Creating a Marine Net Gain Project Pipeline for the Southern North Sea

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INTRODUCTION

Jasmine and Sian; Marine Futures Interns hosted by Lincolnshire Wildlife Trust, and partnered with The Crown Estate, Ørsted and Natural England.

Our Task

We were tasked with creating a project pipeline for Marine Net Gain (MNG) in the southern North Sea. Over the past 5 months, we have constructed an example pipeline that could fulfil the future requirements of MNG. The 'Approach' section of our pipeline shows how a metric could be implemented to support the delivery of MNG. The 'Delivery' section of our pipeline includes project recommendations, providing inspiration for net gain interventions within the southern North Sea. This report acts as a guide to developers and policy makers, to assist the implementation of MNG policy. However, the project recommendations and conclusions are that of our own rather than the contributing organisations.

Acknowledgements

Thank you to those at Lincolnshire Wildlife Trust, The Crown Estate, Natural England, Ørsted and a host of other organisations for contributing towards this project. We greatly appreciate the time and support you have given us throughout the production of this report.

Credit: Sian Peace

TABLE OF CONTENTS

Chapter 1: Introduction **3**

What is Marine Net Gain? 4

Structured Conversations 7

Chapter 2: Pipeline **11**

Marine Net Gain Pipeline Description 12

MNG Approach Pipeline 14

MNG Delivery Pipeline 15

MNG Metric Suggestion 16

Strategic Interventions 17

Chapter 3: Intervention Methods **18**

Example MNG Delivery Pipeline 19

Potential MNG Projects 20

Seagrass 20

Native Oysters 22

Seaweed 24

Saltmarsh 26

Benthic Habitat and Species Restoration 28

Marine Birds and Mammals 30

Nature-Inclusive Design 31

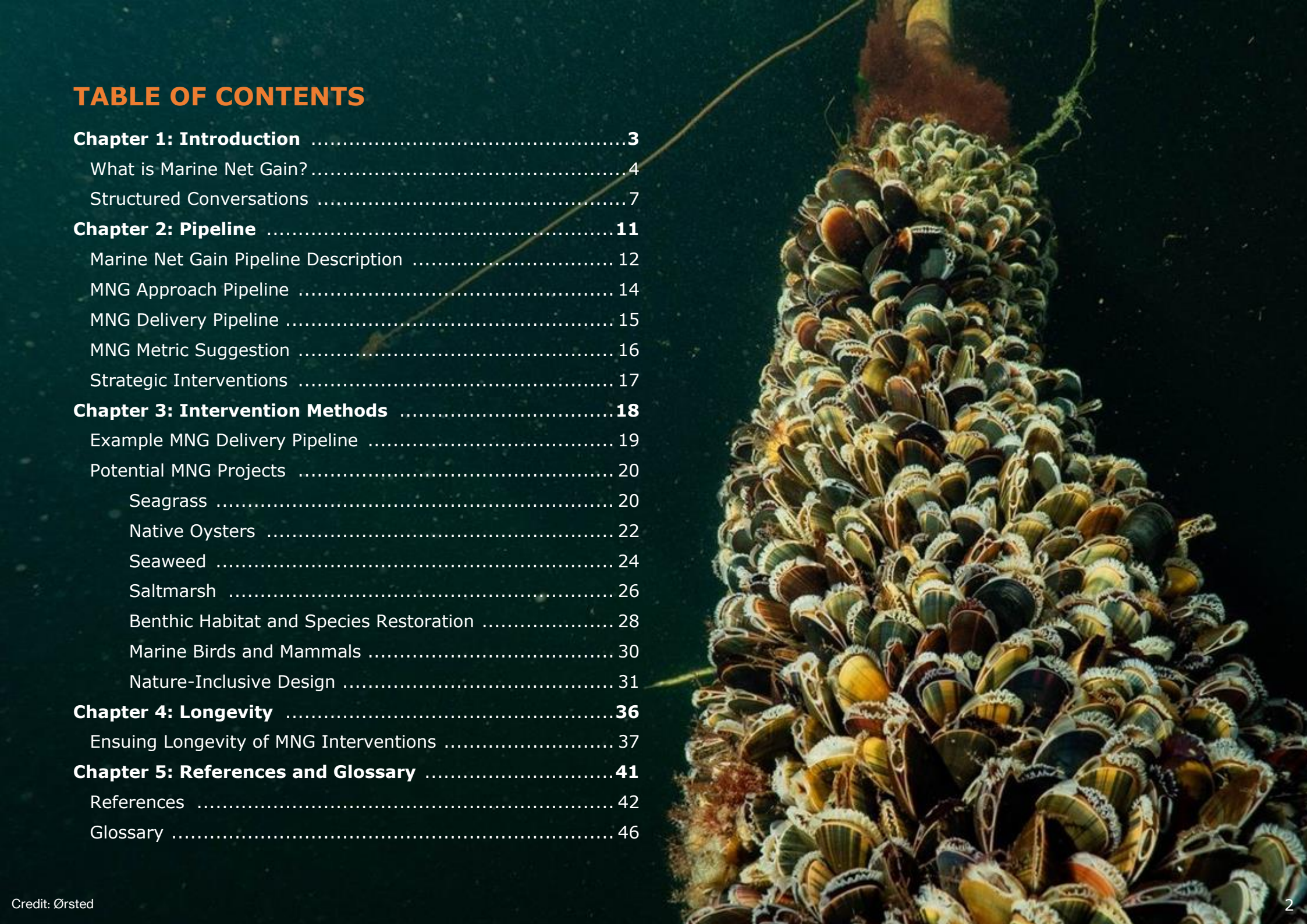
Chapter 4: Longevity **36**

Ensuing Longevity of MNG Interventions 37

Chapter 5: References and Glossary **41**

References 42

Glossary 46



Credit: Ørsted

CHAPTER 1

INTRODUCTION

What is Marine Net Gain?

How will Marine Net Gain differ from Biodiversity Net Gain?

Structured conversations to inform our pipeline

Credit: Ørsted

What is Marine Net Gain?

Net gain is an approach to development that aims to leave the natural environment in a measurably better state than beforehand. This means protecting, restoring, or creating environmental features that are of greater ecological value to wildlife, habitats and people than any losses associated with the original project (Defra, 2022).

Background

In 2018, the UK Government consulted on making Biodiversity Net Gain (BNG) mandatory for new development on land. The respondents suggested that net gain principles should be extended to marine developments, and in its 2019 response, the UK government stated that more work would be needed to define an approach to net gain that was appropriate to the marine environment.

The Department for Environment, Food and Rural Affairs (Defra) undertook a consultation that considers how best to introduce a net gain approach to developments within the marine environment.

The consultation contained the Government's aims and core principles for MNG policy, and sought views on whether to mandate net gain for marine developments, and, if so, the scope of MNG, and how MNG could be applied.

In March 2023, the government published a summary of the responses received. They stated that they would expect to publish their response to the consultation in summer 2023. In December 2023, the Government published their response to the consultation.

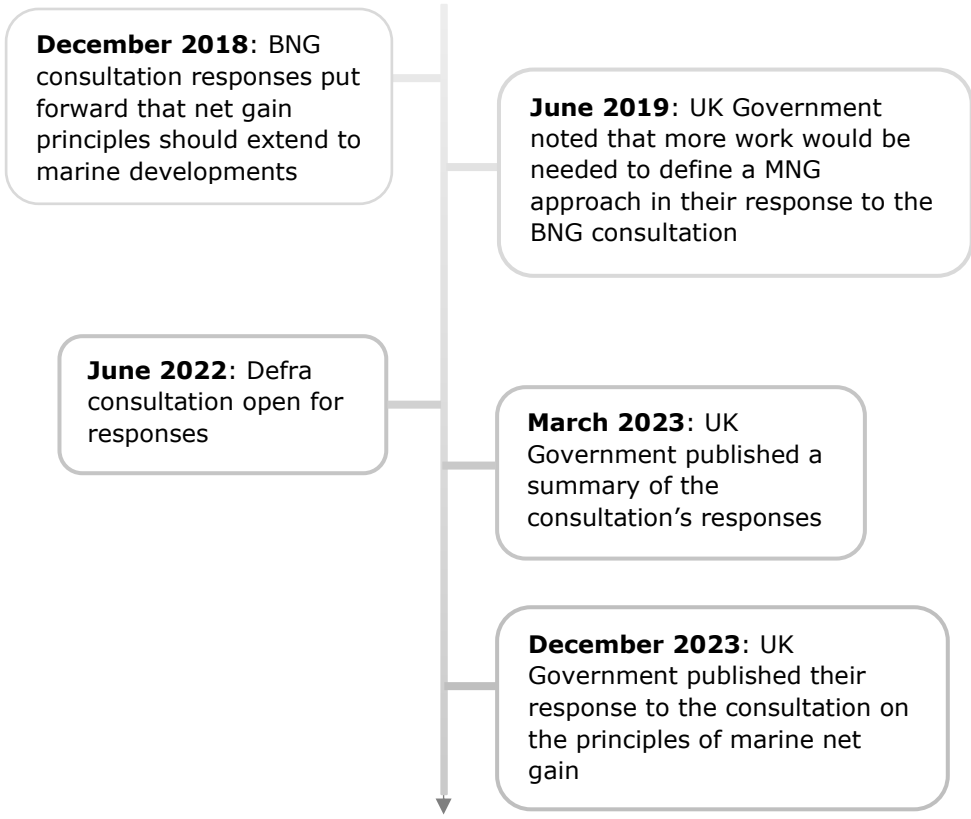


Figure 1. A timeline of the developments of MNG to date.

Defra's MNG Consultation and Response

The Government's MNG consultation (2022) sought views on the delivery of MNG, the scope, and how MNG could be applied. Our recommendations are based on the Defra consultation responses (2023a) and structured conversations we have had within the marine sector to design a pipeline that achieves the most successful outcome. This report's recommendations were finalised before the Government's response (2023b) to the MNG consultation, however our suggestions align with those highlighted within the response. As an example, the Government has clarified that MNG will require developers to consider the impacts on species as well as habitats, and in this report MNG interventions include species as well as habitats.

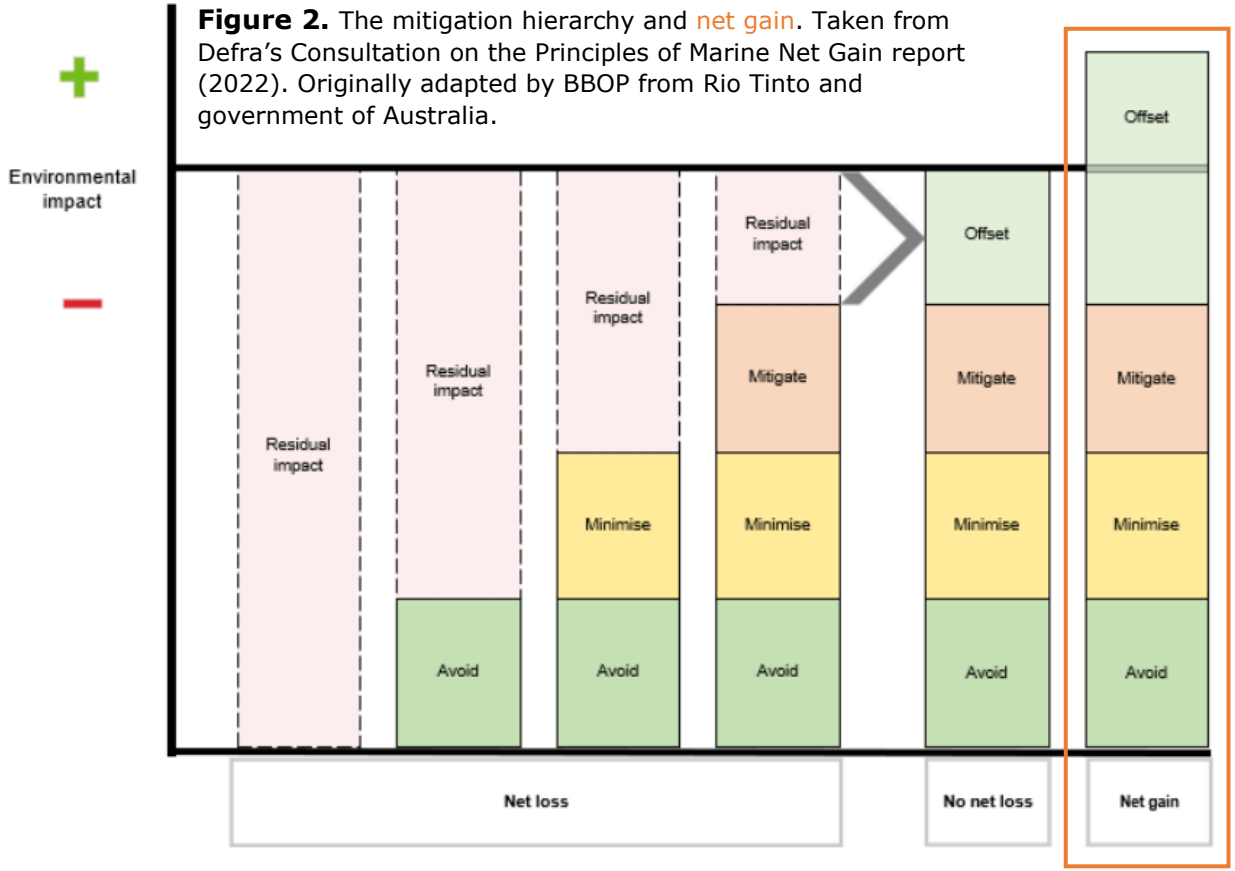


Figure 2. The mitigation hierarchy and net gain. Taken from Defra's Consultation on the Principles of Marine Net Gain report (2022). Originally adapted by BBOP from Rio Tinto and government of Australia.

The Mitigation Hierarchy

The final principles of MNG are yet to be determined, but what we do know is that MNG, similarly to BNG, will follow the mitigation hierarchy (Figure 2).

The mitigation hierarchy ensures that developers avoid, minimise and mitigate the residual environmental impact caused by their development where possible, before offsetting any remaining residual impacts to meet 'no net loss', and going above this threshold to achieve 'net gain'.

The amount of 'net gain' required for MNG is still to be confirmed. Throughout this report we are using a 10% net gain figure in our examples, as is used for BNG.

Biodiversity Net Gain

The current requirements for BNG state that a developer must provide a 10% biodiversity net gain to the environment. They must achieve this 10% net gain by either enhancing and restoring biodiversity on-site, delivering a mixture of on-site and off-site enhancements and restoration, or delivering BNG through the purchase of statutory biodiversity credits. Purchasing these credits is only an option when developers cannot achieve on-site or off-site BNG; it should be considered a 'last resort' (Defra, 2023c). Developers may use a combination of all three options, but must prioritise on-site in the first instance, followed by off-site and then credits. Following these three steps is called the biodiversity gain hierarchy.

BNG uses habitats as a proxy for biodiversity, and therefore does not take species into account. The statutory biodiversity metric tool was created as a way to measure the biodiversity value of habitats, calculating the number of associated units. The metric is used to calculate the units a habitat contains pre-development commencing, and how many units will therefore need to be delivered to achieve 10% BNG.

The Defra metric formula being used for BNG includes factors such as size, quality and location of habitats. When considering the creation or enhancement of habitats, the formula also includes multipliers accounting for difficulty of creation/ enhancement, predictions on time taken to reach the target condition, and distance from the habitat loss caused by development (Defra, 2023d).

How will Marine Net Gain differ from Biodiversity Net Gain?

Due to the marine environment's dynamic nature, the potential biodiversity impacts associated with an offshore development do not always fall within the boundary of the development. There is the potential that unlike BNG, MNG will not follow the biodiversity gain hierarchy, as on-site interventions may not always deliver the best environmental outcomes within the marine environment.

Therefore, extra consideration must be taken, to ensure that highly mobile species such as fish, marine mammals and seabirds, are accounted for when measuring the biodiversity of a marine environment. This may mean that, unlike BNG, MNG may include the delivery of interventions for species alongside habitats.

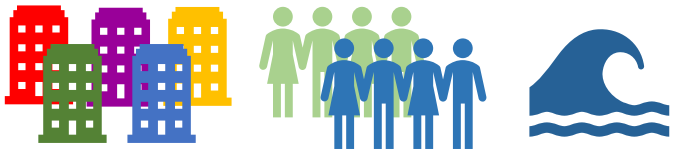
Because there are many differences between biodiversity in the terrestrial and the marine environment, it is important that the MNG policy is created from first principles, separately from the BNG policy used on land. However, BNG and MNG implementations need to be complementary to reduce burden on developers working in both the offshore and intertidal areas (as BNG is applied in the intertidal zones down to the mean low water mark).

It is not currently decided whether a metric will be used to measure net gain in the marine environment, and what multipliers might be needed within this metric to account for the differences highlighted above.

Structured Conversations

We interviewed representatives from five different organisations with interests in the marine environment, including industry bodies, consultancies, statutory bodies and environmental non-governmental organisations (eNGOs). We asked four questions to each of the representatives and here we present the summarised responses. Some responses contained more than one individual's comments, which is represented by multiple icons to the side of a response. These responses were used to guide the design of our MNG pipeline, to make the pipeline representative of the sector's wants and needs.

Who did we ask?



5 SECTOR-LEADING ORGANISATIONS

8 INDIVIDUALS

WITH DIFFERING POSITIONS AND RESPONSIBILITIES IN THE MARINE SECTOR

With a degree of **flexibility**. An overarching **strategic** approach, with **site-specific** intervention situations if this provides the better option.

Strategic level, through pools of funding to do something meaningful, which is critical for success in the marine environment, as long as needs are still considered at the right scale.

With a degree of **flexibility**, but prioritise **pressure removal** (that doesn't include displacement).

Strategic level, with **on-site** and **off-site** intervention options for developers. These on-site options need to prioritise **like-for-like replacements**. We need the inclusion of **research** and innovation too, allowing for new interventions to be explored.

Strategic level that is **flexible**, but is **simple** to follow and implement. Perhaps focussing on broad high-level ecosystem improvements. A **library of strategic MNG opportunities** could be produced.

Q1: What do you feel would be the best way to deliver Marine Net Gain?

Comparing strategic to developer-led interventions, and active interventions to pressure removal.

KEY TAKEAWAYS

The approach must be flexible. The consensus is that MNG should be approached strategically, with the option to implement developer-led site-based and off-site net gain interventions.

Strategic MNG should be done through pooled funding, controlled by an approved entity that sets clear criteria and objectives. This creates transparency for how the fund is used and delivers the best environmental outcomes.

There are contradicting opinions on the extent of how strategic the approach should be. Some believe MNG should be fully strategic, whereas others feel there should be the option for site-level projects, allowing developers to be innovative and take a lead.

Q2: What do you feel would be the best way to measure MNG? How do we recommend MNG interventions based off the size and type of development?

This must be resolved **in advance of the policy** becoming mandatory. MNG activities must be **easily monitored**, and show quantifiable benefits to marine biodiversity. Need to establish a **series of indicators** that could be **applicable beyond offshore wind**. MNG interventions need to be **proportionate to the impact** of the development/activity. E.g., an agreement for a cable may cover a relatively large area along the entire length of the cable, but if buried, the impact may be limited to a small area where it comes above ground.

A **metric-style approach** may be best to identify financial contributions for each project based on their impact. A portion of funding should go to **monitoring and reporting**, but this should be a maximum of 10%, otherwise there would not be enough money for actual restoration efforts, and we would just be monitoring any declines. All monitoring data should be made **publicly available** to improve best practise.

A **metric approach** would be best. A range of models should be made, where scenarios are put through them to find the most successful and liked model.

A **metric** that is similar to BNG in the intertidal, but slightly more simplified. The metric needs to include the type and quality of habitats with their **rarity** and **irreplaceability** within the region, and uses data from the relevant pressures. A **restoration database/portal** could ensure data on restoration projects is shared and proves developers have hit their MNG targets.

The simpler the better. There isn't a 'one-size-fits-all' metric, so there would need to be multiple to account for different types of developments. Condition could be removed from a metric, with the default position that the environment is in a bad/unfavourable state. Pilot projects could be used to try different approaches and test for the most successful metric.

KEY TAKEAWAYS

MNG interventions need to be proportionate to the impact of the development or activity. Monitoring and reporting net gain is necessary and the data needs to be made publicly available to improve best practise and prove developers have hit their targets.

The different options to measure MNG are currently being investigated. If a metric approach is taken, it should be applied to existing developments to test for validity.

Q3: Do you feel that MNG interventions should always be reflective of the site affected by development, or do you feel an off-site large-scale restoration project could also work?

Ideally a **like-for-like** intervention would be the optimum. However, there are many factors in the marine environment that mean this may **not always be practicable**. Especially when implementing habitat creation/restoration activities. **Large-scale, more strategic** interventions could definitely work, and may offer better environmental outcomes.

MNG should not be staunchly tied to direct impacts as it is important that opportunities are not missed. However, MNG measures should be a) **satisfying a regional need** that has been identified b) **additional** and c) **sensitive** to existing habitats and species i.e., ecosystem approach.

We need to be **flexible** and have a **range of options.** Both are important.

There should be a **tiered approach** and consideration for both onshore and offshore. But on the whole, **pro larger strategic projects**.

Strategic large-scale projects should be prioritised, which can be achieved through pooled funding. A strategic approach simplifies the process for the developer. A like-for-like approach may be restrictive.

KEY TAKEAWAYS

All support larger, strategic projects that will likely offer better environmental outcomes. This is development dependent, as decisions on what projects to undertake should be determined by which deliver the best environmental outcomes for each development.

It is not unanimous whether interventions should always be reflective of the site affected by development. The consensus seems to be that MNG will work as long as it is additional, satisfying regional needs and has an ecosystem approach. The approach will likely depend on the upcoming Defra policy.

Within our pipeline, we have not suggested that the developer needs to prioritise site-reflective delivery, and MNG intervention decisions should be taken in the approach that gives the best environmental outcomes.

Q4: Do you feel that using a combination of interventions is the best way to deliver MNG? And does this potentially help to ensure success in delivering MNG?

Yes. A **combination** of different types of intervention will be needed. Realistically, Defra probably won't be overly restrictive in the MNG policy/guidance to limit developers to one type of intervention. Agree that **'not putting all your eggs in one basket'** may be a good way to help ensure successful MNG outcomes.

Yes. This will be key for **encouraging innovation**, which is one of the major hopes for MNG.

Yes. A combination is necessary.

Yes. However, smaller developments may only be able to deliver smaller projects which do not require the use of multiple net gain interventions. Species interventions need to be looked into more closely too, and there is the need to measure impacts and benefits to species.

Yes. A combination allows you to be **riskier** and have the potential for bigger gains for nature; however, we must be **holistic** in the way we approach it.

KEY TAKEAWAYS

A combination of MNG interventions may be the best option. Where a combination of interventions is used, it may encourage innovation. However, using a combination should not be a requirement, especially in the case of small developments.

Within our pipeline, there is the option for a combination of interventions to be stacked together to ensure MNG targets are reached.

To create a pipeline that encompasses the wants and needs of a range of marine sectors, we have pooled the responses together, discovered and discussed the similarities and differences in viewpoints, and created key takeaways that have guided the design of our MNG pipeline.

Credit: Ryan Peace

CHAPTER 2

MARINE NET GAIN PIPELINE

Approach Pipeline

Delivery Pipeline

MNG Metric Suggestion

Marine Net Gain Pipeline

Our pipeline is split into two parts: the **Approach Pipeline** and the **Delivery Pipeline**. Our pipeline is only hypothetical and we acknowledge that it is simplistic. However, it visually demonstrates a potential route for MNG implementation, that we endorse. Our recommendations are a result of the analysis of the perspectives of those currently working within various marine sectors.

The Approach Pipeline

Firstly, the developer would need to produce their plans to fulfil the requirements of the Mitigation Hierarchy. This is current legislation, and as a result the environment should be back to the state it was in before the development occurred. It is important to emphasise that MNG interventions should be considered within Mitigation Hierarchy plans. Not only does early MNG consideration likely enhance net gain longevity, it could save developers time and money in the long-term.

Once these plans are in place, using a MNG metric, the marine biodiversity net gain unit requirement can be calculated for that development. A metric approach was suggested by us as it allows the unit requirement to be proportionate to the development's impact. This was highlighted as important in the structured conversations, and ensures fairness for developers.

*For more on the metric, go to page **16**.*

The developer has the option to choose solely site-level interventions, strategic interventions, or a mixture of both. We felt that the inclusion of site-level interventions within the pipeline was important, as it creates the opportunity for innovation from developers. This may also lead to an expansion of pilot projects within offshore zones, where there is currently a lack of tried and tested approaches.

If the developer wholly or partially takes the site-level pathway, they can either choose from a list of MNG intervention options within their development's Marine Plan Area, or propose a pilot project that will require approval. A Marine Plan Area contains the available projects in a defined region. In this report, the southern North Sea is used as an example. However, if this approach is adopted, in practise there would be six different Marine Plan Areas in England as defined by the MMO.

The chosen interventions are then put into the metric. The developer must deliver projects with post-intervention units that are equal to or more than 10% of their impact. This figure was chosen as a minimum of 10% net gain has been proposed as the threshold to achieve MNG. The developer's choices and plans will need approval from an environmental body before commencing to ensure that environmental considerations are in effect. A monitoring plan would also be required.

If the developer wholly or partially takes the strategic route to deliver their MNG, their development's unit requirement, as calculated by the metric, should be changed to a cost equivalent. The calculated funds would

be pooled into a strategic, managed by the appropriate body, with inputs from partnership organisations. Funds could be used to implement both large-scale and pilot projects. The strategic approach may be the best option for quantifiable, large environmental gains. Decisions on how the unit requirement would be converted to a cost equivalent would need to be made. These decisions should be undertaken collaboratively with input from the Government, regulators, Statutory Nature Conservation Bodies, industry, eNGOs, etc.

The inclusion of a restoration database allows for transparency regarding MNG projects. A restoration database could display each development's MNG plans, the funding decisions and monitoring data. The database would allow anyone to see what projects are currently being conducted or have been completed. Developers may feel inspired by the existing projects and interventions posted on the restoration database, leading to innovation in the sector.

The Delivery Pipeline

Once the approach of strategic and/or site-level has been chosen, the developer can refer to the Delivery Pipeline to decide what kinds of interventions they would like to undertake. Some examples of habitat focused restoration and recovery interventions are shown in the Delivery Pipeline on page 15. If the metric is showing a high unit requirement, a combination of interventions may be necessary, and therefore multiple pathways will need to be followed on the Delivery Pipeline.

Credit: Jasmine Brown

MNG will apply to offshore wind farms. Our pipeline is an example of the steps a developer could take to fulfil their MNG requirement.

Figure 3.
MNG Approach Pipeline

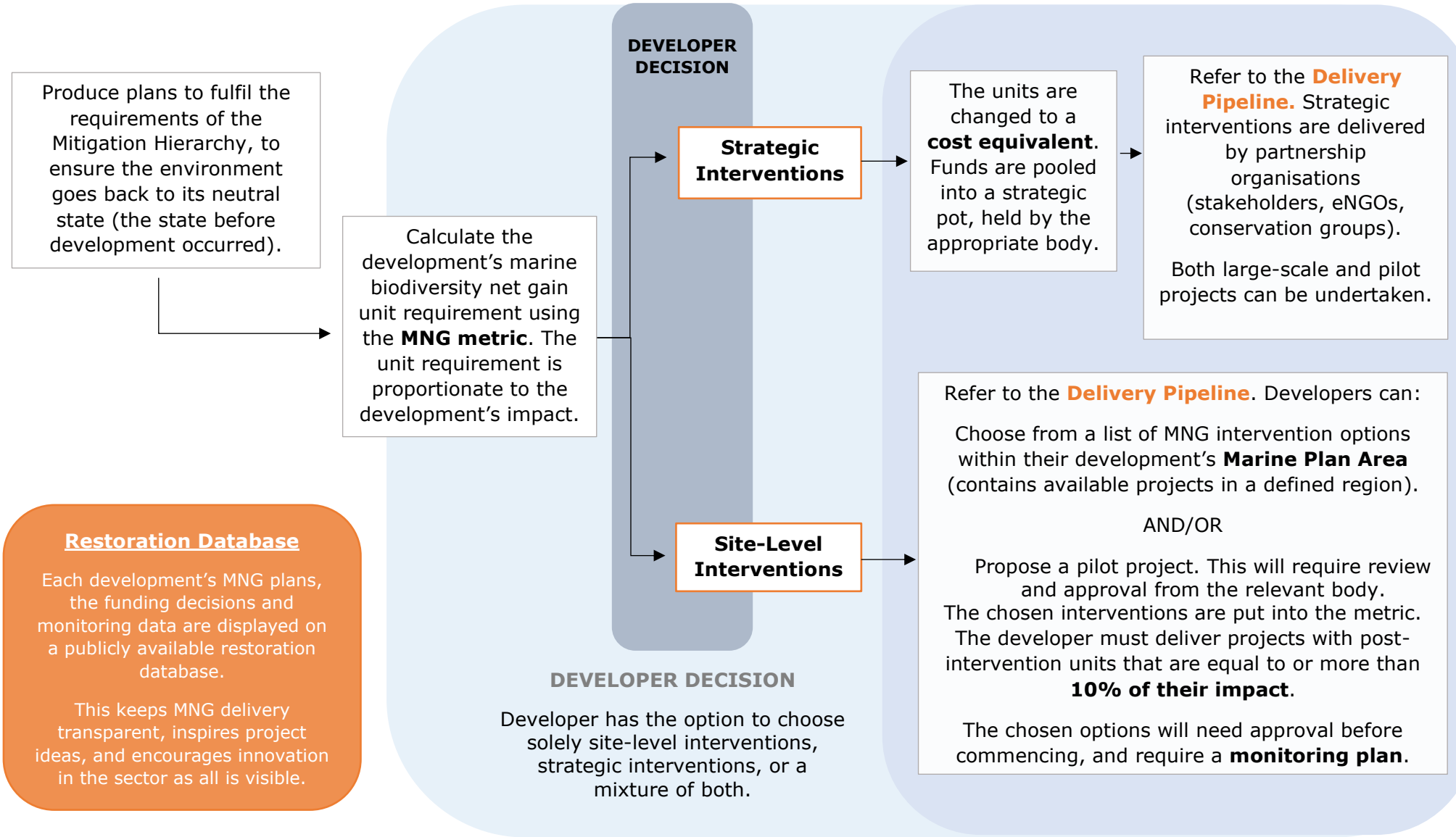


Figure 4.
MNG Delivery Pipeline

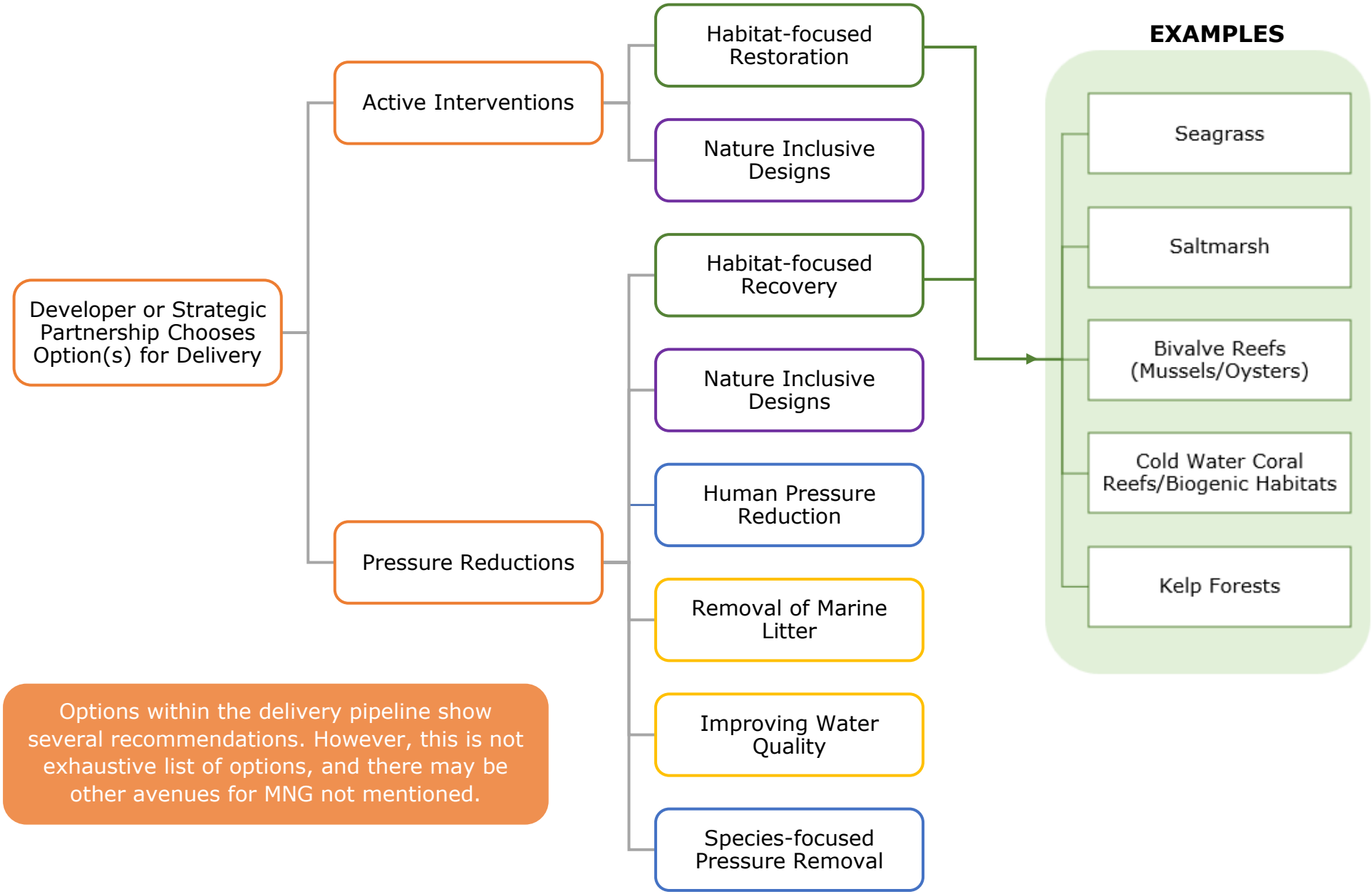


Figure 5.
MNG Metric

Metric Inspired by ABPmer's White Paper, Marine Net Gain: Moving towards a practical framework and metric for the marine environment (2019).

Calculating Project Net Gain

The metric is applied to the development area pre-construction and predictions are made for post-construction to assess impact. Select X number of habitats from a basket of measures (depending on scale of development).

Metric:

Habitat Area x Rarity x Condition

MNG Metric

Habitat Area: Areas impacted by the development.

Rarity: Habitats will be given a score relating to the rarity (considering overall rarity, and rarity regionally). Irreplaceability of habitats should also be considered within these scores.

Condition: Surveys undertaken within the scoping process will determine the condition. Default figures may be used for some habitat types. For example, if it is known that the habitat is in poor condition.

Once calculated, the developer must deliver projects that provide post-intervention units that are equal to or more than 10% of their impact. Units may either be used in a units-for-units approach, delivered by developers, or can be equated to a monetary value for a strategic restoration project.

Using the Net Gain Units calculated, a developer can then see the number of units their interventions are required to deliver in order to provide a minimum of 10% biodiversity net gain.

Metric applied to area pre-intervention:

Habitat Area x Rarity x Condition

Metric applied to area for post-intervention predictions:

Habitat Area x Rarity x Condition x Risk Multipliers

Examples of Risk Multipliers

Delivery Risk: Associated with uncertainty surrounding intervention techniques. For example, tried and tested methods with 100% success rates would have a delivery risk of 1 (there is no risk). Novel restoration methods will have delivery risks of < 1.

Temporal Risk: Adding a timescale-based multiplier to the metric to ensure an intervention meets it's aims within the predicted timeframe. If the intervention takes longer than the predicted timeframe, the associated units will decrease.

Multipliers may be included or excluded depending on intervention method.

STRATEGIC INTERVENTIONS

What is a Strategic Intervention?

A strategic intervention is one delivered with the aims of hitting a target set by a partnership of organisations. The goal of the strategic approach is to identify what interventions will be most beneficial for the environment, with consideration to marine spatial planning. Marine spatial planning will assist in the delivery of MNG, as areas with the best potential for active interventions and pressure removals within the seascape can be identified and targeted. Spatial planning may also lead to co-location of projects, ensuring that the marine space is used in the most efficient way.

The Offshore Wind Evidence and Change Programme's Task and Finish Group (T&F Group) have published reports setting out Strategic Net Gain Targets, and potential delivery options. This work was completed through a collaboration between organisations such as Defra, Energy UK, Natural England, Renewable UK, RSPB, SUDG, The Crown Estate, The Wildlife Trusts and UK Major Ports Group.

Using a partnership like this to identify MNG targets and projects allows for holistic agreements to be made, with considerations for all sea-users.

Strategic Funds

Financial contribution from developers could be used to fund priority environment enhancement or restoration projects. One way of doing this, could be to use something similar to the Marine Recovery Fund.

Creating a pot of funding, held by a partnership with the appropriate knowledge and connections to deliver the interventions would allow for the best application of funding. A partnership allows for group decisions to occur similarly to those made by the T&F Group. The inclusion of environmental experts within these partnerships is vital, ensuring that the environment is prioritised during decision-making.

Inclusion of Pilot Projects, Research and Monitoring

A small percentage of the funds should go towards pilot projects and research, in order to identify new areas with restoration potential and develop new habitat creation/enhancement techniques. Although these projects may not deliver biodiversity net gain initially, the findings from these projects may feed into MNG projects in the future. They should therefore be included alongside 'tried and tested' interventions.

Alongside this, a small percentage of the strategic funds should go towards monitoring within the marine environment. However, it should be emphasised that only approximately 10% of the funds should be used for monitoring, so that the majority of funds are being used to benefit marine recovery.

CHAPTER 3

MARINE NET GAIN INTERVENTION METHODS

Habitat-focused Restoration and Recovery

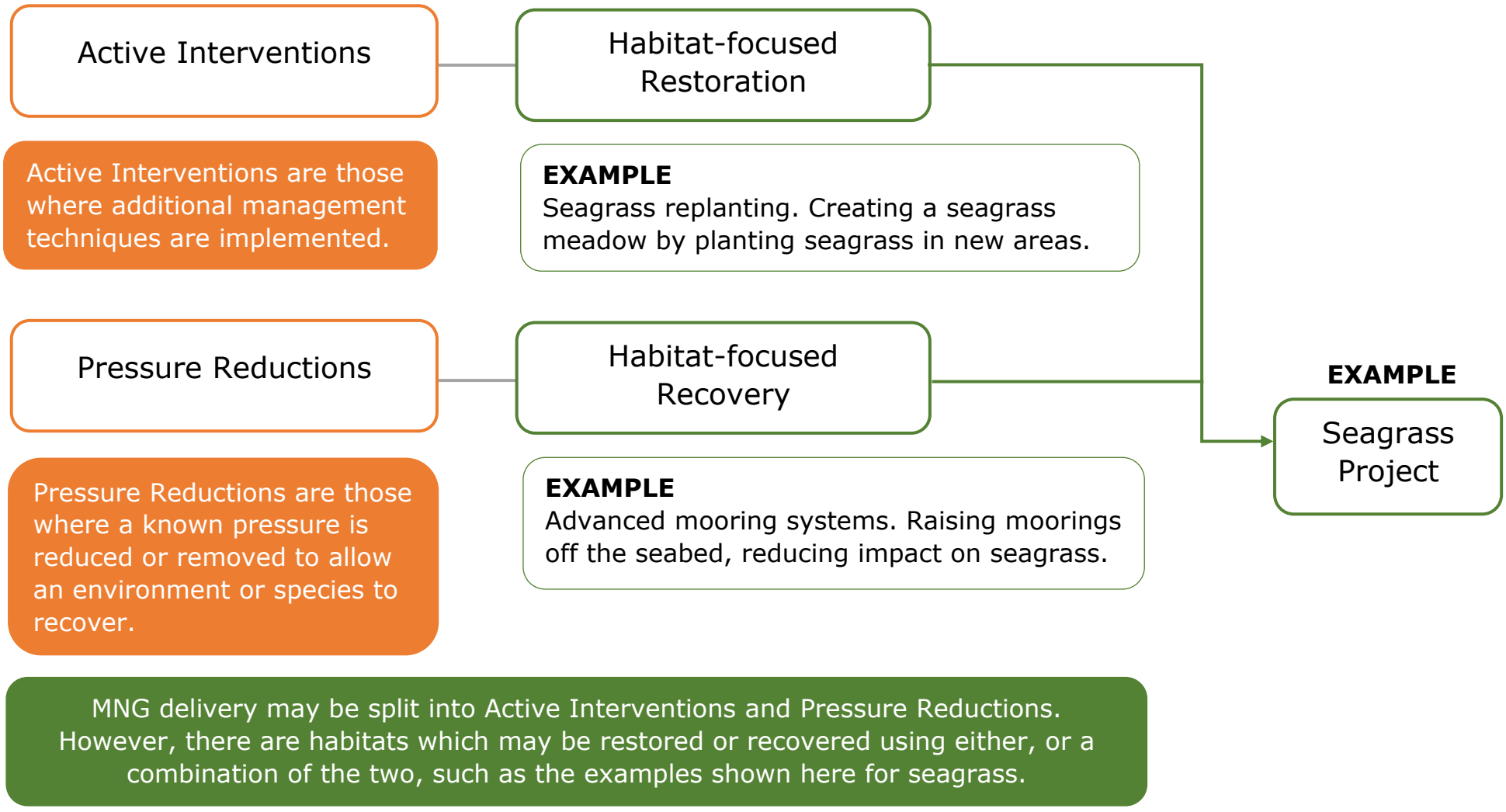
- Seagrass
- Native Oysters
- Seaweed
- Saltmarsh

Benthic Habitat and Species Restoration

Marine Birds and Mammals Recovery

Credit: Ørsted

Figure 6.
Example Marine Net Gain Delivery Pipeline



An Introduction to Potential Projects

The Delivery Pipeline highlights various avenues MNG may take. In order to show how MNG may be implemented, examples of potential projects that could benefit marine habitats and species have been outlined in pages 20-35.

SEAGRASS

How can Seagrass Provide a MNG?

Seagrass (*Zostera*) is an incredible natural carbon capture store, and can therefore act as a great nature-based solution in combatting climate change. Seagrass meadows act as carbon sinks, with the ability to capture carbon 35 times faster than tropical rainforest (WWF). They also act as a nursery for several marine species, can help stabilise sediment on the seabed, and assist in improving water quality (Project Seagrass).

Box 1: Wilder Humber

Ørsted are currently funding a seagrass restoration project (as part of the Wilder Humber programme, implemented by Yorkshire Wildlife Trust), where they are hoping to restore 30ha of seagrass habitat.

Prior to this, they tested for site suitability in various areas. Shortlisted broadscale areas were the Humber, the River Stour & Orwell, and The Solent and the Isle of Wight. Spurn Head in the Humber had the highest site suitability, followed by Jacques Bay and Nacton in the River Stour & Orwell (Ørsted, 2022a).

Techniques for Seagrass Restoration

At present, the main seagrass restoration techniques are reseeding and replanting of adult shoots (Seagrass Restoration Handbook, 2023). Reseeding requires the collection of wild seed, which is then redistributed to targeted restoration areas. Replanting is the harvesting of plants from an existing bed, which are then transplanted to a restoration site.

Potential Seagrass Restoration Projects in the Southern North Sea

The Environment Agency (EA) (2020) mapped potential seagrass areas (Figure 7), using wave and current energy models. Within this, they considered the turbidity of waterbodies and salinity. The areas highlighted in green on the greyscale map show areas with seagrass potential. Alongside this highlight Natural England have created maps identifying existing seagrass habitats. These maps highlight both presence of seagrass and restoration potential for seagrass in the River Stour and Orwell.

As Cleethorpes, the River Stour and Orwell, the Wash, and Blakeney are highlighted by the EA as areas with seagrass potential, site suitability should be tested and pilot projects for seagrass restoration/expansion could be applied here.

Figure 7. Seagrass Restoration Potential Map (Environment Agency, 2020).

Alongside Spurn Head, Jacques Bay and Nacton (in the River Stour and Orwell) also scored highly in site suitability tests conducted by Ørsted. It could be recommended that seagrass restoration projects expanding on the project at Spurn Head, or developing pilot projects at Jacques Bay and Nacton could be delivered as MNG restoration interventions.

Depending on location, different techniques might be used for restoration. In areas like Blakeney and the River Stour and Orwell, there are already existing seagrass meadows, therefore there is the option to replant or reseed off using these populations. However, this may impact the donor bed, so precautions must be taken to avoid losing the existing habitat.

Pressure Reduction

Traditional anchoring and mooring systems can cause damage to seagrass habitats when chains drag along the seabed. Using alternative mooring gear, such as an advanced mooring system, may also provide a biodiversity net gain. In a joint project by the Ocean Conservation Trust and Marine Conservation Society at Cawsand Bay there was a 212% increase in seagrass cover following the installation of an advanced mooring system (Marine Conservation Society). Advanced mooring systems with subsurface buoys attached to the chain allow for it to be elevated off the seabed.

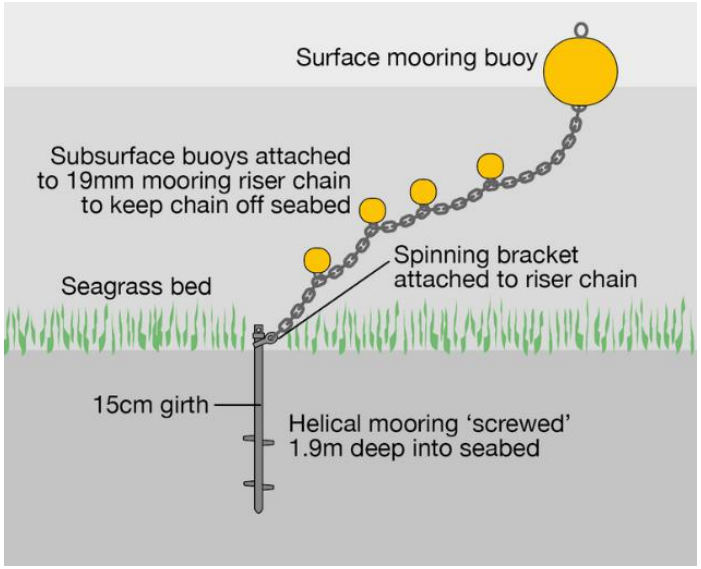


Figure 8. Advanced Mooring System Infographic. Taken from Marine Conservation Society.

NATIVE OYSTERS

How can Native Oysters Provide MNG?

Native oysters (*Ostrea edulis*) are filter feeders, using their gills to feed on phytoplankton and remove excess nutrients within the water. Adult oysters are capable of filtering 200 litres of water per day, which can assist in improving water quality (Preston et al., 2020). The habitats provided by oysters are also great at supporting crustaceans and sponges, and provide a nursery habitat for fish. Restoring native oyster habitats will therefore play a role in improving biodiversity.

Techniques for Oyster Restoration

Oyster restoration can occur through various methods. Native Oyster Network and the EA produced a '[European Native Oyster Habitat Restoration Handbook]' (2020) which highlights the successes, benefits and considerations of these different methods. The methods highlighted within the handbook include on-bottom, off-bottom, and intertidal methods. On-bottom methods are those which involve depositing a cage or concrete structure onto the seabed. Off-bottom techniques are those where oysters are suspended above the seabed. Intertidal methods may encourage settlement within intertidal zones, or may be an initial phase before the deployment of adult oysters onto reefs (Box 2).

Box 2: Wilder Humber

At present, there are various oyster restoration initiatives happening around the UK's coastlines.

Projects like 'Wilder Humber' are growing oysters within trestles in the intertidal, measuring their growth, and collecting data from die-offs to ascertain whether an adult population could successfully live within the Humber estuary. Once the oysters have reached an optimum size within their trestles, they will be released and relayed at several sites across the Humber. This should form the foundations of an oyster reef.

Potential Oyster Restoration Projects in the Southern North Sea

Nature England published a report entitled '[Marine Restoration Potential (MaRePo)]' (2023), where they investigated historic, current and potential areas for habitat restoration potential. This work was done in partnership with the EA, and supported by The Crown Estate through the Offshore Wind Evidence and Change Programme. Within this report, they targeted key threatened subtidal habitats, as defined by the OSPAR convention.

The MaRePo report highlighted that there are limited records of the current distribution of native oysters. The current (2010-2022) records are predominantly for the south coast and absence was inferred by a lack of presence. Their maps showed no native oyster habitats currently present within the Southern North Sea. The current distribution maps produced for MaRePo exclude areas

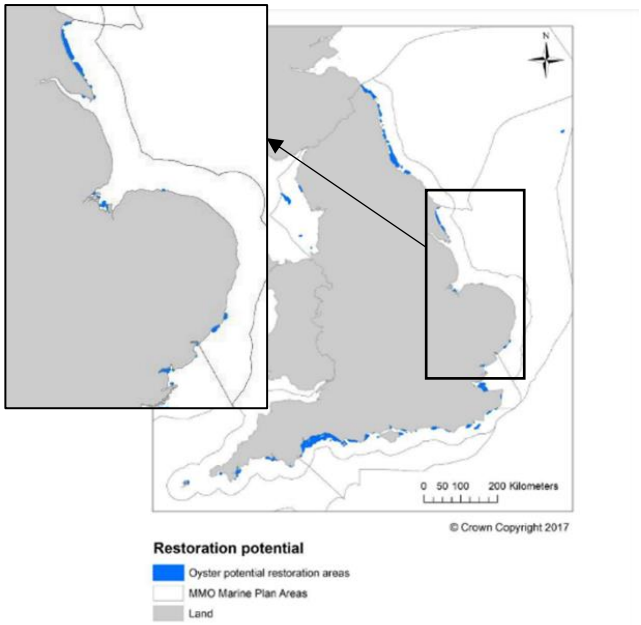


Figure 9. Modelled habitat restoration potential areas of *Ostrea edulis* in English waters (MaRePo, 2023).

of recent native oyster restoration and reintroduction such as the Essex Native Oyster Restoration Initiative in the Blackwater Estuary and Wilder Humber in the Humber Estuary.

The MaRePo restoration map for native oysters showed potential for restoration along the coastline from Flamborough to the Humber estuary (Figure 9). It also highlights opportunities for restoration in The Wash, at Blakeney National Nature Reserve (Norfolk) and on parts of the Suffolk coast. Natural England have suggested that following the creation of these maps, testing the viability of restoration zones with on the ground pilot studies would be beneficial.

Additionally, the European Native Oyster Habitat Restoration Handbook provides guidance for the best areas to deliver oyster restoration. This handbook highlighted abiotic and biotic habitat suitability characteristics, and also the delivery of oyster restoration within Marine Protected Areas (MPAs).

"For native oyster restoration in Marine Protected Areas, most restoration will take place on the seabed in areas of A5.4 Subtidal mixed sediments" *European Native Oyster Habitat Restoration Handbook (2020)*

Marine Conservation Zones (MCZs) within the southern North Sea which are designated for A5.4 Subtidal mixed sediments are Cromer Shoal Chalk Beds, Holderness Inshore, Holderness Offshore, Markhams Triangle, and Orford Inshore. Blackwater, Crouch, Roach and Colne Estuaries MCZ is designated for Native oyster (*Ostrea edulis*) beds.

Additionally, Special Areas of Conservation (SACs) within the southern North Sea which have Estuaries, Large Shallow Inlets and Bays or Subtidal Sandbanks features may include A5.4 Subtidal mixed sediments as a sub feature. SACs with the above features include The Wash and North Norfolk Coast (Large shallow inlets and bays feature), Essex Estuaries, Alde, Ore and Butley Estuaries (Estuaries feature).

Restoration of oysters within the areas highlighted by the MaRePo maps, or MPAs with A5.4 Subtidal mixed sediments may be considered for a MNG project. Where MPAs are considered, it is important that the restoration of a native oyster habitat would not adversely impact the designated features, or impede the aims of the MPA. There may also be viable areas for oyster restoration outside of those listed within this report.

SEAWEED

How can Seaweed Provide a Marine Biodiversity Net Gain?

Kelp is the largest subgroup of seaweed, and is not only being explored for its potential as a carbon sink, but for its ability to contribute towards biodiversity. Kelp acts as a platform for epibiota to grow upon, and creates shelter for juvenile fish. The presence of fish may also attract those higher up the food chain, like seabirds and marine mammals.

Techniques for Kelp Restoration:

Similarly to seagrass restoration, active kelp restoration can occur through transplanting or seeding. Considerations on the existing habitat must be taken into account too. For example, where there is no existing natural substrate present, artificial reefs may need to be introduced (Layton, 2022).

Where kelp habitats are already present, pressure removal techniques may be used to assist kelp in regrowing naturally. The 'Kelp Restoration Guidebook' (2022) can be used for assistance in choosing the best restoration method/ technique.

Box 3: SeaGrown and The Sussex Kelp Recovery Project

SeaGrown and Ørsted have partnered to explore the biodiversity benefits of seaweed cultivation. They are researching the biodiversity within farmed and unfarmed seaweed habitats, which will enable them to suggest how to enhance biodiversity best in future.

The Sussex Kelp Recovery Project is an example of a kelp restoration project. Following the introduction of the Sussex Nearshore Trawling Byelaw, the nearshore seabed is now protected from bottom-towed trawling. The project aims to support and monitor the natural recovery of kelp in Sussex, to assess the need for and feasibility of active kelp restoration.

Potential Kelp Restoration Projects in the Southern North Sea:

The MaRePo maps for kelp focus on two species: *Laminaria hyperborea* and *Saccharina latissima*. Their maps

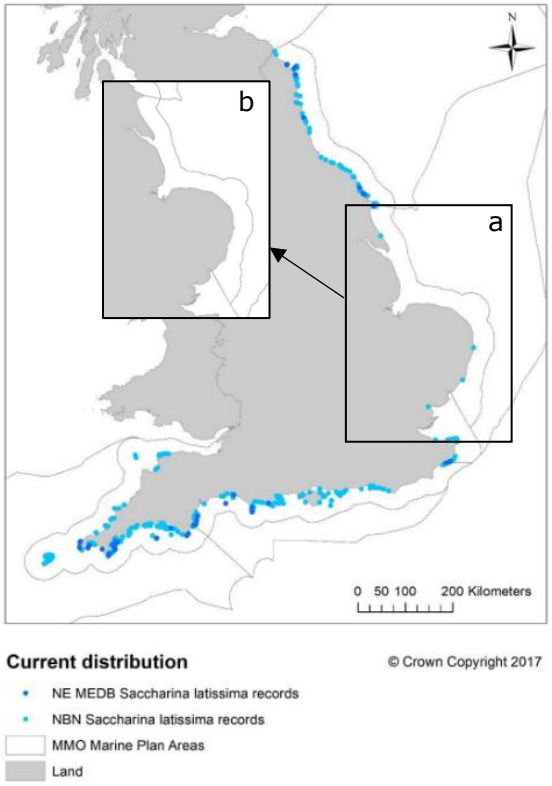


Figure 10. Modelled current distribution (a) compared to habitat restoration potential areas (b) of *Saccharina latissima* in English waters (MaRePo, 2023).

showed that there were no areas with restoration potential for *S. latissima* within the southern North Sea (Figure 10).

The MaRePo maps showed that there is the opportunity for *L.hyperborea*

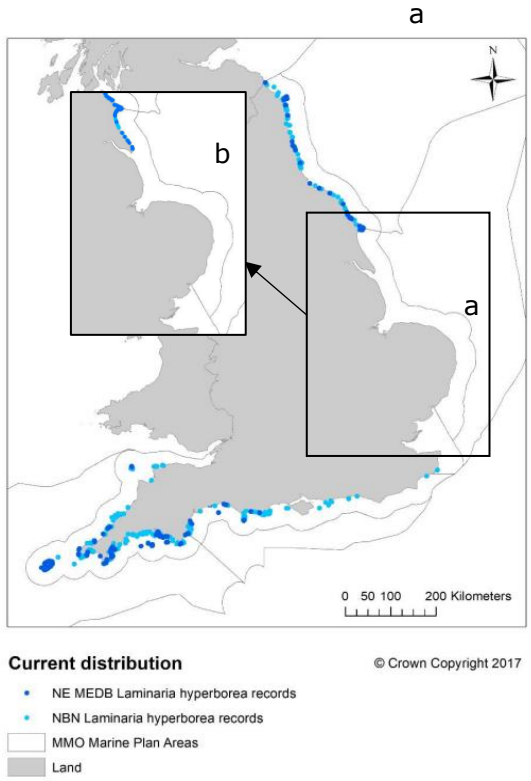


Figure 11. Modelled current distribution (a) compared to habitat restoration potential areas (b) of *Laminaria hyperborea* in English waters (MaRePo, 2023).

to expand its range into the southern North Sea by restoring this species along the coast from Flamborough to Spurn Point (Figure 11).

MaRePo did not map the current distribution and restoration potential for *Alaria esculenta*, *Laminaria digitata, Laminaria ochroleuca* and *Saccorhiza polyschides* species. So there may be restoration potential for these species of kelp elsewhere.

There is also the potential for kelp restoration to occur in co-located areas, such as offshore wind farms. In a report by Patrick Estirdge, entitled '[Co-locating seaweed farming alongside offshore wind]', it was also stated that Ørsted and SeaGrown's partnership aims to incorporate seaweed farms within floating offshore wind farms in the future. This could positively impact the biodiversity at a site-based level. Co-location may also create opportunity for an additional income stream for developers.

Pressure Reduction

Alongside the active restoration methods, pressure reductions may allow existing seaweed habitats to recover. The Sussex Kelp Recovery Project is a good example of this (Box 3), where byelaws are preventing bottom-towed trawling. This will allow the kelp forests to recover naturally, but active restoration methods may be done alongside this to compliment the recovery. Developers may be best placed to implement active restoration methods to compliment these byelaws.

A habitat exhibiting a mixture of seagrass and seaweed. Picture taken on the East Coast, UK. Credit: Sian Peace

SALTMARSH

Saltmarsh carbon uptake and storage capacity is among the highest of any habitat. These "blue carbon" habitats are carbon sinks and provide many ecosystem services. For example, they maintain biodiversity by providing essential habitats for many organisms, including fish and migratory and wading birds, protect shorelines against storms by providing tidal storage, and act as natural pollution filters.

How can Saltmarsh Provide a Marine Biodiversity Net Gain?

Over recent centuries, in England we have lost 85% of saltmarsh (Environment Agency, 2023). Therefore, there is a huge potential to recover this lost habitat, which could be delivered through MNG interventions. As saltmarsh provide essential habitats, reinstating or creating saltmarsh will increase biodiversity in a region. Alongside the biodiversity gain, its addition would bring a heap of other ecosystem benefits, including atmospheric carbon dioxide reduction. If 15% of England's current saltmarsh extent was re-established or created, this could store an additional estimated 2.25 million tonnes of carbon once the habitat is fully established (Burden et al., 2019).

Saltmarsh Potential Habitat Creation Sites in the Southern North Sea

Figure 12 shows the potential saltmarsh habitat creation sites using realignment and/or regulated tidal exchange techniques in the southern North Sea. Note that these sites only indicate the theoretical potential suitability for restoration. This does not indicate that land is actually available or restoration is desirable to communities or the environment in these locations, however, it gives examples of saltmarsh suitability and shows areas of potential saltmarsh restoration that are available for MNG. We are also making the assumption that MNG interventions could be delivered in the intertidal zone, which has not been established yet.

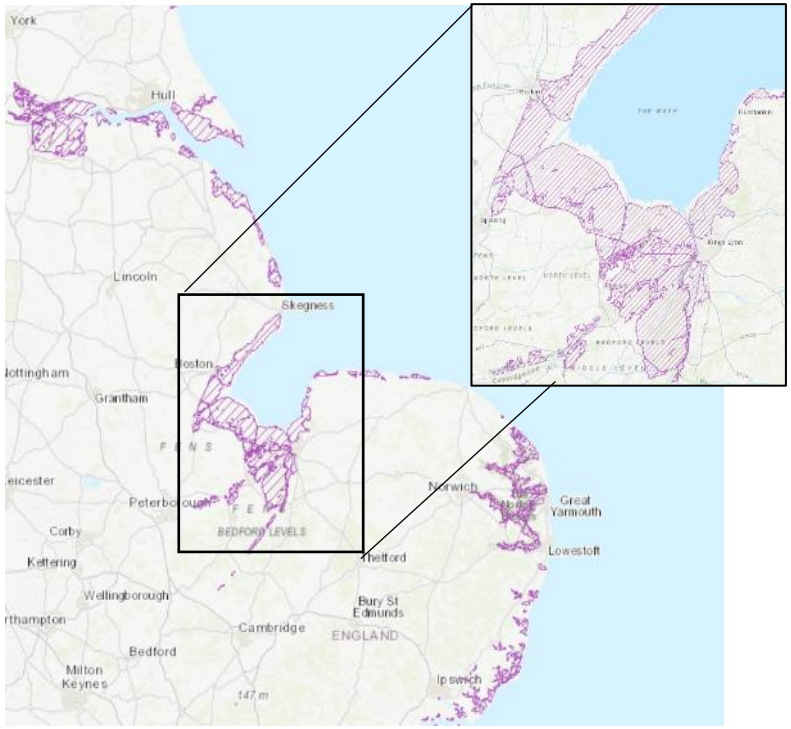


Figure 12. The MMO's mapped sites of saltmarsh potential habitat creation sites within floodplain, using ArcGIS. The zoomed in region is of The Wash.

Having potential saltmarsh creation sites of different sizes gives huge flexibility and ease to fulfilling MNG

requirements, fulfilling a range of unit requirements. For example, a development with a small MNG requirement could choose to restore a small sized site of potential saltmarsh creation, and a developer who had a larger MNG requirement due to larger environmental impacts associated with their development, could choose to restore a larger site of saltmarsh in The Wash (Figure 12). Developers also have the availability to go above and beyond their requirements if they wish to (e.g., out of good will to protect the environment, which they can promote) as site size is flexible.

Current Saltmarsh Restoration Projects

There are many saltmarsh projects on-going currently, at different scales and at different stages. There is evidence of business investment directly to saltmarsh; Aviva has partnered with the Wildfowl & Wetlands Trust (WWT) on an innovative saltmarsh creation project that is one of the largest in the UK, donating £21 million to WWT to restore up to 250 hectares of saltmarsh (WWT, 2023). Ørsted's Wilder Humber programme is another example, trialling a "seascape-scale" model, combining saltmarsh restoration with sand dune, seagrass and native oyster restoration to maximise conservation and biodiversity benefits across the estuary (Ørsted, 2022b).

Smaller scale projects are also taking place, such as Essex Wildlife Trust and the EA's experimental, low-cost pilot project that involves installing coir structures within selected creeks to encourage sediment accumulation and plant growth, protecting the saltmarsh habitat (Essex Wildlfie Trust, 2023). Additionally, the UK Centre of Ecology & Hydrology (UKCEH) are leading a partnership that has secured a £100,000 grant to develop scientific and revenue models and a certification scheme for UK projects wanting to attract private investment by selling companies the carbon benefits that will result from restoring saltmarshes (UKCEH, 2021). As currently the intertidal environment is inlcuded under BNG policy, there needs to be collaboration between BNG and MNG that allows for a smooth, consistent delivery for intertidal MNG projects, if permitted under MNG policy.

Management Considerations

There is a large area of potential saltmarsh habitat creation space in the England (Figure 12). These sites of creation potential opens the opportunity for restoration across a seascape scale, alongside the other habitat restoration areas we have discussed in this report. However, it is important to note that sites must be managed well, as mismanagement can lead to CO_2 emissions, rather than acting as a carbon sink. To support any saltmarsh project, the EA's Saltmarsh Restoration Handbook can be used regardless of project size, to choose the correct approach, depending on the location, surrounding landscape and condition.

BENTHIC HABITAT AND SPECIES RESTORATION

Benthic Habitat Restoration

The Offshore Wind Evidence and Change Programme's T&F Group highlighted restoration of offshore habitats as both high priority, and high opportunity. They noted offshore features, such as biogenic reefs, have been lost partially due to seabed abrasion from bottom-towed fishing gears and have suggested that removal of abrasion from fishing gears may lead to a long-term recovery of these reefs. The T&F group also noted that such pressure reduction measure implementation would require Government intervention.

Fishing gear interacting with the sea floor was also identified as the main pressure affecting benthic habitats and preventing Good Environmental Status within the Marine Strategy Part 3: UK Programme of Measures (Defra, 2021). Benthic species which require these habitats to survive would benefit from these pressure reductions, such as sea pens and other burrowing megafauna.

MNG could play a key role in funding a strategic intervention which channels funding into projects researching and promoting changes in fishing gear. Research is required to ensure that changes in practice would provide a measurable net gain to the environment, and also ensure that good sustainable stocks are still yielded.

Nephrops Trawling

Nephrops are typically fished using trawl methods. Trawls are an example of a mobile fishing gear, which have the potential to damage seabed habitats. Not only does this damage affect the biodiversity of benthic habitats, but it can cause disturbance to carbon stores on the seabed, releasing emissions. The process of trawling can also be fuel-intensive in comparison to static gear (Hilborn et al., 2023).

Finding an alternative method to nephrops trawling could help to improve conditions of benthic habitats. Only 5% of the UK's MPAs prohibit bottom-trawling, despite its highly destructive nature (Dunkley & Solandt, 2021).

"Within five years of protection from bottom trawling, animals in three UK Marine Protected Areas were found to be larger and more diverse." - *Marine Conservation Society*

Moving towards more sustainable fishing methods could help to reduce trawling impacts, whilst allowing fishers to continue fishing.

Creel Fishing

Creel fishing is a sustainable and low-impact fishing method (Tabrizi, 2019). Creels sit atop the seabed, and cause less disturbance due to their small footprint.

Additionally, creel fishing is a less fuel-intensive fishing method, and studies have found that it limits by-catch (Leocádio, Whitmarsh & Castro, 2012). Some studies have also found that the economic return of creel fishing would not change

significantly, as the gear is more selective and could return an increased catch of larger-sized males (Eichert et al., 2018).

Potential Benthic Restoration Projects within the Southern North Sea

Projects similar to The Cumbrian Creel Project could be developed as a MNG intervention within the southern North Sea. Alongside this, byelaws concerning the removal of destructive fishing methods could also be established by the UK Government (implementation of a byelaw could not be delivered by developers for MNG). A project like the Cumbrian Creel Project, would be more effective alongside the implementation of a sustainable fishing bylaw. Additional, complementary measures enforced by the regulator, for example enforcing pot limitations within these MPAs, could help to ensure that the pressure removed is not then replaced with a new pressure.

Site selection would be an important factor, and there are MPAs where this change potting or creel fishing might not be feasible. An example of this is Cromer Shoal Chalk Beds MCZ. An assessment by the Eastern Inshore Fisheries and Conservation Authority (IFCA) identified that towed demersal gear is potentially damaging to chalk reef, and the peat and clay features within this MCZ (Eastern IFCA, 2019). The chalk feature is already protected from trawling through a byelaw.

When discussing the impacts of potting within the MPA, Natural England and Eastern IFCA have stated that "Pressures on MCZ features are not likely to have reached a point where they could be hindering the conservation objectives at the current time. However, cumulative impacts from potting fisheries over time could cause significant risk to designated features of the MCZ" – Eastern IFCA and Natural England Joint Statement, 2023. Following this, they have agreed that some management needs to be developed to prevent potting from causing significant impacts to the chalk reef.

It is therefore important that the introduction of a byelaw is accompanied by complementary measures, and that the designated features of each MPA are considered to ensure that a change in fishing techniques will not impact the area in a different way.

Box 4. The Cumbrian Creel Project

The Cumbrian Creel Project is run by Cumbria Wildlife Trust, and funded by Ørsted.

There is the potential for developers to fund projects that act similarly to the Cumbrian Creel Project, which is currently ongoing within the North West.

Trawling has been banned within the West of Walney MCZ. This pilot project is providing fishers with new gear that can be used within the MCZ, and surveys are being conducted to assess the success of creel traps.

MARINE BIRDS AND MAMMALS

Species-level Marine Biodiversity Net Gain

Reducing pressures affecting marine birds and mammals may be beneficial in improving marine biodiversity. The Offshore Wind Evidence and Change Programme's T&F Group suggested that pressure reductions could come in the form of fishing gear alterations, or changes in fisheries management methods, allowing prey availability to increase. Underwater noise pollution may be particularly disturbing to marine mammals, due to their noise sensitivity. This is an example of how MNG can be applied at a species level, rather than habitat-level.

Bycatch

Pressure on the marine environment may be minimised through bycatch reduction techniques. The Bycatch Mitigation Initiative outlines how the UK government intend to achieve their ambitions: Minimising and, where possible, eliminating bycatch. MNG strategic funding could assist in achieving these goals.

Clean Catch UK have already produced a mitigation hub, providing fishers with suggestions for alternative fishing methods/gear in order to reduce their bycatch. Strategic funding could be used to set fishers up with the appropriate gear to reduce bycatch.

Fisheries Management Methods

Implementing fisheries management methods, for example prohibiting fishing certain areas during spawning season, could reduce pressure on fish populations and lead to increased prey availability for marine mammals and birds.

Underwater Noise Reduction

Strategic net gain may be achieved through noise reductions, reducing pressures on noise-sensitive species. Noise reduction techniques are already used as a compensation or mitigation tool, however larger scale noise reductions, beyond the scope of a development itself, may be considered for MNG.

Noise reductions may be achieved through the introduction of new speed caps for ships. For example, requirements for ships to travel at a slower pace may lead to a reduction in the acoustic footprint from propellors (GL Reynolds, 2019). Alongside this, creating acoustic buffer zones around MPAs may reduce pressures on the species living within these protected areas, and may assist MPAs in reaching more favourable conditions.

Using strategic funds to transition from seismic guns, for surveying the seafloor for oil and gas, to marine vibroseis may also be an example of a noise reduction leading to a MNG. Seismic guns can cause zooplankton die-off, and disturbance to marine mammals. Marine vibroseis have a lessened impact due to their lower sound-pressure level (Matthews et al., 2021).

For each of these methods, considerations into measuring MNG must be included if piloted.

NATURE-INCLUSIVE DESIGN

In this report, Nature-Inclusive Design (NID) refers to the options that can be added to or integrated in the design of marine infrastructure to enhance the biodiversity of native species or communities in the southern North Sea.

Incorporating NID into UK offshore infrastructure has the potential to positively impact marine biodiversity and to contribute towards requirements for MNG, while simultaneously increasing the capacity to produce renewable energy and reduce carbon emissions through the construction of offshore wind farms.

NID options can be integrated into the design of different elements of marine infrastructure, including on monopiles, scour protection layers and cable protection layers. It is not yet clear what the long-term consequences of marine infrastructure will be for seabed biodiversity, but the development of NID strategies could help enhance on-site biodiversity of a development. There is the potential for developers to utilise NID as an intervention method to contribute to their MNG unit requirement. However, there are challenges and barriers such as maintenance, risk, cost and a lack of ecological, site-specific knowledge in relation to NID that need to be considered if it is implemented as a MNG intervention in the UK.

For NID to qualify as a MNG intervention method, the residual impacts from a development must either have already been restored to a no net loss scenario and the impacts from the chosen NID methods must be creating a net gain, or the NID addresses the shortfall to no net loss where needed and goes beyond that to achieve a net gain (see Mitigation Hierarchy, page **5**). The suggestions made in this section are only recommended if they create a net gain.

A developer who has chosen to undertake site-level interventions as part of their delivery approach can choose NID as an on-site MNG intervention. There is the potential for a developer to choose the NID options that will be most beneficial for their development to achieve MNG using a new, currently in design, NID decision tool.

Blue Marine's Nature-Inclusive Design Tool

Blue Marine commissioned MRAG to develop a decision tool that allows feasibility recommendations to be made for marine species restoration, according to biotic and oceanographic constraints of an offshore development. The decision tool allows the user to filter for which offshore wind farms, species or NIDs are potentially feasible under the user's inputted data. For example, if a developer selects the species tab, they are asking the tool which species would potentially be feasible for restoration within their windfarm, given its environmental characteristics.

The tool is a great method for fulfilling the Mitigation Hierarchy and

mitigating and offsetting the negative environmental impacts of a development, but could additionally be utilised for delivering MNG interventions.

This tool is specifically designed for offshore wind farms currently, although the code has been developed in a way in which new data, species, or habitats could be added. Therefore, the tool could be expanded to include all types of offshore infrastructure.

Examples of Nature-Inclusive Design for MNG

Hermans et al. (2020) have created a nature-inclusive design catalogue that includes a list of technically sound and ecologically promising NID options (Table 1). The options are organised into three categories based on the aspect of the offshore infrastructure they apply to:

1. **Add-on options**: structural additions in a design of an offshore substation or monopile
2. **Optimised scour protection layer**: optimisation of a standard scour protection design for a substation or monopile
3. **Optimised cable protection layer**: optimisation of a standard cable protection design for subsea power cables or bale crossings

Category	Specific NID option
1 Add-on options*	Biohut®
	Cod hotel (Cotel)
2 Optimized scour protection layer	Additional rock layer
	Adapted grading armour layer
	Placing unit on or in the scour protection layer:
	– Habitat pipes
	– Fish hotel (WUR)
	– Reefball® and Layer cakes
	– Reef cube®
	– 3D printed units
	– ECO armour block®
	– Oyster gabions
	– Biohut®
3 Optimized cable protection layer	Filter Unit®
	Basalt bags
	ECO Mats®
	Reef cube bag™
	Reef cube matt™

*at the current stage of the technical development, adding an additional element to the design of a monopile is undesirable in offshore conditions. This option is currently feasible for implementation on offshore substations.

Table 1. List of categories with listed Nature-Inclusive Design (NID) options. Credit: Nature-Inclusive Design: a catalogue for offshore wind infrastructure (2020), technical report by Hermans et al.

The option a developer chooses will be specific to the characterising habitats and species surrounding their development. Here is a NID example for each category, which could be applied to developments in the southern North Sea in the form of MNG interventions (Table 2).

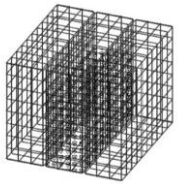
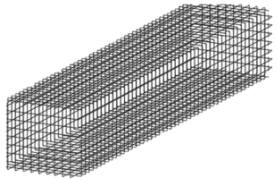
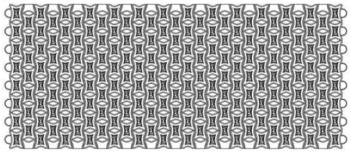
	Add-on option	Optimised scour protection layer	Optimised cable protection layer
NID option	**Biohut®**	**Oyster gabions**	**Eco Mats®**
Target species	• Atlantic cod (*Gadus morhua*) • Poor cod (*Trisopterus minutus*) • Also associated prey species	• Atlantic cod (*Gadus morhua*) • Juvenile Poor cod (*Trisopterus minutus*) • European flat oyster (*Ostrea edulis*)	• European flat oyster (*Ostrea edulis*)
Description	A system of 2-3 cages, which can be modified and adjusted to either stand alone or be placed on a jacket. The inside cage is filled with empty oyster shells, surrounded by two empty cages.	A mesh net cage filled with oyster shells and placed directly on the armour layer of the scour protection.	Mattresses made of linked concrete units, which can be placed on top of cables and used for cable protection. The special cement mix reduces the CO_2 footprint and strengthens the concrete's compression forces.
Ecological benefits	An artificial fish nursery area. The inside cage allows a variety of algae and small crustaceans to attach, providing food for small fish. The two empty cages provide protection due to its mesh size keeping predators outside. The hut serves to increase the biomass of the target species.	It provides an additional hard substrate for oysters to grow and directly provides nutrients to the target species. It also creates shelter for small cod, crabs and lobsters.	As the mats are placed on top of other structures, they create holes of varying sizes. The mats provide substrates for a wide range of species, particularly the European flat oyster.
Design Example			

Table 2. Examples of NID options for each NID category that could be applied to the southern North Sea as MNG interventions, if they would produce a net gain for biodiversity. Information has been adapted from Hermans et al. (2020)'s nature-inclusive design catalogue. For information about the estimated costs of each option, see the report (p. 97, 107 & 111 respectively).

Considerations

There are a host of considerations and concerns that need to be highlighted and solved surrounding NID, which are discussed below.

(1) The UK's Position on NID

In the UK, the main barrier to NID deployment is the UK's position on NID. As most offshore wind farms are installed in soft sediment habitats in the UK, the installation of additional hard substrate will not be approved by the government's adviser, due to the reef species the substrate may attract. The UK's baseline for the North Sea is different to that of other countries bordering the North Sea (for example, Netherlands).

(2) Maintenance

Offshore wind developers in the UK may be concerned that NID could hinder maintenance once species have become established. To resolve this, Dr. Oscar Boss, Marine Ecologist at Wageningen University, suggests that "the design stage should incorporate forethought [into NID] to ensure that piles and surrounding structures are strong and resilient enough to withstand marine growth".

(3) Risk and Cost

There are challenges to implementing NID methods as MNG interventions, including costs, risks involved with new technologies, regulatory barriers, and challenges in engaging stakeholders. Every NID option carries certain technical and ecological risks that need to be considered from an early phase (design phase) and monitored in the later phase (operational phase) of a development's life, in order to properly mitigate these risks and prevent negative ecological consequences. To increase the knowledge base surrounding the benefits and effectiveness of NID methods, we recommend they are implemented as on-site pilot projects by developers. As stated in the approach pipeline, these projects would need to be reviewed and approved before being implemented.

(4) Attraction vs. Production

The attraction hypothesis states that artificial reefs attract nearby mobile species, displacing the biological communities of nearby natural reefs and causing them to aggregate around newly introduced habitat (Bohnsack, 1989). However, this attraction is not always harmful. Attraction does not always increase maximum fish density and instead sometimes disperses existing fish biomass making them harder to catch (Smith et al., 2015). This also depended on the characteristics of the target fish species; transient or pelagic species are often at more risk of harmful attraction than

resident species (Smith et al., 2015). The introduction of reef-like structures may not necessarily result in increased local fish populations, but merely changes in species distributions (Brickhill et al., 2005). Therefore, there needs to be sufficient knowledge of a development's environment to be confident that the NID option will create a net gain. This highlights the need for NID pilot projects to increase the understanding of a development's ecological environment.

(5) Co-use

Effective collaboration between government, offshore wind developers, maritime users and scientists is essential to meet UK targets. Specifically for offshore wind farms, there is a discrepancy between the efforts for nature restoration and implementing co-use (e.g. seaweed farming and small scale fisheries). We recommend an integral policy where the two efforts are interlinked, as recommended by Hermans et al. (2020). This specifically relates to the area within a wind farm but outside the safety zone of a wind turbine (50 m).

We recommend that developers consider the co-use options available to them alongside the most appropriate NID options. For example, Stichting Noordzeeboerderij's nature-inclusive anchoring system the Eco-anchor, in collaboration with Ørsted, is designed to support several multi-use activities within offshore wind farms. Termed 'multi-use sea farms', multi-use activities such as nature-inclusive seaweed cultivation, mussel cultivation and floating solar panels should be considered alongside NID options to create the most successful outcome for biodiversity and help fulfil the MNG requirement for that development.

(6) Pilot Projects and a Knowledge Base

NID as a MNG intervention should contribute to the ecological functioning of the native species of the southern North Sea. We recommend a holistic approach to choosing which NID method is most suitable, including a 4D consideration of the surrounding seascape. As an example, this could include an understanding of the species and habitats present on and around the site, structural and functional connectivity and the seascape as a whole. There needs to be a focus on strengthening keystone species and habitats that need to move towards recovery, for example, species and habitats on the OSPAR list of threatened and/or declining species and habitats. Such an understanding is limited offshore as there are difficulties in collecting this data, however, the incorporation of NID pilot projects and required set monitoring intervals (refer to page 38) would allow a transition to the marine offshore environment being better understood. Crucially, this allows biodiversity gains to occur on-site, while the offshore environment knowledge base develops.

CHAPTER 4

MARINE NET GAIN LONGEVITY

Monitoring Recommendations

Decommissioning Recommendations

ENSURING LONGEVITY OF MNG INTERVENTIONS

Marine recovery can only happen if the natural environment remains in a measurably better state than before the development. **For MNG interventions to be successful, we must implement and embed methods of longevity within the pipeline**. This includes ensuring all interventions create sustainable net gain, which can be undertaken through required monitoring and a net gain that continues into, and is not lost at, the decommissioning stages. This is presented through a feedback loop (Figure 13), to show how new data from monitoring must be used to amend plans to ensure MNG is sustainable and lasts for 30 years (as proposed in the Defra consultation).

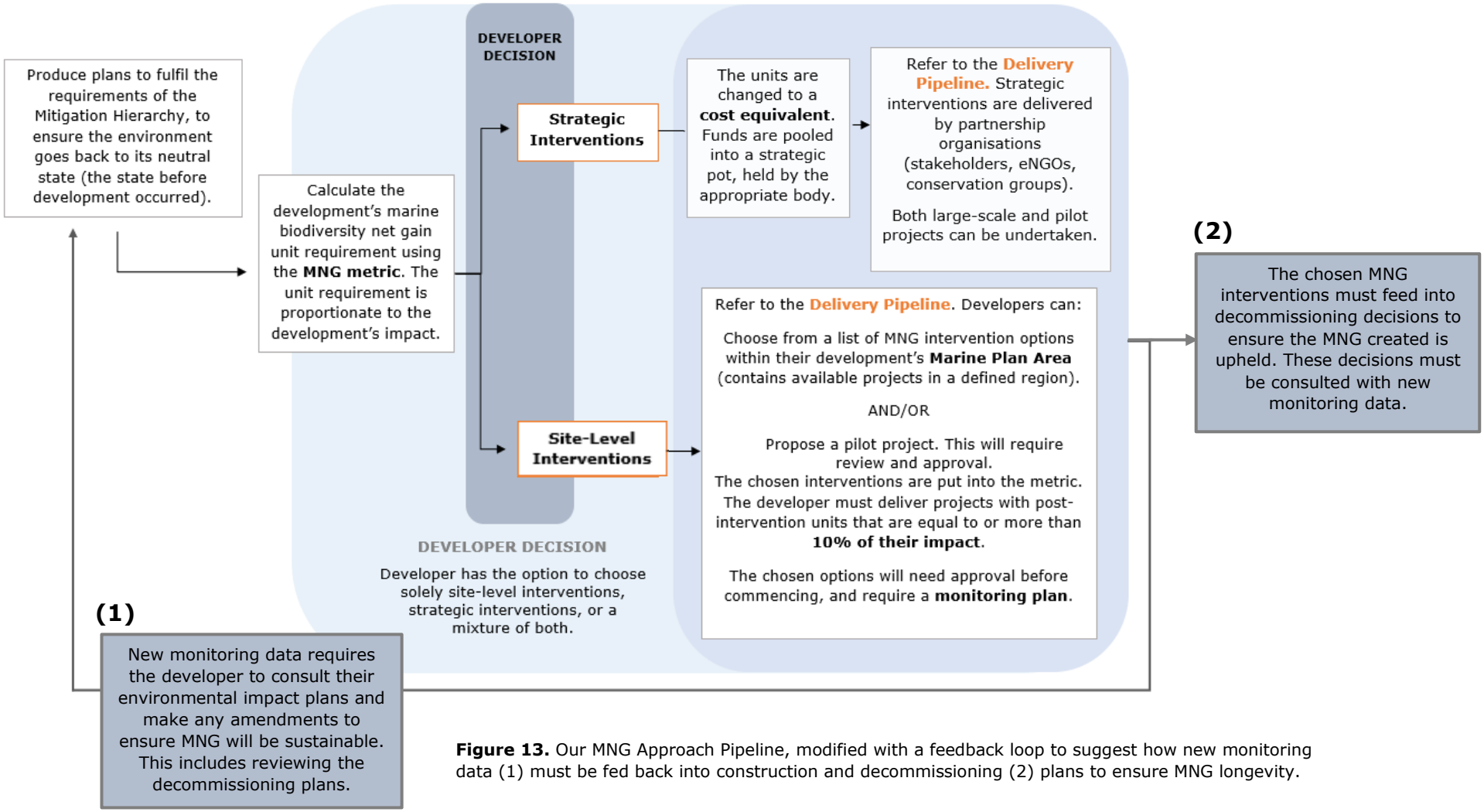


Figure 13. Our MNG Approach Pipeline, modified with a feedback loop to suggest how new monitoring data (1) must be fed back into construction and decommissioning (2) plans to ensure MNG longevity.

(1) Monitoring

Any existing monitoring can be tweaked to factor in MNG interventions. The developer may be required to monitor at agreed intervals during the project's lifetime, or up to a point which the regulator deems the site to have reached the required condition. Interval decisions need to be site-specific and development dependent. E.g., intervals need to consider annual cycles of the development area's characterising species.

(2) Decommissioning

Under the provisions of The Energy Act 2004, the Secretary of State requires that offshore wind farm developers produce a costed Decommissioning Programme and to ensure that is it acted upon.

Currently, for all offshore wind farms and oil and gas fields, all infrastructure is required to be removed during decommissioning. The seabed must be restored to its natural condition and in a state that minimises risks to maritime uses.

There are more effective end-of-life methods for reattaining and enhancing biodiversity than full removal, which is discussed in this section.

How can we implement net gain into decommissioning?

The Decommissioning Programme is started post-consent and is finalised before construction. Therefore, there is opportunity for ensuring there is a net gain plan reflective of the whole development life span: incorporating net gain plans at construction, monitored across the operational period, and maintained during decommissioning. This opportunity needs to be utilised to ensure marine recovery continues after a development's life span.

Many marine man-made structures, such as oil and gas platforms or offshore wind turbines, are nearing their 'end-of-life' and require

Credit: Jasmine Brown

We recommend that offshore wind farms have set intervals in place for monitoring, and that new monitoring data is fed back into construction and decommissioning plans to ensure MNG longevity.

decommissioning. As turbines reach the end of their lifespan, there are currently three main strategies for the management of this process (Figure 14). To date, offshore wind assets have only been decommissioned. Overlaps between these processes can occur, so parts of one strategy can be combined with others for a particular windfarm.

Current research is looking at how to enhance the decommissioned environment, however as the research is still on-going, there are only suggested enhancement options and a lack of tried and tested methods.

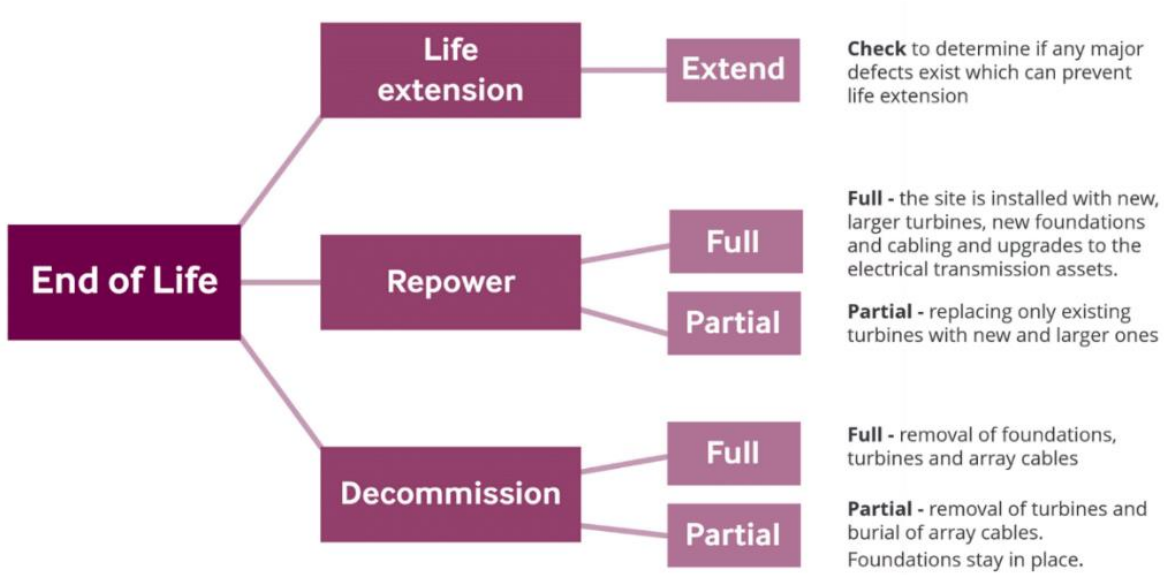


Figure 14. The three main strategies for marine infrastructure end-of-life management. Credit: Offshore Wind Industry Council Pathways to Growth: Consenting Modules.

Which scenario could be adapted to retain Net Gain?

There is the opportunity to restore offshore habitats within decommissioning. Net Gain could drive the innovation of:

a) decommissioning techniques which are less damaging

b) encourage projects at build phase to create infrastructure which is easier to install and remove

The current requirement of full decommissioning doesn't necessarily result in biodiversity gain. Depending on the baseline used, removing all infrastructure could result in habitat and species restoration to the pre-development standard. However, in the case of implemented artificial interventions (e.g., artificial reefs), decommissioning or removal of structures could reverse any gains made. Therefore, it is vital that the MNG interventions implemented during construction and operation determine the end-of-life decisions.

The 'best' end-of-life scenario is also dependent on cost. For example, the cost of removal against MNG needs to be factored in, as any MNG interventions must be economically viable, as we want to encourage developers to take the initiative and be able to implement MNG.

Below are Lemasson et al.'s (2023) evidence-based recommendations for end-of-life:


Credit: Jasmine Brown

- **Full removal** substantially degrades biodiversity, primary & secondary production, life cycle maintenance and pest/disease control. We must move away from this method.
- **Partial removal & adding protective structures** substantially enhanced biodiversity and wild food (including fishing), and enhanced primary & secondary production.
- To achieve OSPAR Strategic Objectives 5 & 6, scientists encourage:
    - **Abandonment** of all
    - **Complete removal** of some, **abandonment** of others
    - **Partial removal** of all

On-going research from the Decommissioning Relative Effects of Alternative Management Strategies Project (DREAMS) and the INSITE Synthesis project will help inform effective management strategies and guide efforts aimed at optimising ecosystem services and preserving biodiversity. We recommend these nature inclusive decommissioning scenarios become regulatory, and encourage that decommissioning is included within MNG decisions to help maintain longevity of any biodiversity net gain achieved.

Questions that still need to be answered:

1. Options to enhance carbon sequestration, biodiversity and nursery site services at decommissioning.
2. Which decommissioning scenario is most beneficial for nature and retains MNG, but is also financially viable?
3. How can we ensure MNG is retained and monitored once the right of land is lost from the developer?
4. Could offshore wind farm developers invest more in nature with the saved expenses compared to complete decommissioning?


Credit: Ørsted

CHAPTER 5

REFERENCES & GLOSSARY

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GLOSSARY

Term	*Definition*
Active Intervention	Active Interventions are those where additional management techniques are implemented.
Biodiversity	The variety of plant and animal life in an environment or in a particular habitat. High levels of biodiversity are considered to be important and desirable for an environment to thrive.
Biodiversity Net Gain (BNG)	Biodiversity net gain is a way of creating and improving natural habitats, making sure development has a measurably positive impact ('net gain') on biodiversity, compared to what was there before development. In England, BNG is becoming mandatory under Schedule 7A of the Town and Country Planning Act 1990.
Creel fishing/Potting	Using baited pots, cages or baskets to catch fish or crustaceans. They are designed in a way that prevents the catch from leaving once it has entered.
Decommissioning	The process by which an operator of an offshore development plans, obtains regulatory approval for, and implements the removal, disposal or reuse of that installation. It typically includes the dismantlement of the infrastructure and site restoration.
Marine Conservation Zone (MCZ)	Marine Conservation Zones are a type of MPA that protect areas featuring a range of nationally important, rare or threatened habitats and species.
Marine Net Gain (MNG)	An approach, designed through first principles that sits alongside existing planning policy and practise, to marine only development that aims to leave the natural environment in a measurably better state than it was beforehand. This means protecting, restoring, or creating environmental features that are of greater ecological value to wildlife, habitats and people than any losses associated with the original project.
Marine Protected Area (MPA)	MPAs are areas of the ocean established to protect habitats, species and processes essential for healthy, functioning marine ecosystems. MPAs are designated to provide them with protection from damage caused by human activities.

Term	*Definition*
Mitigation Hierarchy	The hierarchy follows avoidance, minimisation, restoration and offsets in order to reduce development impacts, control any negative effects on the environment and ultimately create a net gain.
Nature Inclusive Design (NID)	Approaches to, or features of, infrastructure design that can increase habitats or help support species.
Pilot Projects	A pilot, or feasibility study, is a small experiment designed to test logistics and gather information prior to a larger study.
Pressure Reduction	Pressure reductions are those where a known anthropogenic pressure is reduced or removed to allow an environment or species to recover.
Recovery	Reviving an ecosystem back to a healthy state.
ReMeMaRe	Environment Agency's restoring meadow, marsh and reef project.
Restoration	The process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.
Statutory Biodiversity credits	A last resort for developers undergoing BNG, if they can't deliver the BNG they need onsite or via purchasing off-site biodiversity units. Delivered through largescale habitat projects delivering high value habitats which can also provide long-term nature-based solutions.
Strategic	Referring to large-scale interventions that go beyond single site-specific projects.

ABBREVIATIONS

BNG: Biodiversity Net Gain

IFCA: Inshore Fisheries and Conservation Authority

MCZ: Marine Conservation Zone

MMO: Marine Management Organisation

MNG: Marine Net Gain

MNG: Marine Net Gain

MPA: Marine Protected Area

NID: Nature-inclusive design