and mapping to support initial site identification. This typically included understanding the history of the area, including the extent and condition of habitats and species, as well as consideration of the drivers of change to support the prioritisation of marine nature recovery activities. This was used by projects to inform decisions on where it would be feasible to locate marine nature recovery activities taking into consideration areas that should be avoided as well as areas that would provide multiple benefits.

Where data allowed, projects sought to establish baseline levels of deterioration prior to interventions (WMES18, SeagrassNE10, OystersS5-6) from which it was possible to begin to demonstrate ecological improvements over time (SeagrassS15, SeagrassNE12). Projects had also identified the benefits that would flow from the activities undertaken and mapped the potential beneficiaries of these. Beneficiary mapping was used to prioritise stakeholder engagement activities and was central to securing financial investment to support marine nature recovery work (SeagrassNE12, SeagrassS14, KelpS2, CEPSW13, WMES18). This did not, however, include assessment of realised benefits from asset management or improvement.

> *'To me it seemed quite an intuitive approach, talking to those stakeholders. Obviously, they have different remits and different wants from a project, so it seemed quite intuitive to me to kind of, almost, look at it from their angle and kind of map the benefits to them.'* (SeagrassS14)

Projects recognised the advantages that quantifying the value of an asset could have in terms of increasing policy and investment interest in nature recovery. Some saw this as important preparatory step to enable engagement with emerging blue finance markets for carbon sequestration. However, across the sample projects had stopped short of attributing values to the benefits derived from the assets that were the result of marine nature recovery work. Some were unclear about the process or methods that could be used to do this. Others recognised the importance of improving the quality of the evidence base to illustrate changes in ecosystem services attributable to the interventions, to enable accurate valuations to be attributed.

> *'That's what I'm not clear on like what actually is needed to put a value to an ecosystem service'* (OystersS5)

> *'We haven't done any kind of quantification of that. It would be an interesting piece of work to do actually... because that's the sort of thing which would bring in more support.'* (SeagrassS19)

> *'A lot of times we don't have that evidence, that hard evidence we are getting it now, I think. But I think for a really solid natural capital approach for marine environment, I think we still need a lot more evidence.'* (SeagrassS15)

Whilst participants were generally positive about the benefits of adopting a natural capital approach to nature recovery, some reservations were voiced by participants. Ensuring that nature recovery remained the central focus was of critical importance, with concerns that otherwise the approach could end up '*as a green washing exercise'* (KelpS1). Participants also reflected on the complexity of natural capital methods that were still in their infancy and inaccessibility of the language associated with the approach which could limit wider uptake within conservation communities and comprehension of the approach by wider stakeholders and publics.

Stakeholder engagement

The delivery of marine nature recovery outcomes was reliant on a range of stakeholders and agencies that were typically hosted by a lead organisation acting in a facilitation capacity. Lead partners were typically those with adequate resource and influence to take a lead role and this varied from project to project. For example, in Dorset, The Seahorse Trust and Dorset Wildlife Trust had campaigned for Studland Bay to become a marine conservation zone (MCZ), which was designated in 2019. However, limited change in the primary environmental pressure was observed. As the landowner, the National Trust recognised the role they were able to play as a 'kingmaker' in bringing together polarized

stakeholders including recreational bodies and conservationists to lead a partnership aimed at reducing recreational pressure and restoring seagrass habitats in the area.

All projects recognised the importance of trying to engage with a wide spectrum of stakeholders, with a project's success built on generating partnerships with multiple stakeholders. Within partnerships each stakeholder was strategically engaged to bring value and play an important role in the success of the project through sharing of knowledge, expertise, and capacity. Most projects were building on existing established networks, where it was the case that a new partnership was formed stakeholder mapping exercises had been undertaken early in the project process (SeagrassS14, WMES18) to identify key stakeholders and prioritise their engagement activities.

> *'I think the fishing industry, southern IFCA, the University of Portsmouth. I'm going to say them all. The regulators and the harbour and the harbour authorities... Look, I think they've all got such a key role within the whole thing of the project. It wasn't kind of down to just the success or involvement of one particular partner' (OysterS5)*

The broad categories of stakeholders that were universally identified to be critical to include (in some combination, if not all) in marine nature restoration and recovery projects are summarised in Table 5.

Table 5: Key stakeholder groups

Stakeholder	Examples
Recreational bodies	Yachting association, RYA, paddle board associations, diving associations, Kayak clubs.
Commercial bodies	IFCAs, Harbour commissioners, fisheries
Conservation bodies	Government ALB's, Wildlife Trusts, ENGO's
Coastal Forums	Multi-sector partnerships that coordinate coastal management
Academia	Universities
Public	Local communities, Local groups that represent the interests of local communities, Schools
Conservation project networks	Mutual support and knowledge exchange networks

Engagement with bodies that represent recreational sea users were particularly important for projects that were focused on recreational pressure removal. Engagement via membership bodies was noted to be more effective than engaging with independent sea users. Engaging with this group was mutually beneficial. From a project perspective it was important to ensure responsible recreation within the restoration and recovery sites, whilst

improvements in the quality of environments in which recreation took place was valued by the membership body. Although, some were more cynical of the motives of membership bodies for engaging in nature recovery projects arguing that this was to protect the rights of members above achieving environmental objectives.

> *So the Royal Yachting Association is a real key partner. It's kind of a funny one because they're involved in the project and but you kind of wonder which side of the fence are on?... they want the evidence for their members or are they trying to protect the rights of their members for anchoring and mooring* (SeagrassS15)

Organisations regulating activities were key to partnerships and included IFCAs and Harbour Commissioners. IFCA's have the dual remit of achieving sustainable inshore fisheries as well as achieving conservation objectives. In their capacity as regulators, they were central to projects that were focused on pressure removal, using their statutory fishery management powers to implement byelaws that provided the legal basis upon which conservation objectives could be met and hence the mandate for behaviour change. They were also recognised for their essential knowledge and links to fishing communities, valued for the access this gave projects to engagement with this group, who were often identified to be the most challenging to engage given their conflicting commercial interests. Harbour Commissioners were identified as key gatekeepers from which permissions were sought to deliver interventions but who had important links to both commercial and recreational communities to garner support, along with statutory powers and the remit to manage the environment. Similarly, where coastal forums and partnerships were not already acting in a coordination capacity, projects sought to engage with them. Forums and partnerships were valued for their links and influence with a broad range of local stakeholders with a stake in marine environments and for their ability to generate wider interest and support for nature recovery.

Conservation organisations including governmental ALBs were appreciated for their knowledge and experience of delivering conservation in practice and in delivering educational outreach, but also their direct links to policy makers and, critically, access to funding. Natural England was respected for its statutory oversight of environmental designations which supported projects in the identification of appropriate sites for recovery and restoration, and in navigating the often-complex licencing.

Academic partners were engaged and brought methodological rigour to projects through providing expert scientific advice, and often took the lead in providing scientific support through supplementary research projects to monitor ecological and social outcomes.

Generating buy-in and support from the local communities within which projects were embedded was of critical importance. As with recreational stakeholders, publics were engaged through a range of gatekeeper organisations, from parish councils to local community groups and education providers. Participants identified the value of community and wider public engagement and recognised the *'big opportunity to embed this local narrative'* (KelpS3) and *'to get them [local communities] engaged and involved in the*

project' (SeagrassS15). This was fundamental to increasing the sense of stewardship for the marine environments, as well as opening additional funding streams for projects.

> *'I think the volunteering opportunities and working with community groups boosts interest, and I think that opens up opportunities for things like additional funding and it's quite tangible thing that can be done.' (OystersS5)*

Not all stakeholders will engage positively with marine restoration and recovery projects. Those that are disengaged were often reported to be those that perceived themselves to be most impacted by, or fearful of, the impact of a conservation decision. Across the sample projects, the negative impact of conflicts of interest between conservation groups and commercial actors (principally fisheries) could have on achieving nature recovery objectives were highlighted. Participants identified the importance of creating a clear narrative for the work, sharing information, and providing opportunities for these groups, particularly those that might perceive themselves to be negatively impacted by marine conservation work, to engage early in the process. Ensuring that the projects were able to demonstrate the tangible benefits directly to the impacted communities was critically important, although it was universally recognised that this can be a long and difficult process which takes considerable time, effort, and resource to be effective.

> *'The big challenge was getting the byelaw introduced and getting that over the line… So that consultation process was a multi-year longer term commitment going through legal processes and then approval processes. It was, you know, really long and difficult process that required a lot of campaigning and support I mean'* (KelpS1)

Projects were using a range of mechanisms to publicise the value of the work they were undertaking. For the Sussex Kelp Restoration project, support had been garnered from high profile broadcaster Sir David Attenborough which had significantly increased public interest in the cause. Projects had developed educational videos, were publicising their work via social media, newsletters, and websites. They were providing educational site visits for local schools and interest groups and looking at ways in which their work could be embedded as place-based examples within school curriculums. For the Wareham Coastal Change - The Moors at Arne coastal realignment project, several rounds of public consultation over the course of the seven-year period of project development had been conducted prior to the project receiving funding.

Volunteering and citizen science opportunities were considered mutually beneficial and an important mechanism through which to access additional funding. Volunteering opportunities were used to generate support, interest, and provide knowledge exchange opportunities through which the value of the work could be embedded and disseminated. For example, the native oyster restoration project (OystersS5-6) used volunteers to support compliance with biosecurity requirements (cleaning and bleaching oysters prior to release). This support helped to increase the scale and pace at which the project could be delivered. The opportunity to be

actively involved in the delivery restoration and monitoring work was intended to increase the sense of stewardship of the marine environment. For the individual this provided opportunities to increase understanding and appreciation of the value of marine environments as well as benefit from the associated wellbeing provided through being out in nature and being active in helping to restore it.

> *'In my experience here, a lot of the additional funding we've brought in has often been about engaging with community, community projects''* (WMENW8)

However, it was acknowledged that projects could not rely solely upon volunteers or citizen science initiatives, and it was necessary for this to compliment more robust scientific work. Whilst volunteering and citizen science was regarded positively, particularly for smaller projects, the extent to which they were able to draw on volunteers was often limited by the additional expense to projects and the demand on organisational capacity that their inclusion involved.

> *'They have to do the risk assessment and provide the PPE and all that and the supervision...you are not going to do that for a volunteer…there is a lot of cost to our organisation, and we have got to cover those costs.'* (SeagrassNE12)

Benefits and beneficiaries

Projects recognised that there were a range of benefits to people that could flow directly from marine nature recovery and restoration and improving marine ecosystems. This was considered a *'win-win'* (SaltmarshSW17) for people and for nature. Projects were using tools to identify what people value in a place and identify the range of benefits that stem from recovery and restoration projects. Some projects had conducted beneficiary assessments as part of initial natural capital assessments (SeagrassS15, KelpS1-4). Others had conducted beneficiary mapping exercises and discussed directly with project partners the value of the natural environment to those identified (SeagrassS14, WMES18) as well as supporting the identification of those who may not have access to the benefits it provides. The kelp restoration project (KelpS1-4) had extended this, conducting socio-economic surveys directly with fisheries to understand the value to them of improved kelp beds, with the intention of extending this to other beneficiaries' groups to further build their understanding of the value of the environments. Direct beneficiaries identified by the projects included local communities, fisheries, tourism industries, recreational sea users and the wider public.

Environmental, economic, and social benefits were identified as arising from marine recovery and restoration projects. These included improved water quality and clarity (OystersS5-6) which was identified to be critical to the success of restoration and recovery efforts as well as being of benefit to recreational users through improvements in bathing water quality, and visibility for, for example, diving. Seagrass meadows and Kelp forests

were recognised to provide coastal protection through ameliorating wave action, carbon sequestration and providing essential habitats for juvenile fish species and seahorses (KelpS1-4, SeagrassSW11, Seagrass S15, Seagrass S19, SeagrassNE1, SeagrassS14). Improving the abundance of species because of nature recovery interventions created economic opportunities for fisheries, which if sustainably managed allowed fishers to maintain or regain their livelihoods. This was also of cultural and heritage significance for the coastal communities in which they were embedded (CreelNW, OysterS7, OysterS5-6).

> ‘*the really good thing about this project is it helps connect people with the sea because there's a sense of cultural heritage there, like the fact that it used to be the largest native oyster fishery in Europe.’* (OystersS5)

Improving the marine environment was recognised to support local tourism though creating recreational opportunities, improve the local economy through job creation, and support the wellbeing of those who engage with the environment and those that live around it. Whilst these wider benefits were recognised, they were not being quantified.

> *‘If the USP of Studland becomes this fantastic marine environment …there’s economic benefits for that in terms of local… tourism is our economy here, get that right. And it's a really sustainable economy… People's well-being, people's health, all that sort of stuff, you can do that without the seagrass but actually if you can do it better with the whole marine environment being healthy and thriving’* (SeagrassS19)

Challenges

Participants consistently recognised that delivering nature recovery in marine environments was more challenging than in terrestrial environments. Several challenges to marine nature restoration and recovery projects emerged from the data (summarised in Figure 3). Funding availability, securing licences, and building stakeholder interest and support were the most prominent challenges mentioned by participants.

The impact of the challenges identified were dependent on the approach to recovery and restoration being undertaken. For example, issues surrounding licences were particularly problematic for projects that were attempting active restoration whilst issues surrounding conflicting stakeholder interests were more challenging for projects that required behavioural change from other sea users.

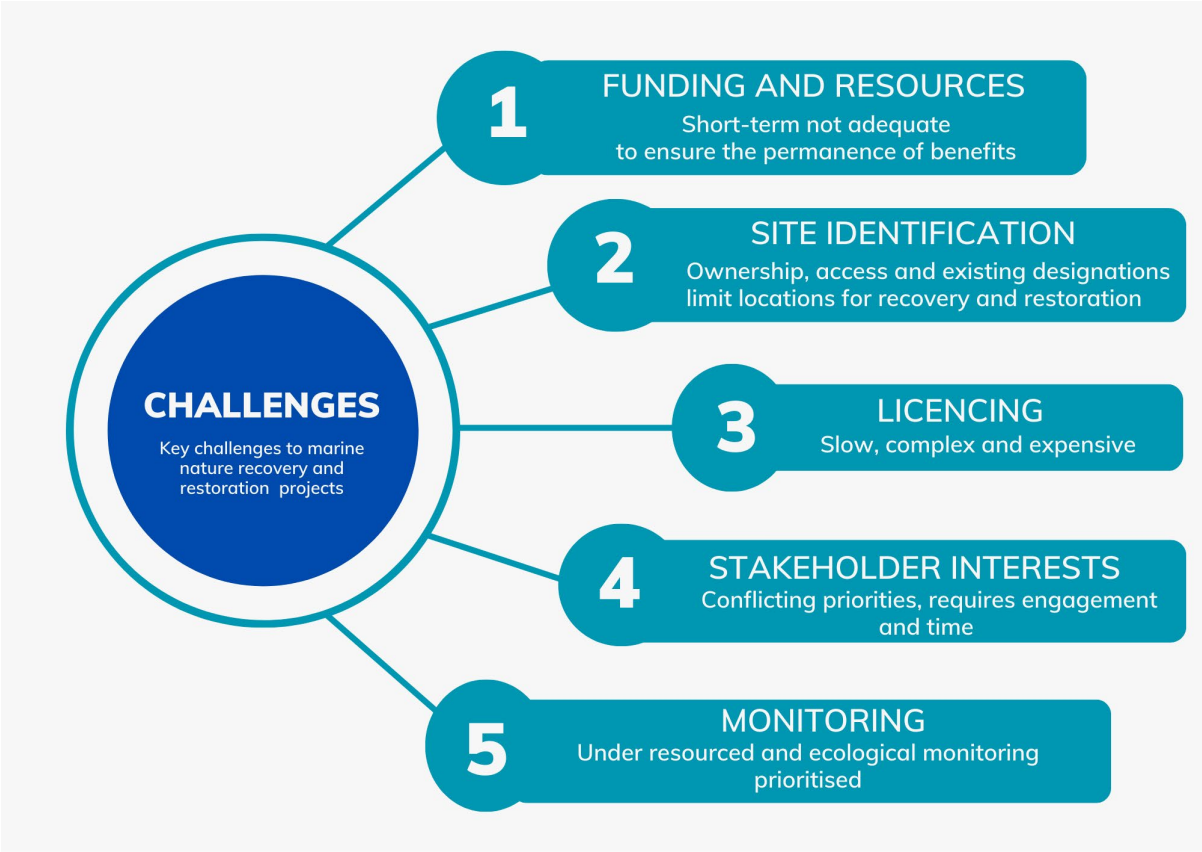

Figure 3: Key challenges to marine recovery and restoration projects

Funding

Participants recognised that '*raising the funds*' (KelpS1) to get projects off the ground to pilot approaches and then scale-up delivery was challenging. This was particularly difficult for community-led initiatives. Across the sample, projects reported submitting multiple applications before being successful in securing funding. Funding often only covered core activities and was not always available to support wider activities across the lifespan of a project, such as coordination and stakeholder facilitation which was of ongoing importance for all projects but particularly challenging for marine management partnerships. Funding was often short-term and was not adequate to ensure the continuation of activities after the life of the project or ensure the permanence of benefits that had been obtained.

> *'Dorset Coast Forum are the ones who are both completely independent but they're also putting in a lot of the legwork. They're the ones who set-up the website replying to public emails, all that stuff you need, it takes time. It takes staff resources to sort of make something like this work, and that's the other frustrating thing is, there's no core funding for the Dorset Coast Forum.'* (SeagrassS19)

In response most projects were staggering their approach to recovery and restoration. For many of the projects, funding did not extend to monitoring activities, which is an essential element of understanding success. This made it challenging for projects to learn from the process as well as demonstrate the wide range of benefits that could be derived and support quantitative valuations of the work being undertaken.

> *'We want to be able to monitor what's going on and to extract the full benefit of the project'* (KelpS1)

Whilst the funding landscape for marine recovery and restoration was active, accessing funding was recognised to be piecemeal and often grants were annual rather than providing multi-year support. To deliver comprehensive projects that included coordination and monitoring, projects assimilated funding from multiple sources or, where possible, they looked to collaborate with others or relied on in-kind contributions from other project partners to deliver aspects of the project according to their expertise. For one project based on the Solway Firth, which straddles the border between England and Scotland, coordinating funding from English and Scottish funding sources was challenging and made adopting a holistic approach to marine management in the area difficult.

Participants reported that funders looked for *'oven ready'* projects (SeagrassNE12) that were ready to be implemented and failed to take into consideration the extensive preparatory work, and the associated costs, that was often necessary to enable the core delivery of projects. Where only short-term funding was available or the deadline for applications were tight, project participants questioned if the effort required to coordinate and submit projects proposals was worth the reward. This sentiment was also expressed in relation to government and European funding, where the project processes and reporting burden on projects was in some instances considered to outweigh the financial costs of delivering the project.

Uncertainties and lack of consistency around funding directly impacted capacity and resourcing, which was particularly problematic for smaller scale projects. Challenges were cited around the ability to recruit and retain skilled and experienced staff and to compete with the private sector. This impacted on continuity and the speed at which projects could be delivered. The Solway Firth Partnership identified that uncertainties in funding had led to gaps in capacity which, until additional funding was secured, were challenging to fill.

Site identification and ownership

The ownership of the seabed, foreshore and land that bordered this presented a challenge for projects in terms of access. This created confusion regarding where responsibility for marine nature recovery project leadership fell and added additional complexity around where projects could be delivered.

Often multiple stakeholders had ownership rights to the land that borders the foreshore including The Crown Estate, local authorities, and independent landowners, which

required projects to get the buy-in from multiple landowners or stakeholders with responsibility for its management. In addition to identifying and engaging with landowners, to negate this challenge, some projects looked to start by delivering projects on public rather than private land (SeagrassSW11) whilst the Kelp recovery project in Sussex had taken legal steps to take on the leasehold of the seabed from the Crown Estate.

Sites that are in the greatest need of restoration and recovery also tended to be those that had existing environment designations and were busiest in terms of use. For projects that were seeking to deliver active restoration, navigating the environmental designations and other existing licences in a site prior to starting work was challenging and limited where projects could be located to avoid conflict with other protected habitats or species. This was noted to be particularly problematic for projects based in the Solent (OysterS6-5, SeagrassS15) where there were numerous environmental designations aimed at halting further environmental decline in the area occurring in parallel to significant conservation, recovery, and restoration activities to improve water quality and habitats. The conditions of licences granted to marine nature recovery projects often reflected this, which despite the identification of multiple candidate locations often severely constrained the number of sites that could be used.

> *'The designations are a challenge because it enormously limits the spaces within the Solent, which is an incredibly busy place at the best of times where we can even consider building a reef or doing any restoration work…but it can be quite restrictive.' (*OysterS6*)*

> *'Although we've got a license to lay culture material across the three sites in the Solent, additional conditions were added on to that license which completely restricted our area to do the work...then actually when we come down to reading the conditions, we can't, we can't do it in most areas.'* (OystersS5)

Licencing

Obtaining the appropriate licences and approvals to deliver marine restoration was a necessity for all projects undertaking active restoration activities and was identified as a key barrier. Across the sample this was recognised to be an overly complex process that directly impacted the speed and scale of projects and the locations that were suitable for restoration and recovery. The Tees River Trust native seagrass and oyster restoration project highlighted how this restricted which donor sites could be used. Participants highlighted that there is no established licencing process for marine recovery and restoration projects, resulting in project being scrutinised in the same way as large-scale infrastructure projects or treated as potentially damaging activities. Participants recognised the need for the licencing process to be streamlined for governmental nature recovery targets set out in the 25YEP to be reached.

‘Marine restoration work is in its infancy. You know, we are pioneering this, this stuff, we really are, but they don't have a licensing band for habitat restoration.’ (OysterS6)

‘*licensing process is so difficult and I think there's just no process really for restoration projects…and the challenges of getting through those. So our licensing process we were put into the same category as Band 3 think it was, it was like dredging and damaging marine activities*.’ (OystersS5)

Participants criticised the speed at which the licencing process was conducted, which was described as excessively slow. This negatively impacted projects where funding was time critical. Participants argued that they struggled to identify who was responsible for handling licencing applications and who to contact within the licencing authority (MMO) for assistance in navigating the process. For smaller projects the associated cost of licences were also prohibitive, with costs of licences often representing a significant proportion of overall nature recovery and restoration funding and budgets.

‘In terms of other stumbling blocks and other issues and one of the big ones, we have to say it's the marine licensing, it's the MMO and the fact that you're doing a very small scale project that is delivering, fungible ecological benefit, and we still have to go through the same hoops, the same process as a port authority who want to put in a big dock or something like that.’ (SeagrassNE12)

*‘I think the cost associated with those licenses and the time it takes doesn't allow restoration projects to scale up.’ (*OystersS5*)*

Stakeholder interests

Marine environments are multi-functional landscapes that provide a variety of functions for different users. Balancing the needs of all users represents a challenge and conflicting priorities for the marine environment was identified as an additional barrier to marine recovery and restoration projects.

‘All the interests are concentrated into the same tiny strip of water, just off the shore, and I think that recognizing that everything around the country, the challenge is how you balance conservation or nature recovery with economic and recreational use, you've got the same sorts of conflicts everywhere’ (SeagrassS19)

Where projects were perceived to represent a threat to commercial activity in an area, garnering support from affected communities (typically fishing communities or recreational users) represented a particular challenge that required extensive campaigning, stakeholder engagement and consultation processes. For the kelp and seagrass restoration projects that had introduced byelaws to stop activities that were recognised to be damaging to habitats, engaging directly with partners (i.e. IFCA’s, harbour authorities or

membership bodies) to act as mediators and engage with these communities was an adopted solution, in addition to extensive public engagement and consultation processes. For active restoration projects, identifying recovery and restoration sites that were already in exclusionary zones was an alternative.

> *'it was really, really important in getting the byelaw sorted and steering through what was an incredibly difficult consultation process, it involved hostility from local fishermen. You know, it's their livelihoods, and that's understandable.'* (KelpS1)

Contextual challenges

Projects identified unforeseen challenges, specifically Brexit followed by Covid-19 as impacting the practical delivery of marine nature recovery projects. Brexit was identified to have reduced the availability of funding as projects were no longer eligible to be the lead applicant for European funding. Covid had halted projects and subsequently limited the extent to which they were able to engage with stakeholders and involve members of the public in project delivery and dissemination activities. For example, Covid presented a challenge to the establishment of the Solway Firth Partnership limiting the ability of projects to bring stakeholders together. The Remedies project experienced delays in receiving confirmed EU funding because of Brexit and subsequent delays in volunteer led active restoration activities because of Covid.

Demonstrating benefits

Demonstrating tangible benefits from marine recovery and restoration projects was critical to gaining support for and generating momentum around projects to ensure their continuation. The lack of visibility of marine environments and their condition was recognised to influence public and investor perceptions and the value that is placed on the protection of marine habitats. The common view voiced by participants was that there was a long way to go before the public valued recovery and restoration of marine environments in the same way as terrestrial environments. Projects therefore needed to create strong and engaging narratives around the importance of their work. This was achieved in part though engagement and communication activities but principally underpinned by comprehensive monitoring to demonstrate change on the ground in addition to wider associated benefits to society. Projects had adopted various mechanism to demonstrate the benefits for people and for nature. This included making the project accessible and engaging via educational and volunteering opportunities to demonstrate the benefits and value of marine nature recovery and restoration work. Specifically for projects that were focused on pressure removal, demonstrating the benefits to affected communities was critical to ensuring buy-in from affected groups. For example, the introduction of byelaws is often contested by affected groups. Evidence of the effectiveness of byelaws in achieving behavioural change and subsequent nature recovery provided critical justification to

reduce challenge to their introduction. Mismatch in the timing of costs and benefits was a further issue. There was potential for the negative impacts of behavioural change interventions to be immediately felt, while benefits could take longer to materialise. Projects needed to be able to implement monitoring over sufficiently long time periods to be able to detect directional change.

> *'So, it's the commercial fishermen are really going to make or break this because the byelaw can be challenged, and if it's, you know if the kelp beds don't recover within a start, really recovering in five years' time, there will be, you know, justification for the fishermen to want the byelaw to be reviewed and retracted.' (*KelpS4*)*

No project had yet identified any quantifiable benefits from the nature recovery work undertaken. Whilst there was some evidence of the success of activities and anecdotally reported evidence of habitat change, all projects lacked scientific evidence and data to document whether improvements to the marine environment had occurred as a direct result of the interventions being delivered.

> *'There's been a lot of anecdotal. We've seen more things than we've seen before or there's a lot of smooth hound sharks or something this year that we haven't seen a lot of before. So, there's been some kind of positive anecdotal things about. We've seen things that we haven't seen for a long time'* (KelpS1).

Projects needed opportunities to trial approaches even if the evidence base of direct benefits are lacking. For example, the carbon sequestration potential of key marine habitats (i.e. kelp, seagrass and saltmarsh) is uncertain but projects need to be afforded the opportunity to trial approaches to help build the evidence base and facilitate emerging carbon markets.

Several factors were identified as barriers to projects being able to demonstrate specific restoration and recovery benefits. First, given the infancy of active marine restoration and recovery, most projects lacked comprehensive baseline data from which subsequent change could be measured. Further, most required more robust data to explain the causes of species and habitats decline prior to the attempted intervention. Projects were therefore required to develop new, often bespoke and comprehensive monitoring approaches which included baseline assessments, which required funding alongside the delivery of conservation activities.

Second, the requirement for long-term monitoring did not align with funding provisions, which was typically only short-term, provided to support capital costs, and was not adequate to support continuous monitoring requirements. Third, the small-scale nature of projects made it challenging to say with any certainty that scaling up delivery would be successful in delivering marine nature recovery or restoration. Finally, projects recognised that there were a range of externalities that were beyond the control of the project that may contribute to species and habitat decline and can influence the effectiveness of

marine nature recovery or restoration efforts. Such factors were identified to include water quality, pollution, weather events, climate change and invasive or predatory species. The impact of these factors needed to be better understood if benefits from the projects were to be realised.

Evaluation and monitoring

All projects were considering how environmental change would best be monitored. This was: (i) to be answerable to external audiences about their achievements; and (ii) as an important basis for learning what works, to refine methods, and a way of managing risk and uncertainty. Monitoring and evaluation plans were part of the project development process and often a prerequisite for funding. For the Seagrass restoration project in Cornwall, demonstrating change was critical in demonstrating return on investment to the private funders of the project.

Projects were taking a staged approach to monitoring and evaluating change in response to the challenges associated with limited resources and capacity. Monitoring was basic and initially focused on demonstrating that the intended ecological changes were occurring. More sophisticated and wide-ranging benefit monitoring was added as, and when, funding was acquired. The Sussex Kelp Restoration project conducted a host of surveys including, benthic cameras, baited remote underwater video (BRUV), eDNA sampling and diver surveys, with plans to repeat these in the same locations over successive years to detect longitudinal changes. Compliance with the byelaw restrictions was also part of the monitoring. The Studland Bay seagrass restoration and recovery project, has ambition to extend monitoring over time to include metrics of social impacts and change in public perceptions and community engagement. Although outreach activities were being undertaken, the monitoring and measurements of these were yet to be defined.

Basic monitoring was used as a basis for the development of more formal evaluations of success. For example, in addition to the ongoing monitoring outlined above, the Sussex Kelp restoration project was seeking funding to evaluate change using the Society for Ecological Restoration International Principles and Standards for the Practice of Ecological Restoration. Globally recognised standards for monitoring and evaluating ecosystem recovery were a mechanism to evaluate progress formally against benchmarks and allow comparison with international projects. Some were using species specific indicators (i.e. European Native Oyster Restoration Monitoring Handbook) to enable the collection of comparable European data (OysterS5-6, OysterS7). Others were looking to identify specific place-based indicators of change (WMES18). Projects were typically looking to detect improvements in species and habitats to demonstrate the effectiveness of approaches, although none were aiming to quantify change over a defined period (i.e. increase by X amount over Y time period).

The extensiveness of monitoring and evaluation plans were influenced by cost and capacity to conduct monitoring and analyse data. Projects prioritised what monitoring

needed to occur according to what was required to demonstrate outcomes and/or comply with the conditions of licences or byelaws. Where byelaws had been introduced, monitoring provided the evidence of effectiveness, a critical justification for their introduction and important basis to counter any future challenges. Projects drew on the expertise of project partners to support *'comprehensive monitoring program[s] by free collaboration',* (KelpS2). Academic partnerships were particularly valued for the support they could provide to monitoring and evaluation, as were citizen science projects, although these were noted to be slower to deliver data and participants raised concerns about the validity and reliability of the data collected. Where projects included citizen science, participants asserted the importance of ensuring that this was not the only form of monitoring. Instead, citizen science data gathering was conducted in parallel with, and to compliment, more robust scientific monitoring, and evaluation.

Given the exploratory nature of recovery and restoration options, projects in the sample were principally focused on demonstrating ecological outcomes and benefits resulting from restoration and recovery work. Whilst the importance of demonstrating social and economic benefits from marine nature recovery and restoration were widely acknowledged, budgetary limitations typically resulted in the prioritisation of ecological monitoring. This is consistent with several authors who recognise the importance of including indicators of social outcomes when evaluating the success of recovery and restoration projects (see for example Miller and Hobbs, 2007, Le et al. 2012, Shackelford et al. 2013, and Wortley, et al. (2013). Ruiz-Jaen and Mitchell Aide (2005) argue that marine recovery and restoration research should make greater efforts to incorporate social, economic, and cultural factors in assessing the effectiveness of ecological interventions and advocate this as a priority for future marine restoration practice.

> *'…developing pieces of work about kind of measuring attitudinal changes and stuff, but we know that we can't really do a half-hearted job, it really needs a full piece on that. The academics have been very forward about coming to us with the proposals for the kind of the ecological questions that we need to answer, but there's less momentum. Not no momentum, but less momentum around the social economic stuff.*' (KelpS3)

Where projects had included social evaluations, they were principally focused on capturing levels of engagement with the projects and project-related events as a measure of awareness and impact. This is consistent with the findings of a literature review to determine trends in evaluations of restoration projects. This found that limited papers looked at the socioeconomic attributes of restoration post-implementation and where this was included the focus was on the extent of community engagement (Wortley, et al. 2013).

All projects voiced ambitions to integrate more sophisticated social and economic monitoring and evaluation into their projects and recognised that this was critical to implementing natural capital valuations. Some projects including the saltmarsh restoration project in the Northeast of England reported to be exploring additional funding

opportunities to support this. This is consistent with the arguments presented by Wortley, et al. (2013), who argue for the need to look beyond these measures to fully capture the socioeconomic outcomes that restoration delivers.

Discussion

This research demonstrates the vibrancy of marine conservation activity occurring within English waters, and explored through in-depth interviews, experiences and challenges associated with marine nature recovery and restoration delivery from the perspective of actors involved in project design and delivery.

Most participants interviewed had been successful in navigating the funding and licencing processes and were working in partnership with a range of stakeholders to actively trial novel approaches to marine restoration and recovery. All were adopting aspects of the natural capital approach to support their work. Participants were familiar with and understood the premise of the natural capital approach. This was viewed positively and considered to add value to marine conservation work as an important mechanism through which to access future funding and increase the stability of nature recovery and restoration work.

All projects' conservation activities were centred on the first three elements of Natural England's natural capital logic chain (i.e. assets, ecosystem services and benefits; Appendix 5). Projects had not attempted to attribute values to the assets they sought to recover or restore, or to the benefits arising. Limited by the lack of data and scientific evidence to demonstrate that benefits were occurring as well as the time it takes to observe change. Uncertainty around the methods for attributing values further prevented projects from making these assessments.

Demonstrating benefits associated with the interventions that are being delivered is of critical importance, as it enables projects to engage fully with the breadth of impact areas and all aspects of the natural capital approach. It further supports the development of a better-informed business case for conservation activity, which is necessary to attract further investment and allow projects to scale up. Funding must go beyond supporting core activities, recognise the whole life cycle of projects including preparatory work, and specifically enable projects to undertake more comprehensive monitoring and evaluation.

The cost of such monitoring should not be underestimated and may exceed that for the initial restoration intervention (Tan et al., 2020). The recent monitoring handbook for native oyster restoration (zu Ermgassen et al., 2021) recommends that monitoring encompasses short- (1-2 years), medium- (4-6 years) and long-term (10+years) change and includes both the site of the intervention and control areas. Additional monitoring after severe weather events is also recommended (Preston et al., 2020); the ability to withstand, and recovery from, storm events is a strong indicator of the success of a restoration project (Jeffs and Zu Ermgassen., 2019).

The habitat and condition indicators typically used to monitor marine areas may not be appropriate in measuring the success of restoration projects. For example, the retention of native oysters will vary according to site conditions, and there is insufficient evidence to yet understand how factors such as area and density relate to the ability of a restored bed to be self-sustaining (Preston et al., 2020). Similarly, seagrass abundance was highly variable across a series of long-terms projects (Rezek et al 2019). Attempting to pre-define success will therefore be highly challenging.

Instead, during what continues to be the early stages of active restoration, monitoring should focus on specific parameters that will help to build the necessary evidence base on what constitutes healthy, sustainable habitats (i.e. successful projects) in particular circumstances. For example, indicators proposed for shellfish restoration projects include spawning success, mortality rates in nurseries, settling and recruitment rates, on-site survival rates, area and height of reefs, and biodiversity of associated species (Preston et al., 2020; Jeffs and Zu Ermgassen, 2019). A similar approach is proposed for kelp and seagrass, with monitoring focussing on survival, growth, and coverage (Morris et al., 2020; Matheson et al. 2017).

Standard approaches to monitoring are needed, to ensure rigorous measures are used and to increase the quality, usefulness, and comparability of results (Eger et al., 2020; Hermans et al., 2020). A minimum set of variables to monitor both the implementation process and the habitat response has been developed for oyster restoration in the United States, to ensure a consistent approach to building the evidence base (DeAngelis and Geselbracht, 2019). The UK now has a similar framework in the European Native Oyster Habitat Restoration Monitoring Handbook (zu Ermgassen et al., 2021), which interviewees have highlighted as a reference they intend to use for monitoring their projects. Handbooks for seagrass and saltmarsh restoration also exist (Gamble et al., 2021, and Hudson et al., 2021, respectively), which include discussion of monitoring options. This is better developed in the seagrass handbook, which provides more detail on how to undertake monitoring components, as well as identifying both recommended and optional monitoring actions. The Society for Ecological Restoration's International Principles and Standards for the Practice of Ecological Restoration (Gann et al., 2019), was also highlighted by interviewees involved in kelp restoration, but this is a generic set of principles rather than guidance for monitoring a specific habitat. This highlights a need for developing a handbook for kelp restoration projects.

It is also important that an obligation to publish, and make easily accessible, the full results of monitoring and evaluation is a reporting requirement for funded projects. Otherwise, negative outcomes may go unpublished, even though these are an essential part of the evidence base, and useful data may be hard to obtain, reducing collective learning opportunities (Boudouresque et al., 2021; Rezek et al., 2019).

Effective monitoring (and the funding for it) includes increasing the value placed on social and economic research within marine nature conservation projects. Incorporating comprehensive social and economic impact monitoring would demonstrate the more

holistic value of marine recovery and restoration work, help to improve stakeholder engagement and public perceptions of the value of marine environments and help ensure more equitable distribution of benefits obtained from projects. Social and economic indicators that could be monitored are already recommended in some restoration handbooks, and include jobs, volunteering opportunities, and social capital (Preston et al., 2020).

Advocates of the natural capital approach should continue to provide easily accessible best practice recommendations and resources to support uptake within marine conservation communities. This includes supporting communities of practice, providing bitesize information and including more case study examples of the application of natural capital approaches within marine contexts.

Part 3: Funding passive recovery projects

Introduction

As Part 2 demonstrates, there are multiple examples of delivery partners such as Non-Governmental Organisations and academic institutions receiving both grants from public sector bodies and direct corporate sponsorship to restore habitats. However, technical challenges make outcomes uncertain and limit the benefits that will be delivered by active intervention projects.

Most practical interventions for habitat restoration in subtidal environments are in early feasibility and pilot phases. The outcomes are therefore very difficult to predict (Hermans et al., 2020; Groen, 2019) and the efforts may ultimately prove unsuccessful (e.g. Preston et al., 2020; Floor et al., 2018; Rezek et al. 2019). Upscaling from pilot to seascape-scale is a significant challenge (Layton et al., 2020), particularly as the lack of core restoration knowledge, limits the opportunity for project prioritisation based on either cost effectiveness or likelihood of success (Morris et al., 2020; Hermans et al., 2020).

Measures for mobile species, such as the provision of nesting platforms for seabirds, are only likely to be successful where they address the specific limiting factor in survival. In the case of kittiwakes, for example, breeding success and population declines are related to prey availability (Carroll et al., 2017), so additional nesting platforms are of limited use. Similarly, while artificial reefs may increase overall fish abundance in degraded estuaries (Folpp et al., 2020), their deployment in areas where habitat is not a limiting factor may negatively influence fish populations (Komyakova and Swearer, 2019). Furthermore, the deployment of artificial reefs to support populations of fish and shellfish remains controversial, due to the resulting change to the existing habitat type and the loss of its associated biodiversity (Boudouresque et al., 2021).

Perhaps most significantly, there are no known mechanisms for the active restoration of most marine species and habitats. Saltmarsh, seagrass, and native oyster habitats are three of the most promising candidates for restoration (as the projects identified in Part 1 attest), but recent mapping showed that the total area of potential active restoration sites for these habitats amounted to only 1.3% of England's marine and coastal space (ABPMer, 2021). Significant improvements in the health of the wider seas will require passive recovery options that focus on the removal of pressures.

This is recognised by the delivery partnerships identified in Part 2 who, as well as engaging in active restoration, are seeking to supplement the centralised process of designating protected sites with locally led recovery initiatives. Projects included coordinated support for byelaw development, funding fishermen to trial alternative gear types, and the deployment of eco-moorings to reduce seabed damage from recreational boats.

However, only a limited number of active partnership-driven recovery projects could be identified, and so the purpose of this section is to compile additional examples on how marine recovery funds have been used to reduce existing pressures, and hence how they might be used to secure further partnership-led interventions for wider-scale nature recovery. Recent assessments have shown that "*the predominant human pressures preventing GES being achieved include commercial fishing and the introduction of marine litter*" (Defra, 2019c, p8), which will therefore be the focus of this additional review.

Commercial fisheries

It has been reported that "*the consensus amongst experts was that the spatial extent of damage to the seabed from fishing gear was greater than any damage caused by other activities*" (Defra, 2019c, p60). Reducing pressures from bottom-towed gear has the potential to provide significant passive habitat recovery, as is already recognised in management measures within marine protected areas. Within the wider seas, one option for a payments-based approach for reducing pressure would be the purchase of quota to reduce fishing effort (Natural Capital Committee, 2019). This type of approach has been applied in practice in, for example, California, where, in conjunction with the creation of a federally mandated closed area for trawling, an environmental non-governmental organisation used private funds to purchase trawling permits and vessels (Gleason et al., 2013). However, modelling studies suggest that the impact on seabed habitats of quota buy-back schemes would be limited unless quota reduction is very severe (Batsleer et al., 2018). Other mechanisms such as 'habitat credits' can be used to incentivise fishers to limit their wider environmental impacts (Kraak et al., 2012) and may be more successful at maintaining revenue while reducing pressures (Batsleer et al., 2018). However, such initiatives are too complex to be addressed simply through the availability of additional project funding and would need to be led as part of wider fisheries management.

More generally, any passive recovery options included within new measures such as marine net gain would need to take account of, and integrate with, wider fisheries

objectives (including the Fisheries Act and Fisheries Management Plans) and existing site-specific obligations associated with developments (both mandatory and voluntary), such as the Fisheries Co-existence and Liaison Plans, and community funds seeking to address local socio-economic issues (which have included providing support to fishing groups).

However, there are certain approaches to reducing fishing pressure that can be supported through project-level funding. In England, public sector funding for projects seeking to reduce pressures from fishing activity has historically been available through the European Maritime and Fisheries Fund (EMFF). This included support for projects developing technical innovations to reduce the impacts of gear on both mobile species and habitats, active restoration, monitoring and litter collection, as well as raising awareness and developing wider conservation and management plans. The EMFF was replaced by the Fisheries and Seafood Scheme (FaSS)[4], which has allocated a total of £9.4million across 532 individual projects since May 2021 (MMO, 2022). Of this 12% was awarded to projects within environmental themes (Table 7).

Table 6. The number and value of projects funded under environmental protection themes within the Fisheries and Seafood Scheme between May 2021 and August 2022 (data obtained from MMO, 2022)

Funding theme	Number of projects	Value of projects
Limiting the environmental impact of fishing	60	987,111.04
Collection of lost fishing gear and marine litter	3	84,617.21
Protection and restoration of marine biodiversity	1	27,791.25

The published information on successful applications is limited, but the single project in the 'Protection and restoration of marine biodiversity' theme was connected to the partnership working to restore kelp forests off the Sussex coast. Project titles did not always provide a clear indication of the purpose of the project. However, the available information suggests that 90% of the projects in the 'Limiting the environmental impact of fishing' theme were for new or replacement gear, with 62% seeking to improve the selectivity and sustainability of static gears or otherwise increase mesh sizes to reduce bycatch. There was no clear indication whether any of the remaining projects concerned changing from gears such as dredges/trawls to other gear types with lower seabed impacts, although it was not possible to discern the exact nature of 16 of the funded projects. The distribution of funding by the Scotland-focussed Fishing Innovation and Sustainability has a similar pattern. Of 30 recent

[4] https://www.gov.uk/guidance/fisheries-and-seafood-scheme

projects[5], only one concerned piloting alternative gears (testing the use of baited seabed traps for cod).

One example of support from the EMFF being used to trial alternative capture approaches with lower seabed impacts concerned exploring the use of creels as opposed to trawls for *Nephrops* (Norway lobster) in inshore areas off the Cumbrian coast. The project included both a pilot (Tabrizi, 2019) and an ongoing, follow-on phase (discussed during the interviews for this report, with respondent CreelNW16). The project remains small-scale (two fishermen) and is primarily seeking to understand factors such as catch success and economic viability. The project has highlighted a key issue with fishermen changing gear types, which is that "*you need a different boat to be able to pull in creels compared to trawling. So we had to then work with a fisherman who was already potting"* (CreelNW16). Therefore, learning on whether those currently trawling would change their practices will be limited. Where fishermen have been asked about their willingness to change gear types to access new opportunities if they lose existing fishing grounds, most were reluctant, citing reasons including the need to obtain different licences and existing market dynamics (Hooper et al., 2015). The Cumbrian creel project also recognises that a shift to different fisheries may also require associated awareness projects to support the development of the necessary local markets. This is particularly true where, as in the Cumbrian creel project, the expectation is that switching to alternative fishing approaches will allow the catch to command higher prices. It is important that these economic dimensions are explored in project promoting alternative gear types.

Litter

The removal of abandoned, lost and derelict fishing gear, thus reducing the risk of entanglement and mortality, has also been suggested as a potential passive recovery measure for marine species (Hardesty et al., 2015). This is also recognised within FaSS, which allocated £107,000 across 5 projects concerning removing marine litter (Table 6; two projects allocated to the 'Limiting the environmental impact of fishing' theme also related to reducing the risk of ghost fishing). Nearly 80% of this was awarded to support extending the efforts of the international Fishing for Litter[6] initiative. This is in line with the strategic direction taken by OSPAR, which includes guidelines for fisher sustainability education programmes (OSPAR Commission, 2019) and a specific action in the second regional action plan (OSPAR Commission, 2022) to strengthen these. The scale of litter collected via this scheme varies with time and by location, with vessels in the Netherlands collecting 4189 tonnes between January 2011 and December 2021, but Scotland only 1844 tonnes since 2004 (Mannaart and Bentley, 2022). The scheme is rated very

[5] https://fiscot.org/fis-projects/
[6] https://fishingforlitter.org/

positively by stakeholders, and participation has also influenced the wider waste management behaviour of fishers both at sea and in other contexts (Wyles et al., 2019).

Anchoring

The seabed is also impacted by anchoring, including from recreational vessels. The purchase of Advanced Mooring Systems (AMS) is a further option for using funds to support passive restoration. AMS remove the chains used in traditional moorings and reduce wider interaction between the mooring and the seabed, reducing scour impacts. AMS are increasing in popularity, and a recent review identified eight projects using AMS for boat moorings, and a further four for marker moorings, in southern England and Wales (Maclennan, 2022). AMS remains a small-scale solution but has particular significance in supporting the recovery of seagrass beds (Parry-Wilson et al., 2019).

Conclusions

These examples illustrate that project funding can be used for commercial fishing interventions that promote passive recovery, but also that such funding is already available, and has been for some time. There has been only limited uptake of funding available through FaSS for projects that seek to go beyond reducing bycatch. Projects to support habitat recovery do not, therefore, appear to be prioritised by applicants to FaSS (and/or those allocating the funds). Potentially, then, there is a role for a new fund that takes a more proactive approach in defining the types of projects that will be supported to promote wider passive recovery. However, as with active restoration schemes, the measures of success for such projects would need to reflect that they would, at least initially, be pilot studies testing parameters such as practical and economic feasibility, and ultimately the tested ideas may not be viable.

FaSS projects promoting habitat recovery appear to be led by partners outside the fishing industry, reinforcing the assumption that they are not prioritised by the sector more widely, and so, even if successful, may not be scalable. Additional analysis is needed to understand more fully whether interest in participating in such projects could be increased, but options could include connecting with new projects under the UK Seafood Fund Skills and Training Scheme (where such training included environmental sustainability), and with industry-led initiatives such as Fishing into the Future[7]. Any barriers created by the current licensing system should also be reviewed.

Using payments to support passive recovery through litter removal and Advanced Mooring Systems is also a well-tested approach. The impacts are easily quantifiable in terms of amount of litter removed and area of scour damage reduced, with additional positive

[7] https://www.fishingintothefuture.co.uk/

outcomes including in terms of wider environmental awareness and attitudes. In the case of litter removal, the existing connection between FaSS and the Fishing for Litter scheme potentially limits the need for any new funding initiative to focus in this area.

Part 4: Using Natural Capital to Measure losses and gains

The earlier sections of this report highlight the challenges in defining generic metrics to measure success in both active restoration and passive recovery projects. Both remain in pilot or early feasibility phases, for which monitoring and evaluation, and hence the opportunity for shared learning, has been limited. Success cannot, at present, be measured using parameters such as area or condition, and the existing evidence base is insufficient to allow the likelihood and scale of success to be predicted in advance. Outcomes are, however, measurable, but individual projects require bespoke monitoring (using standardised approaches), that contributes to building a wider evidence base on the ecological, social and economic implications of different interventions.

These measurement issues create significant challenges for developing an ecological equivalence metric in the context of marine net gain. In the recent consultation on the principles of marine net gain, a contributions-based approach (which would operate like a levy on marine development) was proposed as an alternative to a metric (Defra, 2022). This introduces greater flexibility, but also a different set challenges, not least in defining the measure on which the scale of contributions should be based. It is important that such a measure incentivises the avoidance of environmental damage and supports the wider mitigation hierarchy, ensuring environmental impact is minimised and increasing the likelihood that unintended environmental consequences will be avoided. The proposed principles for marine net gain (Defra, 2022) therefore suggest a focus on residual impacts (i.e. those that remain after avoidance, minimisation, and mitigation).

The natural capital approach includes methods that, in principle, allow the losses from residual impacts to be valued in monetary terms, and hence potentially steer the level of net gain contributions using a cost-benefit approach. That approach brings challenges of its own, however, particularly the availability of appropriate existing data. A further option for using the natural capital approach to assess the ‘value’ of residual losses would be in terms of articulating the societal benefits provided by different assets. This would support a categorisation of assets and/or a multiplier that could be used in determining an appropriate level of net gain contributions. Those two options will be discussed in the remainder of this section.

Economic valuation

Under a 'nature first' approach as proposed for marine net gain (Defra, 2022), the residual impacts of primary importance will be those that concern species and habitats, for which monetary values are not readily available. Hooper et al. (2019) carried out a literature review to identify the current state of marine and coastal ecosystem service valuation within the UK and the Republic of Ireland and highlight the evidence gaps. They found 59 relevant studies from the period 1994 to 2018, yielding 355 individual monetary values (their full database is reproduced in a separate document and available from the authors on request). Of these, 74% derived from stated preference approaches (contingent valuation and choice modelling). Non-use values, and those for recreation and hazard reduction (flood risk, climate regulation) were the most common values obtained (together accounting for 85% of the values obtained). The environment in general, beaches and/or the coastline, and coastal water dominated in terms of the habitats or species featured in the studies (44% of values). Where specific habitats were considered, saltmarsh, wetland, coastal fringe and intertidal habitats were also relatively common (33%). Fish were the most frequently valued species (8%), followed by marine wildlife in general terms (5%) and marine mammals (4%). Hooper et al. (2019) also noted that a single study could be responsible for generating values for a relatively large number of individual species and/or habitats (e.g. Christie and Rayment, 2012; Jobsvogt et al., 2014), which therefore all derive from the same method and framing and suffer from any weaknesses in the overarching study.

Hooper et al. (2019) report highlights the significant evidence gap for values for subtidal habitats, and that there were far fewer values for mobile species than for habitats. This suggests that few relevant studies currently exist that could provide evidence for the value of residual impacts from developments. Offshore benthic habitats, seabirds and marine mammals (likely to be key receptors in terms of residual impacts for industries such as offshore wind) were the subject of just seven studies, generating 31 individual values.

It is likely that other studies have been undertaken since publication of the Hooper et al (2019) report, and tools such as the Ecosystem Services Valuation Database (ESVD)[8] provide searchable online resources to find valuation studies. However, Hooper et al (2019) noted that the number of studies per year peaked in 2011 and 2013, so there is no evidence of recent increasing or sustained effort to obtain new values for marine assets and benefits. Indeed, a recent review of data in the ESVD demonstrated that values for seabirds, marine mammals and wildlife watching more generally remain sparse, and did not retrieve any studies after 2018 (Burton and Bayes, 2022).

Even where apparently relevant values exist, there may be limitations on whether they can be used beyond the context of the initial study. The values found by Hooper et al. (2019)

[8] https://www.esvd.info/

for marine species, habitats and benefits were reported in range of units (for example, per person, per household) over different time periods (e.g. per trip, per year), although this information was not always clearly defined. To understand the full value of the change, values expressed in smaller units must be aggregated across the relevant population. Care is required in undertaking any such aggregation, to adjust for known factors that may cause the response of the sample population to be different from that of the wider public, but also to recognise factors that may not be easily observed, such as people with a greater interest (and hence higher values) being more likely to respond to a survey than their less motivated counterparts (Johnson et al., 2017). The aggregation undertaken for a study of recreational use value, for example, was subsequently questioned, as it implied a highly improbable number of daily visitors to certain shipwreck sites.

It is also important to understand how the magnitude of any change affects values. Often, this is not a linear relationship and stated preference values may be insensitive to scope. Hooper (2014) for example, found that doubling the area of intertidal mudflat protected resulted in only a 14% increase in willingness to pay. A US study found no significant difference in willingness to pay to prevent the deaths of 2,000, 20,000 or 200,000 wildfowl, all of which represented less than 2% of the total waterfowl population (Desvouges et al., 1993). There are other studies that do show significant changes when the amount of the good being valued is changed (Carson, 1997), but the Desvouges et al. (1993) study highlights a particular need for careful consideration of how respondents value small changes in environmental conditions (Boyle et al., 1994), which is particularly pertinent in the context of residual impacts from individual developments.

Furthermore, context is extremely important in valuation studies, and so the framing of any values must be understood before they can be used in determining the value of environmental losses. Stated preference studies overwhelmingly ask respondents for their *willingness to pay* for a particular outcome (often an increase in the abundance or protection of a certain species or habitat). This value may not be the same as their *willingness to accept* an impact on that species/habitat. Willingness to accept values are often higher, as people tend to have stronger responses to losses than gains (Bateman et al., 2002) and so the financial compensation required to offset the loss of wildlife would be greater than an expected contribution towards securing an equivalent gain.

A further caution with stated preference studies is that respondents' pre-survey level of knowledge affects the value they place on the environmental good (Needham et al., 2018). Respondent's knowledge and understanding of marine assets may be limited, particularly for those such as unfamiliar subtidal habitats, so values for these may be less robust.

Stated preference is only one approach to economic valuation, although the alternative options are limited for many marine habitats and species. The direct interactions that would support the use of methods such as revealed preference (e.g. travel cost, hedonic pricing) tend to be lacking. Avoidance and replacement costs have been used for English coastal habitats in the context of flood risk reduction through managed realignment, (for example by MacDonald et al., 2020) but are of limited usefulness for subtidal habitats.

Production function approaches would be applicable in the context of, for example, determining the value of essential fish habitat in supporting particular stocks of commercial fish, but the heavy data requirement makes these difficult to use in practice. Increasing evidence on levels of carbon uptake and storage provides the opportunity for carbon prices to be used in valuing subtidal habitats (e.g. Luisetti et al., 2019). However, these represent only one element of the total economic value and using them alone would significantly undervalue marine habitats such as subtidal sediments.

These factors do not preclude the use of existing valuations but emphasise the need for caution, and the importance of ensuring that any source data was collected, and is described, in such a way that best practice can be applied (as per benefits transfer guidance such as in Johnson et al., 2021 and eftec 2009) before it is applied to new contexts. However, given the small size of existing evidence base and the challenges of robust benefits transfer, it is likely that significant investment in the collection of appropriate primary data will be required, which will also need to take account of wider challenges in valuation.

Other measures of importance

Money is simply a unit for measuring value, which is convenient because it can be more easily compared than different biophysical units. Given the challenges of economic valuation, an alternative approach would be to consider other measures that highlight the value, i.e. importance, of marine natural capital assets. Such measures could, for example, support the development of multipliers for use in determining the level of contributions that should be made in recognition of residual environmental damage.

A key component of any such method would be in providing greater nuance around what makes an ecosystem asset important. Previous suggestions in the context of marine net gain (ABPMer, 2019) have included using the list of priority habitats and species in Section 41 of the NERC Act 2006. However, this includes all subtidal sands and gravels even though these are the most common subtidal habitat class in the UK and include a wide range of sub-habitats with varying degrees of diversity and sensitivity.

Under a ‘nature first’ approach, the primary factor in defining importance would be to use conservation criteria, a detailed assessment of which is beyond the scope of this work, and reference should be made to other material. For example, in recent work commissioned by Natural England, Tillin et al. (2022) scored individual marine biotopes according to factors such as timescale for recovery, ease of restoration, rarity and uniqueness, to define which should be considered irreplaceable. While all damage to habitats considered irreplaceable (those with a score greater than Tillin et al.’s (2022) threshold of 40) should be prevented, the method also provides a mechanism for allocating importance to the wider list of marine habitats.

As Tillin et al. (2022, p45) note, “*No threshold for scoring was identified at which a habitat moves from being considered replaceable to irreplaceable. Any habitat that scored highly for any of the assessed criteria may pose challenges for recovery, restoration or*

recreation." Additional analysis could therefore be undertaken to identify which habitats scored highly in at least one of the irreplaceability categories, to provide a broader mechanism for scoring relative importance. By its nature, this work considered only habitats, but other mechanisms can be used to attribute importance to assets not included within Tillin et al. (2022), such as mobile species. The Section 41 species list may be appropriate in this case, as well as other recognised measures of conservation importance, such as those habitats and species that are designated features of protected areas.

Where the natural capital approach could support the development of impact multipliers is in articulating the benefits of nature to society. Recognition of these wider environmental benefits as second-order considerations would be in keeping with the proposed Principle 3 for marine net gain (Defra, 2022). A natural capital focussed mechanism for categorising the importance of marine assets would therefore be to determine their relative contribution to particular ecosystem services.

There are several published resources that provide evidence on the relative importance of individual natural capital assets to the supply of ecosystem services, including NatureScot (2020); Burkhard et al. (2014); Potts et al. (2014); and Burdon et al. (2017). However, these use dated and differing classification frameworks and do not always clearly state the source of underlying evidence or evaluate its robustness (Hooper and Austen, 2020). A new universal Asset-Service Matrix[9] that connects marine assets and ecosystem services is being produced by the JNCC under the mNCEA programme, which provides a consistent framework and references the evidence base for each asset-service connection.

The list of potential ecosystem services supplied by natural capital assets, as defined by accepted frameworks such as the Common International Classification of Ecosystem Services (CICES Haines-Young and Potschin, 2018), is long. Robust evidence may be lacking for certain services, and the contribution of marine assets relative to terrestrial assets or to other forms of capital may be limited. It may therefore be appropriate to select a subset of major ecosystem services and determine the contribution of assets to those. The ecological principles used in the process of designating HPMAs, for example, focussed on assets that could provide three key services: (i) long-term storage of carbon; (ii) support for life cycle stages of commercially important marine species; and (iii) the provision of flood and/or erosion protection (Natural England and JNCC, 2022).

It has recently been proposed that a contributions-based approach to marine net gain could have a basic charge related to the capital expenditure of the project, but that a stronger link to the residual environmental impact should be made using simple environmental metrics (ABPMer and eftec, 2022). An ecosystem services approach (as

[9] https://www.marlin.ac.uk/asm

well as other ‘nature first’ measures such as the irreplaceability classification) would allow natural capital assets to be scored for importance, and hence provide a relative weighting that could be applied as part of the calculation for such an approach. In theory, it is possible to determine monetary values for marine assets, and hence take a cost-benefit approach to assessing residual environmental losses. In practice, however, this would require significant investment in new primary data, as the potential to apply the existing evidence base is limited. Alternative mechanisms to attribute importance scores to marine assets include (as second-order considerations) the degree to which assets supply certain ecosystem services, coupled with scores for first-order conservation criteria such as the degree to which habitats are irreplaceable (as defined by Tillin et al., 2022). These could be used to determine a multiplier applied to a basic charge for a contributions-based approach to net gain.

Overarching conclusions and recommendations

This research has taken a broad view to understanding the priorities for marine nature recovery and restoration funding, examining how funding is allocated and gathering stakeholder perspectives on the challenges associated with delivering improvements to marine environments.

To increase the scale and speed at which marine nature recovery and restoration activities are delivered there is a need to diversify funding options. Central to this is widening responsibility for financing marine nature recovery to include both public and private investment in marine nature improvement. Marine Net Gain and the emergence of voluntary ecosystem service markets, that seek to embed the protection of marine environments within mechanisms intended to address wider environmental challenges (i.e. energy security and net zero), are key policy strategies underpinning the inclusion of private investment into marine nature recovery and restoration. However, these markets need robust scientific underpinnings, and the success of these initiatives are contingent on several factors: increasing the number, quality of projects and range of methodologies including recognising the role of passive recovery approaches that deliver marine nature recovery and restoration on the ground; and monitoring and measuring their success over time.

The research also illustrates the critical need to increase clarity on how different policy and funding mechanisms interact and integrate with one another to maximise the benefits for nature. Clarity is also needed regarding the role of policy and funding in standardising approaches and in governance of emerging strategic initiatives, to increase fairness and mitigate risks where initiatives blend public and private finance.

From this it can be argued that it is critical to generate more evidence to illustrate the effectiveness of marine nature improvement approaches. Hence, increased financial support should be channelled to research and development that supports the refinement of restoration methods and enables the extension of these to a greater proportion of marine habitats and species. Funding must support innovation and endeavour to

recognise uncertainty and opportunities for benefits that will increase the scale of recovery and restoration as well as generate an evidence body and direct future policy.

Critically, there is a need for more comprehensive approaches to monitoring, this will improve the evidence base on effectiveness of interventions and support wider learning. This research evidences why this is fundamental to the success of strategic policy initiatives including Marine Net Gain and voluntary ecosystem service markets. We conclude that individual projects require bespoke monitoring (using standardised approaches), and this will contribute to building a wider evidence base on the ecological, social and economic implications of different interventions. There is also a need to address the obstacles to delivery on the ground. Key issues to address include providing greater support for marine partnerships and the actors involved in their coordination accompanied by making critical amendments to the regulatory structures to reduce barriers to the delivery of recognised marine nature recovery and restoration initiatives.

The following policy recommendations draw on the evidence generated across the four-part research. The recommendations seek to increase support for marine nature recovery projects by improving the equity and effectiveness of funding mechanisms whilst addressing the challenges of delivering active marine recovery and restoration and ensuring the maximum outcomes for nature.

1) ***Coordination and clarity on the public funding landscape should be improved***

To ensure efficient and strategic support for marine nature recovery there needs to be strategic oversight of the public funding landscape. This will avoid duplication and ensure maximisation of public investment and outcomes for nature and enable more effective integration with private investment opportunities. There is a need for increased clarity regarding public funding and guidance on how different types of funding streams will be integrated (i.e. guidance and rules for how different funding sources can be stacked). In addition to Defra's recently published guidance on stacking (Defra, 2023) for biodiversity net gain and nutrient markets, consideration needs to be given to how this will work within the marine sector. From the point of delivery there is also a need to translate this guidance to increase clarity and encourage greater levels of participation in the delivery of nature recovery activities. To use a terrestrial example, ongoing uncertainty around public funding for the delivery of environmental land management could hamper landowner willingness to engage with both net gain and emerging ecosystem markets and has been noted to be impacting willingness to engage with innovation programmes such as FCRIP.

2) ***Clear governance is required to ensure public accountability***

The marketisation of ecosystem services via ecosystem markets and marine net gain carries considerable risks. The commercialisation of our environmental assets and the services that flow from these may arguably not be in best interests of the environment or the public. Without clear governance there is a risk that power and decision making will lie with investors rather than wider society. Whilst delivering nature recovery to the extent that

is required to avert ecological crisis will require more investment than the public funding can support, this must be targeted, allocated and delivered in an equitable and transparent way with the public sector playing an important role in ensuring public accountability.

3) ***Marine and terrestrial environments must be recognised as integrated systems***

Building on the need for coordination of the public funding landscape, the systemic nature of land and sea within nature restoration policy and funding needs to be recognised by increasing funding provisions at the marine and terrestrial interface. A more joined up approach will help to encourage funders of terrestrial nature recovery to extend and support marine projects. This must also be supported at an institutional level by integrating policy teams, bringing marine and terrestrial policy thinking together within government to recognise the interconnections between land and sea with funding allocated holistically to cover all nature recovery rather than in silos, which creates funding tensions. Integration in this way would help justify increased funding and access to funding for marine conservation and will help extend funding beyond the intertidal, to include the restoration of subtidal environments.

4) ***Public investment is required to support innovation***

Most practical interventions for habitat restoration in subtidal environments are in early feasibility and pilot phases, outcomes are very difficult to predict, results take time to observe and success is often uncertain. There are currently only restoration methods for a small proportion of the ocean's habitats and species and no known mechanisms for the active restoration of most marine species and habitats. To address this there needs to be a continued appreciation that many early projects may fail. Government support remains critical to enable methodological testing and learning from the piloting process.

5) ***Greater emphasis should be placed on payments for passive recovery***

There is evidence of significant support for active restoration despite the uncertainties and the limitations of approaches. There is comparatively less support for interventions that promote passive recovery through the removal of marine pressures (e.g. commercial fishing pressures), as evidenced by fewer active partnership- and industry-driven recovery projects. Where funds were identified uptake has been shown to be limited and projects focused on reduction of bycatch and not on addressing wider disturbance from gear type, anchoring or litter. There is a role for the establishment of a new fund that takes a more proactive approach in defining the types of projects that will be supported to promote wider passive recovery. Although the success for such projects would need, at least initially, to pilot parameters such as practical and economic feasibility, and ultimately, as with active restoration projects, the tested ideas may not be viable.

6) ***Licencing for marine nature recovery and restoration must be reformed***

Licencing for marine restoration and recovery projects is required to be tailored specifically to marine nature recovery and be better aligned with the funding process. For example, the time taken to process licences should not prohibit participation in short-term funding

cycles. Marine nature recovery and restoration should be recognised within the licencing system by developing a separate class of licences for marine recovery and restoration projects which includes a dedicated outward facing administrative team. There is a need also for improved agency coordination and link-up between the marine management (MMO/IFCA) and conservation authorities (NE) to improve the support given to projects to identify appropriate conservation sites and manage associated stakeholder interests. Increased regulatory flexibility would also enable conservation projects to trial approaches and monitor impacts and interactions with other species and habitats, enabling a greater number of candidate sites available, particularly for active restoration activities.

7) ***Increased recognition of the role and support for collaborative partnerships in marine nature recovery***

Collaborative partnerships are critical to the success of marine recovery and restoration projects and a fundamental component of natural capital approaches. Partnerships and successful collaborations are underpinned by strategic facilitation. It is important to acknowledge the time, expertise, capacity, and resources required to generate and maintain stakeholder engagement. Funding is also needed to recognise the substantial amount of preparatory work that underpins the delivery of nature recovery projects as well as the continued monitoring beyond the delivery of core interventions necessary to observe outcomes and realise benefits. Providing research and development, multi-year and specific monitoring and evaluation funding would address this.

8) ***Monitoring and evaluation should be standardised, expanded and appropriately resourced***

Biodiversity monitoring has been seen solely as an expensive way of measuring how an environment is performing. The full value of monitoring is not appreciated and should be recognised as a vital means of assessing the performance of policies and critical to underpinning the sustainability of conservation activities. Funding must therefore extend beyond core activities to recognise that individual projects require bespoke monitoring (using standardised approaches). Monitoring contributes to building a wider evidence base and should include the capture of data that go beyond the ecological to recognise the importance of social and economic implications of both policy and interventions. There needs to be more funding allocated to marine social science and better integration of social sciences within ecological and structural funding streams. This will enable projects to adopt natural capital approaches more comprehensively and demonstrate the full range of benefits and costs. It would further support economic valuations that are vital to generating wider support and investment for projects to ensure their sustainability and enable more equitable value for money assessments used by investors for comparison against non-environmental projects.

9) ***Best practice in applying a natural capital approach should be encouraged***

Projects require support to understand and practically embed natural capital thinking around streamlining the designation process and approaches in marine nature recovery.

Best practice guidance as to how to embed natural capital into marine nature restoration and recovery could be used to support collaborative partnership projects via existing resources and the ongoing work of the Marine Natural Capital and Ecosystem Assessment programme. To increase relevance, future revisions of the resources should include bitesize information and case study examples of the application of natural capital approaches in marine nature restoration and recovery. Projects value the opportunity to learn from others within the conservation community. Networks and communities of practice around natural capital and the emerging approaches to marine nature recovery and restoration should be supported to promote the exchange of knowledge and skills and create collaborative opportunities leading to increasing interest and the rate of nature recovery delivery.

10) ***Options for a using natural capital approach to understand project-level gains and losses will be limited without significant additional primary data***

The existing evidence base of monetary values relevant to UK marine assets is limited and may not be appropriate for use in the context of understanding what level of payments should be sought to address the project-level environmental impact of developments. It may be more appropriate to use the natural capital approach in considering environmental value more broadly, in terms of scoring assets for their importance in providing ecosystem services that are of benefit to society.

List of abbreviations

25YEP	25 Year Environment Plan
3Cs	Championing Coastal Coordination
AIFCA	Association of Inshore Fisheries and Conservation Authorities
ALB	Arms-length Body
AMS	Advanced Mooring Systems
BNIF	Big Nature Impact Fund
BRUV	Baited remote underwater video,
CICES	Common International Classification of Ecosystem Services
Defra	Department for Environment Food and Rural Affairs
eDNA	Environmental DNA
EIP	Environment Improvement Plan
ELMs	Environmental Land Management scheme

ENGO	Environmental Non-Governmental Organisation
ESVD	Ecosystem Services Valuation Database
FaSS	Fisheries and Seafood Scheme
FCERM	Flood and Coastal Erosion Risks Management Strategy
FCRIP	Flood and Coastal resilience Innovation Programme
FISP	Fisheries Industry Science Partnerships
GES	Good Environmental Status
HPMAs	Highly Protected Marine Areas
IFCA	Inshore Fisheries and Conservation Authority
JNCC	Joint Nature Conservation Committee
LNRS	Local Nature Recovery Strategies
MCZ	Marine conservation zone
MMO	Marine Management Organisation
mNCEA	Marine Natural Capital and Ecosystem Assessment
NE	Natural England
NEIRF	Natural Environment Investment Readiness Fund
NRN	nature recovery network
OWEC	Offshore wind evidence and change programme
OWEIP	Offshore Wind Environmental Improvement Package
ReMeMaRe	Restoring Meadow, Marsh and Reef
RHCP	Regional Habitat Compensation Programme
RYA	Royal Yachting Association
SAC	Special Areas of Conservation
SMEEF	Scottish Marine Environmental Enhancement Fund
SPA	Special Protection Area
UKRI	UK Research and Innovation

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Appendices

Appendix 1: Marine funder discussion guide

Understanding the drivers of and mapping the funding landscape for marine nature recovery in the UK

This research is being conducted by the Marine Natural Capital and Ecosystem Assessment (mNCEA) funded by Defra. The project seeks to build a picture of the funding landscape for marine nature recovery and restoration in the UK. It is recognised that there is less funding for marine recovery and restoration than there is for recovery and restoration work in terrestrial environments. Funding for marine nature recovery can be difficult to find, funders struggle to imagine what is under the water and practical action can be very expensive.

The Environment Act (2021) aims to achieve the restoration of 70% of designated features in Marine Protected Areas (MPA's) to a favourable condition by 2042, with the rest in a recovering condition. Delivery on these ambitions require a range of funding mechanisms to enable the practical delivery of marine restoration and recovery activities. This research will provide a snapshot of the current funding landscape for marine nature recovery and restoration in the UK, and in response to policy aims, explore how the market is evolving to meet the ambitious targets set by the UK government.

Specifically, the research aims to address the following questions:

- What are the key drivers of marine nature recovery and restoration in the UK?
- Who funds projects that aim to improve marine environments?
- What financing mechanisms are used to enable the delivery of marine nature recovery and restoration?
- What are the criteria used by funders to make financing decisions?
- How is the landscape for marine nature recovery and restoration evolving and what new funding streams are emerging?

This research is being conducted by Natural England's Senior Social Science Specialist Dr Helen Kendall (email: helen.kendall@naturalengland.org.uk)

We are specifically interested in speaking to those involved in the design and administration of marine nature recovery funding programmes. Ideally, we would like to invite you to participate in a short online interview (of no more than 30 minutes), however, we could instead send to you the interview questions for you to complete in your own time and return to us via email before 6th February.

Funder questions

A. Funding programme background

1. Who are the main investors in the funding programme?
2. What are the key drivers behind the establishment of your funding programme?
3. What does the funding programme hope to achieve?
4. What are the main priorities of the funding programme? (i.e., recovery/restoration of specific species and habitats, partnership building, supporting the development of ecosystem service markets etc.)
5. What type of marine nature recovery activities does the funding programme support?
    a. If the programme supports marine and terrestrial projects, what proportion of projects that are funded, support marine nature recovery and restoration and what factors influence how funding is distributed?

B. Funding award decision making

1. How are funding decisions made? i.e., what criteria do you use to evaluate projects to award funding?
2. How do you evaluate the success of projects that are awarded funding?
    a. What criteria does the programme use to evaluate the success of projects that are awarded funding?

C. Horizon scanning

1. How do you see the funding landscape for marine nature restoration and recovery evolving?
2. Where are the gaps in marine nature recovery and restoration funding? (i.e., where do you see projects finding it difficult to find funding for their activities)?
3. What new funding mechanisms do you see emerging?
4. How do you see your funding programme adapting or engaging with these new mechanisms?
5. What are the opportunities/challenges for co-ordinating different initiatives and securing strategic approaches/gains?

Appendix 2: Funding Programme summary

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
Coastal coordination	Championing, Coastal, Coordination (3C's)	- The Environment Agency - Natural England - Marine Management Organisation - Association of Inshore Fisheries and Conservation Authorities	Pilot year £750,000 Additional 3 phases of funding secured 2023-2025 £600,000 each year.	Marine	Funding awarded to programmes that test development of three themes: 1. Coordination of planning and delivery of locally owned plans 2. Coastal champions to strengthen capacity and capability 3. Restoration and recovery of natural habitats	- Led by an environmental charity or not for profit and include other stakeholders - Demonstrate collaboration between civil society and the public sector and outline engagement with private sector to secure investment - Develop wider understanding of the land-sea interface and impacts of terrestrial/freshwater components on the marine environment through the development of coastal champions

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
						- Encompass restoration and recovery of marine habitats wither through improved understanding of marine pressures, improved understand of the status of marine environments, design or implement interventions to protect or restore marine environments.
Biodiversity net gain		Will apply from November 2023 for developments in the Town and Country Planning Act 1990, unless exempt. It will apply to small sites from April 2024.	TBC – potentially significant. Depends on development.	Intertidal (potentially)	Under the Environment Act 2021, all planning permissions granted in England (with a few exemptions) will have to deliver at least 10% biodiversity net gain from November 2023. This sits alongside: a strengthened legal duty for public bodies to conserve and enhance biodiversity,	BNG will be measured using Defra's biodiversity metric and habitats will need to be secured for at least 30 years.

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
					new biodiversity reporting requirements for local authorities, and mandatory spatial strategies for nature: Local Nature Recovery Strategies or 'LNRS'.	
Marine net gain	'Principles' consultation stage.	'Principles' consultation stage.	TBC – potentially significant. Depends on development.	Marine	Marine net gain aims to: 1. Secure positive environmental outcomes, halting or reversing biodiversity decline, creation of marine and coastal habitats and protection of species. 2. Contribute to ocean recovery, support climate	Criteria yet to be established but will use an assessment framework to objectively measure associated biodiversity losses and calculate if proposed habitat enhancements deliver required biodiversity net gain.

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
					change mitigation, resilience, and adaption. 3. Enable sustainable growth of marine industries and development activities.	
Strategic compensation	The Regional Habitat Compensation Programme (RHCP)	- Environment agency	Depends on the development.	Intertidal	Set of regional programmes that coordinate and oversee habitat creation projects to ensure that flood and coastal risk programmes meet legal obligations to habitats and species defined by the Habitat Regulations (2017)	EA implements and monitors habitat compensation targets arising from Shoreline Management Plans. Targets are a legal obligation of development.
	Flooding, Coastal Erosion Risk	- Environment Agency	£5.2bn over 5y as capital spend for flood defences to	Intertidal	Environment Agency has strategic leadership for delivering the National	Strategic driver underpinning the delivery of funding of projects that address the risks

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
	Management (FCERM)		protect property and infrastructure.		Flood and Coastal Erosion Risk Management Strategy required by the Water Management Act (2010) for England which aims to ensure readiness and resilience to flooding and coastal change. The programme is providing financial support for FCRIP.	connected with flooding and costal erosion.
	The Flood and Coastal Resilience Innovation Programme (FCRIP)	- Environment Agency	£200 million between 2001-2027.	Intertidal	Programme aimed at fulfilling governments policy statement on flood and coastal erosion and the Environment Agency's National Flood and Coastal Erosion Risk Management Strategy to test practical and innovative actions to improve resilience to	Competitive tender process, expressions of interest submitted by projects. EOI's independently reviewed by the EA board 30 projects recommended to the Defra secretary of State for funding. 25 Projects approved for funding in December 2022.

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
					flooding and coastal erosion with a focus on moving away from hard defences and developing nature-based solutions and testing the ability of nature-based projects to generate revenue.	
Offshore wind environmental improvement package	Offshore Wind Environmental Improvement Package (OWEIP)	- Department for Business, Energy and Industrial Strategy (BEIS)	Industry funded Marine Recovery Fund – potentially significant dependent upon level of development.	Marine	Acceleration of offshore wind development and reduce, mitigate, or compensate for harms to protected habitats and species. Underpinned by the Energy Bill which includes powers to improve the Habitats Regulations Assessment process for marine aspects of offshore wind developments,	Offshore wind developers required to provide information to BEIS on how development will impact protected habitats and species. Developer to be able to choose whether to deliver strategic compensatory measures itself or discharges certain forms of compensation as a financial contribution to the 'Marine Recovery Fund' (MRF). The MRF will act as a

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
					reducing the time taken assess environmental impacts whilst maintaining protection for wildlife and marine habitats.	framework/delivery mechanism for certain types of statutory MPA compensatory measures that would be more effectively/efficiently delivered strategically by or on behalf of Government, using financial contributions from OSW developers to cover the cost. Contributions from marine net gain would also be managed through this fund.
	Offshore wind evidence and change programme (OWEC)	- The Crown Estate - Department for business, Energy, and Industrial Strategy (BEIS)	£50 million 'kick-starter' over 5 years. £12 million invested in research to protect the environment.	Marine	Aim to understand the cumulative environmental impacts of offshore wind and the impacts on sea users and communities, focus on four research themes:	No information online re: funding allocation criteria.

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
		- Department for the Environment, Food and Rural Affairs (Defra)			1. Finding space for offshore wind 2. Improving understanding of environmental impacts and benefits 3. Consideration of environmental sensitivity through Habitat Regulations 4. Investigating environmental benefits	
Government and ALB restoration objectives	Green Recovery Challenge Fund	- Defra - Natural England - Environment Agency	£40 million, grants up to £2million	Intertidal	Supports projects that deliver against one of three themes: 1. Nature conservation and	Funds environmental charities and partnerships including at least one environmental charity. Projects required to demonstrate how they

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
		- National Lottery Heritage Fund			restoration, including ecosystem restoration and species recovery including improving the health and resilience of the marine environment. 2. Nature-based solutions, particularly for climate change mitigation and adaptation, including blue carbon habitat restoration projects 3. Connecting people with nature (green	meet one of the three core themes and will create or retain jobs.

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
					and blue spaces)	
	Scottish Government Nature Restoration Fund	- Nature Scot	£5 million awarded 2022- fund increasing to 55 million over 4 years and £12.5 million per year.	Marine	Two funding streams: 1) Nature restoration, transforming nature, large scale transformation projects £250,000+ 2) Transforming nature development stream, supporting propriety activities to enable project to apply for	1) Nature restoration, transforming nature: - Projects must meet one of 5 priority themes including Coastal and marine initiatives which promote restoration, recovery, enhancement, or resilience. - Sites must be maintained in the condition created with NRF funds to enable the longer-term benefits to be realised

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
					funding stream 1.	- If a site is sold, the NRF maintenance obligations must be included within the sale contract. 2) Transforming nature development stream: - Projects funded for 6 months; funding does not guarantee funding from the delivery programme. - Eligible activities include, feasibility studies, surveys, data gathering stakeholder engagement, exploring blended finance options, securing permissions and licences, development of

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
						project plans, development of monitoring and maintenance plans, seeking quotes and engaging with suppliers and contractors, monitoring and reporting on the development phase, site and land feasibility investigation.
	Scottish Marine Environmental Enhancement Fund (SMEEF)	- Nature Scot, - Marine Scotland, - Crown Estate Scotland	Donation based Scheme. Users of the maritime environment voluntarily re-invest in the seas. Aims to provide a return on investment e.g. via increased breeding success,	Marine	Testing and piloting ways in which investible projects can be created in the marine environment. Two grant funds: 1) Restoration, Recovery and Enhancement grants (RRE)	Projects are required to demonstrate how they meet one of two priority outcomes: 1) Improvements to the status of marine and coastal habitats and species 2) Enhancing the provision of

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
			enhanced ecosystem services such as reduced flood risk, and increases in biodiversity or understanding of how marine ecosystems interact with people and industry.		2) Research grants £10,000+ SMEEF provides opportunities for industry to invest in the natural capital, which is integral to their organisations, support sustainable growth in marine sectors and increase the economy of Scotland's coastal communities.	ecosystem services e.g., resilience to coastal flooding and erosion, carbon storage In addition, projects must demonstrate how they have wider social benefit, have a proportionate monitoring and communications plan, can demonstrate clear additionality to already committed actions. SMEEF will fund multiple stages of an individual project, partners must be UK based and deliver activities in Scotland.
	Marie Natural Capital and Ecosystem	- Defra - Natural England - CEFAS	£37.5 million	Marine	Science innovation and transformation programme, which spans across land and water	Non-competitive tender awarded to ALBs.

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
	Assessment (mNCEA)	- Environment Agency, MMO - & JNCC			environments. Established to collect data on the extent, condition and change over time of England's ecosystems and natural capital, and the benefits to society. Specifically: - Increase the spatial scale of some data (for example, species distribution, biodiversity) - Provide reliable data to help account for carbon stocks within England's soils, peatlands, trees, and marine habitats - Assess ecosystems in	

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
					inland and coastal waters, marine environment, and on land including soil ecosystems - Draw together existing data streams, - Provide tools to understand how we impact nature both positively and negatively	
	Marine Pioneer	- MMO - Ministry of Housing, Communities and Local Government (MHCLG) - Treasury - Department of Business, Energy and Industrial	Unclear.	Marine	Led by MMO. Pioneering new approaches to the management of the marine environment. Established with the aim to inform the delivery of the 25YEP, test the application of the natural capital approach, integrate planning and delivery, apply better funding	Non-competitive tender. Funding the development of a marine natural capital plan developed for two pilot locations (Devon and Suffolk).

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
		Strategy (BEIS) - Department of Education (DoE)			mechanisms and share lessons.	
Local Nature Recovery strategies (LNRS)/Nature Recovery Network (NRN)	-	- Defra - Responsible Authorities lead on LNRS preparation.	Not yet clear.	Intertidal (potentially)	England-wide system of spatial strategies that will identify priorities and map proposals for specific actions to drive nature recovery and provide wider environmental benefits.	Not yet defined- confirmation will come from the Environment bill and the regulations and guidance to be issued from Defra. 'Responsible Authorities' appointed by Defra secretary of state to lead on LNRS preparation.
Environmental Land Management (ELMs)	Local Nature Recovery	- Defra	Public funding for locally targeted actions to make space for nature alongside food production. Undisclosed amount.	Intertidal	Options for which landowners may be paid under development but likely to include creation, restoration, and management of inter-tidal and saline habitats (saltmarsh). Committed to	Not yet defined.

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
					ensuring that this does not preclude access to private funding and actively exploring options to support blended finance.	
	Landscape Recovery	- Defra	R1 (pilot)- £22m. Future rounds under review. Grant funding available to support projects in the initial 2-year development stage, after which projects expected to attract private investment.	Intertidal	Funds landscape scale nature recovery projects by landowners / managers, over two phases 1) project development and 2) implementation. First round projects focused on 2 themes: 1) Recovering and restoring England's threatened native species 2) Restoring England's	No defined list of activities or associated payment rates. Projects will negotiate bespoke agreements but should represent value for money and can attract private investment. Eligibility: open to individuals or groups that deliver large scale projects (5000-5000ha). Aim of R1 is to support project planning and agree funding

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
					streams and rivers. Themes subject to change in subsequent years.	arrangements for implementation. Projects in R1 assessed against set of feasibility, cost, and impact criteria. Criteria. Highest scoring projects awarded funding. Projects proceed to implementation with agreed funding from Defra and the private sector. Aim to progress as many R1 projects to implementation as possible. Implementation agreements will be long-term (20+) and bespoke.

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
Blue Finance (i.e. ecosystem markets and carbon sequestration)	Natural Environment Investment Readiness Fund (NEIRF)	- Defra - Environment Agency	Grants between £10- £100,000	Intertidal	Aims to stimulate private investment and market-based mechanisms that improve and safeguard our domestic natural environment by helping projects get ready for investment.	Seeking to fund proposals that focus on generating revenue from ecosystem services, rather than goods or commodities. Specifically, projects should do one of the following: 1) Help achieve one or more natural environmental outcomes from the 25-year environment plan 2) Can produce revenue from ecosystem services to attract and repay investment 3) Produce an investment model that can

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
						be scaled up and reproduced Projects must protect or enhance the domestic natural environment in line with one or more of the 25-year environment plan goals in the context of a range of natural capital asset types including coastal margins and marine. Fund activities in England although benefits can accrue in Scotland or Wales.

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
	Big Nature Impact Fund (BNIF)	- Defra - Federation Hermes - Finance Earth	£30 million government investment. Government backed fund.	Possibly intertidal	Public-Private (blended finance vehicle). Public investment in the Fund will incentivise and de-risk private investment. Fund managed by US investment manager Federation Hermes and UK- based environmental impact investment advisor Finance Earth. DEFRA will provide seed funding and pay an active role in governance and setting the funds objectives.	The Fund will invest in a portfolio of projects that generate revenue from nature-based solutions providing ecosystem services (e.g. benefits from natural services including, for example, flood mitigation and water quality improvements from tree planting or carbon sequestration from restoring peat bogs). Will use NEIRF funded projects as a pipeline for investment. Unclear of this will support marine based projects at this stage.

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
Revised approaches commercial fisheries management	UK Seafood Fund	Defra	£100 million	Marine	To support the long-term future and sustainability of the UK fisheries and seafood sector. Four main objectives of the fund include: 1) Science and innovation 2) Infrastructure 3) Skills and training and 4) Export support.	Fund objectives met via 4 programmes addressing the core aims – criteria set by individual programmes.
	UK Seafood Innovation Fund	- Defra - CEFAS	Up to £50,000 for feasibility studies and up to £250,000 for full R&D projects.	Marine	Innovation pillar of the UK Seafood Fund. Aims to sustainability to reduce the environmental impact of seafood. Specifically interested in projects that can reduce the carbon	Funds projects that develop an idea, innovative technology or product that will benefit the sustainability or productivity of the UK seafood industry. Specifically, project

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
					impacts of aquaculture.	should meet the following criteria: 1) Provide an innovative idea or solution 2) Demonstrate long-term sustainability, productivity and environmental benefits Collaborative projects between the seafood sector and technology businesses are encouraged. No quotas per UK region or sector, funding awarded to the most innovative ideas. Funding decisions made by CEFAS.

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
	Fisheries Industry Science Partnerships (FISP)	- Defra	FISP and the Seafood Innovation Fund share £24 million of funding allocated to the science and innovation part of the UK seafood fund. Funds projects up to £500,000.	Marine	FISP represents the Science and Innovation strand of the UK seafood fund.	Projects must be a collaboration between the seafood industry and research institutions. Fund is closed and no plans for further rounds.
	Fisheries and Seafood Scheme (FaSS)	- Defra - MMO	Level of funding specific to FaSS measures minimum £500-£250,000	Marine	Funds projects that support the development of the catching, processing, and aquaculture sectors, and for projects that enhance the marine environment. Specifically delivering the following outcomes:	Individual level guidance provided for key project areas supported. All projects will be assessed for value for money, benefits to be delivered, affordability and deliverability. Funding cannot be issued without the required planning consents and/or licences

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
					- Creating a more sustainable and resilient sector - Boosting demand for seafood - Improve participation though co-design and management - Achieving good environmental status though the conservation and restoration of the marine environment - Supporting net zero through reducing emissions within the industry	being in place, funding is not provided for licencing. Projects aimed at achieving good environmental status can apply for funding for the following measures: 1. Aquaculture providing environmental services 2. Preventing and collecting Marine Litter 3. Support for the design and implementation of conservation measures 4. Protection and restoration of marine biodiversity

Drivers	Associated funding programmes	Programme administrators and actors	Funding available	Funding scope (intertidal/marine (both inter-subtidal)	Programme objectives	Decision making criteria (projects required to demonstrate)
						Provides a set of results indicators for each project types designed to measure the benefits to be delivered by the project and guidance on the monitoring information projects must provide. Once completed projects are required to provide this evidence as part of the post project monitoring to show the actual benefits achieved.
Culture and heritage	National Lottery Heritage Fund	- National Lottery	Projects up to £5 million.	Intertidal	UK's largest funder of heritage with the aim of funding projects that connect people to national, regional and local heritage in the UK.	Funds projects with a clear focus on heritage. Heritage not defined but includes, nature works to improve habitats or conserve species, as well as helping people to connect to nature and has funded marine projects.

Appendix 3: Marine nature recovery and restoration project discussion guide summary

Section number	Section title	Question areas
1	Drivers of marine nature recovery projects	- Drivers of marine or costal recovery projects. - Is the project part of a wider landscape or seascape imitative? - Key organisations or individuals involved in the project. - Challenges in initiating and delivering marine or costal recovery projects.
2	Stakeholder participation	- Stakeholder involvement in marine or costal recovery projects. - Does involvement improve the likelihood of nature recovery happening? - Identification of groups/individuals important to the success of the project. - Does engagement improve the value the public place on the marine environment? - Identification of hard-to-reach stakeholders. - Interventions to increase/improve stakeholder engagement.
3	Wider project benefits	- Benefits to people. - Importance of the realisation of the benefits to people in the project design and communication. - Main beneficiaries. - Unexpected outcomes. - Familiarisation with the natural capital approach. - How and why it was applied in the context of the project. - If not used, why? - Suggestions for how to increase the application of the natural capital approach. - Reservations around the application of the natural capital approach.
4	Defining and evaluating success	- How will outcomes be measured?

Section number	Section title	Question areas
		- How will the success of the project be defined? - Approaches taken to evaluating the success of the project. - If habitat recovery occurred, what factors were important in leading to this? - How do you think future policy (net gain) might support marine nature recovery?
5	Wind down and close	- Additional points. - Any missed questions.

Appendix 4: Participant information sheet and consent

PARTICIPANT INFORMATION SHEET

Project title: Using a natural capital approach to support marine nature recovery

This sheet is intended to answer any questions that you may have about contributing to Marine Natural Capital Ecosystem Assessment (mNCEA) marine nature recovery project. Please read this information before providing your consent to participate.

Who is conducting the research?

The mNCEA project research is being undertaken by Natural England. Principal Natural Capital Specialist Tara Hooper is leading this component of the research project in conjunction with Senior Natural Capital Specialist Susan Burton. Interviews are being undertaken by Social Science Senior Specialists Helen Kendall, Ian Fitzpatrick and Susan Burton.

Project aims

The marine nature recovery project aims to compile information about marine nature recovery projects across England. This is to help us understand the national picture, particularly in terms of best practice, barriers and opportunities. We are particularly interested in understanding how different projects are considering the benefits they provide to society: how concepts such as ecosystem services were used in project development and communication, and how the success of the project in terms of nature recovery and benefits to society may be measured.

We will be exploring the experiences of those involved in the marine nature recovery projects to generate knowledge relating to:

The factors that lead to the development of marine nature recovery projects.

The stakeholders involved in marine nature recovery projects, their role and what motivated them to engage.

The beneficiaries of marine nature recovery projects and/or any groups that may be negatively affected.

The challenges to the implementation of marine nature recovery projects.

The wider benefits to society that may have arisen (or could arise) from projects.

How the success of projects is defined and measured.

We will be conducting virtual interviews with projects across the England.

The research is being funded by the Department for Food and Rural Affairs (Defra) until March 2025.

Invitation to participate

You have been identified as a key stakeholder in the delivery of a marine nature recovery project. By that we understand that you have taken a key role in the design and/or delivery of a project with the objective of restoring marine habitats or species. We would like to invite you to take part in two stages of the research. The stages are as follows:

The Survey: A brief survey (taking no longer than 10 minutes of your time) aimed at collecting background information on your project which will allow us to map what marine nature recovery projects are occurring in English waters.

The interview: Through an in-depth interview (taking no longer than 45 minutes) we will seek to understand more about your nature recovery project, including who the beneficiaries are, how projects are considering the benefits that they provide to society, how concepts such as ecosystem services are used in project development and communication, the challenges to implementation and how the success of the project is defined and measured.

Your participation in the project is entirely voluntary and you may decline this invitation to participate. If you choose not to participate, you will not be approached again for this study.

Project procedures

If you chose to participate you will be asked to follow the link provided in the participation invite email and complete the brief survey. In the second stage you will be asked to participate in an online interview (conducted remotely via Microsoft

Teams) in July/August 2022. The interview will be conducted by researchers Susan Burton, Helen Kendall and Ian Fitzpatrick. We will contact you via email to arrange a time that is convenient to you.

With your agreement the interviews will be recorded to aid with our analysis. Even if you agree to being recorded, you may choose to have the recorder turned off at any time. You may review the recording if you wish and choose which parts of the recording we can use.

How will my data be stored and used?

The information that you provide will be handled in accordance with Natural England's social research privacy notice.

The researchers will make notes in addition to voice recordings during the interview to provide information to our study and to aid analysis. A report will be written on completion of the data analysis. Your personal information will not be identifiable in this report and where any of the information that you provide is used, your responses will be fully anonymised.

All notes made during the interviews will be anonymised and stored in a secure place at Natural England for a maximum of 3 years after which time they will be destroyed by secure shredding. Any electronic files of notes made during interviews will be kept in a secure file and secure back-up using multifactor authentication and will be deleted after 3 years. Any voice recordings will be kept in a secure place at Natural England and destroyed after 3 years. We may share audio recordings of your interview with an external transcription service. If we do this, we will remove any personal data shared during the interview. Apart for the purpose of transcription we will not share your personal data with any third parties. All research outputs will be archived by the project funders Defra.

Right to withdraw from participation

No risks associated with this research that would affect your participation have been identified. Participation is entirely voluntary, and you may withdraw at any time before, during or after the interviews, without providing any reason. The right to withdraw from the research is available until February 2023 when it is anticipated that a final report of the research findings will be submitted.

Anonymity and confidentiality

The preservation of confidentiality is paramount and again all personal data that you provide as part of the research will be handled in accordance with Natural England privacy notice. Notes recording the information you share with us will be not identify you individually, nor will you be identified in any published material without your

consent. We will ensure that any personally identifying information included in audio recordings are removed prior to being sent to an external company for transcription.

A copy of the research findings will be made available to you if you wish.

CONTACT DETAILS AND APPROVAL

Co-investigator:	**Principle investigator:**
Sue Burton	***Tara Hooper***
Senior Specialist	**Principal Specialist**
susan.burton@naturalengland.org.uk	**Tara.hooper@naturalengland.org.uk**
+447500097405	**+442077141881**

This research was approved by Natural England's Research Ethics Committee on 10th June 2022, (Ref – 22004).

For any queries relating to ethical concern, you may contact the secretariat of Natural England Ethics committee Chris Griffin at: chris.griffin@naturalengland.org.uk

If you have any concerns relating to data handling, you may contact Natural England data controller at: Foss House, Kings Pool, 1-2 Peasholme Green, York, Y01 7PX or email at: foi@naturalengland.org.uk

CONSENT FORM

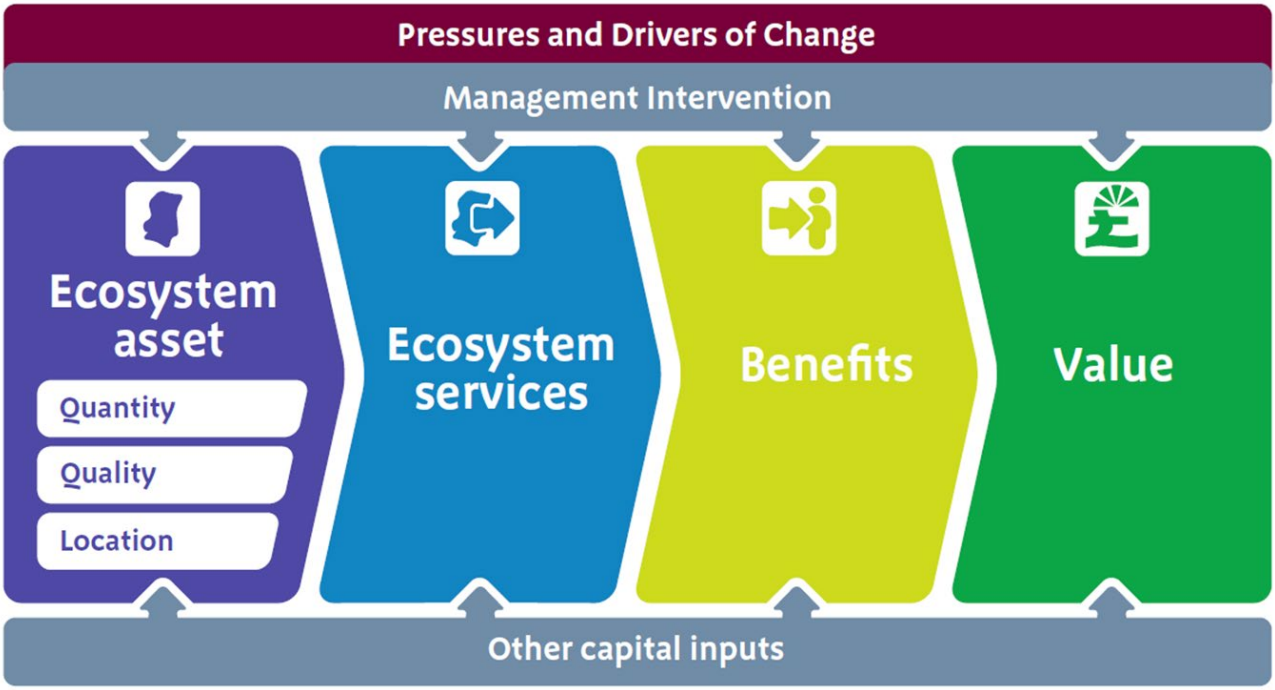
This is a consent form for the participation in an interview for the "**using a natural capital approach to support marine nature recovery"** project. The project aims to explore where and how marine restoration projects have been implemented in the UK and understand the societal benefits that have/could be achieved to support future policy development around marine nature recovery. We are particularly interested in exploring the experiences of those designing and delivering marine nature recovery projects in the UK.

We will be conducting interviews with key representatives from marine nature recovery projects across the UK.

Please complete this form and return to: helen.kendall@naturalengland.org.uk

	Declaration	Tick to confirm
1	I confirm that I have read the participant information sheet and that I understand the objectives of the research study. I have had the opportunity to consider the information, ask questions and clarify any doubts I have had regarding the project have been answered satisfactorily.	
2	I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason.	
3	I consent to the processing of my personal information (name, organisational affiliation, contact details and anonymised interview contributions) for the purposes of this research study.	
4	I agree for my contribution to the research to be recorded and transcribed.	
5	I understand that my research data will be fully anonymised and published as a scientific report for the funders Defra.	
6	I consent to the retention of my personal information (name, contact details, and anonymised interview contributions) for the duration of the "using a natural capital approach to support marine nature recovery" project (or for up to five years).	
I agree to take part in this research.		
Participant: **Name:** **Signature:** **Date:**		

Appendix 5: Natural England's Natural Capital Logic Chain, based on Potschin, Hayes & Young (2011)



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Catalogue code: NE44

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