A blue carbon code for UK seagrass

Agile Initiative Policy Brief
November 2023

Executive Summary

- **Seagrass protection and restoration can capture and store carbon**, while providing significant other benefits to people and the planet.
- **Evidence gaps must be filled in order to develop a UK seagrass carbon code**, particularly on locally-specific greenhouse gas fluxes, improved mapping of candidate areas for seagrass protection and restoration, localised socio-economic implications and governance best practice.
- **Existing crediting programmes can highlight best-practices**: appropriate governance structures and sufficient scientific robustness can be informed by international carbon codes and other domestic environmental schemes.
- **Deployment of a seagrass carbon code could ensure the benefits of seagrass protection and restoration are tracked for national policy objectives** such as including carbon sequestration in the National Inventory Report of greenhouse gas emissions and removals, and contributions to the 25 Year Environment Plan targets.

How can seagrass contribute to national policy goals?

Seagrass is an aquatic flowering plant that, when in a favourable environmental state, grows in extensive meadows that provide important coastal protection, habitat and marine carbon ("blue carbon") sequestration and storage.

Seagrass protection and restoration can act as a valuable nature-based solution: working with nature to address societal challenges, providing benefits for both human well-being and biodiversity.

These benefits could contribute to key UK policy goals, and there is broad Government support for advancing the knowledge and evidence base around blue carbon and using this knowledge to support ecological restoration of coastal habitats. This potential has been recently highlighted in an Evidence Needs Statement from the UK Blue Carbon Evidence Partnership composed of the Department for Environment Food & Rural Affairs, Department for Energy Security & Net-Zero, Department of Agriculture, Environment and Rural Affairs (Northern Ireland), Welsh Government and Scottish Government.[1]

Seagrass protection and restoration can contribute to many of the goals outlined in the 25-Year Environment Plan (see table).

Furthermore, the Environmental Improvement Plan 2023 makes several specific recommendations relevant to seagrass protection and restoration.[2] One of these is to establish Highly Protected Marine Areas (HPMAs) that "allow sites to fully recover, increasing resilience to climate change, and help us to understand more about the management and recovery of blue carbon habitats". Other recommendations are to support the Marine Natural Capital and Ecosystem Assessment (mNCEA) programme to "fill core data gaps on the services blue carbon habitats provide" and develop a Marine Net Gain policy (see below).

Policy Areas	Role of seagrass protection and restoration	25-Year Environment Plan Ambitions
Carbon sequestration and storage	Seagrass captures and accumulates organic matter in the sediment, which is stabilised by extensive root and rhizome systems. If left undisturbed from dredging and other destructive activities, habitat maintained in a favourable state can retain extremely durable carbon stores that persist for centuries to millennia.	Mitigating and adapting to climate change Reducing the risks of harm from environmental hazards
Coastal protection	Under climate change and associated sea level rise, an increase in coastal flooding resulting from storm surge events is expected. Seagrass meadows can help minimise coastal damage, by stabilising sediment and attenuating wave energy.[3]	Mitigating and adapting to climate change Reducing the risks of harm from environmental hazards
Biodiversity	Seagrass meadows are important foundation habitats, with diverse communities growing directly on seagrass leaves and living in the sediment; and the meadows provide shelter and feeding grounds for juvenile fish, cephalopods, and invertebrates, including species of high commercial value.	Thriving plants and wildlife Enhancing beauty, heritage and engagement with the natural environment
Water quality	Filtration and sediment accumulation provided by seagrass can help reduce concentrations of contaminants in runoff from the land, and facilitate nutrient retention and cycling, removing some excess nitrogen in coastal waters.[4] Seagrass can also have a natural biocidal action, reducing the amount of pathogenic bacteria known to impact human health and affect marine fauna.[5]	Clean and plentiful water Reducing the risks of harm from environmental hazards
Jobs and the economy	The nursery function of seagrass meadows (acting as essential habitat for juvenile stages of commercially important fish) paired with water quality benefits, have positive implications for local fisheries and related economies.	Using resources from nature more sustainably and efficiently Enhancing beauty, heritage and engagement with the natural environment

Greenhouse gas reporting - National Inventory Report

The UK compiles annual reports of greenhouse gas emissions and removals in a National Inventory Report (NIR) to submit to the United Nations Framework Convention on Climate Change (UNFCCC). Inclusion of seagrass carbon removals in this report would enable their contribution to national and international emission reduction goals. The UK Blue Carbon Evidence Partnership lists 'Working towards the potential inclusion of saltmarsh and seagrass in the UK Greenhouse Gas Inventory' as a key 'blue carbon objective'.

However, a 2022 assessment led by the UK Centre for Ecology and Hydrology indicated that **seagrass mapping is currently lacking,** with work needed to complete a base map of current coverage and design standardised methods to assess habitat condition and development over time before seagrass could be included in the NIR[6]: a point reiterated in other recent research[7] and our multi-partner recent technical review.

An improved understanding of emissions and sequestrations (see below) could also contribute to the NIR and enable the use of 'Tier 2' regionally specific estimates or 'Tier 3' process-based models (rather than to 'Tier 1' global default emission factors).

UK CONTEXT AND RESEARCH NEEDS

Seagrass meadows are found in coastal areas around Great Britain and Ireland. Current seagrass area is significantly reduced compared to its native range: as much as 92% of the habitat has been lost due to coastal reclamation, dredging, heavy metal contamination, nutrient over-enrichment and disease.[7] It is therefore anticipated that there are **significant areas around the UK well-suited for seagrass establishment**, reflecting its historic range. It is also essential that we protect our existing meadows from further decline for more rapid results and net habitat gain.

However, in addition to insufficient mapping of current and potential seagrass area, there is a **lack of UK-specific data on seagrass carbon storage, and especially carbon sequestration rates.**

Furthermore, seagrass restoration may sequester carbon but result in increased emissions of two other important greenhouse gases, methane and nitrous oxide. While evidence from other locales suggest seagrass meadows are still net carbon sinks, these non-CO_2 fluxes must also be understood to validate the overall climatic value of seagrass protection and restoration, but at present there are **no UK data on non-CO_2 greenhouse emissions** associated with seagrass.

Additional uncertainties remain over **how best to manage seagrass as a nature-based solution**. Different management interventions to protect and restore seagrass may show different levels of success in carbon and broader benefits, and/or the optimal approach may depend on site-specific conditions or project-specific goals.

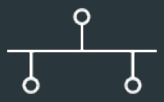
Pilot projects can resolve remaining scientific questions if designed with systematic, holistic data collection in mind: ensuring that they measure baseline carbon stocks and track changes following any interventions. Pilot projects can also **highlight best-practices for seagrass governance**, ensuring that local communities are invested in any implementation programmes and that relevant financial and social needs are met.

Advancing progress towards a UK seagrass cabon code

Six key evidence needs that will advance progress towards a UK seagrass carbon code that is inclusive of the broader benefits gained for people and nature from ecosystem

Data collection
Estimate carbon sequestration rates (e.g. using dating techniques such as 210Pb), and emissions of methane and nitrous oxide.

Feedbacks
Understand positive and negative feedbacks that promote or hinder restoration success (e.g. synergistic interactions with other species and with the biogeochemical cycling).



Monitor
Monitor and measure carbon fluxes before, during, and after restoration in multiple seagrass projects to serve as pilot projects for code development.

Enabling Conditions
Conduct spatial assessments across the land-sea continuum to guide site selection and increase chances of project success (e.g. considering social-ecological context, carbon offsets, land- and sea-based sources of stress, ecosystem services, biodiversity).

Restoration
Improve understanding of the relative differences in carbon offsets through various seagrass project approaches, with climate and habitat changes over time.

Wider Benefits
Evaluate wider benefits gained through seagrass carbon offset projects for biodiversity, ecosystem health, and human communities (e.g. supporting fisheries, recreation, and ecotourism, reducing coastal erosion).

Developing a UK Seagrass carbon code

A 'carbon code' that formalises assessment methods and provides an accepted framework through which credits are generated could drive the necessary research and standardisation to overcome many of these challenges and promote seagrass protection and restoration.

The code could also help ensure that the benefits associated with protecting and restoring seagrass meadows are recorded such that their contribution towards national policy targets is recognised. For example, a sufficiently reliable measurement, reporting and verification (MRV) programme to facilitate ongoing reporting and assessment for the carbon code could also gather relevant information used as activity data used in the National Inventory Report.

The Environmental Improvement Plan 2023 states the Defra will "Develop new nature markets for habitats such as saltmarsh and seagrass", and the concept is further supported by the UK Blue Carbon Evidence Partnership identifying "Encouraging and enabling investment in blue carbon habitats" as a key goal, again noting new nature markets.

Lessons can be learned from existing carbon codes to streamline design and adopt best practice. At present, the Verified Carbon Standard (VCS), the most widely used greenhouse gas crediting programme globally, has a protocol to award credits for blue carbon, but this has not yet been applied for seagrass (one project is currently underway in the USA). Similarly, Intergovernmental Panel on Climate Change (IPCC) guidelines can provide a baseline estimate of seagrass sequestration rates, but these have not been used to generate seagrass carbon credits, and, as highlighted above, further work is needed to confirm whether they might be appropriate or scalable for the UK context.

In the UK, two major existing voluntary carbon codes, the woodland carbon code and the peatland code, and the in-development saltmarsh carbon code, also provide significant insight into the development of successful offset schemes.

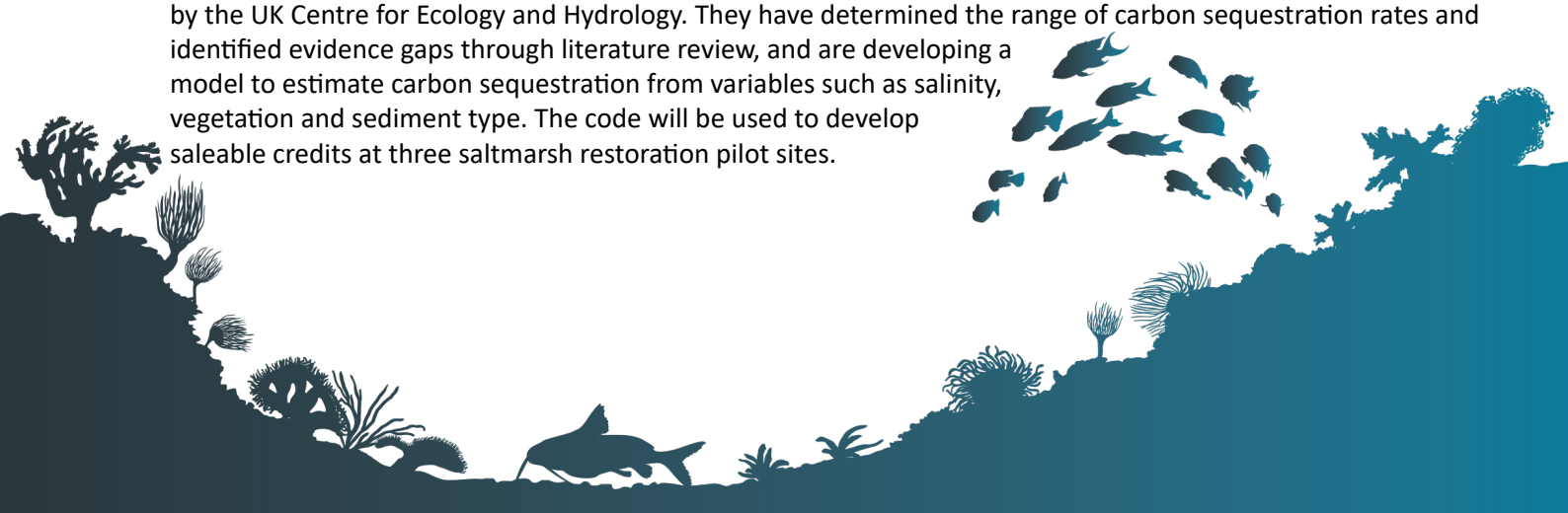
Formalising credits in a specific national framework can also ensure integration and compatibility of seagrass protection and restoration projects with other national offsetting/accreditation programmes. For example, land used to generate carbon credits under the Woodland Carbon Code can also generate biodiversity units under 'Biodiversity Net Gain': the Woodland Carbon Code establishes a carbon-focussed baseline and biodiversity credits must reflect additional enhancement beyond this. 'Biodiversity Net Gain' does not apply to coastal areas, but the equivalent 'Marine Net Gain' programme, currently under development, should be designed with these wider interactions in mind.

EXISTING CARBON CODES

Woodland Carbon Code (WCC): Formally launched in 2011, the WCC is the standard for UK woodland creation projects, which generates independently verified woodland carbon units. It is internationally recognised and endorsed by the International Carbon Reduction and Offset Alliance for its high standards of sustainable forest and carbon management.

Peatland Code (PC): The PC is a voluntary certification standard for peatland projects and includes assurances to voluntary carbon market buyers that the climate benefits being sold are real, quantifiable, additional and permanent. Developed with the IUCN, it now has 100 projects registered in the UK. The long-term, future objective is to expand to account for wider benefits for biodiversity and water supply (hence it is called the Peatland Code, not the Peatland Carbon Code).

Saltmarsh Carbon Code (in development)[8]: A UK Saltmarsh Carbon Code is being piloted by a consortium led by the UK Centre for Ecology and Hydrology. They have determined the range of carbon sequestration rates and identified evidence gaps through literature review, and are developing a model to estimate carbon sequestration from variables such as salinity, vegetation and sediment type. The code will be used to develop saleable credits at three saltmarsh restoration pilot sites.



Barriers

There are already a number of seagrass restoration projects underway in the UK, but these have faced significant barriers, which limit the establishment of seagrass restoration at larger scale. Currently, efforts to address threats to existing meadows are negligible.

Finance

Different seagrass restoration methods are being trialled, but they can be expensive. Significant costs can be associated with the habitat restoration itself, for example collecting seeds, processing and storing seeds or growing-out in a nursery and then transplanting to the restoration area. Further costs arise from permits and ongoing management and monitoring requirements. Extensive, long-term monitoring and reinforcement (re-seeding/transplants) is particularly important for habitat-based carbon removal schemes, where there may be concerns around the permanence of carbon storage.

As a result, carbon credits alone are unlikely to fully finance seagrass protection and restoration projects (at least with current schema and market values of carbon). **It is therefore key that the wider benefits of seagrass protection and restoration are recognised, and potentially valorised.** Seagrass restoration may result in 'premium' carbon credits, which command greater value than generic carbon credits, as it is associated with significant environmental co-benefits beyond carbon removal alone. Alternatively, the carbon credits could be one component of an income stream, with additional finance generated by 'stacking' additional credits (e.g., biodiversity offsets), or 'bundling' and selling multiple environmental credits resulting from the same restoration project.

To enable the operation of these 'more-than-carbon' aspects, a seagrass carbon code must standardise and ensure sufficient quality criteria for any wider benefits, resulting in the recognition that these carbon credits have a premium, and/or establishing a baseline such that further credits pass an additionality test (as noted above for how the Woodland Carbon Code can operate alongside biodiversity net gain).

Regulations and governance

It can be challenging for practitioners or investors to identify who has jurisdiction over coastal areas (see figure on page 8), making it timely and sometimes costly to consult with the relevant authorities in order to start a seagrass restoration project.

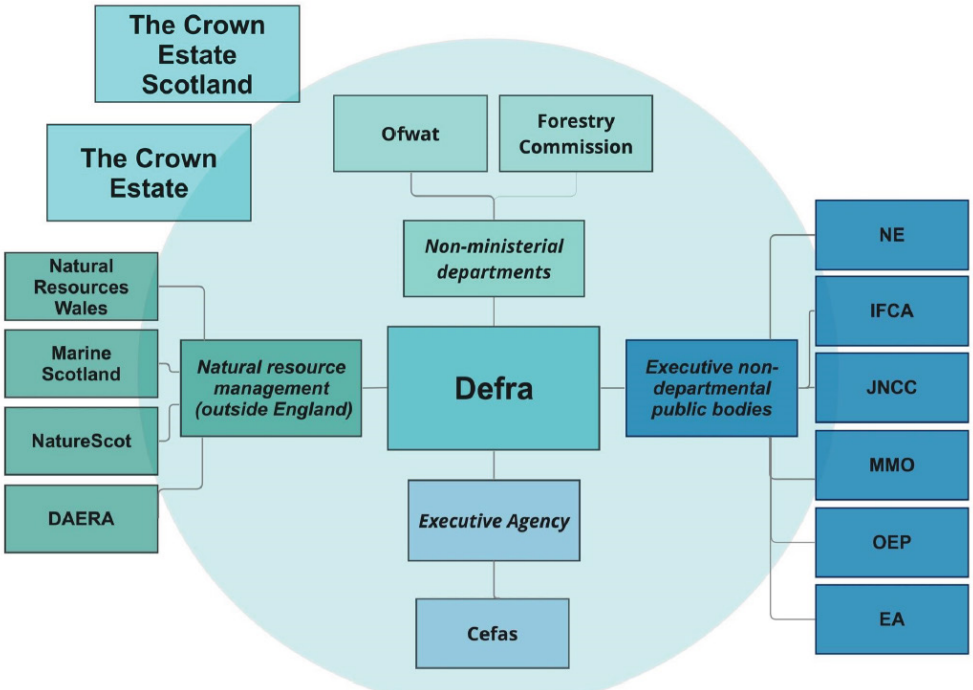
Then, without a standard recognition of seagrass restoration as positive habitat management, there may be further permitting costs or restrictions involved with implementation.

To overcome these barriers, the government should ensure coordination between the large range of agencies with involvement in coastal environmental management, and reassess environmental permitting restrictions where they seem to be acting against their intended purpose of reducing environmental harms.

STAKEHOLDERS INVOLVED IN COASTAL RESOURCE MANAGEMENT

A large range of stakeholders are involved in coastal resource management, and an important role for government may be facilitating relationships and coordinating action across different bodies.

Organisations referred to by acronyms are: DAERA – Department of Agriculture, Environment and Rural Affairs (Northern Ireland); Ofwat – Water Services Regulation Authority; Cefas – Centre for Environment, Fisheries and Aquaculture Science; NE – Natural England; IFCA – Inshore Fisheries and Conservation Authorities; JNCC – Joint Nature Conservation Committee; MMO – Marine Management Organisation; OEP – Office for Environmental Protection; EA – Environment Agency.



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Suggested citation:
Lynch, J., Ward, M., Wedding, L. M., Millington-Drake, M., McGarrigle, A., Cullen-Unsworth, L., Lilley, R.J., Seddon, N. 2023. A blue carbon code for UK seagrass: Agile Initiative Policy Brief. University of Oxford, Technical Report. November, 2023.

Further Information

This policy brief brings together research from an associated full report on "Developing a UK Seagrass Carbon Code"

Contributions were made by researchers involved in the Agile Initiative, CO2RE, the Nature-based Solutions Initiative, the Oxford Seascape Ecology Lab, Project Seagrass, and the Blue Marine Foundation.

Further funding support for the full report was provided by the Ofwat innovation fund, overseen by the Water Services Regulation Authority (Ofwat) for England and Wales and delivered by Challenge Works, supported by Isle Utilities and Arup, and University of Oxford's ESRC (Economic and Social Research Council) Impact Acceleration Account.

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The Agile Initiative is supported by the Natural Environment Research Council as part of the Changing the Environment Programme – NERC grant reference number NE/W004976/1

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