



POLICY BRIEF: IRELAND

Policies and Legal Instruments Supporting the Eco-Engineering of Marine Artificial Structures in Ireland

Developed by the **Ecostructure** project

ecostructureproject.aber.ac.uk

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I Protecting the Irish Coastline

Stretching over 3000 kilometres in length, Ireland's vast coastline is already seeing the impacts of climate change. Rising sea levels, flooding, and coastal erosion are particular pressures to which Irish coastal communities and infrastructure are not yet environmentally, socially or economically resilient. These combined pressures have increased the need for artificial coastal defence structures in order to protect the places people live and facilitate economic coastal activity.¹

To date, coastal defence in Ireland has primarily relied on hard artificial structures such as seawalls and groynes (commonly termed 'grey infrastructure'). These artificial coastal structures come at the expense of natural coastal habitats and the ecosystem services they provide - including their ability to serve as natural flood defences. To meet the needs of our coastal communities, economies, and

ABOVE

Seawalls at Coliemore Harbour in Dublin.

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environments, urgent discussions are therefore needed about the effectiveness – both financial and ecological – of traditional coastal defences, and how new infrastructural approaches that use nature-based solutions can mitigate the impacts of climate change with less cost to the environment. The following policy brief describes one such solution and existing policy and legislative mechanisms that may support its implementation in Ireland.

2 Nature-based Solutions & Eco-Engineering



Nature-based solutions are innovations that are inspired and supported by nature that are cost-effective and provide environmental, social and economic benefits.^{2 3} Nature-based solutions bring diverse, natural features and processes back into landscapes and use nature's complex system processes in order to achieve desired outcomes, such as reduced flooding or erosion risk.

Ecological engineering, or **eco-engineering**, is one pathway to bring nature-based solutions into coastal protection. Eco-engineering is the design and implementation of beneficial environmental enhancements into engineered structures to the benefit of both human society and the natural environment.^{4 5 6 7 8} The uptake of eco-engineering designs, from green roofs to engineered wildlife corridors that pass over motorways, has steadily progressed as recognition of its environmental, economic, and well-being benefits has spread. When applied to artificial coastal structures like seawalls, piers, rock groynes and jetties – structures that support human activities or protect coastal communities and landscapes from erosion or storm surge – eco-engineering can add structural, economic, and/or social value.^{9 10 11}

BELOW:

Adding crevices to the surface of artificial coastal structures can provide shelter for coastal organisms like sea snails, barnacles, and seaweeds.

While hard coastal structures often replace and disrupt complex natural habitat and processes, adding or building in eco-engineering enhancements can help mitigate some of the harmful impacts of artificial coastal structures and enhance the



biodiversity found on them¹². Such enhancements can either be retrofitted to an existing structure or incorporated into the development of planned structures. Examples of designs include artificial rock pools; the addition of textured surfaces, pits and crevices; and habitat units that target specific species of interest.



3 The Ecostructure Project

A five-year research project examining eco-engineering enhancements for marine artificial structures

ABOVE:

An artificial rock pool mounted on a seawall in Ireland provides a home to marine life when the tide goes out. Eco-engineering designs like these can increase biodiversity on marine artificial structures.

Ecostructure, a research project part-funded by the European Regional Development Fund (ERDF) through the Ireland Wales Cooperation Programme 2014-2020, brought together five leading universities in Wales and Ireland to research and raise awareness of eco-engineering solutions to the challenge of coastal adaptation to climate change in the Irish Sea.

Ecostructure has generated [new evidence](#) for eco-engineering approaches that improve the value of artificial structures as habitats for marine wildlife. These approaches – such as



mountable rock pools, the addition of texture on concrete surfaces, and habitat units that act similarly to nest boxes – can also introduce secondary benefits to marine artificial structures for coastal communities, such as:

- ▶ green spaces for public well-being
- ▶ habitats for commercially-important fish and shellfish
- ▶ water quality and nutrient cycling
- ▶ and more.

As part of Ecostructure, a review of the regulatory landscape relevant to coastal infrastructure was conducted to identify pathways through which coastal eco-engineering could be incorporated in Ireland. Through this work we identified legal requirements, policies, and management practices that could support the uptake of eco-engineering in planning while simultaneously aligning with Irish and EU policy on biodiversity and climate change adaptation.

The findings of this review are summarised in this brief and reveal a complex legislative environment that underpins coastal infrastructural development in Ireland, particularly for coastal defence works. While barriers to eco-engineering interventions no doubt exist, Ireland’s legislative framework creates a number of opportunities for eco-engineering to be implemented, particularly at a regional and local level.

ABOVE:

Ecostructure researchers prepare to launch a unit designed to provide habitat for lobsters at an offshore wind farm in the Irish Sea.

View Ecostructure’s tools and outputs [here](#).

View relevant publications on eco-engineering [here](#).

4 Legislation and Policies to Support the Eco-Engineering of Coastal Structures

4.1 Legislative Framework

There is currently no direct pathway for coastal eco-engineering to be deployed on hard coastal infrastructure. However, recent legislation in Ireland has created opportunities for the promotion of eco-engineering enhancements for marine and coastal infrastructure projects through the Climate Action and Low Carbon Development (Amendment) Act 2021. Environmental screenings (specifically those conducted as part of Environmental Impact Assessments and Appropriate Assessments under the Planning and Development Acts 2001-2021 and Planning and Development Regulations 2001-2018) may provide an opportunity for introducing eco-engineering solutions for coastal infrastructure.

The primary legal framework underpinning spatial planning in Ireland, including the land section of the coastal area, is the **Planning and Development Act 2000**. This and other key legislation such as the Foreshore Act 1933, the Planning and Development Act 2000, the Harbours Act 1946, and the Coast Protection Act 1963 are relevant to coastal projects and protection works. Most importantly, the more recent restructuring of Ireland's marine planning system under the **Marine Area Planning Act 2021** – which is likely to replace most of the provisions of the Foreshore Act – may provide more opportunities to include eco-engineering solutions for coastal structures.

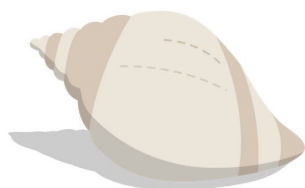
Objectives and regulatory measures incorporated under the following legislation may be useful in support of agencies, developers, or public bodies who may wish to incorporate an eco-engineering proposal into their planning activities.

- The [Climate Action and Low Carbon Development \(Amendment\) Act 2021](#) aims to embed carbon budgeting into law and create a

CONSERVATION EVIDENCE

Read Ecostructure's synopsis of the current evidence on eco-engineering.

- [Explore Online](#)
- [View the Report](#)
- [Watch the Video](#)



statutory basis for national climate objectives, including the requirement for biodiversity-rich, environmentally sustainable and climate-neutral economic measures. The Act provides a legal framework that can be used to promote the use of eco-engineering in marine and coastal infrastructure projects, as well as contributing to Biodiversity Net Gain and carbon cost calculations.

- The [Planning and Development Acts 2000-2021](#) provide the framework under which development takes place through detailed regional planning guidelines, development plans, and local area plans and provide the statutory basis for the protection of the natural environment and for the implementation of environmental impact assessments. The Acts also set out the consent framework which must be obtained for coastal infrastructural developments such as flood barriers and coastal protection. Every proposed plan or project requires the consent of either the relevant local authority or An Bord Pleanála. Coastal structures included within the scope of the Act are defined within Part 2, 10.
- The [Environmental Impact Assessment Directive](#) requires that any development which is likely to have an impact on the environment must be screened to determine if there is a need for an EIA as required by the EIA Directive (2014/52/EU). In Schedule 5, Part 2 10(k) of the regulations, developers are required to prepare a screening report for proposed coastal protection works in accordance with the criteria set out in Schedule 7, which specifies for example location, size, nature, and characteristics of the potential impacts, to determine whether an EIA should be prepared. An Environmental Impact Statement is only required for coastal works that exceed 1km in length (according to Schedule 5, Part 2, Class 10).

BIOPREDICT

BioPredict is an Ecostructure tool that helps predict the biological communities that will be supported by proposed new artificial structures on the coast of the Irish Sea.

[Explore the Tool](#)



- [Flood Risk Management Plans](#) (FRMPs) in Ireland set out a strategy for cost-effective and sustainable long-term management measures for flood risk based on the results from the Catchment Flood Risk Assessment and Management (CFRAM) study (carried out between 2012 and 2017 to meet the requirements of the EU Floods Directive). There are 29 plans which set out a range of flood risk management measures for each river basin. **These plans can offer an opportunity to identify where eco-engineering interventions may be suitable.**

4.2 Planning and Management Environment

Ireland operates on a two-tier planning system in which planning responsibilities are split between the central government and local councils/planning authorities. The system is 'plan-led', with planning decisions based on national and local Development Plans and policies.

Preparation of City and County Development Plans in Ireland requires county and city councils to carry out Strategic Flood Risk Assessments in compliance with the Floods Directive, as well as SEA's and AA's under the Habitats Directive. The assessments embed environmental objectives within strategic infrastructure developments and ensure that the built environment complies with biodiversity and environmental conservation and protection requirements. **Key areas and considerations for eco-engineering projects can be identified in City and County Development Plans in coastal counties, including clauses which may provide justification for such projects.**



ECOSTRUCTURE MAPPING REPOSITORY

Ecostructure produced GIS maps of 3405 artificial structures and 1260 coastal flood defences on the Irish and Welsh shores of the Irish Sea, indicating the current extent of coastal hardening and providing a basis for predicting further developments in response to climate change. [Request maps here.](#)

5 Funding

Opportunities to source funding for eco-engineering projects in Ireland will most likely be found at the regional and local level.

One key funding mechanism that should be considered is the OPW's Minor Works - Minor Flood Mitigation Works and Coastal Protection Scheme, which provides funding for Local Authorities to undertake minor flood works or studies for projects costing up to €750,000. Under this mechanism, a local authority can identify a priority area in their coastline under significant threat from coastal erosion or flooding and put forward a proposal for OPW funding to implement management measures. It should be noted that the scheme is typically awarded to projects, which are likely to have easily identified and implemented solutions.

The OPW's 'Guidelines for Coastal Erosion Risk Management Measures and Funding Applications under the Minor Works Scheme' provides guidance to Local Authorities with proposals and funding applications. As part of the application process, a Coastal Erosion Risk Management Study is required for proposed structural measures that prevent or mitigate erosion. These studies must fully investigate, substantiate, and demonstrate the technical merits of any measures being proposed and the clear value of the measures to justify public money being spent.

PUBLICATIONS

Read peer-reviewed research, reports, and guidance documents produced by Ecostructure.

[Our Publications](#)

RIGHT:

Ecostructure researchers and stakeholders discuss eco-engineering opportunities in Wales.



6 Opportunities & Barriers

6.1 Barriers

Lack of a clear legislative pathway

Ecostructure Stakeholder engagement revealed that there is little formal guidance that promotes or encourages the use of eco-engineering in Ireland. The development of policy guidance, e.g. from the Office of Public Works, would be highly valuable and would go a long way towards encouraging the uptake of eco-engineering solutions.

Perception of Unsuitability

The two most common types of defences used in Ireland currently are rock armour revetments and seawalls, which many practitioners believe have limited potential for the incorporation of eco-engineering enhancements.

Cost

Consultancies are less interested in using ecologically-sensitive infrastructure because of perceived higher costs than traditional infrastructure. At present, there are no specific funding schemes for fostering the implementation of nature-based solutions (NbS) at the national or European level, therefore eco-engineering and other NbS must compete with conventional coastal protection measures for funding.

Management Uncertainties

Uncertainty over the responsibility for ownership and maintenance is another complication. Due to the variety of stakeholders that may be involved in implementing and maintaining eco-engineering enhancements and NbS, the responsibilities and obligations for providing funding are not always clearly distributed.

EF PREDICT

Ecostructure’s EFPredict can be used to predict the ecosystem functions of biological communities supported by artificial structures, from which it's possible to infer the ecosystem services that they might provide.

[Explore the Tool](#)

Ecostructure created experimental tiles that mimic the surfaces of natural rocky shores to see whether this surface texture might improve hard structures as homes for wildlife. At right, the tiles are shown before and after 18 months.





ABOVE RIGHT:

A prototype letterbox crevice unit providing shelter to a blenny (a small marine fish).

6.2 Opportunities

While there is no national policy supporting nature-based solutions in Ireland, relevant interventions are being promoted at the county and city level through some County and City Development Plans and Climate Change Action Plans. In order to overcome the above barriers, it is essential for eco-engineering research to address the legislative and funding concerns identified and contribute evidence-based guidance and techno-economic assessments in order to increase the uptake of eco-engineering enhancements, upscale eco-engineering designs, and deliver biodiversity net gain.

Maritime Area Planning Act 2021: At the time of writing the Irish Maritime planning and governance is undergoing a significant change, whereby the Maritime Area Planning Act 2021 will eventually replace the Foreshore Acts 1933-2021. Chapter 8 of the Maritime Area Planning Act 2021, which covers the “rehabilitation of maritime area and emergency works”, contains promising provisions for potential eco-engineering implementation. In addition, Coastal Protection Schemes delivered by the OPW under the Coast Protection Act 1963 may provide an opportunity for retrofitting coastal flood protection structures with eco-engineering enhancements.

Regional and local planning and management in Ireland can highlight where and how to advance an uptake of eco-engineering solution for Irish coastal structures, for example the National Biodiversity Action Plan 2017-2021 specifically encourages incorporation of ecological engineering features into new and existing structures. [The Irish Coastal Protection Strategy Study \(ICPSS\)](#) could serve as a baseline to identify suitability for eco-engineering interventions and the Flood Risk

EDUCATIONAL RESOURCES

Browse and download educational resources that have been produced as part of Ecostructure, including videos, fact sheets and field guides, and our best practice newsletters.

[Explore Resources](#)



LARVAL DISPERSAL TOOL

Our **online larval dispersal tool** uses hydrodynamic models to model dispersal of larvae from coastal locations in the Irish Sea, providing insights into the potential future spread of both native and non-native species.

[Explore the Tool](#)

Management Plans (FRMPs) could facilitate inclusion of eco-engineering interventions under the principles of the mitigation and enhancement.

In 2020, Ireland's Marine Institute completed a [Regional Seascape Character Assessment](#), which included the designation of 13 Seascape Character Types (SCTs) (e.g. shallow offshore waters, large estuaries, and sea loughs) and 15 Seascape Character Areas (SCAs) that describe the physical and biological characteristics and socio-cultural values of the Irish coast. Each SCA describes the natural and cultural characteristics of a distinct region, shedding light on key habitats, species, hydrological processes, and heritage – including coastal structures. Viewed together, these SCTs and SCAs can provide a valuable framework through which to generate eco-engineering solutions appropriate to the natural and cultural assets of a distinct region.

In 1997 the Department of the Marine developed and published the [Environmentally Friendly Coastal Protection - ECOPRO Code of Practice](#). This Code of Practice offers a wide array of best practices for coastal erosion management and the development of environmentally friendly coastal protection interventions. Unfortunately, the Code of Practice is not widely cited by Local Authorities and has fallen into disuse. Ecostructure's outputs could be used to revise or develop an updated code of practice based on the current evidence base on eco-engineering.

Biodiversity Offsetting is another novel concept through which eco-engineering interventions may be undertaken, but this is not yet acknowledged or endorsed within Ireland's regulatory environmental framework.

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