Environmental Restoration & Net Gain

Understanding the influence of man-made structures in the marine environment

INSITE

Influence of man-made structures in the ecosystem

INSITE SUMMARY

The INSITE Programme was launched in 2014 as the first joint industry partnership between academia and oil and gas operators in the North Sea to deliver focused research to provide the independent scientific evidence base to better understand the influence of man-made structures (MMS) on the North Sea ecosystem.

Building on the existing evidence base under INSITE I and II, and other relevant global studies, the programme has been developing an understanding of the current global scientific consensus on the ecological and environmental implications of deploying man-made structures (MMS) in the sea at scale, leaving non-operational MMS in situ, or removing non-operational MMS. Evidence gathered through INSITE supports the development of high-level policy approaches and nature-positive approaches to decommissioning that can underpin the attainment of good environmental status and other policy actions relating to the sustainable management of UK seas.

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Front cover Illustration credit: B for Katie Chappell

SYNOPSIS

This document summarises key policy-relevant scientific findings arising from the 'INSITEs Into: Environmental Restoration and Net Gain' webinar held on 18th April 2023. The webinar featured several INSITE projects, including CHASANS, DREAMS, Synthesis, and FuECoMMS, each contributing valuable insights into the connectivity and effects of man-made structures in the North Sea. One notable consensus emerging from INSITE is the recognition that complete decommissioning and removal of MMS has a negative impact on preserving and enhancing ecosystem services. The scientific consensus is that it is beneficial to consider options such as partial removal or leaving structures intact, as these structures can support biodiversity and restore ecosystems in a manner similar to natural complex ecosystems. These projects offer crucial policy-relevant evidence to guide the achievement of environmental restoration and Marine Net Gain (MNG) objectives while expanding offshore energy infrastructure.

MMS REMOVAL SCENARIO

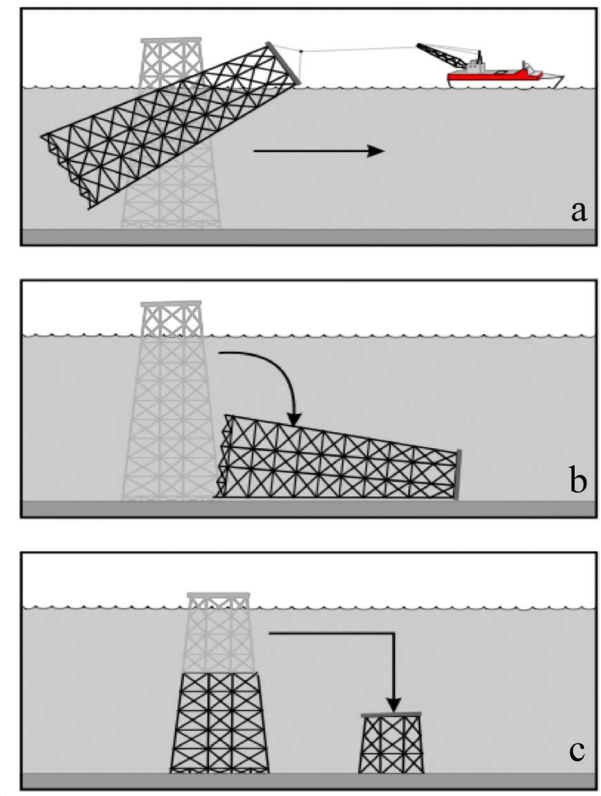

Image credit: Worldwide oil and gas platform decommissioning: A review of practices and reefing options. Ann Scarborough Bull & Milton S Love. Feb 2019. Ocean and Coastal Management 168:274-306

INTRODUCTION

Decisions on how best to manage the marine environment need to be made in transparent, accountable, and proportionate ways, to align government targets on offshore energy with other commitments such as increasing biodiversity and restoring marine habitats.

Science plays a critical role in informing decision-making and in enabling and evaluating action, particularly in identifying alternatives and clarifying the costs and benefits of a course of action. This policy brief explores where INSITE can support policy around environmental restoration and MNG.

Marine Net Gain (MNG): An approach to development that aims to leave the natural environment in a measurably better state than beforehand. This means protecting, creating or restoring environmental features that are of greater ecological value to wildlife, habitat and people than any losses associated with the original project. *The INSITE programme can provide evidence to inform the development of strategic plans to promote the sustainable use of marine resources and ensure ecosystem integrity, such as those within wider policy and plans including Marine Spatial Prioritisation (MSPri), the BESS, Marine Protected Area (MPA) management targets.*

Environmental Restoration: The process of promoting recovery from a degraded state. This can be for ecosystems, habitats, or species — or even prioritise the outcomes of each individually. Restoring the environment can improve the condition of the habitat and provide connections with other habitat patches. *Policies underpinning restoration and priority habitats include the UK Marine Strategy, the 25 Year Environment Plan, the Scottish National Marine Plan and the British Energy Security Strategy (BESS). Research on restoration complements the marine natural capital evidence baseline and the development of models to test scenarios for nature recovery as well as informing measures that contribute to resilience, sustainability and ecosystem objectives including those of the fisheries act - and contributing to the increased understanding of Marine Protected Area MPA networks.*

INSITE

INSITE PROJECTS

PROJECT 1

Connectivity of hard substrate epifaunal populations (CHASANS) (2019-2024)

Delivered larval connectivity models to help understand the importance of artificial structures as a network of islands in the North Sea and therefore inform on decommissioning strategies.

Image credit: Prof Joanne Porter, Heriot-Watt University

PROJECT 2

Decommissioning Relative Effects of Alternative Management Strategies (DREAMS) (2019-2024)

Conducted a comprehensive meta-analysis of global evidence on the impact of MMS decommissioning on the structure, functioning and dynamics of marine ecosystems and incorporated this into a model to help forecast ecosystem services and understand impacts to assist in policy decision making.

PROJECT 3

Synthesis (2022-2024)

Engaged 40 worldwide scientific experts to develop a quantitative evidence base that helps inform on the ecological and environmental implications of deploying, leaving, or removing MMS at scale. *Additionally, the ORIES (Offshore Renewable Impacts on Ecosystem Services) Decision Support Tool is being developed, which builds on the DREAMS/Synthesis work to identify the impacts of offshore wind on ecosystem services.*

PROJECT 4

Functionality and Ecological Connectivity of Man-Made Structures (FuECoMMS) (2019-2024)

Helps to fill knowledge gaps and identify the role of MMS on key marine ecosystem processes and the implications or benefits they have if left in place. The project includes fieldwork to sample around MMS to measure the changes in carbon storage and biodiversity within the sediments helping to inform on achieving wider policy objectives.

KEY MESSAGES AND POLICY CONTRIBUTIONS

POLICY 1

Marine Net Gain

The research can contribute to MNG initiatives that assign a value to ecosystem service and impacts, as well as assisted vs natural recovery by providing insights for intentional biodiversity gains and the implementation of effective MNG aspirations.

KEY SCIENTIFIC FINDING 1

DREAMS (HIGH CERTAINTY)

Scientific literature assessing the different decomissioning effects of alternate management systems in the DREAMS project, led to the conclusion that full removal of Offshore Wind MMS is overall negative for ecosystem services. Leaving structures in place or partially removing them is beneficial to the system and towards achieving environmental targets. *Further primary evidence gathering on offshore structure impacts is needed for some areas i.e. Aquaculture, water quality & genetic material to provdide a complete overview of impacts and benefits.*

KEY SCIENTIFIC FINDING 2

SYNTHESIS (HIGH CERTAINTY)

Scientific opinion gathered from 40 experts by the Synthesis project regarding the effect of MMS during use and at the point of decomissioning is for structures to be left in place. Equally, leaving structures in place can contribute and help steer efforts towards achieving policy objectives of biodiversity net gain and restoration.

KEY SCIENTIFIC FINDING 3

FuECoMMS

Through food web mapping the FuECoMMS project found that MMS develop into complex 3D systems and play a comparative role to the local environment as some natural systems, such as Bass Rock (Firth of Forth) for example. *Notably, the sucession of these systems, the structure, hydrodynamics, and the time it takes to reach such a complity differ from natural structures, but the same components exist.*

POLICY CONTRIBUTION

Using an evidence synthesis approach, the DREAMS project highlights the relative **benefits and limitations of different strategies for decommissioning,** in which the findings suggest **leaving all or part of offshore wind structures in place is beneficial for MNG and environmental restoration-focused policies.**

POLICY CONTRIBUTION

The Synthesis project provides a quantative assessment of the views of the wider scientific community and shows **general consensus around partially or fully leaving all structures in place.** They emphasise the importance of determining the overall effects to best achieve policy objectives focusing on MNG and environmental restoration.

POLICY CONTRIBUTION

The FuECoMMS project is exploring the role of MMS on delivery of key marine ecosystem services and processes, e.g., carbon storage, and the role of seabed diversity in remediation following release of pollutants through MMS decomissioning. Results showing **no significant effects on sediment biodiversity in areas around decommissioned MMS (near complete removal)** are useful when considering implications for MNG aspirations. Further consideration will be needed in newly decommissioned sea areas now 'open' to other sea users. *Note this project is ongoing and adding to the evidence base and knowledge around such systems.*

Both the DREAMS and Synthesis projects have been extended until Dec 2024 to continue adding to the evidence base by updating the literature review and providing further certainty and confidence around the results, as well as contributing to the ORIES tool in development aiming for release late 2023.

Working example of biodiversity gain

There is already evidence of successful biodiversity gain studies around MMS, such as co-located oyster bivalve biogenic reefs (Kennon, N.A., 2023). For example, offshore wind farms couples with seaweed aquaculture in the Netherlands (North Sea Farm 1)

KEY MESSAGES AND POLICY CONTRIBUTIONS

POLICY 2

Environmental Restoration

The research provides evidence to assist in environmental restoration and support the design of nature-focused approaches that help in understanding ways to increase biodiversity and restore habitats.

KEY SCIENTIFIC FINDING 1

CHASANS

The CHASANS research identified different sinks and sources among epibenthic species living on MMS that affects ecological connectivity across the central region of the North Sea. Connectivity differs between areas over the year, with offshore sites connecting sporadically with each other all year but inshore sites are best over the winter months.

ADDITIONAL ENHANCEMENT

There are additional enhancement opportunities to gain when leaving structures in place or commissioning new platforms. This has already been observed under Californian oil and gas platforms whereby shell mounds formed during platform operation, but degraded over time following decommissioning, as falling mussels and other organisms were no longer sourcing the system.

POLICY CONTRIBUTION 1

Particle tracking modelling from the CHASANS project provides evidence on the likely success of biodiversity enhancement, monitoring and restoration and the impact of new deployments. **These outputs will help in finding the best locations for restoration efforts** and enable offshore developers to identify engineering options with the smallest environmental impact. This contributes to the evidence base for strategic planning, restoration, and compensation as well as wider policy strategies including BESS, UK Marine Strategy, MPA networking and MMO Strategic Plan. *Future climate driven scenarios for connectivity are being developed.*

POLICY CONTRIBUTION 2

Comparison of decommissioning options from full removal, partial removal and rigs-to-reef conversion, highlights advantages and disadvantages of each. Notably, **all options that retain infrastructure, especially rigs to reef, support development of biological communities that restore ecosystem services, such as food sources, carbon sequestration, nursery habitats, as well as de-facto fishery management zones,** which may promote more healthy, biologically diverse seas in these areas and local recovery to Good Environmental Status.

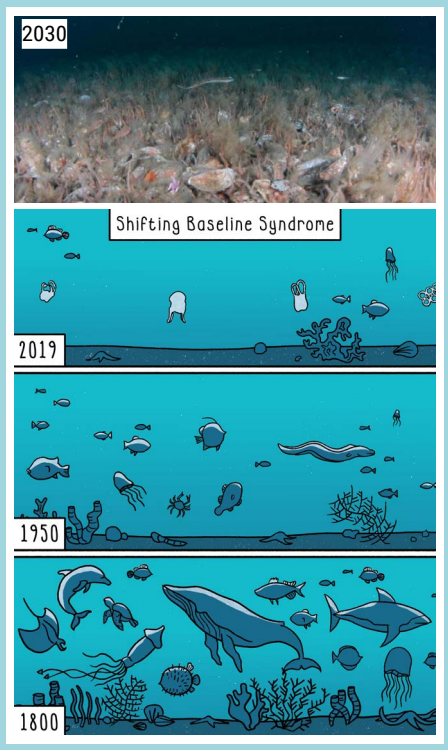

Image credit Cameron Shepherd *(Shifting Baselines)*, Prof Joanne Porter, Heriot-Watt.

Steps to achieve Marine Restoration and Enhancement include:

1. Prevention of activities
2. Removal of pressures
3. Type A ecoengineering: Create habitat and environmental conditions and species come back.
4. Type B ecoengineering: help by restocking/ replanting and reseeding

Ecoengineering is challenging at sea due to the difficulty of manipulating ecosystems- however, capping with new sediment could be workable. *Both ecoengineering strategies are better nearshore than offshore.*

ORIES Decision Support Tool

which is Excel-Web based and to be completed in **October 2023**. This will build on DREAMS/Synthesis work to identify the impacts of offshore wind on ecosystem services filling some of the criteria necessary for developers to make the best decisions in the marine space.

Some of the projects that are currently working in this area, such as those from Natural England, are already directly supporting Defra in the development of MNG policy, as seen below:

COMPLETE

— Report on how to define irreplaceable marine habitats ie: advisory of areas for no development.
— Report on assisted vs natural recovery i.e., where is it best to intervene or not.

ONGOING

— Exploring metrics to measure losses and gains.
— MaRePo (Marine Restoration Potential): i.e., of Maerl, sea pens, kelp, offshore oysters. Looking at the potential of habitat restoration using OSPAR list of threatened habitats.

INDUSTRY VIEWPOINT

As part of a collaborative INSITE project, the UK Energy Research Centre (UKERC) canvased the views from offshore developers on what action they would like to see for advancing the understanding of the impacts and advantages of MMS at sea. Key action areas are:

— Restoration of habitats using MMS
— Support of phytoplankton and zooplankton restoration and enhancement opportunities around MMS
— Carbon sequestration possibilities of MMS and space around
— Fisheries impacts
— Maintaining nursery habitats with use of MMS
— Development of an environmental net gain metric (alongside the biodiversity metric) that assigns a value to ecosystem service and impacts