



The Climate Action Regional Offices are an initiative of Local Government, funded by the Department of Climate, Energy and the Environment, as a shared service for Local Authorities

Coastal Change Management: A Practical Resource

Support for local authority staff in addressing coastal change management issues through evidence-based planning and response

February 2026





Note:

This document is intended as a practical resource for local authority staff working in the area of coastal change management. Local authority staff should consult with the competent authorities, their colleagues (e.g. planners, legal team, biodiversity officers, procurement, local area engineers, etc.) and acquire external expertise advice as necessary to ensure adherence to best practice and legal obligations.

Coastal change management is an evolving area in the context of the implementation of the Report of the Inter-Departmental Group on National Coastal Change Management Strategy (2023) and recent legislative reform in the area of Planning including Marine Area Planning. This document is intended as a signpost to the issues to be considered in the area of coastal change management and represents our best understanding at the current time. It does not purport to be, and should not be considered to be a legal interpretation of local authority obligations relating to coastal change management. This publication does not necessarily represent the views of the Government

CARO (CARO@CorkCoCo.ie) welcomes any comments/corrections to the document and undertakes to update the document regularly in line with developments in the area. The most up-to-date version of the document will be available on www.CARO.ie.



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CARO, Atlantic Seaboard South is one of four regional offices established as a national shared service by the Local Authority Sector in response to Action 8 of the 2018 National Adaptation Framework (NAF) and it is guided, supported and funded by the Department of Climate, Energy and the Environment (DCEE). The CAROs are mandated to coordinate and support local government to lead transformative change and deliver measurable climate action.

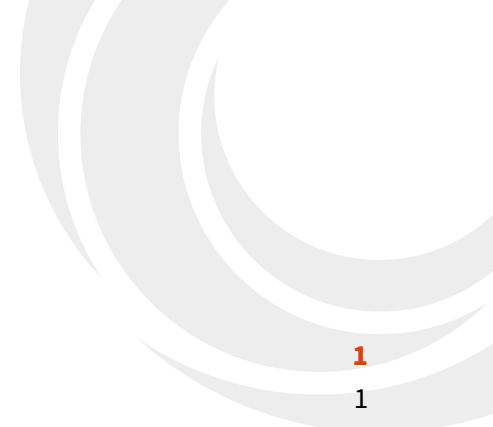
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- Dept of Housing, Local Government and Heritage
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- Office of the Planning Regulator
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- National Parks and Wildlife Service
- Maharees Conservation Association
- The Heritage Council
- Cork County Council
- Fingal County Council
- Galway City Council
- Kerry County Council
- Waterford City & County Council
- Wexford County Council
- Wicklow County Council





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Terms and Acronyms

AA	Appropriate Assessment
CARO	The Climate Action Regional Offices
CFERM	Flood and Erosion Risk Management
CFRAM	Catchment Flood Risk Assessment and Management
CIRIA	Construction Industry Research and Information Association
DAS	Dumping at Sea
DHLGH	Department of Housing, Local Government and Heritage
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
ERDF	European Regional Development Fund
EU	European Union
GES	Good Environmental Status
GIS	Geographic Information System
GSI	Geological Survey Ireland
HWM	High Water Mark
ICPSS	Irish Coastal Protection Strategy Study
IDG Coastal Change	Inter Departmental Group on Managing Coastal Change Strategy
IDGR	Report of the Inter-Departmental Group on National Coastal Change Management Strategy
IMDBON	Irish Marine Data Buoy Observation Network
INFOMAR	Integrated Mapping for the Sustainable Development of Ireland's Marine Resource
LA	Local Authority
LWM	Low Water Mark
LiDAR	Light Detection and Ranging
MAC	Maritime Area Consent
MAP	Maritime Area Planning Act
MARA	Maritime Area Regulatory Authority
MSFD	Marine Strategy Framework Directive
MUL	Maritime Usage Licence
NbS	Nature-Based Solutions
NGO	Non-Governmental Organizations
NIS	Natura Impact Statement
NMPF	National Marine Planning Framework
NMS	National Monuments Service
NPWS	National Parks and Wildlife Service
OPR	Office of the Planning Regulator
OPW	The Office of Public Works
OSI	Ordnance Survey Ireland
SAC	Special Area of Conservation
SCVI	Social Coastal Vulnerability Index
SPA	Special Protection Areas
WFD	Water Framework Directive



1. Introduction

1.1 Purpose of this Document

Change is a normal feature of coastal processes, supporting natural adaptation to environmental conditions. Under certain circumstances, those natural changes can pose a risk to communities or infrastructure, and these risks can be increased by the impacts of climate change. Managing risks associated with coastal change where they arise requires informed, consistent, and proactive approaches to protect natural assets, essential infrastructure and communities. These issues can pose particular challenges for Local Authorities managing infrastructure and in emergency scenarios.

The purpose of this document is to provide a practical resource to support local authority staff (LA staff) in addressing coastal change management issues through evidence-based planning and response. This document aims to provide a roadmap for LA staff dealing with coastal change management, outlining the issues to be considered, the steps to be taken and the organisations to be engaged with in the process of planning and implementing coastal change management actions.

It is important to note that although coastal erosion may exacerbate flooding in coastal areas, coastal flooding is not within the remit of this report as it is already dealt with in existing programmes such as the National Catchment-based Flood Risk Assessment and Management ([FRAM](#)) Programme (2018), and the subsequent capital flood relief programme.

1.2 Coastal Change Management

1.2.1 Hazards and Risks

Coastal change management involves managing hazards and risks at the coast arising from erosion, accretion, the shifting inter-tidal zone due to sea level rise, storm surges, wave action, and wind, particularly as these are intensified by climate change. The current evidence points to a gradual sea level rise of up to 1 metre to the year 2100 due to climate change. Further information on climate change effects and its impacts at the Irish scale can be found in [Ireland's Climate Change Assessment](#).

LA staff typically face coastal change management challenges such as coastline and cliff erosion affecting infrastructure and communities, sediment accumulation and scour, damage to coastal roads, embankment failures, and deterioration of coastal structures including masonry walls, quays, piers, and heritage assets (Figure 1).

Figure 1 Examples of coastal change management challenges experienced by LA staff



Shingle accumulation at Cloughaninchy Co. Clare (Arup)



Scour at the toe of revetment at Greenore Co. Louth (Arup)



Erosion of access road following storm event, Seaview, Co. Wexford (CARO)



Erosion of coast adjoining revetment, The Murrrough, Co. Wicklow (Wicklow County Council)

1.2.2 Strategic Management of Coastal Change

The coastal change management models in place in other countries vary depending on their experience of coastal change and the roles and responsibilities of national and local government and agencies. The EU promotes an Integrated Coastal Zone Management (ICZM) approach to coastal change management which is a dynamic, multidisciplinary and iterative process to promote sustainable management of coastal zones. ICZM seeks, over the long-term, to balance environmental, economic, social, cultural and recreational objectives, all within the limits set by natural dynamics.

Different strategic coastal change management options exist, as listed in Table 1. These strategic options and models are expected to be assessed as part of the development of future policy for Ireland in the long-term under the report of the Inter-Departmental Group on National Coastal Change Management Strategy ([IDGR](#)).

Table 1 Strategic coastal change management approaches as per the IDGR

Approaches	Actions required
Do nothing	No active intervention, allowing natural processes to take over with areas of land being lost to the sea over time
Hold the line	Build or maintain coastal defences to protect a coastline against the impacts of coastal change
Managed realignment	Landward realignment of existing coastal defences, or an existing coastline, to a new, more sustainable alignment accounting for the impacts of coastal change
Managed retreat	Co-ordinated movement of people and infrastructure away from risks and allow the coastline to retreat
Advance the line	Defences are built out at sea e.g. tidal barrage, land reclamation

2. Legislation and Policy Framework

2.1 Introduction

The legislative framework for development in coastal areas include the [Planning and Development Acts, Foreshore Acts](#), the [Maritime Area Planning Act, Harbours Acts, Coast Protection Act, the European Union \(Planning and Development\) \(Environmental Impact Assessment\) Regulations 2018](#), the [EU Water Framework Directive](#), the [EU Marine Strategy Framework Directive](#), the [Birds Directive](#) and the [Habitats Directive](#).

The functions of local authorities are outlined in the [Local Government Act 2001](#). In relation to coastal change, local authorities are legally obligated under the provisions of the [Planning and Development Act 2000](#), as amended, and the [Planning and Development Act 2024](#), to create development plans for their respective administrative areas. These development plans must include objectives relating to climate change adaptation and mitigation, and the management of areas, uses and structures. Coastal change and erosion risk must be considered and addressed through policies in these statutory plans, including setting objectives to ensure new developments in coastal areas are resilient to climate change impacts such as sea-level rise and coastal erosion.

The [Maritime Area Planning \(MAP\) Act 2021](#) amends the Planning and Development Act 2000 to designate certain local authorities as Coastal Planning Authorities and their functional area in that regard extends to the nearshore. The MAP Act effectively repealed components of the Planning and Development Act, specifically Part XV which included obligations for local authorities to obtain permission for development within the foreshore area.

With respect to responding to coastal change, local authorities are, generally, responsible for the management of matters associated with coastal change and erosion in their respective administrative areas. Further information on the legislative framework and consents required in the response to coastal change is provided in Section 9 and Appendix A.

2.2 Report of the Inter-Departmental Group on National Coastal Change Management Strategy (IDGR)

In response to the increasing risks associated with climate change, including changing weather patterns and an estimated sea level rise of up to 1 metre by the year 2100, the Government established the Inter-Departmental Group on Managing Coastal Change Strategy (IDG Coastal Change). The purpose of the Group was to scope out an approach for the development of an integrated whole of Government strategy for managing coastal change. The IDGR, published in 2023 sets out the IDG Coastal Change initial findings and recommendations to enable the State to assess risks and develop appropriate responses.

The [IDGR](#) is structured around three strategic pillars, described below, and the report outlines 15 key recommendations aimed at enhancing governance, improving the understanding of risk and developing effective management responses.

- **Pillar 1** focuses on building institutional capacity and co-ordination, with the Department of Housing, Local Government and Heritage (DHLGH) designated in the lead coordination role.
- **Pillar 2**, which is led primarily by the OPW, emphasises the need for robust data collection, coastal monitoring, and technical risk assessments to build an understanding of the risk of coastal change and identify potential technical risk management options, including the development of a monitoring programme and national-scale hazard mapping.
- **Pillar 3** relates to development of appropriate management responses to coastal change. It includes the development of a national set of coastal change management plans by the IDG Coastal Change, in consultation with local communities and other stakeholders, subsequent preparation of a programme of capital measures and the promotion of nature-based (NbS) solutions, to address coastal risks. Under pillar 3, the IDGR includes strategic management responses to coastal change such as the consideration of legislative options for beach nourishment licences and permits and strategic managed retreat.

A summary of implications for LA staff and progress of these recommendations is included in Appendix E.



3. Roles and Responsibilities

This section outlines the roles and responsibilities of local authorities, government departments, other state agencies, and other stakeholders regarding coastal management.

3.1 Local Authorities

Current key responsibilities of local authorities in relation to coastal change management are:

- Monitoring coastal change.
- Identifying areas, infrastructure and communities at risk as a result of coastal change.
- Implementation of coastal management solutions in publicly owned areas in response to risk assessment (design, seek funding, seek relevant consents, build, etc.).
- Improving and maintaining regional and local roads, including maintaining associated coastal protection assets.
- Preparation of development plans which may provide objectives and policies in relation to the appropriate sustainable development and management of development in coastal areas at risk of erosion.
- Assessment of planning applications for developments located in coastal areas at risk of coastal erosion.
- Preparation of Local Authority Climate Action Plans which include measures for climate change adaptation with an emphasis on coastal erosion management.
- Enforcement in relation to unauthorised developments within the nearshore area in addition to other enforcement powers in the areas of roads, environment, building control, etc.
- Monitoring and reporting on water quality.
- Responding to emergencies relating to coastal management (e.g. cliff collapse).
- Communicate with local communities in relation to emergencies, local issues, installation of coastal management interventions, etc.

Specific responsibilities for local authorities recommended as part of the IDGR are:

- Participation in training and capacity building programmes coordinated by the CAROs (Recommendation 1.h).
- Engagement with local communities to identify appropriate interventions (Recommendation 8.a).
- Include coastal change risks in statutory plans, such as Climate Action Plans (Recommendation 8.b).
- Leading consultation processes for managed retreat strategies (Recommendation 15.b).
- Reflecting coastal risk in local planning policies to avoid inappropriate development (Recommendation 15.c).

3.2 Government Departments and Other State Agencies

This section outlines the principal government departments and state agencies in Ireland that have a direct role in managing coastal change, including coastal erosion. It provides a summary of each organisation's specific responsibilities in relation to coastal hazards.

While the entities listed here play key roles at national and regional levels, it is important to note that other specific stakeholders may be relevant depending on the specific context, location or nature of the coastal issue at hand. The information presented is based on official government sources and is intended to support informed decision-making and inter-agency coordination.

3.2.1 Department of Housing, Local Government and Heritage (DHLGH)

As per the IDGR, the Department of Housing, Local Government and Heritage has been designated in the lead coordination role, to promote a joined-up, whole of Government response to coastal change by all relevant Departments/Agencies having regard to their existing policy remits; and to chair the Interdepartmental Steering Group on Coastal Change (IDG Coastal Change). DHLGH is tasked with reporting on the work of the Interdepartmental Steering Group to the Cabinet Sub-committee on Environment and Climate Change.

3.2.2 Interdepartmental Steering Group on Coastal Change (IDG Coastal Change)

As per the IDGR, the IDG Coastal Change is established to identify possible approaches, associated resource requirements, and to develop the range of policy responses that the challenge of coastal change encompasses. This includes identification of resources and skills required at local and national level and development of programmes necessary to develop those skill sets. It also includes identification of most appropriate measures

to support managed retreat options and the promotion of a multisectoral approach to the application of nature-based solutions through knowledge development and identification of suitable locations. The IDG Coastal Change will be responsible for the preparation of a set of national set of coastal change management plans.

3.2.3 The Office of Public Works (OPW)

Under the IDGR, the OPW are designated as the national lead coordinating body for the assessment of coastal change hazards and risks and the assessment of technical options and constraints. This includes co-ordinating the monitoring of physical coastal change, development of a national coastal change monitoring programme, and the development of a National Coastal Defence Asset Database. The OPW will also be responsible for developing national-scale coastal erosion hazard mapping and an associated risk assessment, used to assist in identifying communities and coastal areas at potentially significant risk of coastal change.

3.2.4 Marine Area Regulatory Authority (MARA)

The Maritime Area Regulatory Authority, ([MARA](#)) is an independent agency empowered to manage the occupation of the Maritime Area and to enforce certain provisions of the [2024 Planning and Development Act](#). MARA is a prescribed body for consultation on all types of planning consents under the Planning Acts. In relation to the Planning and Development Act, MARA's responsibilities lie predominantly in enforcing any conditions imposed by An Coimisiún Pleanála on any maritime development. MARA's functions are set out in the [Maritime Area Planning Act 2021](#) (the MAP Act) as amended and include:

1. Assessing [Maritime Area Consent \(MAC\)](#) applications for the maritime area, which are required by developers before development permission can be granted (see Section 9.3.2);
2. Assessing [Maritime Usage Licences](#) for specified activities (see Section 9.3.3);
3. Compliance and enforcement of Maritime Area Consents (MACs), licences and offshore development consents;
4. Investigations and prosecutions; and
5. Administration of the existing Foreshore consent portfolio.

3.2.5 Office of the Planning Regulator (OPR)

The [Office of the Planning Regulator](#) ensures that Ireland's planning system aligns with national policy and best practices. While it does not directly manage coastal erosion, it evaluates and advises on the consistency of development plans with the proper planning and sustainable development of coastal areas and compliance with the [Planning System and Flood Risk Management Guidelines](#), which are relevant to coastal hazard planning. The OPR may also coordinate research and provide training on such matters.

3.2.6 Geological Survey Ireland (GSI)

[Geological Survey Ireland](#) supports coastal erosion monitoring through participation in national and international projects, including those funded by the European Space Agency, which use satellite imagery to track shoreline changes. GSI also produces [geological maps and data](#) that help identify areas vulnerable to erosion.

3.2.7 Environmental Protection Agency

[The Environmental Protection Agency](#) monitors and regulates environmental quality across Ireland, including coastal and estuarine waters, and supports climate adaptation and marine protection through research and implementation of EU directives. It is also the regulatory authority for licensing and enforcement of Dumping at Sea operations; more commonly known as dredging.

3.2.8 National Parks and Wildlife Service (NPWS)

[NPWS](#) is responsible for the protection and conservation of Ireland's natural heritage and biodiversity. NPWS works with local communities and Local Authorities to mitigate risks to coastal habitats and species, including risks due to human activities such as disturbance and accelerated erosion. It engages in outreach, consultation, licensing and enforcement to ensure that legal requirements under the Wildlife Acts, the Habitats Directive and the Birds Directive are observed. It is vital that prior to carrying out any coastal works that the local authority's biodiversity officers and NPWS are consulted early in the process to identify suitable management options and ascertain if any impacts to protected species or habitats are likely to occur and to ensure that wildlife licences or

derogations are sought where appropriate. Maps and data relating to protected sites are made freely available at <https://www.npws.ie/maps-and-data>.

3.2.9 National Monument Service

The [National Monuments Service \(NMS\)](#), a division of the Department of Housing, Local Government and Heritage, is Ireland’s main authority for the protection and management of archaeological heritage in terrestrial and marine environments.

3.2.10 The Climate Action Regional Offices (CAROs)

The [Climate Action Regional Offices \(CAROs\)](#) coordinate and support local government to lead transformative change and measurable climate action across Ireland. The CAROs work with local authorities to deliver climate policies and behavioural change within their own organisations and empowering citizens and enterprise to embrace the need for climate action.

In the context of coastal erosion, the CAROs assist local government with climate change adaptation guidance, with plans for future training. The CAROs are mandated through the IDGR to work with relevant agencies to establish a training and development programme for LA staff and to identify and scope the requirement for additional expert technical, environmental and administrative capacity at LA level.

3.2.11 Marine Institute

The [Marine Institute](#) provides scientific research and advice on Ireland’s marine environment. It contributes to coastal erosion management by maintaining the [Marine Atlas](#), an open data platform that supports marine planning and environmental assessments. The Institute supplies oceanographic, bathymetric, marine sediment analysis and habitat data that are essential for understanding and responding to coastal change.

3.3 Other Stakeholders

Other stakeholders shown in Table 2 may be relevant whenever managing coastal change or addressing coastal erosion, as they are the responsible for certain areas or infrastructure that might be at risk due to the coastal changes or may be prescribed bodies under the Planning Regulations; or statutory consultees under other legislation (e.g. the ‘Habitats Directive’ as described in Section 9.2.2).

Table 2 Other stakeholders in the coastal change management

Stakeholder	Responsibility on coastal change and management
An Taisce	Responsible for promoting coastal protection through education and public programmes like Clean Coasts and the Blue Flag Beach Programme, which support water quality, safety, and environmental standards.
Transport Infrastructure Ireland	Responsible for protecting and maintaining national road and rail infrastructure, including implementing coastal protection measures where erosion or flooding threatens transport assets
Uisce Éireann	Manages public water and wastewater services, including infrastructure that may be impacted by coastal flooding or erosion, and contributes to water quality protection under the Water Framework Directive.
Iarnród Éireann	Implements coastal protection works to safeguard railway infrastructure from erosion, flooding, and climate change impacts, particularly along vulnerable east coast corridors.
Port Authorities	State-owned, Semi-State, private port companies or LA controlled ports manage and maintain port infrastructure, some of which includes coastal protection works and climate adaptation measures to ensure operational resilience.
Waterways Ireland	Manages and maintains Ireland’s inland navigable waterways, including canals and rivers, with responsibilities that include protecting waterway infrastructure and adjacent natural environments.
Commissioners for Irish Lights	Provides and maintains marine aids to navigation (lighthouses, buoys, beacons), including marking hazards and wrecks, and supports coastal safety and environmental protection.
Local stakeholders and NGO’s	See Appendix G.

4. Understanding and Management of Coastal Change

4.1 Introduction

The IDGR constitutes a road map for responding to coastal change challenges due to climate change in a structured and planned way. This is to provide the basis for a long-term strategy with an integrated and co-ordinated approach to coastal change management.

However, it is acknowledged that some of the IDGR recommendations will not be implemented until the medium or longer-term and therefore local authorities should continue to discharge their existing functions to address immediate issues and plan for potential future change taking account of the information available at that time and guided by the principles set out in the IDGR.

With this in mind, this document attempts to address both, the planned longer term strategic management of coastal change and the current recommended approach to coastal change management by LA staff.

4.2 Strategic Approach to Coastal Change Management

It is recommended that strategic management of coastal change adopts a full cycle of monitoring, mapping, assessing, planning, implementing and continuing monitoring. This cycle approach is detailed in Figure 2.



Recommendations of the Inter-Departmental Group on National Coastal Change Management Strategy (IDGR)

R - IDGR recommendation number

Estimated Completion Date

- ✔ Existing prior to the IDGR
- Short-Term 2026 to 2027
- Medium-Term 2028 to 2030
- Long-Term 2031 onwards

MONITOR

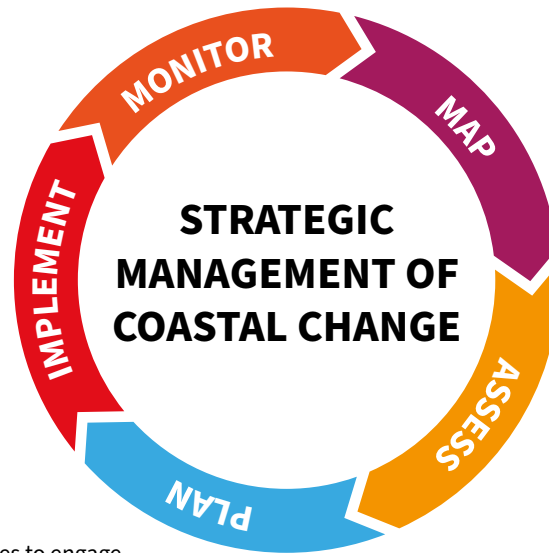
- National Coastal Change Monitoring Programme by the OPW (R3.a)
- Coastal Defence Asset Database by the OPW (R4.a)
- Past Coastal Erosion Database for reporting historic erosion by the OPW (R6.c)
- Coastal Monitoring and Data Collection by the OPW (R3.a)
- Coastal Aerial Imagery and LiDAR Survey (CALs) Programme by the OPW (R3.a)

IMPLEMENT

- Capital Measures set out in Coastal Change Management Plans by the IDG Coastal Change, and subsequent management and coordination of community works by the OPW (R10)
- Promotion of Nature-based Solutions by the IDG Coastal Change (R11)
- Most appropriate measures and mechanisms required to support a managed retreat by the IDG Coastal Change (R15)

PLAN

- ✔ In vulnerable locations, local authorities and State agencies to engage with local communities to identify the most effective solutions (R8.a)
- ✔ Local authorities, in statutory plans, including the LA Climate Action Plans required under the Climate Act, continue to identify potentially vulnerable locations that could be affected by coastal change (R8.b)
- National Set of Coastal Change Management Plans by the IDG Coastal Change (R9.b)
- Spatial Planning Guidelines by the DHLGH with policy direction to Planning Authorities in coastal areas (R12)



MAP

- ✔ ICPSS by the OPW
- Shoreline Change Assessment by GSI
- National Coastal Erosion Hazard Mapping by the OPW (R6.a)

ASSESS

- National Coastal Erosion Risk Assessment by the OPW (R6.a)
- Identify Areas of Potentially Significant Coastal Change Risk by the OPW (R6.e)
- Assess and appraise technical options for Areas of Potentially Significant Coastal Change Risk by the OPW (R7.a)

Figure 2 Cyclical approach to strategic management of coastal change

4.3 Management of Coastal Change by LA staff

4.3.1 Governance

There is a need for coordination between LA coastal management staff and other LA staff, community groups, local authorities and agencies at local and regional levels.

- At local level, effective coastal management requires coordination among various departments, including coastal engineering, roads (many coastal works are integrated into roads projects such as coastal walls that protect roads), biodiversity, emergency management, and planning to ensure sustainable development in coastal areas.
- Co-ordination and engagement with local community groups, businesses and agencies is also required to deliver coastal management.
- At regional level, coordination with neighbouring local authorities and the OPW is essential to address coastal changes and hazards affecting multiple local authorities. Coastal engineering solutions for a coastal area must also consider potential impacts on adjacent coastal areas.

4.3.2 Proposed Approach

Coastal change challenges may appear on private or public lands, impacting public or private assets or infrastructure, in areas subject to environmental protection and may also affect cultural heritage assets and be the subject of third-party consenting requirements.

Once a coastal change is reported to or observed by LA staff, it should be ascertained whether the situation can be described as an emergency (necessitates immediate action to avert imminent danger to people, property or the environment). If it is deemed to be an emergency, immediate response measures are initiated (see Section 6). If the coastal change is not deemed to be an emergency, LA staff should assess through the implementation of a monitoring plan for the vulnerable area, whether intervention is needed and screen for environmental, heritage, archaeological, and planning constraints. If intervention is assessed as not required but critical infrastructure is at risk, it may be prudent to put in place an interim plan to mitigate against future potential emergency. Emergency or not, the coastal change observed should be reported to the OPW via the Past Coastal Erosion Database (see Section 4.3.3.3).

If intervention is required, relevant studies should be procured, and a suitable coastal change solution proposed. There is a wide range of strategic approaches (Table 1) and coastal management solutions (Section 5) which can be assessed. Coastal management solutions may include hard engineering solutions or nature based solutions including interventions designed to move human activities out of a risk zone (e.g. move a car park away from the coast) or to reduce the damaging effect of human activities on coastal defence assets (e.g. measures to deter people from accessing and damaging dune systems). When assessing coastal management options, it is important to consider key factors such as local conditions, the assessment of key risks, expected erosion, the impact on the environment, and what the community needs to ensure delivery of a solution that balances environmental, economic, social, cultural and recreational objectives, all within the limits set by natural dynamics.

Once the preferred management option has been identified, and if this includes protection works, necessary consents and licences should be identified and obtained (see Section 9), funding secured (see Section 7), and finally the works implemented. It is recommended that any implemented works are monitored post installation to assess performance, potential impacts on adjoining areas and identify any maintenance requirements. The proposed approach to coastal management developed in this document is designed to guide LA staff and it is summarised in Figure 3.

A solid understanding of the coastal processes driving change is essential for effective monitoring, evaluation, and management of coastal challenges. A brief overview is presented in Appendix D.

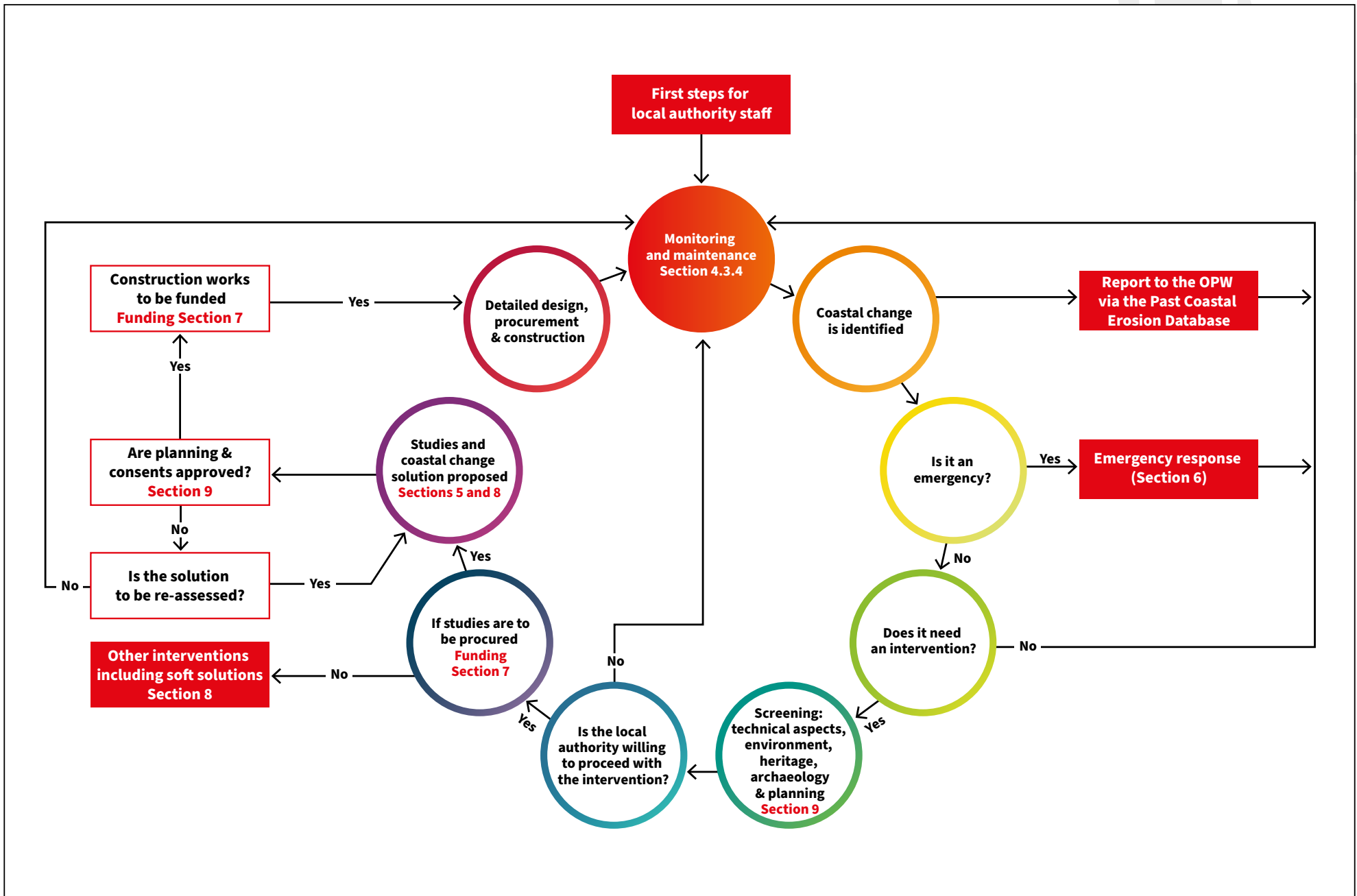


Figure 3 Proposed approach to coastal management for LA staff.

4.3.3 Key information, Data and Associated Sources

Building a knowledge bank within the LA of coastal areas at risk and vulnerable assets is essential for all coastal management and assessments of risk. There are different data sources to be considered by LA staff to help this assessment which will be described in the following sections:

- Local experience and datasets based around “on-the-ground” experience.
- Currently available data sources.
- Data sources currently under development such as the National Coastal Erosion Hazard Mapping (NCEHM) by the OPW.

4.3.3.1 Local Experience

It is important to recognise the value of engaging with LA staff working in coastal areas and the local community who have direct, on-the-ground experience with respect to assets in coastal areas. Their detailed knowledge of the location, condition, and operational status of coastal protection assets (e.g. coastal protection of a road) is a critical resource. If it is effectively captured, it can inform more accurate assessments, support effective planning, and contribute to the long-term success of coastal management initiatives.

4.3.3.2 Currently Available Data Sources

Currently available key data resources include:

- Metocean data such as waves, wind, currents
- Physical risk mapping sources such as ICPSS.

These are listed in Appendix B.

4.3.3.3 Data under Development

Key data sources from the recommendations arising from pillar 2 of the [IDGR](#) are currently under development (see details of progress and status in Appendix B.3). These consist of:

1. Coastal Monitoring and Data Collection by the OPW (Recommendation 3).
 - a. Collation of existing coastal monitoring datasets
 - b. Data Collection
 - i. [Pilot coastal monitoring survey programme \(PCMSP\)](#)
 - ii. South and West Aerial Imagery and LiDAR survey
 - iii. North and West Aerial Imagery and LiDAR survey
 - iv. South and East Aerial Imagery and LiDAR survey

The information once complete will be made available to local authorities by the OPW.

- c. Development of national coastal monitoring programme.
2. Coastal Defence Asset Database preparation by the OPW (Recommendation 4).
 3. Past Coastal Erosion Database (Recommendation 6).

The Past Coastal Erosion Database is a platform under development by the OPW to allow local authorities and members of the public to report coastal erosion events in their area quickly and easily. The information provided will aid the OPW in its role as the national lead coordinating body for the assessment of coastal change hazards and risks.

This information will help local authorities make informed spatial planning and development decisions in relation to coastal change and will provide an evidence base to help identify localised coastal protection problems and evaluate the need and justification for associated works.

All reports of coastal erosion, once reviewed and approved by the OPW, will also be visible to other stakeholders and users.

4. National Coastal Erosion Hazard Mapping (Recommendation 6).

New national-scale coastal erosion hazard mapping is currently under development. This mapping will provide a prediction of potential future coastal erosion, including an assessment of the potential impact of sea level rise on coastal erosion rates.

4.3.4 Monitoring and Maintenance

Local authorities carrying out coastal monitoring surveys should consult with the OPW Survey and Coastal Monitoring Section in order to avoid duplication and align with the specifications of the national survey plan.

Key considerations on best practice for LA staff are:

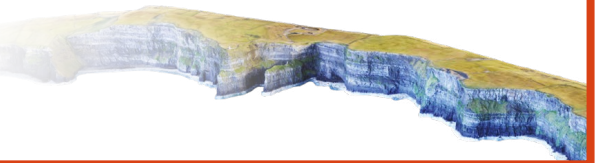
- It would be beneficial to establish an internal network, comprising local area engineers, biodiversity officer, planners, heritage officer, etc. to ensure a coordinated approach to coastal management and prioritisation of works.
- Local authorities hold essential knowledge about coastal defences within their jurisdiction, including those integrated into wider infrastructural projects (e.g., coastal walls protecting roads or utilities). To ensure effective monitoring and maintenance, it is important that this local knowledge is captured systematically. It is recommended that local staff engage and provide feedback on the Coastal Defence Asset Database by the OPW and to help to identify any potential vulnerabilities before they escalate into emergency situations (Section 6).
- Any coastal change identified should be reported to the OPW (Past Coastal Erosion Database).
- It is recommended to establish a monitoring plan particularly for areas of the coastline where coastal change and risks to community, infrastructure or environment have been identified.
- It is also recommended to establish a monitoring plan once coastal works have been completed. Monitoring should cover the works and adjoining areas to ensure that dune systems, beaches and coastal areas are not impacted by the works in the short, medium or long-term.

Key physical issues to be monitored are:

- Evidence of localised erosion or accretion.
- Changes in beach profile (e.g. lowering, narrowing) both year on year and/or on a seasonal basis.
- Retreat of the coastline after storm events.
- Damage to structures and infrastructure.
- Damage to coastal defence assets, including natural assets (e.g. sand dunes, shingle, saltmarsh) due to human activities (e.g. tourism, recreation, agriculture, physical infrastructure).
- Existence of debris.
- Existence or installation of rock armour or other coastal protection measures by private owners.
- Displacement of rock armour units, exposed toe, geotextile or other defects to installed coastal protection measures that could damage integrity. Further guidance on monitoring can be found in Chapter 10 of the Rock Manual (CIRIA, 2007).

Ongoing collection of data and surveying of coastal areas is being carried out by the OPW (Section 4.3.3.3), further details of this data are shown in Appendix B.3).

See case study F.5 (The Cork Coastline Vulnerability Assessment Study) and case study F.6 (Cliffs of Moher Condition Survey and Geohazard Assessments)





5. Coastal Protection Works

5.1 Introduction

Coastal protection works need to be compatible with the coastal processes at the site and the chosen strategic coastal change management approach (Table 1); e.g. the construction of significant coastal protection works is unlikely to be appropriate if the chosen strategic approach is “Do Nothing”.

Information is required, concerning the magnitude and mechanisms of existing longshore sediment transport, together with likely long-term shoreline changes from erosion, accretion or recession and expected nearshore wave heights. A detailed understanding of coastal processes and hazards is essential to sustainable management of coastal change and the successful design, construction and operation of coastal protection works. Coastal protection works have the potential to impact on adjacent areas. Therefore, any proposal for protection works must take account of the wider implications and consider the impact on the entire site, adjacent coastal cells as well as the marine environment. For these reasons, in certain cases, it may not be appropriate to propose coastal protection works.

Compliance with key objectives should be considered when assessing coastal protection works. Key objectives should be defined for each project. An example showing potential core criteria and objectives is provided in Table 3. These objectives should be weighted, and the options evaluated using a Multi-Criteria Analysis.

Table 3 Key criteria to be considered in development of local coastal management solutions


Core Criteria	Objective
Economic	Assets
	Land use and ownership
	Infrastructure
Social	Health and safety (construction) including risk of major accidents
	Health and safety (design life) including risk of major accidents
	Community
	Access to critical services (e.g. healthcare, education, childcare, etc.)
	Human health
Environmental & Heritage	Environmental Aspects (Ecology, Habitats and Birds Directives and flora and fauna)
	Biodiversity
	Climate change
	Landscape and visual
	Cultural heritage
	Licensing and Statutory Permits
Technical	Hazard reduction
	Constructability
	Impact on adjacent areas
	Sustainability and adaptability to climate change
Cost	Capital expenditure
	Maintenance expenditure

5.2 Coastal Protection Works

Coastal protection works typically involve either hard engineering works, or soft solutions that work with nature and natural processes, but may include a combination of both. The solution chosen will have different levels of impact on coastal processes and the surrounding environment. Careful consideration of design elements catering for local conditions is required to avoid unintended negative impact on local coastal features, including increased erosion risk. A summary of typical coastal protection works is shown in Table 4 and some examples are shown in Figure 4.

Soft and hard solutions can be combined to create mixed solutions such as an artificial beach with supporting structures. Combining beach nourishment or saltmarsh restoration with hard engineering can also result in smaller, less visually intrusive structures. Further details on hard and soft coastal engineering solutions can be found in technical guidance such as the references shown in Appendix B.4.

Table 4 Coastal protection works advantages and disadvantages

Type of protection	Coastal protection and defence solution	Advantages	Disadvantages
Soft/Nature-Based Solutions/ Building with Nature	Dune regeneration/creation: Protecting and regenerating and/or forming new sand dunes including planting supporting vegetation to act as natural barriers	Benefits for flood and coastal risk management, wave energy dissipation, climate change mitigation, biodiversity recovery and promoting human wellbeing.	These solutions may not be appropriate (without supporting structures) to protect critical assets.
	Coastal wetland restoration/creation: Rehabilitating or establishing wetlands by typically assessing and supporting natural hydrology, regrading land, re-moving barriers to tidal flow, and plant-ing native wetland vegetation to rein-troduce natural hydrology and ecologi-cal functions.	<p style="text-align: center;">See Case Study F.4</p> 	
	Reef restoration/creation: Reconstructing or introducing reef structures (concrete units or rocks) to reduce wave energy and support marine ecosystems.	Benefits for climate change mitigation and biodiversity recovery. These might offer some reduction of incoming wave energy.	
	Beach nourishment: Addition of shingle, sand or sediment to a beach to combat erosion and increase shoreline stability.	Raises beach levels. Reduces wave attack on cliff face.	Planning and licensing considerations (time, risk, cost) may impact the feasibility of this solution. Impact of sourcing of materials may be significant and should be considered carefully. May not be an option in an area with minimal sediment supply. Long-term maintenance effort usually required. Cause of the erosion is not eliminated as beach material is sacrificed with time. It often needs supporting structures (hard solutions).

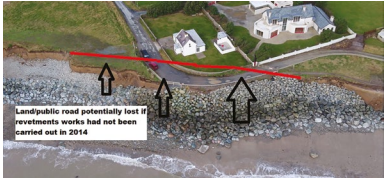
Type of protection	Coastal protection and defence solution	Advantages	Disadvantages
	<p>Redistribution of beach material: Moving sand or sediment along the coast from accreted to eroded areas to balance sediment supply which was interrupted by a man-made structure such as a breakwater.</p>	<p>Forces a natural redistribution of retained sediments downdrifts of the obstacle and it may be beneficial for both areas.</p>	<p>As per beach nourishment.</p>
Hard	<p>Revetment: Sloped structures made of rock or concrete units placed on the shoreline to absorb wave energy and prevent erosion.</p> <div data-bbox="300 573 727 833" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center; color: red; font-weight: bold;">See Case Studies F. 1, F. 2, F. 3</p>  <p style="font-size: small;">Land/public road potentially lost if revetment works had not been carried out in 2014</p> </div>	<p>Reduce wave impact energy on the cliff or coastal area. It holds the coastline.</p>	<p>These solutions may not always be the appropriate choice and may have negative impact on adjacent areas including increased erosion risk. Consent issues: Marine Area Consent (MAC) and planning Visually intrusive and may be hazardous to beach users if the rocks are very large. Requires beach access for construction. Potential impact in adjoining areas.</p>
	<p>Emergenced breakwater (Detached breakwater) and submerged breakwater: Sloped structures made of rock armour or concrete units placed offshore parallel to the coastline (detached) or perpendicular to the coastline that reduce wave impact and encourage sediment deposition.</p>	<p>Dissipate wave energy further seaward than under natural conditions. Encourage beach build-up at the shoreline in the lee of the structure.</p>	<p>Consent issues: Marine Area Consent (MAC) and planning May pose a hazard to vessels navigating the waters. Submerged breakwaters are more beneficial from the visual impact point of view but transfer more wave energy to the beach than emergent ones.</p>
	<p>Seawall: Vertical or sloped walls built along the coast made of concrete or masonry walls to protect land and infrastructure from wave action and erosion.</p>	<p>They can reflect or absorb the wave impact energy and prevent erosion. It holds the coastline.</p>	<p>Visually intrusive and may prevent access to the beach or sea. Prevent normal development of the shoreline and may hamper strand line flora and fauna. Potential impacts (scour and beach lowering) in front of the seawall and adjacent areas.</p>
	<p>Groynes: Structures built perpendicular to the shore made of rock armour or wood to trap sediment and reduce longshore drift, helping to maintain beach width.</p>	<p>Hold back sediment that would otherwise move along the beach under the action of waves and long-shore currents. Accumulation of sand on the updrift side of the groyne to protect the coastline</p>	<p>Consent issues: Marine Area Consent (MAC) and planning Can increase the erosion along the down drift shoreline.</p>
	<p>Embankment: Raised impermeable embankments made generally of earth and covered by grass designed to prevent coastal flooding.</p>	<p>Mainly for flooding defence purposes</p>	<p>Not appropriate for situations subject to significant wave action and erosion.</p>



Figure 4 Examples of coastal engineering solutions (source: Arup): Beach nourishment works with shingle in Greystones beach (upper left); and breakwaters Greystones Harbour Co. Wicklow (upper right); T shaped Groyne in Penrhyn (UK) (bottom left), concrete wave wall Aillebrack Co. Galway (bottom right).

5.3 Nature-Based Solutions (NbS)

As defined at the 5th United Nations Environment Assembly (UNEA 5.2), nature-based solutions (NbS) are actions aimed at protecting, conserving, restoring, and sustainably managing natural or modified terrestrial, freshwater, coastal, and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services, resilience and biodiversity benefits

Nature-based coastal protection uses natural ecosystems like salt marshes and features like dune systems (some of these created through beach nourishment) to buffer against storm surge and waves, reduce erosion, and protect communities. Reducing the impacts of human activities may play a significant role in NbS. Human activities that affect habitats and accelerate erosion include wild camping, car parking, fires and exercising on dunes. Implementation of behavioural change initiatives such as provision of alternative car parking and camping facilities and control of access to the dunes can complement more traditional measures such as planting and fencing. Nature-based solutions can also be included as an enhancement to hard solutions (grey infrastructure), for instance by including habitat modules (living seawalls) to support marine biodiversity in an existing wave wall.

Dune restoration, often carried out in partnership with local communities, is a key nature-based approach —see dunes.ie for guidance and case studies. Examples include successful community-led projects in Maharees and Life on Machair, which demonstrate how restoring dunes can enhance coastal resilience.

Salt marshes, with their extensive root structures, can dissipate wave energy, store carbon, improve water quality, support biodiversity as well as offering recreational benefits. The vast majority of salt marshes created by intervention are breaching raised ground to allow tidal inundation of low-lying land behind. When designing and creating saltmarshes, consideration needs to be given to the protection of adjoining areas such as mudflats which are protected habitats and important resource for birds.

Beach nourishment, which involves the addition of sand to build a protective buffer zone naturally protecting coastal areas behind, may support biodiversity and provide recreational benefits. However the source of sediment to be used in beach nourishment needs to be carefully considered in order to ensure that other habitats are not negatively affected.

A NbS working group has been set up by IDG Coastal Change to advance Recommendation 11 of the Coastal Change Management Strategy and further information will be made available from this in the future. Nature-based solutions offer considerable co-benefits. These benefits include enhancing biodiversity, supporting sediment retention, supporting carbon sequestration, and contributing to the overall resilience of coastal systems. Even when they cannot serve as standalone protective measures, nature-based solutions can often be integrated with engineered solutions to reduce structural demands and deliver valuable ecological and social outcomes.

Further information on NbS is available in some of the documents listed in Appendix B.4. These resources offer insights into best practice, case studies, and technical guidance for implementing NbS in coastal areas.



6. Emergency Response

6.1 What is an Emergency?

An emergency is an imminent or actual event that is urgent, sudden or serious in nature or an unforeseen change that requires an immediate and coordinated response to remedy harm or avert imminent danger to life, health, property or the environment. Emergencies are usually unanticipated, at least in terms of exactly what happens and when and where they take place. However, emergencies can, and should, be planned for (Alexander, 2005).

It is important to recognise that, in most cases, coastal erosion does not constitute an emergency. This is because coastal erosion is typically a gradual process that has been anticipated, often occurring in areas where its progression has been known for years. Additionally, it should be highlighted that implementation of the coastal management approaches outlined in Figure 2 and Figure 3 should mitigate against the development of emergency situations.

6.2 Preparedness

As noted above, coastal erosion events are rarely an emergency; but on occasion coastal change events can be very sudden and unpredictable in nature. They often require urgent attention to prevent further escalation or damage to infrastructure. These events can often happen outside normal business hours. Therefore, in order to address such events, it is recommended that a response procedure is in place.

It is recommended that this response procedure should at a minimum address the following items:

- Responsibility matrix identifying the risk manager (owner), key local decision makers, stakeholders and approvers for works (ideally in form of localised organogram).
- Contacts for key personnel identified above.
- Structured response plan that includes:
 - Activation
 - Coordination
 - Communication and consultation with key stakeholders
 - Assessment of risk level
 - Immediate actions from a H&S perspective
 - Permitting considerations.
- Communication of immediate solution to key stakeholders.
- Evaluation of procurement and funding options.
- Implementation strategies.
- Long-term solution review.

6.3 Emergency Coastal Protection Measures

Coastal protection works can arise in various forms but typically in an emergency situation there is an urgent need to reinforce an area where there has been a failure to prevent further rapid deterioration of the event. It is difficult to list every eventuality that could be faced by local authorities but common emergency issues include:

- storm-related damage to coastal roads,
- damage to other coastal infrastructure and assets including embankments and walls,
- exposure of infrastructure following a catastrophic erosion event (e.g. loss of several metres in one storm),
- erosion opening up a new flow route due to loss of high ground,
- cliff collapses,
- subsurface voids beneath roads, or
- scour resulting from wave action and/or storm surge.

Table 5 outlines a range of coastal protection measures that may be employed in emergency situations, along with a general discussion on their applicability and suitability in different contexts. It is important to note that this list is not exhaustive, and the selection of appropriate measures should be tailored to local conditions. The coastal team, or identified responsible LA staff, should carefully consider factors such as site characteristics, technical aspects, availability of materials and funding, urgency of response, and long-term sustainability when identifying suitable interventions.

Table 5 Typical coastal protection measures (emergency situations)

Typical Solution	Description	Applicability
<p>Rock Armour Revetments</p>	<p>Rock armour revetments are one of the primary structures for the prevention of coastal erosion. They offer a robust solution in terms of protecting coastlines and preventing erosion. However, they could be considered one of the most involved solutions in that there is typically significant excavation works and site access requirements to enable the construction.</p> <p>They also rely on the availability of a suitable supply of rock armour and aggregates of the specified grade.</p> <p>They are constructed by installation of carefully designed graded layers of rock armour that are installed in such a way to remain stable during wave action while dissipating wave energy and preventing wash out materials on the slope.</p>	<p>Rock armour revetments as noted over are a “heavy” engineering solution. They should generally be considered where there is a high consequence associated with a coastal change event. For example, a key piece of public infrastructure is at risk.</p> <p>They will generally be an expensive option (relatively speaking) and will require time to implement. Rapid deployment is not generally possible.</p> <p>They require engineering design and can result in a number of environmental and social impacts. A good level of site data is required particularly in relation to waves, current and geotechnical data at the site.</p> <p>Access to the maritime area is required as the “toe” of the revetment is required to be founded at a level below low water where it will not be subject to wave action.</p>
<p>Rip Rap Placement</p>	<p>Rip Rap is a similar solution to a rock armour revetment but involves the random placement of rock armour typically in a single layer. The engineering design is less defined for a Rip Rap solution and as a result the level of protection provided by Rip-Rap alone is less certain. It should be noted that there is often an opportunity to employ Rip-Rap as an initial part of a phased solution that will conclude with a revetment installation as Rip-Rap can be successfully installed and then incorporated as a layer of the rock armour protection.</p>	<p>Rip-Rap is more suited to rapid installation in that there is less engineering planning and definition required.</p> <p>It is typically suited to a situation where a change event has occurred (e.g. an embankment failure) and there is an urgent requirement to protect an exposed surface. It should be noted that it will not provide the same level of certainty as a rock armour revetment and where there is a need to protect vital infrastructure a follow up solution will be required to deliver a required design life.</p>
<p>Sandbag Protection including big bags</p>	<p>One of the most common and basic elements used in operational flood fight interventions. Sandbags structures and reinforcements are a popular choice due to their convenience, efficiency and durability; they are easy to prepare and handle, can be placed quickly and are particularly useful when the damage to the defence structure is limited.</p>	
<p>Rock Gabions</p>	<p>Rock Gabions are metal cages filled with rock. Similar to rip rap they provide a short-term solution.</p>	<p>These deteriorate (corrode) and move so its use is limited in marine environments and only for short periods.</p>

Concrete Armour Mattresses and grout bags	<p>Grout bags are geotextile fabric pump-filled with concrete, forming a durable apron for scour and erosion protection.</p> <p>While concrete armour mattresses are formed by interconnecting concrete blocks, tied with wire, on a geotextile fabric. They typically come in “panels”</p>	<p>This solution works well to prevent scour and ensure integrity of breakwaters, wave walls, and other marine coastal structures.</p> <p>Care needs to be taken with mattress solutions in highly exposed wave climates and similar to gabions the interconnecting wires can suffer from integrity issues.</p>
Geotubes® or Geobags:	<p>Sand-filled textile containers used for temporary or low-impact breakwaters or emergency repairs;</p>	<p>Fast and cost effective. These offer longer durability than sandbags so are recommended to be considered for emergency works.</p>

Other solutions such as Seabee concrete units have been successfully used for coastal protection emergency works in areas of soft sediments (see Case Studies F.1.1 and F.1.2). Consideration of environmental, licensing and consenting constraints is essential (see Section 9).



6.4 Key Things to Consider

The following outlines some of the key considerations (non-exhaustive) that a LA should be mindful of when planning an emergency intervention at a coastal site.

Note that a number of these considerations are quite technical in nature and the LA may need to engage specialist technical services to support them in the assessment of these aspects. LA staff may need to receive additional training as some of the solutions are complex.

It should also be noted that the points below mainly relate to “hard engineering” solutions as it is thought that these will represent the most likely solutions deployed in an emergency scenario.

6.4.1 Who to Contact?

Having a list of key stakeholders who should be contacted is critical. This will vary between local authorities and therefore needs to be considered under preparedness as previously discussed in Section 6.2

6.4.2 Health and Safety

Health and safety must be the first priority when responding to coastal emergencies. Before any technical or engineering solutions are considered, the immediate risk to public safety should be assessed. In many cases, this may require closing off the affected area and restricting public access until a safe and appropriate response strategy has been agreed upon.

6.4.3 What is the Risk?

Once immediate health and safety concerns have been addressed, LA staff will need to consider what risk does the situation present to infrastructure? Is the risk at a sufficiently high level to merit an immediate intervention to prevent further deterioration or increased risk to infrastructure, personnel or property?

6.4.4 Is an Immediate Intervention Required?

It should be remembered that any intervention on the coastline will have the potential for short-, medium- and long-term impacts from social, environmental, economic and planning perspectives. Therefore, an intervention should be the “solution of last resort” in an emergency scenario.

If the perceived risk indicates that an intervention is necessary, then the LA should always try to adopt a suitable “do minimum” solution that will stabilise the situation, ensure safety of personnel and property while allowing sufficient time for consultation with suitably experienced personnel to plan for a more permanent solution.

6.4.5 Urgency and Time Available

If the risk is deemed to be at a level that merits intervention, the next question is what is the timeline required for an intervention? This is driven by the perceived risk. In an emergency this could vary from hours; to days; to months. The time available can also be driven by factors such as weather, (e.g. if there is a period of inclement weather expected that could increase risk) or tidal access windows.

The time available will often dictate the materials that can be made available and therefore will ultimately determine the solution that can be feasibly implemented at the time.

6.4.6 Regulatory Requirements

Assess what consents are required for the emergency works (refer to Section 9). Exemption of works from planning does not mean that they will not require consents from MARA or NPWS.

6.4.7 Material & Plant Availability

The availability of suitable plant and material is a constant challenge for coastal projects which is only exacerbated in an emergency scenario. For example, there may be a need to mobilise high-capacity long reach excavators to place rock armour or rip-rap in hard to access locations.

Therefore, a LA should always be aware of what materials and plant are available in the region that could be mobilised and delivered to site at short notice.

The availability of suitable rock armour for a revetment or rip rap solution is a particular challenge with some of the larger rock materials having to be imported from UK or Continental Europe. The LA should familiarise themselves with the practical guidance provided in the Construction Industry Research and Information Association (CIRIA), Rock Manual (CIRIA, 2007) in relation to the assessment and procurement of quarries and rock armour respectively. Having knowledge of rock sizes previously installed in particular the region (if applicable) and location where the rock was sourced can be a practical step taken to developing domain knowledge in the event of an emergency situation.

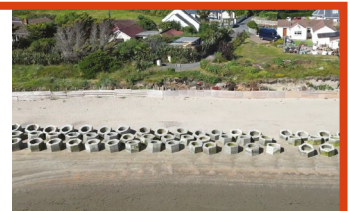
In an emergency, the lack of suitable material might result in having to place rock or materials that may not be particularly suitable, but can provide a temporary solution. In this situation, the LA should always be mindful of ensuring flexibility in the emergency solution to ensure that future works utilising suitably designed and specified engineering works are not made more difficult due to the emergency solution.

6.4.8 Coastal Processes

The introduction of any new infrastructure along the coast has the potential to change the coastal processes (e.g. sediment transport, erosion, etc.) along a given coastal cell. The study of coastal processes is an important and detailed process that might not be possible to complete in an emergency situation where protection is to be constructed at short notice.

Therefore, the LA should always aim to minimise any changes to the profile of the existing coastline at a location requiring intervention. The introduction of sharp changes in geometry should be avoided as this will likely result in further erosion/deposition at another location in a short period of time.

See Case Study F.1.2 where the lack of terminal transition in a rock revetment created accelerated erosion at its end.



Monitoring of the effects of emergency works on coastal processes and adjoining areas is recommended following construction.

6.4.9 Toe Elevation

The founding level of a coastal protection solution is generally referred to as the “toe”. The “toe” is the most critical area in terms of ensuring integrity of an engineering solution along the coastline. It is critical that the “toe” is founded on a firm stratum that is not susceptible to erosion or degradation through wave action, and it is normally extended below the potential scour depth.

There is always a tendency to try and avoid works below high-water level due to the complications it raises in terms of plant access, tidal and permitting implications. However, failure to secure the toe of the coastal works robustly can result in a rapid deterioration and undermining of a recently constructed solution.

6.4.10 Wave Overtopping

Overtopping is the ingress of water (often in form of sea spray) observed onshore when waves surge up and possibly over a coastal structure posing a significant risk to people and infrastructure.

Changing the shape of the coastline or sea wall can affect how waves behave. It can lead to more seawater being pushed over the top and onto the land behind. LA staff should familiarise themselves with the general guidance in Eurotop (Eurotop, 2018). However, it is anticipated that specialist technical support will be needed by LA staff to calculate the risk of wave overtopping and its possible impact on the area.

6.4.11 Prevention of Washout

In any scenario where there has been erosion of a shoreside structure, and a temporary solution has been put in place, it is critical to ensure that steps are taken to limit the risk of washout of fine materials. Therefore, filter aggregate layers or a geotextile fabric should be put in place prior to the installation of the temporary or permanent solution.



7. Key Sources of Funding

Funding for coastal protection works is available through a variety of mechanisms, public and private, that support both emergency response and long-term measures. Funding can be sought for a broad spectrum of activities aimed at addressing the impacts of climate change in coastal areas. These include: the planning and design of adaptation/resilience measures; the construction of protection works; the implementation of nature-based solutions; as well as community engagement; monitoring; and evaluation, and capacity building to support effective delivery and long-term sustainability.

7.1 Determining the Appropriate Funding Stream

The nature, location, purpose and ownership of the land/infrastructure to be protected are critical factors in determining the availability and appropriateness of funding streams for any scheme implementation. Some examples are provided below:

- The OPW minor works funding is a possible source of funding for coastal works; however this is often only appropriate in a limited number of cases, as even small-scale coastal protection interventions are by their nature capital intensive.
- Where critical transport infrastructure is at risk, interventions may be funded through the Department of Transport, co-ordinated by the National Transport Authority. An example of this is the [East Coast Rail Infrastructure Protection Projects \(ECRIPP\)](#) where work is being funded under [Project Ireland 2040](#) and is co-funded by the EU Connecting Europe Facility (CEF) fund.
- In other cases, such as a risk presented to critical fresh water supply, or sewage treatment infrastructure, it is anticipated that Uisce Eireann would source and co-ordinate funding for same.
- In a case where private assets are involved (e.g. coastal protection for a golf course), asset owners will typically need to fund their own investments for protection measures and manage accordingly unless there is longer term strategic economic, environmental or social benefit that may substantiate a co-funded approach.
- In some cases, a joint approach across a number of stakeholders and projects is often required or beneficial and a variety of funding sources may be appropriate.
- More details of potential funding streams are provided in the following sections.

7.2 Available Irish Funding Mechanisms and Processes

Public funding for coastal resilience works is available through national programmes, EU-level initiatives or a combination of both, with opportunities to support both emergency response and long-term adaptation efforts. While not all funding streams are directly accessible by local authorities, many can be leveraged indirectly, for example, via partnerships, regional strategies, or integration with broader infrastructure or climate adaptation projects.

The funding schemes outlined in Table 6 and Table 7 represent the primary mechanisms that either currently provide or have previously offered direct financial support towards the enhancement of coastal resilience across Ireland. These programmes offer targeted assistance for infrastructure development, nature-based solutions, and support community-led adaptation efforts in response to coastal erosion, flooding, and the broader impacts of climate change.

Table 6 The OPW Minor Flood Mitigation Works and Coastal Protection Scheme

The Office of Public Works (OPW) Flood Mitigation Works and Coastal Protection Scheme	
Purpose	Support localised (cities, towns, villages), short-term flood and coastal protection works
Who can Apply	Local Authorities
Financing	<ul style="list-style-type: none"> • Co-funding (up to 90%) • Current funding is up to €750,000 per project but this is expected to increase up to €2 million per project (August 2025 announcement). This will allow for an increase in the scale of works projects encompassed by the Scheme, which includes nature-based solutions. • The OPW will be sending out further details of the revisions to the Scheme to Local Authorities in the short term and will work closely with Local Authorities on implementation of the revisions.” (published in August 2025)
Eligible Works	<ul style="list-style-type: none"> • Localised flood mitigation and coastal protection measures • For emergency and/or long-term adaptation efforts
Administering Authority	The OPW
Further Information	https://www.gov.ie/en/office-of-public-works/frm-pages/major-flood-relief-schemes-and-minor-works/

Table 7 Island Capital Investment Programme

Island Capital Investment Programme	
Purpose	Provide capital funding for essential infrastructure on Ireland’s offshore islands, with a strong focus on coastal protection to safeguard communities from sea level rise and storm impacts
Who can Apply	<ul style="list-style-type: none"> • Island communities, with funding accessed via local authorities. • No open public call: funding is allocated through direct engagement between local authorities and the Department
Financing	<ul style="list-style-type: none"> • Part of the 10-year Our Living Islands policy (2023–2033) • Up to 90% capital funding from the Department of Rural and Community Development; remaining costs covered by local authorities. • Funding is multi-annual
Eligible Works	Supports long-term adaption efforts
Administering Authority	Department of Rural and Community Development and the Gaeltacht
Further Information	Our Living Islands – Gov.ie

A broader range of funding opportunities is detailed in Appendix C.1 and Appendix C.2. While these programmes are not specifically designed to support coastal resilience works, they may still offer indirect or complementary support. Many fund wider environmental, infrastructure, or community initiatives that can be strategically leveraged to advance coastal resilience-building efforts. Information on infrastructure guidelines and the public spending code is provided in Appendix C.3.

7.3 Available EU Funding Mechanisms and Processes

In addition to public funding schemes available in Ireland, EU-level funding programmes can also be strategically leveraged by local authorities to support coastal resilience efforts. While these programmes are not always explicitly focused on coastal protection, many of them fund climate adaptation, nature-based solutions, and infrastructure resilience, all of which can play a significant role in strengthening coastal communities against climate-related impacts. The most relevant EU schemes are outlined in Appendix C.2.

8. Community Engagement Communications

8.1 Supporting Communities

Local Authorities play a key role in supporting communities affected by coastal change. Local authorities are encouraged to work closely with residents to identify needs, understand concerns and co-develop solutions that are sustainable and context appropriate.

There has been growing interest in NbS and local authorities need to work to develop a greater understanding among communities on the role that NbS may play in coastal change management.

Local authorities can provide practical support in coastal areas through:

- Provision of car parking, signage, and beach access infrastructure to the beaches to keep traffic off dunes and facilitate restoration of dune ecosystems.
- Installation of chestnut fencing and other soft measures.
- Undertaking or assisting in Appropriate Assessment (AA) and Environmental Impact Assessment (EIA) screening for communities implementing NbS, that may not have the expertise within their group to carry out these assessments.
- Facilitate the connection and activation of communities working on coastal management through local beach-based events, promotion of the [Dunes Forum](#), and organisation of national Dune Gathering events.

These actions can help guide communities toward soft solutions and reduce pressure to implement hard engineering interventions by raising public awareness and understanding of coastal change and its implications, managing expectations, and empowering communities to take local action to protect their coastal environment.

Soft coastal protection measures, such as dune restoration or fencing, may not be suitable in areas experiencing significant coastal change or high levels of risk and hard measures may be necessary in these cases. In other cases, soft solutions can be implemented, but it should be acknowledged that such measures may not prevent ongoing natural erosion of the coastline. These limitations, along with the rationale for selecting particular approaches, should be clearly communicated by LA staff to local communities to ensure transparency, manage expectations and support informed decision-making.



Photo: Martin Schoppler, Maharees Conservation Association

9. Relevant Consents, Licensing and Environmental Assessments

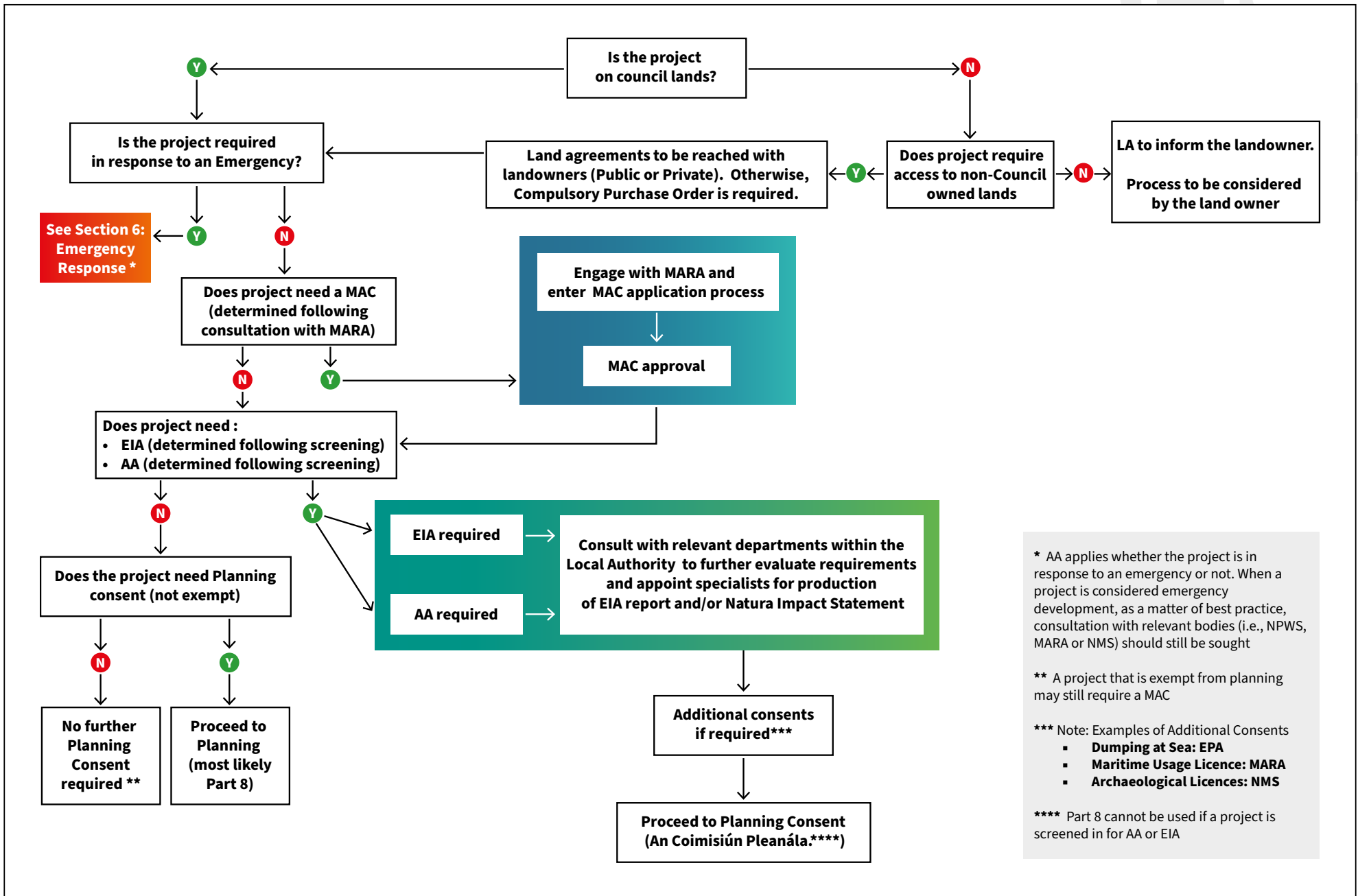
For coastal erosion developments in Ireland, it is essential that local authorities ensure that interventions are environmentally sustainable, technically justified and align with the strategic and statutory policies at national, regional and local levels. Ensuring compliance with the requirements of the planning system and other codes (e.g. environment, etc.) is essential.

Therefore, it is imperative that LA staff consult with their planning section and biodiversity officers to understand the full extent of licences and consents required for any potential development. An overview of consents, licences and assessments required for coastal developments is provided in this section. These include:

- Planning Consent Requirements
- Environmental Assessments
- Marine Consents; and
- Other Consents.

Figure 5 provides a flowchart detailing the steps local authorities should consider when first identifying the need for a solution to coastal erosion in a given area. This flowchart is for guidance purposes only and LAs proceeding with coastal works should seek relevant expertise to advise on consents and processes required for the specified works.





* AA applies whether the project is in response to an emergency or not. When a project is considered emergency development, as a matter of best practice, consultation with relevant bodies (i.e., NPWS, MARA or NMS) should still be sought

** A project that is exempt from planning may still require a MAC

*** Note: Examples of Additional Consents

- **Dumping at Sea: EPA**
- **Maritime Usage Licence: MARA**
- **Archaeological Licences: NMS**

**** Part 8 cannot be used if a project is screened in for AA or EIA

Figure 5 Overview of consenting process to be undertaken by LA staff

9.1 Planning Consent

9.1.1 Requirement for Planning Permission

Under the [Planning and Development Act, 2000](#), as amended ('the Planning and Development Act') development is described under Section 3(1) as “*the carrying out of any works on, in, over or under land or the making of any material change in the use of any structures or other land*”. In the maritime context, ‘development’ is defined in the Maritime Area Planning Act 2021 (see Section 9.3.1) as :

- (a) *the carrying out of any works in the maritime area, or*
- (b) *the making of any material change in the use of the sea, seabed or any structure, in the maritime area, and includes the reclamation of any land in the nearshore area.*

In this context, planning permission is required for development in Ireland that is not considered exempted development.

The classes of development relevant to coastal change management processes are included in Part 2 of Schedule 5 of the Planning Regulations. Examples of these are provided in Appendix A.3.

LA staff should consult with their own planning departments to ensure that effective stakeholder engagement is maintained throughout the pre-application process.

It is important to note that a Marine Area Consent (MAC) is required before an application for planning permission can be considered (Section 9.3).

9.1.1.1 Part 8 Applications

The Planning and Development Act is the principal legislation that a LA must comply with when carrying out its own development within its functional area. Part 8 of the Planning and Development Regulations 2001 (as amended) sets out the process that a LA must follow. Under the Part 8 process, the LA is able to act as the competent authority.

If, following screening for Environmental Impact Assessment it is deemed that a development requires an Environmental Impact Assessment Report (EIAR) (Section 9.2.1) or following Appropriate Assessment screening that a Natura Impact Statement (NIS) is required (Section 9.2.2), a LA cannot proceed with a Part 8 application and must instead seek consent from An Coimisiún Pleanála. In any instance where a Part 8 application is considered, the relevant LA should consult with any Part 8 procedural manual that may be in place.

9.1.1.2 Part 10 Applications

A Part 10 planning application is a specific, streamlined process for local authorities (or local authorities in partnership with another body such as the OPW) to propose their own development. As noted in Section 9.1.1, where a development from a LA requires either an EIAR or an NIS, an application for planning permission must be submitted to An Coimisiún Pleanála which is the competent authority under the process.

9.1.2 Exempted Development

In specific instances, certain classes of development can be considered exempt from the requirement for planning consent. In every situation related to exempted development, it is vital that public authorities consult with the relevant planning department and, where necessary, obtain legal advice on whether a development can be considered exempted development or not. This advice and correspondence shall be documented and recorded.

Section 4 of the Planning and Development Act lists exempted development, and it is advised that LA staff should refer to this in order to determine whether planning is required for any coastal protection works.

It is important to note that under Section 3(4), development shall not be exempted development if an environmental impact assessment or an appropriate assessment of the development is required. It is also important to note that a MAC is still required if an exempted development is occurring in the Maritime Area. Certain emergency or urgent works may be exempt from planning permission requirements. Section 138 of the [Local Government Act 2000](#) provides that a LA may act without permission on both public and private land if the works are necessary to avoid subsidence, etc. It is important to note that an ‘emergency’ in the Local Government Act 2000 is defined in Section 138(5), stating that it:

“...shall be deemed to include a situation where, in the opinion of the [chief executive], the works concerned are urgent and necessary (having regard to personal health, public health or safety...)”

Additionally, the Roads Act may also provide a framework for small-scale or emergency works. This is specifically outlined in Section 53(1)(c)(i):

“The carrying out by a State authority, statutory undertaker or local authority of emergency works necessary to eliminate or reduce danger or risk to persons or property or of maintenance works shall not require consent under paragraph (a).”

Further information on exempted development is shown in Appendix A.2.

9.2 Environmental Assessment

9.2.1 Environmental Impact Assessment

To determine what consents, if any, are required for the proposed works, screening for the requirement for an Environmental Impact Assessment (EIA) should be undertaken. An understanding of the location of the projects in question will enable early identification of potential receptors which could be impacted, and any relevant licences which should be accounted for in procuring planning consent.

Part 2 of Schedule 5 of the Planning Regulations S.I. No. 600/2001 lists the classes of development, which require an EIA to be undertaken by the competent authority and an EIAR to be submitted by the applicant to accompany the consent application. Further information on developments requiring an EIA for works related to coastal change management is shown in Appendix A.3.

Where a development is of a class listed in Part 2 of Schedule 5 but below the specified threshold, EIA screening must be completed to determine whether the proposed development is likely to have a significant effect on the environment. If the proposed development is likely to have a significant effect on the environment, then an EIA is required. **Where a full EIAR is required, the Part 8 application route is no longer available, and the public authority must apply directly to An Coimisiún Pleanála for planning approval.**

Guidance on EIA Screening is available on the Office of the Planning Regulator [OPR website](#).

9.2.2 Appropriate Assessment

Under the EU Habitats Directive (92/43/EEC) (the ‘Habitats Directive’), Special Areas of Conservation (SACs) are designated in order to protect important and rare habitats and species other than birds. Under the Birds Directive (Directive 2009/147/EC), Special Protection Areas (SPAs) are designated for the protection of vulnerable bird species. Together, SACs and SPAs form the Natura 2000 network of European sites.

Under the EU Habitats Directive, a proposed development must be screened to determine if it, individually or in combination with other plans or projects is likely to have a significant effect on a Natura 2000 site or the Natura 2000 network of sites. If a significant effect on a European site cannot be ruled out, then an appropriate assessment must be carried out.

Appropriate Assessment (AA) Screening must be carried out by suitably qualified and experienced professionals within or contracted to a competent authority (local authorities are included in the definition of competent authorities).

If the AA Screening determines that significant effects on Natura 2000 sites are deemed to be likely, uncertain or unknown, an appropriate assessment must be undertaken. Appropriate assessment will require the collection of data and information on the coastal project and on the site and any other site that might be significantly affected by the plan or project. An analysis of potential effects of the project on the site and any other site that might be affected by the plan or project, must be presented in a Natura Impact Statement (NIS). This may require the engagement of specialists including a geomorphologist who will report on issues such as sediment transport and susceptibility to erosion. **As noted in Section 9.1.1.2, when AA screening determines that a Natura Impact Statement (NIS) is required for a development, then LAs cannot proceed with a Part 8 application and instead must submit a Part 10 application under Section 177AE of the Planning and Development Acts to An Coimisiún Pleanála.**

Guidance documents in relation to the AA process include:



- [European Commission - Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6\(3\) and \(4\) of the Habitats Directive 92/43/EEC \(2021\)](#)
- [Guidelines for Good Practice Appropriate Assessment of Plans under Article 6\(3\) Habitats Directive \(International Workshop on Assessment of Plans under the Habitats Directive, 2011\); National Parks and Wildlife Services - Guidance for Planning Authorities \(2020 revision\);](#)
- [Office of the Planning Regulator Practice Note PN01 – Appropriate Assessment Screening for Development Management \(2021\).](#)

9.2.3 Derogations under Birds and Habitats Directives

A Ministerial derogation can be granted under Article 9 of the Birds Directive to allow works to proceed that would otherwise be restricted. It is recommended that LA staff should consult with NPWS and the LA Biodiversity Officer in relation to derogations, which could potentially be applied particularly in cases of collapse, flooding, or subsidence, or other events which may impact on public health and safety.

“Article 9.1 Member States may derogate from the provisions of Articles 5, 6, 7 and 8, where there is no other satisfactory solution, for the following reasons:

(a) in the interests of public health and safety, in the interests of air safety, to prevent serious damage to crops, livestock, forests, fisheries and water, or the protection of flora and fauna;”

Derogation under the Habitats Directive may also be required, depending on the impact of the planned works. A Ministerial derogation may be issued under the EU Habitats Directive in limited circumstances to protect rare or threatened plant and species protected under the Habitats Directive. [See NPWS guidance.](#)

9.3 Marine Consents

An overview of the consenting and regulatory authorities roles and responsibilities for maritime developments and usages is available on [MARA](#) and [OPR](#) websites.

9.3.1 The Maritime Area Planning Act (2021)

Coastal works are likely to be located partially or wholly in the maritime area. [The Maritime Area Planning Act 2021](#) (‘the MAP Act’) established a new consent regime for maritime usage and developments in the maritime area. The new consent regime effectively overhauls the previous process under the Foreshore Act 1933. As part of this overhaul, the MAP Act involved a transfer of responsibility from the Department of Housing, Local Government and Heritage to a newly established Maritime Area Regulatory Authority (MARA) which is responsible for managing existing foreshore leases, licences and consents, and the issuing of new maritime consents which replace previous ‘foreshore licences’ (see Section 9.3.2 and 9.3.3).

Under the MAP Act, the maritime area is defined as the area of sea extending from the High Water Mark (HWM) to the outer limit of the continental shelf of the State. Previously, the Foreshore Act 1933 governed activities within the maritime area, defined as the land and seabed below the line of high water of ordinary or medium tides, extending out to the 12-nautical-mile limit of the territorial sea. The High Water Mark is as defined on the OSI Historic 25-inch mapping (1888-1913), or occasionally as shown on the 6-Inch mapping with modern updates defined by the Chief Boundary Surveyor (CBS) through Maritime Boundary Orders. A digitised representation of the HWM as defined by the CBS is [available](#) as GIS data from OSI, but this is always subject to confirmation from the original source.

Further information on the MAP Act is contained in Appendix A.1.

9.3.2 Maritime Area Consents

A Maritime Area Consent (MAC) is a right to occupy a part of the maritime area for a specific maritime usage, conditional on securing any other necessary approvals.

The maritime usages which require a MAC can be found in [Table 1 of the MARA Guidance](#) on applying for a MAC. Applications may be made to MARA for a declaration as to whether a MAC is required for a proposed maritime usage.

In order to be granted and hold a MAC, applicants are required to be fit and proper. The Act sets out a number of requirements to which MARA must have regard when considering if a MAC applicant is fit and proper; including

whether an applicant is financially and technically capable of delivering the MAC project. MARA currently undertakes a “Fit and Proper Test” for each MAC application received. Section 90 of the MAP Act enables MARA to declare certain person(s) (i.e. applicants) to be fit and proper without a case-by-case assessment for each MAC application received. MARA in the exercise of the powers conferred on it by [section 90](#) (1) of the MAP Act after consultation with the Minister for Climate, Energy and the Environment and having had regard to the matters listed in [section 90](#) (3) of the Act, has designated by order the coastal planning authorities as ‘fit and proper persons’ to hold any MAC as provided for in the Maritime Area Planning Act 2021 (Fit and Proper Person) Order 2025, S.I. 467 of 2025.

Local Authorities are required to submit MAC applications for the right to occupy the maritime area for each proposed development or activity. These applications will be assessed individually having regard to the requirements set out in Schedule 5 of the Act and determined by MARA accordingly. However, the assessment will be significantly simplified for coastal planning authority applications as they are already designated as fit and proper persons and will not need to undergo this element of the assessment. In addition, a development permission or any other relevant authorisation, where applicable, will require to be obtained by the local authority following the award of the MAC and prior to occupation of the maritime area.

Under the transitional provisions of the MAP Act, MARA has provided a pathway for developers or public authorities to bring any unauthorised usages of the maritime area into compliance. For any development that was undertaken before 12 August 2021 which was not the subject of foreshore authorisation, a person may, under Section 106(4) and 130(4) of the MAP Act, apply for a MAC or Maritime Usage Licence (Section 9.3.3) to remedy any unauthorised usage. However, if this is not done before 17 July 2028 the fact that the usage is an existing maritime usage and not a proposed maritime usage will not be taken into account. Ensure to consult with MARA in case of any doubt as to the status of any usage which may currently be non-compliant.

9.3.3 Maritime Usage Licences (MULs)

A Maritime Usage Licence (MUL) is a licence to carry out a specific activity in Ireland’s maritime area, subject to securing any other necessary approvals. It is important to note that if an EIA is required (see Section 9.2.1), MARA cannot grant a MUL. A MUL is required for activities that are generally:

- Activities that do not require long-term occupation of a part of the sea.
- Specific, regulated usages: The types of activities that require this licence are outlined in the MAP Act.

Examples include:

- Navigational and maintenance dredging.
- Marine surveys for site investigations.
- Installing temporary structures like pontoons.

A full list of these specific usages are included in the [MARA website](#).

9.4 Other Licences

9.4.1 Dumping at Sea in Relation to Dredging

Under the [Dumping at Sea Act 1996](#), as amended, any activity that includes the disposal of any material or substance at sea from a vessel, aircraft or offshore installation may require a Dumping at Sea (DAS) licence. The purpose of this licence, issued by the Environmental Protection Agency (EPA), is to prevent marine pollution and to protect the marine environment.

The most frequent reason for needing a DAS licence is the disposal of dredged material. This material is often excavated from harbours, ports, or shipping channels to maintain their depth and navigability. Other activities that can require a licence include disposal of rock or other materials from marine infrastructure projects.

Any public authority wishing to dispose of material at sea is required to apply for a DAS permit. Further information is available on the EPA website: <https://www.epa.ie/our-services/licensing/freshwater--marine/dumping-at-sea-das/>.

9.4.2 Heritage: Archaeological Licences

[The National Monuments Act 1987](#), as amended, provides protection to all historic wrecks and archaeological

objects found in Ireland and within its maritime area. The National Monuments Act includes:

- National Monuments: These are structures and sites of archaeological or historical interest that have been officially designated and placed under state protection.
- Archaeological Objects: This refers to any man-made object dating back at least 100 years. All such objects found in Ireland, whether on land or in the sea, are legally protected and are considered to belong to the State.
- Recorded Monuments: The Act established the Record of Monuments and Places, which lists known archaeological sites across the country, providing them with legal protection.
- Protected Areas: The Minister can issue preservation orders for archaeological areas, and it is a criminal offence to interfere with these areas without a licence.

Local authorities should consult with their conservation officer or with a qualified archaeologist (and marine archaeologist for works in the maritime area) to determine what consents may be required. An initial desktop survey of the National Inventory of Architectural Heritage database and the relevant Record of Protected Structures for each LA can provide an initial overview of potential heritage receptors.

The licences potentially required for any development can include:

- Underwater Dive/Survey Licence: This licence is required if the development involves any form of diving, surveying, or archaeological work on a protected wreck or underwater archaeological site. This is often required for site investigations or as a condition of a larger maritime area or planning permission.
- Ministerial Consent: This is required if the proposed works are at or near a National Monument, which could include a shipwreck. The National Monuments Service must grant this consent before the project can begin.
- Archaeological Excavation Licence: If the project involves any form of excavation that could uncover archaeological objects, an excavation licence is necessary. This applies to both on-land and underwater excavations.

10. Further Learning

Pillar 1 of the Report of the Inter-Departmental Group on National Coastal Change Management Strategy aims to build capacity in order to develop the requisite skills and knowledge that are required, within the sector to deliver coastal change management policy and guide potential management options.





Appendix A: Consents and Licensing Processes involving Coastal Management

A.1 The Maritime Area Planning 2021(MAP Act)

The Map Act includes the following definitions:

“coastal planning authority” means the planning authority (within the meaning of section 2 of the Act of 2000) for any of the following:

- (a) the county of Louth, Meath, Fingal, Dun Laoghaire-Rathdown, Wicklow, Wexford, Carlow, Kilkenny, Tipperary, Cork, Kerry, Clare, Galway, Mayo, Sligo, Leitrim or Donegal;*
- (b) the City of Dublin, Cork or Galway;*
- (c) Waterford City and County or Limerick City and County;’*

The MAP Act applies to ‘the “maritime area”,

“extending from the high water of ordinary or medium tides of the sea to the outer limit of the continental shelf, and includes—

- (a) the sea and tidal areas of internal waters of the State as construed in accordance with the Act of 2021,*
- (b) the territorial seas of the State as construed in accordance with the Act of 2021,*
- (c) the exclusive economic zone as construed in accordance with the Act of 2021, and*
- (d) the continental shelf.’*

Section 75(1) of the MAP Act states:

“where development permission is required for a proposed maritime usage in a part of the maritime area, a person shall not seek, or otherwise have (by whatever means), such permission unless he or she is, in respect of that part, the holder of a Maritime Area Consent (MAC) for the occupation of that part for the purposes of such usage.”

Section 75(1) does not apply to maritime usages listed in Schedule 3 of the MAP which also includes emergency works.

Section 76 (1) of the MAP states:

“where development permission is not required for a proposed maritime usage in a part of the maritime area, a person shall not undertake such usage unless he or she is, in respect of that part, the holder of a MAC for the occupation of that part for the purposes of such usage.”

A MAC is not required for maritime usages specified in Schedule 4 of the MAP Act. Additionally, if a particular maritime usage has been authorised under the Foreshore Act 1933, as amended, it does not need a MAC but if it an amendment to the usage is to be made, then a MAC will be required.

Under Section 98 (1) of the MAP Act a relevant person shall not be required to be the holder of a MAC in respect of relevant works undertaken, or to be undertaken, in the maritime area for the purposes of protecting life or property in an emergency situation (including such works relating to sea defences). However, it should be noted that under Section 98 (4), the Minister may by regulations specify the any of the following matters:

- (a) the works to which this section applies;*
- (b) the person who may undertake relevant works or relevant works falling within a class of relevant works specified in the regulations;*
- (c) the consultation that must be carried out by a relevant person before undertaking the relevant works;*
- (d) the notifications that a relevant person must give upon his or her completion of the relevant works;*
- (e) the indemnifications that a relevant person must give the MARA or a CPA before undertaking relevant works;*
- (f) the procedures for obtaining a MAC in respect of the relevant works after the works have been carried out where, but for this section, those works would have required a MAC before being undertaken.*

A.2 Developments Exempted under Planning and Development Act (2000)

Section 4 (1) of the Planning and Development Act of 2000 lists exempted development, including:

- ‘(aa) development by a local authority in its functional area (other than, in the case of a local authority that is a coastal planning authority, its nearshore area)*
- ‘(ab) development by a coastal planning authority that—*
 - ‘(i) owns the maritime site on which the development is proposed to be situated, or*
 - ‘(ii) is the holder of a maritime area consent granted for the occupation of a maritime site for the purposes of the proposed development, in its nearshore area;*
- ‘(f) development carried out on behalf of, or jointly or in partnership with, a local authority, pursuant to a contract entered into by the local authority concerned, whether in its capacity as a planning authority or in any other capacity;*
- ‘(h) development consisting of the carrying out of works for the maintenance, improvement or other alteration of any structure, being works which affect only the interior of the structure or which do not materially affect the external appearance of the structure so as to render the appearance inconsistent with the character of the structure or of neighbouring structures;*
- ‘(1A) Subject to subsection (1B), the following classes of development shall also be exempted development for the purposes of this Act if carried out wholly in the maritime area: ...*
 - ‘(f) activities that are the subject of, or require, a licence under Part 5 of the Maritime Area Planning Act 2021;’*

Section 4 (1B) and (1C) places the following restrictions on exempted development:

- ‘(1B) Development shall not be exempted development if an environmental impact assessment of the development is required.’*
- ‘(1C) Development shall not be exempted development if an appropriate assessment of the development is required’*

Under Article 6 of the Planning and Development Regulations S.I. 600 of 2001 as amended,

‘development of a class specified in column 1 of Part 1 of Schedule 2 is exempted development provided that such development complies with the conditions and limitations specified in column 2 of Part 1.’

Class 54 of column 1 of Part 1 of Schedule 2 is ‘Reclamation of an area, not exceeding 100 square metres, of foreshore for the purpose of protecting a pier, slipway or other structure on the foreshore.’

Article 9 of the Planning and Development Regulations S.I. 600 of 2001 places restrictions on exempted development to which Article 6 relates, including development which would:

- ‘(vi) interfere with the character of a landscape, or a view or prospect of special amenity value or special interest, the preservation of which is an objective of a development plan for the area in which the development is proposed or, pending the variation of a development plan or the making of a new development plan, in the draft variation of the development plan or the draft development plan,*
- ‘(vii) consist of or comprise the excavation, alteration or demolition (other than peat extraction) of places, caves, sites, features or other objects of archaeological, geological, historical, scientific or ecological interest, the preservation, conservation or protection of which is an objective of a development plan or local area plan for the area in which the development is proposed or, pending the variation of a development plan or local area plan, or the making of a new development plan or local area plan, in the draft variation of the development plan or the local area plan or the draft development plan or draft local area plan,*
- ‘(viiB) comprise development in relation to which a planning authority or An Coimisiún Pleanála is the competent authority in relation to appropriate assessment and the development would require an appropriate assessment because it would be likely to have a significant effect on the integrity of a European site,*

- (viiC) consist of or comprise development which would be likely to have an adverse impact on an area designated as a natural heritage area by order made under section 18 of the Wildlife (Amendment) Act 2000.*
- (x) consist of the fencing or enclosure of any land habitually open to or used by the public during the 10 years preceding such fencing or enclosure for recreational purposes or as a means of access to any seashore, mountain, lakeshore, riverbank or other place of natural beauty or recreational utility,*
- (xi) obstruct any public right of way,*

A.3 Development Relevant to Coastal Change Management

Part 2 of Schedule 5 of the Planning Regulations S.I. No. 600/2001 – Planning and Development Regulations, lists the type of projects that require an EIA if they meet or exceed certain limits or criteria. The classes of development relevant to coastal change management processes that are listed include:

10. Infrastructure Projects:

10 (f) (ii) *Canalisation and flood relief works, where the immediate contributing sub-catchment of the proposed works (i.e. the difference between the contributing catchments at the upper and lower extent of the works) would exceed 1,000 hectares or where more than 20 hectares of wetland would be affected or where the length of river channel on which works are proposed would be greater than 2 kilometres.*

10 (g) *Dams and other installations not included in Part 1 of this Schedule which are designed to hold water or store it on a long-term basis where the new or extended area of water impounded would be 30 hectares or more.*

10 (k) *Coastal work to combat erosion and maritime works capable of altering the coast through the construction, for example, of dikes, moles, jetties and other sea defence works, where the length of coastline on which works would take place would exceed 1 kilometre, but excluding the maintenance and reconstruction of such works or works required for emergency purposes.*

13. Changes, extensions, development and testing

(a) Any change or extension of development already authorised, executed or in the process of being executed (not being a change or extension referred to in Part 1) which would:

- i. result in the development being of a class listed in Part 1 or paragraphs 1 to 12 of Part 2 of this Schedule, and*
- ii. result in an increase in size greater than –*
 - 25 per cent, or*
 - an amount equal to 50 per cent of the appropriate threshold, whichever is the greater.*

A.4 Legislative Framework

The legislative framework for development in coastal areas include the [Planning and Development Acts](#), [Foreshore Acts](#), [the Maritime Area Planning Act](#), [Harbours Acts](#), [Coast Protection Act](#), [the European Union \(Planning and Development\) \(Environmental Impact Assessment\) Regulations 2018](#), [the EU Water Framework Directive](#), [the EU Marine Strategy Framework Directive](#), [the Birds Directive](#) and [the Habitats Directive](#).

At a national level, the agreement of the overarching National Marine Spatial Plan (NMPF) in 2021 provides a new way of looking at how Ireland uses the marine area and planning how best to use it into the future. The NMPF seeks to balance the different demands for using the sea including the need to protect the marine environment. It is about planning when and where human activities take place at sea. There are also relevant policies in relation to seascape and landscape.

In addition, the National Planning Framework guides at a high-level strategic planning and development for the country over the next 20+ years, so that as the population grows, that growth is sustainable (in economic, social and environmental terms). It recognises that Ireland’s coastline is a remarkable but fragile resource that needs to be managed carefully to sustain its character and attributes in physical, environmental quality and biodiversity terms.

At a European level, the European Commission has been working to identify and promote measures in relation to Europe’s coastal zones deterioration and to improve the overall situation, which is largely based on an

integrated approach to coastal zone management, and in later years the focus is on marine spatial planning. In 2007, a three-year EU CONSCIENCE project¹⁰ was launched to help inform how to improve sustainable management of coastal erosion across EU Member States.

A.5 EU Directives

Water Framework Directive (WFD)

Public authorities are required under [the Water Framework Directive \(WFD\) \(2000/60/EC\)](#) to demonstrate the compliance of projects with the objectives of the WFD, namely that all activities do not result in adverse effects to designated water bodies (or WFD sensitive areas). A WFD Assessment is required to ensure that developments will not jeopardise the potential for WFD water bodies to achieve good chemical or ecological status, whether already achieved or as a future objective. It is important to note that a WFD assessment is a legal requirement for any project that has the potential to affect a designated 'water body', which includes rivers, lakes, groundwater, estuaries, and coastal waters within one nautical mile of the coastline. Failure to perform a WFD assessment or to demonstrate compliance can lead to significant delays in the planning process or even the denial of planning permission.

There are currently no published guidelines for WFD Assessments in Ireland. Guidance documents published by the UK's Environment Agency for WFD Assessments (<https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters>), however, recommend a staged analysis as follows:

- Stage 1 – Screening
- Stage 2 – Scoping
- Stage 3 – Detailed Assessment
- Stage 4 – Identify mitigation and monitoring measures; and
- Stage 5 – Derogation, i.e., if the assessment concludes that the proposed development is not compliant with the objectives of the WFD.

Marine Strategy Framework Directive Assessment

Where the WFD covers the area within 1 nautical mile of land, the main application of the Marine Strategy Framework Directive (MSFD) begins seaward of the baseline beyond the coastal coverage of the WFD.

The key objective of the MSFD is to achieve and maintain Good Environmental Status (GES) across all European marine waters. This is done by applying an ecosystem-based approach to management, ensuring that human activities are conducted in a sustainable way that protects the marine environment and the resources it provides for current and future generations.

The MSFD includes 11 qualitative descriptors that describe the state of the marine environment and the pressures on it. These descriptors are the framework used by European Union (EU) Member States to assess the health of their marine waters and to define what GES looks like.

An MSFD assessment is required for coastal erosion developments because these activities directly interact with and can have significant impacts on the marine environment. Coastal erosion developments, such as the construction of sea walls, breakwaters, or other "hard engineering" solutions, can affect the achievement of GES in any relevant waterbodies.

Whilst an MSFD assessment does not grant planning permission, it is required for coastal erosion developments to ensure that these developments do not prevent Ireland from achieving its legal obligations to protect and maintain a healthy, clean, and productive marine environment as defined by the GES criteria.

Appendix B: Data Sources and Links

B.1 Key Coastal Datasets Identified

Table 8 Key Datasets

Data Type	Dataset (link)	Description	Source	Year Captured	Spatial Coverage
Aerial Imagery	OSI Aerial Imagery	Orthoimagery of the coast of Ireland.	OSI	Various	National
Bathymetry Data	Integrated Mapping for the Sustainable Development of Ireland's Marine Resource (INFOMAR)	Bathymetry data captured as part of the INFOMAR programme.	GSI and the Marine Institute	2000 - present	National
Bathymetry Data	Pilot Coastal Monitoring Survey Programme	Bathymetry data captured at the locations included in the Pilot Coastal Monitoring Survey Programme.	OPW	2020 - present	Local
Coastal Maps	ICPSS 2050 Erosion Line Coastal Areas Potentially Vulnerable to Wave Overtopping Oblique Imagery Survey 2003	Dataset showing the potential future position of the coastline in the year 2050. Maps showing combined wave climate and water levels. Oblique imagery of the coast of Ireland.	OPW	2010 – Present day	National
Shoreline Change	GSI Shoreline Change Viewer	Shoreline rates show how fast the coast is moving. They show if it is moving out towards the sea or back towards the land.	GSI	2000 - 2021	National
Coastal Features	Tidal Lines HWM - LWM	High Water Mark (HWM) and Low Water Mark (LWM).	OSI	-	National
Metocean Data	Wave forecast Tidal predictions The Irish Marine Data Buoy Observation Network	Wave forecast tidal predictions, metocean information (wave height, wave period, wave direction, wind speed, etc.) from existing data buoys, etc.	Marine Institute	Ongoing	National
Marine Atlas	Maps shown in Marine Atlas	Aquaculture sites, designated sites, environmental monitoring, fishing activity, Heritage Assets, Marine Mammals, buoys, ports, etc.	Marine Institute	Ongoing	National

B.2 Other Key Datasets Identified

Table 9 Other Key Datasets Identified

Data Type	Dataset	Description	Source	Year Captured	Spatial Coverage
Additional Environmental Data	EPA Maps	A collection of datasets compiled by the Environmental Protection Agency which includes a number of useful maps for environmental themes including water quality, waste, air quality, extractive industries, wastewater treatment and noise mapping	Environmental Protection Agency	Ongoing	National
Spatial Planning	Land Use Zoning, Planning Applications	All land use zonings contained within Local Authority Development Plans, and planning applications made from 2010 onwards using point and boundary data.	Local Authority/ DHLGH	2010 - present	National
Historic Environment Viewer	Historic Environment Viewer	The Historic Environment Viewer is an interactive map and search facility that provides access to the records of the National Monuments Service “Sites and Monuments Record” and the National Inventory of Architectural Heritage.	DHLGH	Ongoing	National
Maritime Spatial Planning	MARA Map	The MARA Map displays all MAC and MUL applications that have been granted by MARA to date	MARA	Ongoing	National
NMS Wreck Viewer	Protected Wreck sites	The Wreck Viewer is an interactive map and search facility that provides access to the records of protected wrecks held by the National Monuments Service.	DHLGH	Ongoing	National
NPWS Maps Viewer¹⁾	Protected Sites in Ireland NPWS Designations Viewer	Special Protection Areas (SPA), Special Areas of Conservation (SAC) and Natural Heritage Areas (NHA) View and download Protected Sites spatial data	NPWS	Ongoing	National

- 1) The site-specific information on the NPWS website for Natura 2000 sites i.e. SAC and SPA sites, is currently under review. Up-to-date information relating to Natura 2000 sites can be obtained by linking to the Statutory Instrument on NPWS website, or emailing NPWS at natureconservation@npws.gov.ie.

There are also many other datasets and geographical information surveys that may help to carry out any specific analysis. Note that all Irish public sector datasets may be found in <https://data.gov.ie/>.

B.3 Datasets by the OPW under the Pillar 2 of the IDGR

This Appendix provides a summary of progress on key work being undertaken by the OPW under Pillar 2 recommendations of the Report of the Inter-Departmental Group on National Coastal Change Management Strategy.

It should be read in conjunction with the IDGR.

The information provided is in tabular format. In the long-term, the OPW plans to establish a unified platform that consolidates all available coastal data, enabling entities to access this information for any specific area of the coastline.

An estimated completion date is provided to help inform when the outputs of the various workstreams may be available, and to assist in raising awareness amongst LA staff. These estimated completion dates are described below:

- **Short-Term** – it is anticipated that the work will be complete and available to LA staff within the next two years (2026 to 2027 inclusive).
- **Medium-Term** – it is anticipated that the work will be complete and available to LA staff in three to five years (2028 to 2030 inclusive).
- **Long-Term** – it is anticipated that the work will be complete and available to LA staff in over five years (2031 onwards).

LA staff should contact the OPW directly if they require further, more specific information on the work being progressed and the estimated completion date.

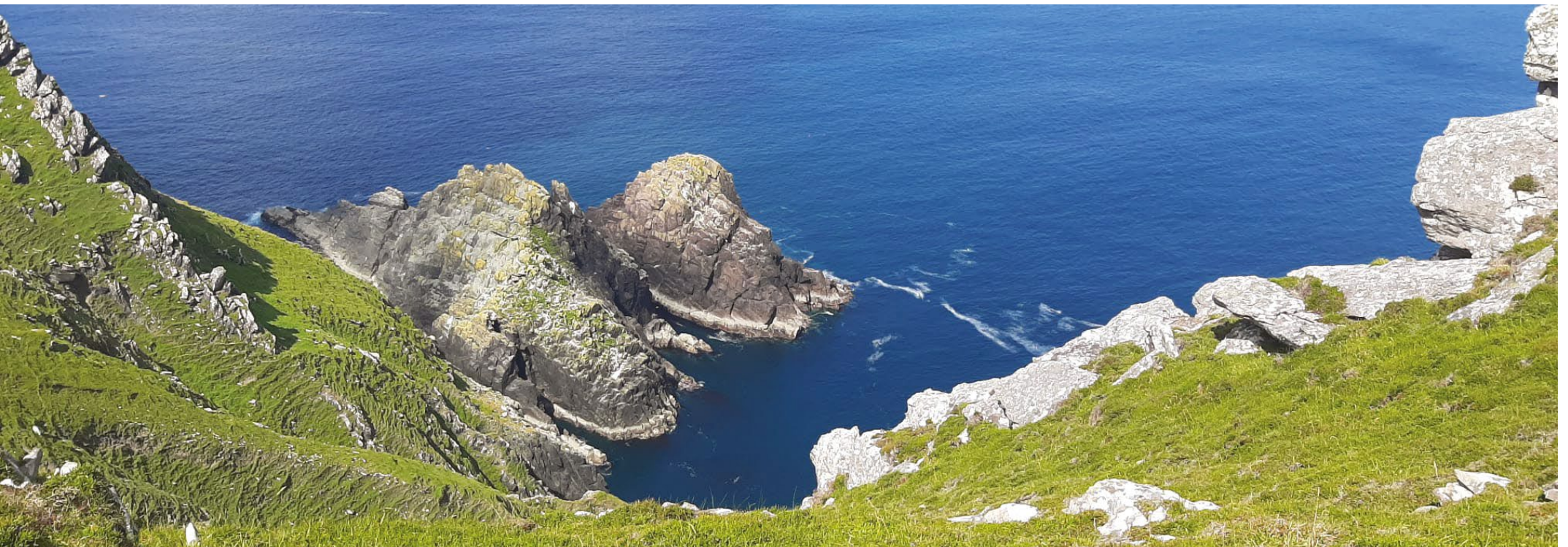




Table 10 Summary of key ongoing work under Pillar 2 of the Report of the Inter-Departmental Group on National Coastal Change Management Strategy

Recommendation	Project	Lead	Status	Estimated Completion Date	Summary or Progress Update
3(a)	Collation of Existing Coastal Monitoring Datasets	OPW	Ongoing	Short-Term	Collation of existing coastal monitoring dataset is ongoing. This includes geo-spatial and other relevant datasets. The OPW have engaged with a wide range of stakeholders to develop a register of available national, regional, and local datasets. The responses received are currently being compiled. The register of relevant datasets is due to be available in 2026.
3(a)	Coastal Aerial Imagery and LiDAR Survey (CALs) Programme	OPW	Ongoing	Short-Term	The OPW have commissioned surveys to capture high-resolution aerial imagery and LiDAR data for the entire coastline of Ireland. All data is taken at or around low tide. Data collection is complete and data processing ongoing. All data is expected to be available in 2026.
3(a)	National Coastal Change Monitoring Programme	OPW	Ongoing	Short-Term	The development of the new National Coastal Change Monitoring Programme is ongoing. The draft location, type and frequency of the monitoring proposed for each section of the coastline is expected to be available in 2027. Once developed the draft proposal will be issued to the relevant local authorities for consultation.
4(a)	Coastal Defence Asset Database	OPW	Ongoing	Short-Term	The Coastal Defence Asset Database is currently being developed and populated with details of all visible natural and engineered coastal defences, derived from available imagery. Completion of the initial data population stage is expected in 2026. Additional information will be added to the Coastal Defence Asset Database in future stages of the project.
6(a)	National Coastal Erosion Hazard Mapping	OPW	Ongoing	Medium-Term	Available and readily derivable data is being used to develop National Coastal Erosion Hazard Mapping for Ireland. This will help inform the National Coastal Erosion Risk Assessment and will support new spatial planning and development guidelines (also Medium-Term). A pilot study is complete and the national programme is due to commence in 2026.
6(a)	National Coastal Erosion Risk Assessment	OPW	Not started	Medium-Term	Follows “National Coastal Erosion Hazard Mapping”, see above. The hazard mapping will be used together with data on different receptors or assets to assess coastal erosion risk nationally and help identify areas or communities at significant risk.
6(c)	Past Coastal Erosion Database	OPW	Ongoing	Short-Term	The Past Coastal Erosion Database is under development and has been trialled by a number of local authorities. The OPW plan to launch it in the short-term and it will allow LA staff and members of the public to report coastal erosion in a single, centralised location.
6(e)	Identify Areas of Potentially Significant Coastal Change Risk	OPW	Not started	Medium-Term	Follows “National Coastal Erosion Risk Assessment”, see above. This will identify areas of significant risk based on the National Coastal Erosion Risk Assessment and consultation with local authorities and the public.
7(a)	Assess and appraise technical options for Areas of Potentially Significant Coastal Change Risk	OPW	Not started	Medium-Term/Long-Term	Follows “Identify Areas of Potentially Significant Coastal Change Risk”, see above. Detailed appraisal of technical (hard and soft) options for managing risk in identified Areas of Potentially Significant Coastal Change Risk.



B.4 Other sources of knowledge

Technical information can be found in the following links:

- The Rock Manual (CIRIA, 2007)
- [Beach Management Manual \(second edition\)](#) (CIRIA, 2010)
- International levee handbook (CIRIA, 2013)
- Groynes in coastal engineering (CIRIA, 2020)
- Maritime Works – Part 1-1: General - Code of practice for planning and design for operations (BSI, 2013)
- Maritime Works – Part 1-2: General - Code of practice for assessment of actions (BSI, 2017)
- Maritime structures – Part 7: Guide to the design and construction of breakwaters (BSI, 1991)
- Coastal Nature-Based Solutions: A Quick Scoping Review. (Department for Environment and Rural Affairs, 2021).
- Coastal Engineering Manual (USACE, 2008)

Table 11 key guidance documents on Nature-Based Solutions (NbS) in Ireland and the UK

Country	Title	Summary
Ireland	Nature-Based Solutions for Catchment Management – The OPW	Outlines NbS approaches such as wetland restoration and afforestation to reduce flood risk and enhance biodiversity.
UK	Coastal and Estuary Management – GOV.UK	Provides evidence and examples of saltmarsh and mudflat restoration as effective NbS for flood and erosion risk reduction.
Ireland	Building Coastal and Marine Resilience in Ireland	Highlights the importance of building resilience across socio-ecological and economic systems, through the environmental and socio-economic resilience of two coastal communities.
UK & Ireland	Saltmarsh Restoration Handbook	Provides practical guidance on restoring and creating saltmarsh habitat across the UK and Ireland and provides advice on planning and implementing such schemes with case studies and lessons learnt from examples.
Ireland	Blue Green Infrastructure and Nature-based Solutions Framework	This Framework for Blue Green Infrastructure (BGI) and Nature-based Solutions (NbS) seeks to increase awareness and knowledge of the concept of ecosystem services and of the value of green and blue infrastructure

Appendix C: Funding Sources and Links

C.1 Funding Sources – Longlist

Table 12 Additional Funding (Ireland)

Scheme	Who can apply	Financing	Eligible works	Administering Authority
Community Waters Development Fund (LAWPRO)	Community groups, local authorities	Small grants (€1,000–€25,000)	<ul style="list-style-type: none"> Supports long-term adaptation efforts Nature-based, water quality-focused coastal resilience projects 	DHLGH
CLÁR Programme	Community and voluntary groups, local development companies	Grants of €5,000–€50,000 (up to 90% of costs)	<ul style="list-style-type: none"> Supports long-term adaptation efforts Small-scale infrastructure in rural areas with population decline 	Department of Rural and Community Development
An Taisce Clean Coasts	Clean Coasts community groups	Small grants (up to €500)	<ul style="list-style-type: none"> Supports long-term adaptation efforts Dune planting, habitat restoration, small-scale climate resilience actions 	DHLGH, Local Authorities, and sponsors
Heritage Council Community Heritage Grant Scheme	Community/voluntary groups, heritage NGOs	Grants from €500 to €25,000	<ul style="list-style-type: none"> Supports long-term adaptation efforts Heritage restoration, biodiversity, local heritage research 	DHLGH
FLAG Coastal Communities Development Scheme	Enterprises and initiatives in fishing, aquaculture, maritime sectors	Part of €15 million fund (2025–2029)	<ul style="list-style-type: none"> Supports long-term adaptation efforts Heritage restoration, community resilience, environmental and cultural projects within 10km of coast 	Irish Government & EU (EMFAF)
Waterways Ireland Community Heritage & Biodiversity Grant Scheme	Community-based groups	Small grants from €20,000 fund	<ul style="list-style-type: none"> Supports long-term adaptation efforts Heritage-focused environmental improvements aligned with Waterways Ireland Plan 	DHLGH (Ireland) & Department for Infrastructure (Northern Ireland)
Restoration Improvement Programme	Local Authorities (Roads)	Annual allocation	<ul style="list-style-type: none"> Supports long-term adaptation efforts Road surface restoration and improvement including at-risk coastal roads 	Department of Transport
Restoration Maintenance Works Scheme	Local Authorities (Roads)	Annual allocation	<ul style="list-style-type: none"> Supports long-term adaptation efforts Surface dressing, patching, minor repairs including at risk coastal roads 	Department of Transport
Humanitarian Assistance Scheme *Activated in response to a severe weather event	Households affected by severe weather event such as flooding	Grants	<ul style="list-style-type: none"> Supports emergency measures Essential needs, household items, structural repairs 	Department of Social Protection

Scheme	Who can apply	Financing	Eligible works	Administering Authority
Emergency Business Flooding Scheme * Activated in response to flooding event	Small businesses, sports clubs, community orgs without flood insurance	Up to €20,000 (Standard); up to €100,000 (Enhanced)	<ul style="list-style-type: none"> Supports emergency measures Repair of premises, fixtures, fittings, stock (not loss of earnings) 	Department of Enterprise, Trade and Employment
Climate Action Fund - Community Climate Action Programme	Community groups via local authorities, Competitive application via local authorities*	Grants up to 100% (with prefunding up to 25% available), €61.5 million total (Phase 1); runs to 2027	<ul style="list-style-type: none"> Supports long-term adaption efforts Community-led climate adaptation and resilience projects, including coastal initiatives 	Department of Environment, Climate and Communications (Shared Island Fund)

*The Community Climate Action Programme is administered through local authorities, each of which has received an allocation under the Climate Action Fund. While there are currently no open calls for applications, the programme has previously funded relevant community-led climate adaptation and resilience projects.

C.2 EU Funding Sources

Table 13 EU Solidarity and Emergency Aid Reserve (SEAR)

EU Solidarity and Emergency Aid Reserve (SEAR)	
Who can apply	EU Member States and accession countries Application within 12 weeks of disaster
Financing	Up to €1.2 billion annually (2021-2027 budget)
Eligible Works	Infrastructure repair, temporary housing, clean-up, healthcare
Administering Authority	EU SEAR (merged Solidarity Fund & Emergency Aid Reserve)
Further Information	Flexibility and special instruments - European Commission

Table 14 LIFE Programme – Climate Change Mitigation & Adaptation (sub-programme)

LIFE Programme – Climate Change Mitigation & Adaptation (sub-programme)	
Purpose	EU's funding instrument for the environment and climate action
Who can apply	Public bodies including Local Authorities, NGOs, research institutions, private entities
Financing	Large-scale grants (e.g., €5.7m for LIFE on Machair a project restoring rare coastal habitats in the west of Ireland, improving both biodiversity and natural flood protection – Nature & Biodiversity sub-programme)
Eligible Works	<ul style="list-style-type: none"> Supports long-term adaptation efforts Includes climate adaptation, biodiversity, coastal resilience, nature restoration
Administering Authority	European Climate, Infrastructure and Environment Executive Agency (CINEA)
Further Information	Programme for the Environment and Climate Action (LIFE) - European Commission



Table 15 PEACEPLUS - European Regional Development Fund (ERDF) – Investment Area 5.2 Marine and Coastal Management

PEACEPLUS (ERDF) – Investment Area 5.2 Marine and Coastal Management	
Purpose	Enabling a cross-border approach to the protection of the marine and coastal environment from potentially damaging human activities, and support the development of climate change adaptation plans, which will increase the resilience of ecosystems, coastal communities, infrastructure and the marine economy
Who can apply	Cross-border partnerships involving public sector bodies, local authorities, research institutions, and community organisations operating in Northern Ireland and the border counties of Ireland
Financing	<ul style="list-style-type: none"> • Budget allocation: €24,786,522 for Investment Area 5.1 Marine and Coastal Management between 2021 – 2027 • In 2025, €24.8 million was awarded to three major marine and coastal climate projects • Funding is provided through the European Regional Development Fund (ERDF) under the PEACEPLUS Programme (2021-2027).
Eligible Works	<ul style="list-style-type: none"> • Supports long-term adaptation efforts • Actions supported include coastal monitoring; habitat recovery and restoration; development of nature-based solutions; development of adaptation and resilience plans for key sites
Administering Authority	European Regional Development Fund (ERDF) via SEUPB (Special EU Programmes Body)
Further Information	PEACEPLUS SEUPB

Table 16 European Space Agency – Coastal Resilience Call

European Space Agency – Coastal Resilience Call	
Purpose	Support the development of innovative services that leverage space technology to address the challenges posed by climate change to coastal cities, rural coastal regions, and ports
Who can apply	<ul style="list-style-type: none"> • Research institutions, public bodies, private sector • Bidding teams must obtain Letter(s) of Authorisation from the relevant national delegation(s) before submitting a Full Proposal • Applications are open until 31-10-2025
Financing	<ul style="list-style-type: none"> • Zero Equity Funding • Feasibility study – Max 500k EUR, 50%-80% funded by ESA • Demonstration project – No max amount, 50-80% funded by ESA
Eligible Works	<ul style="list-style-type: none"> • Supports long-term adaptation efforts • Feasibility study or demonstration projects • Projects may include nature-based or hybrid solutions, infrastructure resilience upgrades specifically addressing coastal erosion
Administering Authority	The European Space Agency (ESA)
Further Information	Coastal resilience to climate change

While the funding is primarily focused on the development of commercial services, ESA support can play a valuable role in advancing coastal resilience. While not directly tied to the delivery of resilience works, it enables the integration of data-driven approaches that can inform and enhance future planning, monitoring, and decision-making in coastal adaptation efforts (e.g., nature-based solutions)

Table 17 Horizon Europe – Cluster 6

Horizon Europe – Cluster 6	
Purpose	Under Horizon Europe (Cluster 6), the European Commission funds research and innovation projects for a greener Europe and a healthy planet for all including a specific focus on research and innovation to foster the sustainable, balanced development of rural, coastal and urban areas
Who can apply	Local Authorities, Research institutions and universities, NGOs and civil society organizations, SMEs and industry partners, Coastal community networks
Financing	<ul style="list-style-type: none"> • Horizon Europe 2021-2027 has a budget of €95.5 billion. • Horizon Europe uses lump sum funding to reduce administration and financial errors which are defined up-front and fixed in the grant agreement and are paid upon completion of the activities in work packages
Eligible Works	<ul style="list-style-type: none"> • Supports long-term adaptation efforts • In 2025, four topics were covered including innovative solutions for coastal communities which focussed on projects to enhance climate resilience, biodiversity protection, and social inclusion
Administering Authority	European Commission
Further Information	Resilient, inclusive, healthy and green rural, coastal and urban communities - European Research Executive Agency



C.3 Infrastructure Guidelines and the Public Spending Code

LAs need to ensure that increased investment and resourcing of coastal resilience works is compliant with public spending procedures set out in the [Infrastructure Guidelines](#) and [Public Spending Code](#). These procedures aim to achieve value for money, accountability and transparency in relation to public expenditure.

For the purposes of spending appraisal, public spending is categorised as either current spending or capital spending. Current expenditure covers day-to-day public spending relating to the provision of government services. The Public Spending Code details the requirements for managing public funds in Ireland to ensure value for money.

Capital spending is large, low-frequency (often one off) spending on infrastructure, with the associated benefits accruing to the public over time. The Infrastructure Guidelines set out the guidance for the evaluation, planning and management of public investment projects, including the purchase or acquisition of assets or shareholdings, in Ireland. The arrangements set out in the Infrastructure Guidelines apply to all public bodies and all bodies in receipt of Exchequer capital funding. The Project Life Cycle refers to the series of steps and activities needed to take the proposed spend on investment projects such as coastal resilience from concept to completion and evaluation.

- **Stage 1: Strategic Assessment & Preliminary Business Case** - The first stage of the project lifecycle is key to developing the strategic case for investment, with a Strategic Assessment being required before proceeding to develop a Preliminary Business Case (PBC). The purpose of the Strategic Assessment is to examine the rationale for investment as well as to ensure the strategic alignment with government policy.
- **Stage 2: Project Design, Planning and Procurement Strategy** -. At this stage of the project lifecycle, the preferred option is subject to more detailed scrutiny, assumptions are further tested and refined, risks are better understood, and the design stage is sufficiently advanced to arrive at the Detailed Business Case.
- **Stage 3: Final Business Case** - The Final Business Case is the final approval stage in the project lifecycle. Its purpose is to reassess the assumptions underpinning the PBC and ultimately the validity of continuing with the investment through to implementation.
- **Stage 4: Implementation** - Following final approval for the award of a contract, the Implementation Stage of an investment proposal begins. The critical tasks at this stage are to award the contract, manage and monitor the project to ensure that it is executed satisfactorily, within budget, to standard and on time.
- **Stage 5: Post Completion Review and Benefits Realisation** - The final stage of the project lifecycle is the Post Completion Review and Benefits Realisation, which is key to identifying lessons learned and driving continuous improvement in how public investment projects are evaluated, planned and managed. The purpose of the post-completion review is ultimately to determine whether the investment proposal was delivered in accordance with both its intended scope and budget as well as with the Infrastructure Guidelines.



Appendix D: Understanding Coastal Change

D.1 Types of Coastal Areas

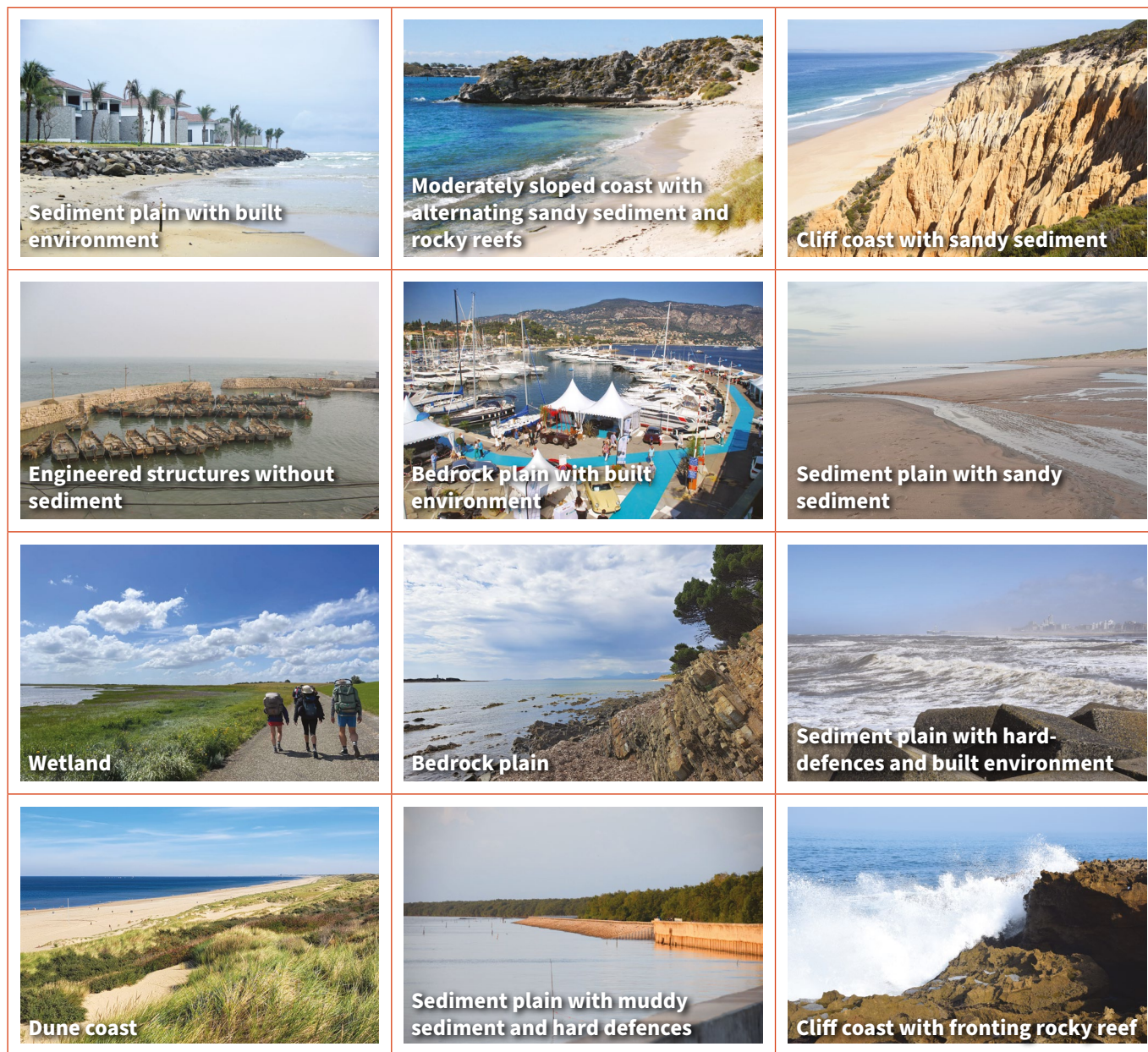


Figure 6 Illustrative examples of coastal environments, showing variations in sediment type, coastal type, presence of built environments. Source: IHE Delft, (Calkoen et al., 2025)

D.2 Coastal Erosion

D.2.1 Short-Term Processes

This happens mostly during extreme events: storms, anti-cyclones and hurricanes. The winds blowing towards the coast build up the water level, which can be dangerous when combined with high tide. Low air pressure and the wind also generate powerful waves that further raise the water level and run up on the beach and against dunes.

On wide, sandy beaches much of the wave energy is dissipated but steep, already eroded beaches increase wave runup, and revetments and beach walls reflect the waves, leading to more erosion.

D.2.2 Longer-Term Processes

Longer-term and larger-scale processes govern the sediment balance of a beach. If more sediment leaves a stretch of coast than enters it, the coastline will erode and the profile in front of the coastline will be eroded along with it. The dominant process here is the longshore transport, mostly driven by oblique waves that drive a strong longshore current. A convex coast tends to create a sediment deficit while a concave coast typically has converging longshore transport and can trap sediment.

D.2.3 Sediment Balance

Sediment balance refers to the balance between sediment entering and leaving a coastal area. A positive balance results in accretion while a negative balance may result in erosion. Headlands and coastal structures can disrupt the sediment balance by interrupting the longshore transport of sediment, which leads to accretion (growth) of sediment on the updrift side and erosion on the downdrift side.

D.2.4 Sediment Supply

In addition to the supply of sediment by waves and tide, rivers are also another significant source of material such as sand, clay and silt which has been eroded from upstream land.

D.2.5 Beach Orientation

The shape and orientation of beaches are governed by their geological setting (headlands, islands in front of the coast, river mouths) and the wave climate. Beaches enclosed by headlands or breakwaters will roughly align with the incoming wave crests; if the wave climate is strongly seasonal, then beaches may rotate, leading to temporary erosion on one side and accretion on the other side.

D.2.6 Beach Profile

High waves and high water levels tend to flatten beach slopes, leading to (mostly temporary) erosion of the upper profile and dunes; during calmer conditions this sand usually returns to the beach. This natural process can be disrupted by hard infrastructure such as houses, beach walls and revetments built too close to the shore.



Appendix E: National Coastal Change Management Strategy: Summary and Progress

Strategic Pillar 1		Implications for LA staff	Progress
Enhancing Governance and Capacity Building			
1. Governance	Understanding the roles and responsibilities of different parties in Coastal Management Change		Defined
2. Capacity Development	The Interdepartmental Steering Group should analyse the relevant skills and resources at the local authority level and develop the programmes necessary to develop the required skill sets and resources nationally for coastal change management in the long-term		Ongoing
Strategic Pillar 2		Implications for LA staff	Progress
Understanding Risk and Potential Risk Management Options			
3. Coastal Monitoring and Data Collection	Data sources for LA staff		Ongoing with certain projects completed / data available in the short-term (see Appendix B.3)
4. Coastal Defence Asset Database	It will help LA staff make informed spatial planning and development decisions in relation to coastal change and will provide an evidence base to help identify localised coastal protection problems and evaluate the need and justification for associated works. A draft database which will be issued to coastal local authorities for verification and amendment		Ongoing, with initial data population stage complete in the short-term (see Appendix B.3)
5. Coastal Change Research Programme	New data sources for LA staff		Medium-term
	Opportunities for funding		
6. National Assessment of Coastal Change Risk	New information for LA staff: Predictive coastal erosion hazard mapping pilot study on two pilot sites.		Ongoing. To be finalised and published by the OPW in the short-term
	New information for LA staff: Intertidal zone migration risk assessment		Available in the medium-term
	New information for LA staff: Past Coastal Erosion Database.		Ongoing. To be finalised and published by the OPW in the short-term
	New information for LA staff: Coastal erosion hazard mapping, risk assessment, and identification of areas of potentially significant coastal change risk		Not started. Available in the medium-term
7. Assessment of Technical Risk Management Options	In the medium-term identification of vulnerable locations by local authorities		Not started. Available in the medium-term/Long-term

Strategic Pillar 3**Implications for LA staff****Management Responses to Coastal Change**

8. Short-term measures	Local authorities to engage with local communities to help ascertain the most appropriate interventions.
9. Coastal Change Management Planning	Local authorities to identify potentially vulnerable locations. Statutory plans in such cases put in place spatial policies to limit development.
10. Coastal Change Management Delivery	National set of coastal change management plans by the Interdepartmental Steering Group A programme of capital measures should be prepared by the Interdepartmental Steering Group. The OPW to manage and coordinate the implementation of any programme of capital measures to protect communities, as set out in the Coastal Change Management Plans.
11. Promotion of Nature-based Solutions	Information for LA staff
12. Planning Guidelines	Information for LA staff
13. Consider legislative options	Information for LA staff
14. Coastal State's Maritime Area	Information for LA staff
15. Developing Managed Retreat Options	Information for LA staff



Photos: CARO

Appendix F: Summary of Case Studies and Best Practice

F.1 Coastal Areas Protected with Seabee Units

F.1.1 East Coast Soft Sediment Coastal Area Protected with Seabee Units (Source: Fingal County Council)

On the East Coast of Ireland soft sediment coastal areas often face acute challenges from coastal erosion and flooding, threatening public infrastructure and the local community. In response to this escalating risk, a temporary, interim coastal protection measure was implemented in one of these areas.

The intervention involved the installation of an array of precast Seabee units along the beach (Figure 7). These interlocking concrete structures were designed to dissipate wave energy and slow down localised erosion processes. The project received financial support from the OPW through its Minor Works Grant Programme, with total costs amounting to approximately €2 million.

While the Seabee units were not intended as a permanent solution, they provided critical short-term protection and allowed time for the development of a long-term strategy. The LA is currently pursuing the statutory planning process for the Coastal Flood and Erosion Risk Management (CFERM) Plan for the area, which aims to deliver a sustainable and comprehensive solution to protect both the coastline and the SAC.

The project highlights the importance of early and structured engagement with stakeholders, including the local community, the OPW, and the NPWS.



Figure 7 Seabee Units, East Coast of Ireland

F.1.2 Coastal Protection Works at the Murrough Using Seabee Units, Co. Wicklow (Source: Wicklow County Council)

The purpose of the Seabee unit coastal protection works carried out by Wicklow County Council was to protect the Murrough which is a 15km long coastal wetland area and to protect the rail line that runs parallel to the shoreline.

F.1.2.1 Background

The Murrough is one of the largest coastal wetland complexes on the east coast of Ireland which extends from Wicklow harbour to as far as Greystones. At its southern end the Murrough is a natural coastal barrier consisting of a ridge of sand and gravel which protects the Broad Lough. The area is extensively used for recreation whilst the northern extent of the Murrough is of significant environmental importance, holding a number of National and European Designations

Erosion at the Murrough in the area immediately north of Wicklow Harbour had been a concern for many years. The rock armour which was in place was originally commissioned by the OPW in the mid-seventies as part of a coastal protection scheme. The structure was subsequently extended and/or modified in several projects over the years.

F.1.2.2 Coastal Protection Works

The existing rock armour revetment structure at the Murrough was constructed without an appropriately designed terminal section and consequently experienced extensive erosion at its northern end particularly during the extreme storm events in 2014 and 2016. It has also experienced loss of stone armour in some areas. In order to respond to safety concerns following the storms, RPS were appointed to assess the accelerated coastal erosion at the northern end of the existing coastal defence and to design emergency coastal protection works to mitigate the effect of erosion at the northern end of the revetment. Data used by RPS included:

- Topographic survey and bathymetric data
- Wind and wave data
- Tidal and extreme water level data
- Wave transformation model and simulations

The design consisted of a 200m Seabee unit extension (Figure 8) complemented by a 50m rock armour transition section that is designed to reduce outflanking at the end of the structure and which slopes to the existing beach levels to provide vehicular access to the beach in case of emergencies. A concrete step access to the beach was incorporated at the southern end of the Seabee revetment.

Construction works were carried out by Wicklow County Council's direct labour staff from May 2016 to November 2016 (Figure 9).

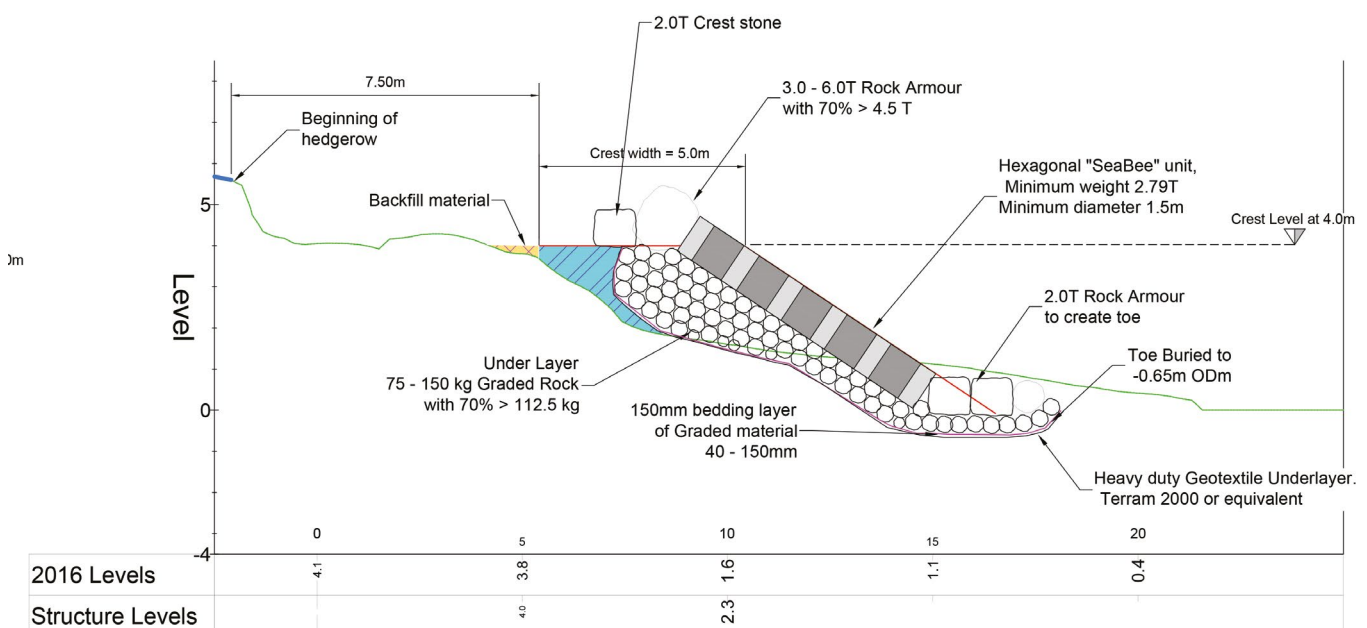


Figure 8 Cross-section coastal protection with Seabee units



Figure 9 Seabee revetment works at termination of hard defences at the Murrough and new beach access concrete steps

F.2 Rossbeigh, Glenbeigh, County Kerry (Source: Kerry County Council)

The purpose of the Coastal Protection Works at Rossbeigh was to protect a section of the L-7518 Local Secondary Road to the west of Rossbeigh Beach.

F.2.1 Coastal Protection Works

The project consisted of the construction of a 75m long Rock Revetment at Rossbeigh, Glenbeigh, Co. Kerry which was designed to protect the sea cliff at this location from further erosion and to ensure the structural stability of a section of the L-7518 Local Secondary Road.

Works (Figure 10) were completed by the Killorglin Area Direct Labour Staff in Q1 & Q2 2019.

F.2.2 Funding

This was an OPW funded Minor Works Scheme with Malachy Walsh and Partners acting as the Design Consultant and Project Supervisor for the design process. Kerry County Council staff employed in the Killorglin Engineering Area completed the works by Direct Labour.

Total expenditure of €503,398.31 was incurred on this project.

F.2.3 Lessons Learnt

The implementation of a monitoring regime on either side of the works, or geomorphologist expertise at the planning stage, would have been beneficial in order to identify short, medium or long-term effects that may have resulted from the intervention, in particular any significant changes to the Rossbeigh sand dune system and beach.



Figure 10 Coastal Protection Works at Rossbeigh

F.3 Seaview Coastal Protection Project, Kilmore, Co. Wexford (Source: Wexford County Council)

The Seaview coastal protection project aims to protect 14 properties, a public road and beach access along the southern coastline, in response to the accelerated erosion and storm events over recent years link to video.

F.3.1 Background

Access to Seaview beach was first established in 1930, with rock armour being first installed in 1979 to protect the entrance to the estate.

Rock armour was damaged in 2013 and revetments repairs were carried out in 2014 (Figure 11).

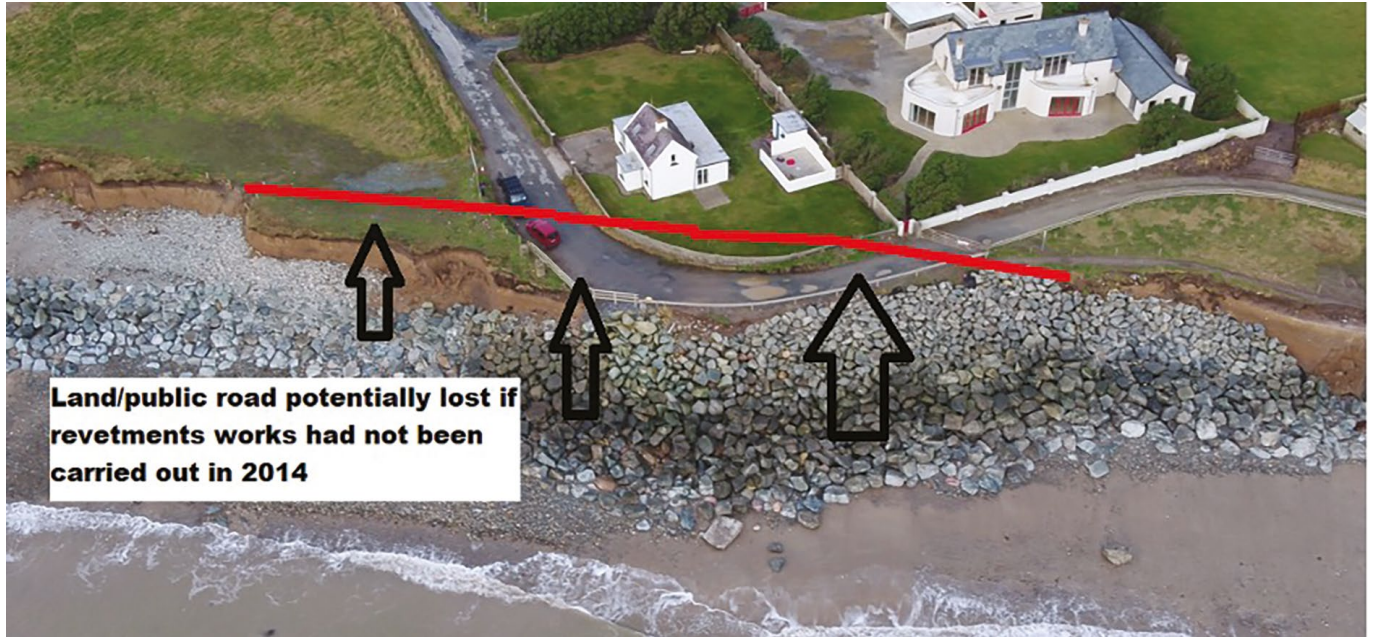


Figure 11 Rock revetment repairs carried out in 2014

F.3.2 Beach Access (2018)

In 2017, following Storm Ophelia, the beach access ramp (a concrete structure) (Figure 12) was severely damaged and was demolished in 2018 due to safety concerns.



Figure 12 Beach access steps 2013 (left) and 2018 (right)

Consultants (Malachy Walsh Partners (MWP)) prepared and submitted drawings to Wexford County Council (WCC) proposing temporary and permanent beach access solutions. Cost option appraisals were also considered as shown in Table 18.

Table 18 Cost options appraisal

Option	Description	Cost (approx. only)	Considerations
1	Ramp and adjoining steps	€285,000	Significant extra cost to facilitate occasional use for coastguard access and land drainage access. Alternatives being considered.
2	Shallow gradient ramp	€300,000+	Expensive. Foreshore licence required. Coastal protection measures also required.
3	Steps only	€120,000	Possible optimum solution. Impact on all users to be assessed.

However, as the OPW and the Department of Marine did not provide funding for beach access (the OPW fund only coastal protection schemes), WCC proceeded to install temporary wooden access steps instead (Figure 13).



Figure 13 Seaview Temporary Access steps in 2018

F.3.3 Coastal Erosion Assessment (2021)

A series of storm events between 2018 and 2020 significantly accelerated coastal erosion in the area, posing an increased threat to the 14 houses along the Seaview coastline and the access road serving them. Coastal monitoring was conducted using visual inspections, photographs, Global Positioning System (GPS) tracking, and drone surveys.

Long-term coastal erosion rates had previously been estimated at approximately 0.5 meters per year. However, storm events have significantly accelerated this rate. MWP were appointed to prepare a coastal erosion report including economic assessment and risk assessment which included the following:

- Comparison of historic and present-day mapping to estimate shoreline retreat rates;
- Preliminary assessment of relevant risk to assets;
- Preliminary assessment of relevant coastal and physical processes, tides, waves, cliff instability;
- Identification of environmental and permitting issues;
- Preliminary evaluation of potential options, their cost, and the economic benefits likely to accrue.

The report which was prepared was submitted to the OPW in February 2021 as part of the funding application for coastal protection works. Funding to design the scheme was approved by the OPW under the Minor Works Scheme in 2021

F.3.4 Construction of Emergency Works (2022)

In January 2022, approx. 80m of emergency works were carried out at Seaview by WCC contractor and funded by the OPW under a different application to value of circa €500,000. The basis of the funding application was accelerated erosion over recent years and erosion experienced after storm events.

F.3.5 Coastal Protection Design (2021-2023)

In 2021 following a funding approval under the OPW Minor Works Scheme, MWP were appointed to carry out preliminary design and ecology reports of the scheme, which included the following:

- Topographic and bathymetric surveys;
- Benthic, habitat and marine surveys;
- Archaeology surveys;
- Sediment sampling and analysis;
- Geotechnical and ground investigations;
- Coastal Process modelling;
- Review of assessment and surveys;
- Preliminary Design.

F.3.6 Relevant Consents, Licensing and Environmental Assessments

In 2023 final coastal modelling, environmental reports were completed and Part 8 planning application was submitted.

No Marine Area consent was required as the proposed works were not located in the maritime area. There was significant stakeholder engagement in the form of numerous meetings and engagement with the residents (and wider community) and Rosslare Municipal District.

F.3.7 Main Coastal Protection Construction (2025)

Following a new funding approval under the OPW Minor Works Scheme for the construction of the scheme, in October 2024, a construction contract was awarded for a 350m rock armour protection (see cross-section Figure 14) to incorporate a precast concrete 76m long x 2.5m wide beach access protected on both sides by rock armour, allowing pedestrian and machinery access to the beach if required. The works which began in February 2025 with a completion date of December 2025, are funded by the OPW (90% of the cost). Wexford County Council funded the remaining 10% of the works and the 76m long Beach Access.

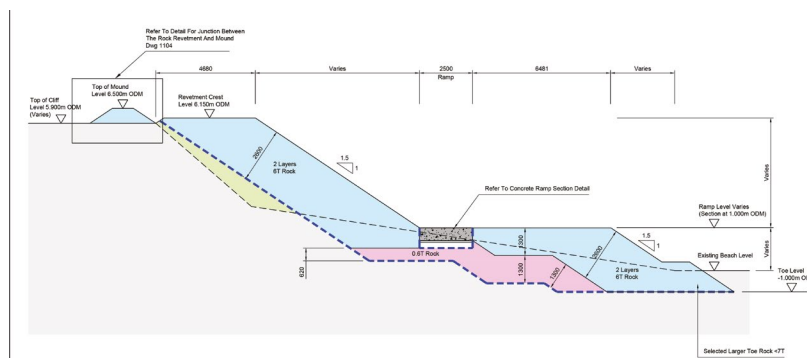


Figure 14 Cross-section of proposed rock revetment.

Works commenced in February 2025 and are due for completion December 2025 (Figure 15).





Figure 15 Construction works

Figure 16 shows the 2025 works in relation to the 2022 emergency works and erosion rates experienced at the site.

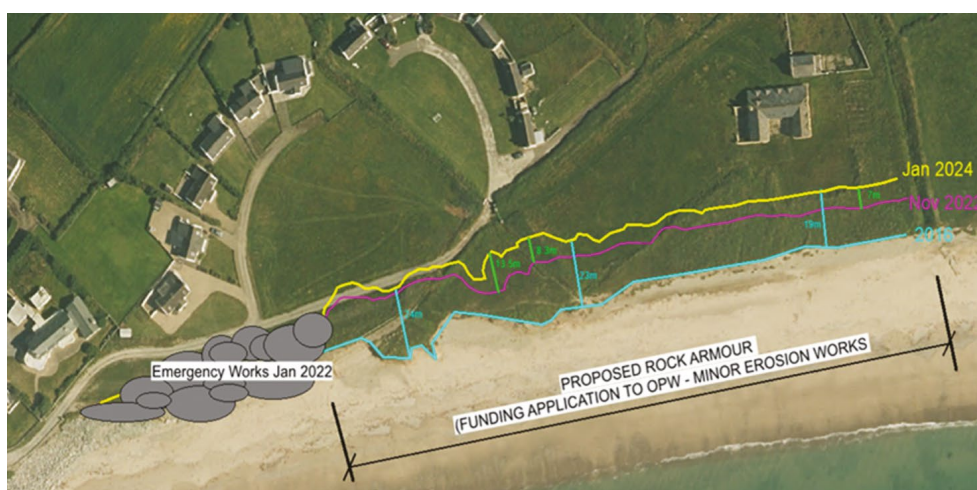


Figure 16 Seaview showing emergency works in 2022, rock armour under minor works funding application to the OPW and erosion rates

F.3.8 Cost

Total value of the Seaview project scheme is approx. €2.2m. This cost covers the design carried out from 2021 to 2023, emergency works carried out in 2022, surveys and construction works to be finalised in 2025. The OPW provided 90% of the funding for the main coastal protection works (including design) carried out in 2025 with the remaining 10% being provided by Wexford County Council along with the cost of the 76m long beach access (the OPW do not fund beach access).

F.4 Nature-based Solutions and Building with Nature

F.4.1 The Maharees, County Kerry, Ireland (Source: Maharees Conservation Association)

The Maharees is a 5 km long natural tombolo which is located on the north side of the Dingle Peninsula in County Kerry. The area is predominantly composed of sandy beaches and dunes which host unique and protected species and habitats.

It is a low-lying coastal area highly vulnerable to erosion, which has been exacerbated by tourism and climate change. The region has experienced significant dune degradation due to storm events and recreational pressure, threatening local infrastructure, habitats, and livelihoods. The dune degradation led to significant sand deposition on the main access road to the Maharees on several occasions preventing the community from accessing their places of work, school, services, etc.

The Maharees Conservation Association was founded by the local community in 2016 in response to coastal changes that were impacting on the local community. With the support of a range of state agencies, the local authority Kerry County Council, academic institutions and NGOs, the community group has pioneered a series of collaborative nature-based solutions to enhance coastal resilience. Key solutions included marram grass planting and control of vehicular, camping and pedestrian access to the dunes through the installation of fencing and signage and the provision of car parking facilities.



Figure 17 Chestnut Fencing Maharees, County Kerry: Credit: Mick Whelan, Maharees Conservation Association



Figure 18 Marram grass planting in the Maharees: Credit: Ray Buckley, Maharees Conservation Association

These nature-based solutions were combined with the delivery of educational campaigns to promote responsible recreational use, to highlight the conservation work and maximise awareness about the fragility and importance of the dunes amongst the resident and visiting community.

The community-led dune conservation work has resulted in a significant improvement of the ecological status of the coastal area along the peninsula. Dune restoration has also resulted in reduced sand deposition along the road that provides access to the area.

The outcomes in the Maharees demonstrate the importance of community engagement in coastal management. The case highlights the importance of integrating scientific knowledge with local action, the balance that needs to be achieved between tourism with conservation and the value of adaptive, low-cost interventions tailored to site-specific conditions.

Figure 19 shows the impact of the works in the Maharees on the dunes. More information on the Maharees coastal restoration project can be found in these links 1 and 2.



Figure 19 Dunes before and after restoration

Credit: Huw Roberts, Maharees Conservation Association

F.4.2 Grattan Beach, Galway (Source: Galway City Council)

Grattan Beach is a popular coastal site in Galway City, but its sand dunes have long been vulnerable to tidal erosion and human activity. In response, Galway City Council launched a nature-based solution to restore and protect the dunes, working in collaboration with local groups, researchers, and the community.

The restoration project involved installing light fences (see20) designed to encourage the formation of the embryo dunes. These structures help trap windblown sand, allowing plant species such as marram grass to take root and stabilise the area. Over time, this process supports biodiversity, protects against coastal flooding, and enhances the beach's natural resilience.



Figure 20 Light fences installed at Grattan Beach

The restored dunes now act as a buffer against storm surges and rising tides, reducing erosion and safeguarding nearby infrastructure. The vegetation and dunes also reduce the amount of sand that is blown upwards off the beach. The project has resulted in increased biodiversity, new sightings of flora, and an increase in the abundance of vegetation species such as sea beet, sea rocket, and sea orache. Since the works were carried out, enhanced public engagement with the site has also been observed.

Grattan Beach has become a “Living Lab” for nature-based solutions, with regular monitoring, beach cleans, and educational events. The site now supports cultural ecosystem services, including non-material benefits such as recreation, heritage appreciation, and community connection, making it a place of pride for locals.

The Grattan Beach Dune Restoration project is a successful example of climate adaptation through nature-based solutions and community co-creation. It demonstrates how low-impact interventions can deliver environmental, social, and educational benefits. As a pilot project, it sets the stage for similar initiatives across Galway City and beyond, showing how we can impact nature while enhancing public spaces.

[More information on the Grattan Beach Dune Restoration Project can be found in the Roadmap for Grattan Beach and Dune Site.](#)

The roadmap outlines key short-term, medium-term, and long-term actions that could be implemented to protect the dunes, support biodiversity, whilst also ensuring access to the beach is maintained and enhanced so people can continue to enjoy Grattan Beach at their leisure.

F.4.3 Houtribdijk, Netherlands (Source: IHE Delft)

Instead of raising the dike and strengthening the revetment, beaches were created at both sides of the dike, plus a new wetland area, the Marker Wadden, which protects the dike further and provides highly valuable habitat for vegetation, juvenile fish and birds.



Figure 21 GE image of Markerwadden and Houtrib dike (left); walkway through Markerwadden (right)

Key facts	
Purpose	Upgrading the protection of the surrounding areas from storm surges and maintaining the safety of the lakes, while enhancing natural and recreational values.
Recent reinforcement	From 2017 to 2020, the dike was reinforced to meet modern safety standards, capable of withstanding a 1-in-10,000-year storm event.
Nature-based Solution	The reinforcement project utilized innovative “Building with Nature” methods, such as creating wide, sloping sandy foreshores that absorb wave energy.
Design features	The design includes a soft, shallow foreshore, a varied artificial dune landscape with young drifting dunes, wet dune valleys, and areas dedicated to recreation and nature.
Ecological value	The reinforcement and pilot projects aimed to provide ecological advantages, such as enhanced biodiversity and habitat for flora and fauna, moving beyond a purely structural function.
Recreation	The project also sought to provide opportunities for recreation and contribute to a scenic route across the Dutch landscape.
Collaborators	Ministry of Infrastructure and Water Management, in consultation with various advisers and stakeholders like environmental groups, fishermen, and cyclists.

F.4.4 Prins Hendrik Zanddijk, Netherlands (Source: IHE Delft)

The dike needed to be strengthened to comply with the Delta Law in the Netherlands; in a combination between Rijkswaterstaat and nature organizations the dike was covered by a dune and a sandy spit was constructed in front of it and designated as a bird habitat.



Figure 22 Prins Hendrick Zanddijk

Key facts	
Purpose	The project aimed to reinforce the failing Prins Hendrik dike to protect the Prins Hendrik Polder from flooding and to enhance the natural ecological value of the Wadden Sea area.
Construction	5.5 Mm3 of sand was extracted from the seabed by a trailing suction hopper dredger and pumped ashore through a floating pipeline.
Nature-based Solution	It was a pioneering “soft” coastal defence, using sand to create a new dune and beach landscape seaward of the original dike, a method distinct from traditional dike reinforcement with clay and asphalt.
Design features	The design includes a soft, shallow foreshore, a varied artificial dune landscape with young drifting dunes, wet dune valleys, and areas dedicated to recreation and nature.
Flood defence	The new sand dike provides future-proof flood defence for Texel, meeting the safety standards required for superstorms.
Ecological value	The dynamic sandy area provides new habitats for Wadden Sea flora and fauna, including tidal flats, mudflats, salt marshes, beach, and dunes.
Recreation	Though most of the area is not accessible to the public, the project created public access to the new area via a cycle path and footpath, which includes a viewpoint offering panoramic views of the landscape.
Sustainable management	The design incorporates flexible elements to accommodate future sea-level rise and uses sustainable methods like planting marram grass and willow twigs to prevent sand displacement.
Collaborators	A joint effort by the Ministry of Infrastructure and Water Management, the province of Noord-Holland, the Wadden Fund, the municipality of Texel, and the Hollands Noorderkwartier district water control board.

F.4.5 Salt Marsh Restoration Eastern Scheldt (Source: IHE Delft)

Instead of raising dikes and strengthening the seaward slopes, salt marshes in front of the dikes were restored, which will dissipate the wave energy, reducing the wave impact on the dike and thereby lowering the cost of dike restoration, while providing high ecological value.



Figure 23 Salt marsh Eastern Scheldt

Key facts	
Purpose	The primary goal is to restore pioneer salt marshes by creating high-quality habitats for birds and other species, which helps protect coastlines from erosion and supports ecosystem functioning.
Species	The key plant used is <i>Spartina anglica</i> (cordgrass), a pioneer species that quickly anchors itself and builds up sediment.
Planting method	Plants are grown on coconut mats with a density of about 10-14 plants per square meter. These mats are then rolled out and fixed to the mudflats at low tide, with the edges dug into the bed to prevent dislodging.
Location	The pilot project involves testing this method at three locations in the Eastern Scheldt.
Coastal protection	Salt marshes stabilize sediments, reducing currents and wave action, and creating natural barriers against erosion.
Biodiversity	The restored salt marshes provide essential habitats, contributing to the rich biodiversity of the Natura2000 network, which the Eastern Scheldt is part of.
Ecosystem Functioning	By creating new salt marsh ecosystems, the project aims to improve overall ecosystem functioning and resilience, as the marshes store carbon.
Sustainable management	The design incorporates flexible elements to accommodate future sea-level rise and uses sustainable methods like planting marram grass and willow twigs to prevent sand displacement.
Collaborators	The project is a collaboration involving organizations such as EcoShape, IMARES, and NIOZ

F.4.6 Hondsbossche Dunes (Source: IHE Delft)

The Hondsbossche Dike has for centuries been a heavily defended sea dike, sticking out into the sea and continuously having to be defended against the impacts of waves and surges, with heavy revetments and a series of groynes.

In spite of these efforts, in the '00s the dike failed the strict criteria imposed by the Dutch Delta Law, and a radically new approach involving a wide beach and dune system was designed and built. The area was renamed Hondsbossche Dunes.

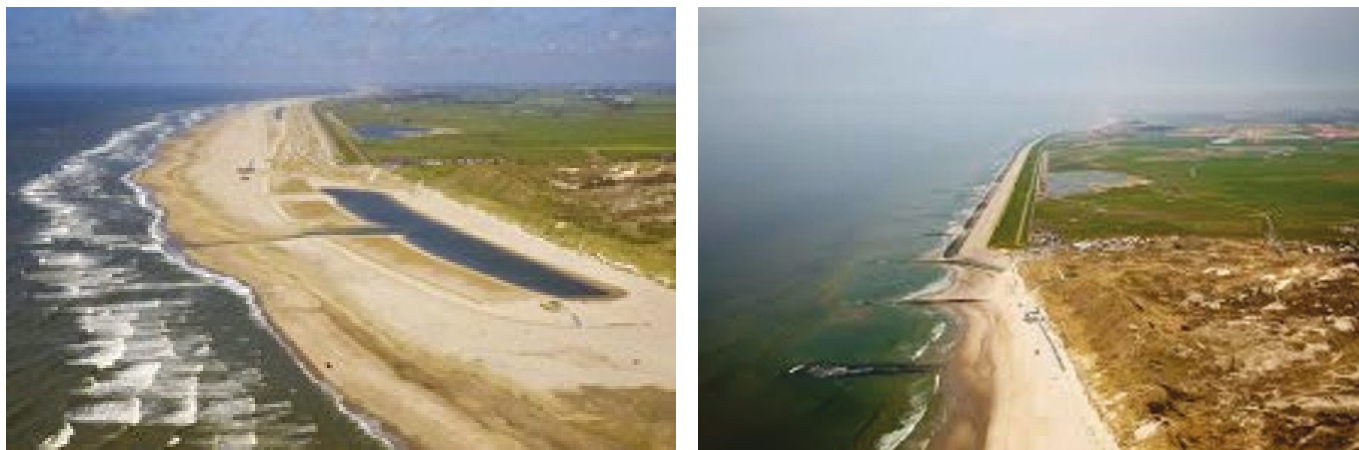


Figure 24 Hondsbossche Dike, 2010 (top) and Hondsbossche Dunes, 2015 (bottom)

Key facts	
Purpose	To strengthen a weak spot in the Dutch coastline and create a dynamic, nature-friendly coastal defence system.
Construction	Approximately 30-40 million cubic meters of sand were dredged from the sea and added to the foreshore and beach to form the new dunes.
'Building with Nature'	A core principle, this approach uses natural processes like wind and vegetation to strengthen the dunes, create habitats, and make the landscape resilient.
Dual function	The new Hondsbossche Dunes serve as a primary flood defence for the land behind it but also function as an attractive area for ecological development and tourism.
Design features	The design includes a soft, shallow foreshore, a varied artificial dune landscape with young drifting dunes, wet dune valleys, and areas dedicated to recreation and nature.
Ecological value	The creation of different dune profiles and wet valleys promotes natural dynamics, enhances biodiversity, and provides habitats for birds and plants.
Recreation	The dunes offer a visually appealing and accessible area for recreation and tourism, with spaces situated near the villages of Petten and Camperduin.
Learning opportunities	The project provides a unique opportunity to study the morphodynamics of dunes, natural processes following large-scale sand nourishment, and the effectiveness of sandy solutions for coastal defence

F.4.7 Maasvlakte-2 Rotterdam Port Extension (Source: IHE Delft)

The Rotterdam harbour extension was largely constructed as a curved dune coast with beach, allowing for smooth current patterns and extensive recreational beach and nature values. As it stretches 5 km into the sea, nature compensation projects were created including new dunes and a dune valley, and an extensive marine reserve.

The Maasvlakte-2 project involved reclaiming approximately 2,000 hectares of land to create a new, advanced port area for the Port of Rotterdam, featuring deep-sea container terminals, chemical industries, and modern infrastructure such as automated transport systems. It was completed in 2013 and opened for business in 2015.



Figure 25 (Right) GE image of the Maasvlakte-2 Rotterdam Port extension

Key facts	
Purpose	To expand the Port of Rotterdam with new industrial land and supporting infrastructure, adding 1,000 hectares of port area.
Land reclamation	2,000 hectares of land were reclaimed from the sea.
Port Depth	Port basins were dredged to a depth of 20 meters, allowing the largest container vessels to dock.
Infrastructure	Includes deep-sea quay walls (2.35 km), feeder quay walls (1.15 km), 14 km of railway, 13 km of roads.
Material	Approximately 240 million cubic meters of sand were used for land reclamation.
Sea defences	3.5 km of hard sea defences and 8 km of sandy beach and dunes.
Sustainability	Features fully electric, automated container terminals powered by wind energy, as well as new habitat creation for natural environments.
Stakeholder collaboration	The project was a collaboration between five Dutch ministries, the Province of South Holland, and the cities of Rotterdam, in close collaboration with NGOs, and included several nature conservation projects.

F.4.8 Sand Motor
(Source: IHE Delft)

The Sand Motor is a large, 2011 Dutch pilot project that deposited 21.5 million cubic meters of sand in a single, massive operation to build a peninsula for long-term coastal protection. This “mega nourishment” works with natural forces, allowing wind, waves, and currents to gradually spread the sand along the coast, thereby reinforcing the coastline, creating a recreational area, and promoting biodiversity.



Figure 26 GE image of Sandmotor, 5 years after construction (left) and view on dune lake after storm late 2024

Key facts	
Coastal defence	It reinforces the coastline against sea-level rise and storm events.
Nature-based Solution	The Sand Motor uses the principle of Building with Nature, a sustainable approach that works with natural processes rather than against them. Instead of frequent, smaller sand additions, the Sand Motor involves a large-scale, one-time deposit of sand, which is less disruptive to the ecosystem.
Ecosystem services	It creates space for new plants, birds, and fish to thrive, fostering biodiversity.
Recreation	It provides a new, attractive area for leisure and outdoor activities (swimming, kite surfing)
Innovation	It serves as a unique living laboratory to develop and test new knowledge for coastal management.

F.4.9 Dike-in-dune Project, Katwijk aan Zee (Source: IHE Delft)

The dunes in front of the seaside town of Katwijk aan Zee did not meet the test of withstanding normative conditions, and would have had to be raised and widened, which would have been difficult to fit into this seaside resort with a sea view from the boulevard. This led to the design of a dike to protect against extreme conditions, plus an underground parking garage, buried under a natural dune system. The dune system functions normally, and only under very extreme circumstances the dune erosion would reach the hidden dike. The project, completed in 2015, also created a public event plaza and improved access between the village and the beach.

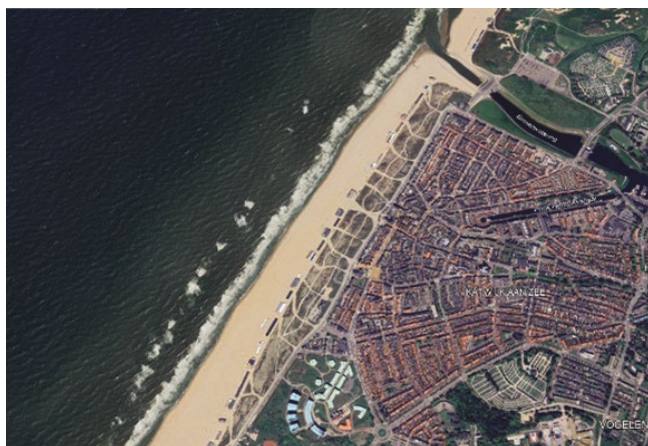


Figure 27 Satellite image of completed Dike-in-Dune project (left) and view on entrance of parking garage (right)

Key facts	
Purpose	The purpose is combining essential flood defence with public recreational space and practical parking to maximize land use.
Dike-in-Dune System	A stone-clad dike is hidden by a seaward row of natural-looking dunes, creating a 120-meter-wide dune landscape that blends with the natural environment.
Underground parking	A large, 500-meter-long parking garage is built directly behind the dike, extending under the dunes to provide 670 parking spaces.
Landscape integration	The project's architecture and materials are designed to be modest and fuse seamlessly with the existing urban fabric and dune landscape.
Public Space and Recreation	The design includes a dune transition area that functions as an event plaza and creates a network of paths connecting the village and the beach.
Climate resilience	The reinforced coastal area meets stringent safety standards, protecting the town of Katwijk from flooding.

F.5 Cork Coastline Vulnerability Assessment (Source: Cork County Council)

The Cork Coastline Vulnerability Assessment Study (2022–2025) seeks to assess and map the vulnerability of the Cork coastline which spans 1,118 km, including 422 km of soft coastline such as beaches, mudflats, and soil cliffs. The project is a collaboration between Cork County Council, University College Cork (UCC) and MaREI, aiming to provide actionable insights for coastal management.

The project consists of 2 workflows:

- To develop a Geographical Information System (GIS) database which illustrates the susceptibility of areas of the unprotected coastline to coastal processes and vulnerability of areas of socioeconomic importance.
- Develop a numerical model for 5 select beaches to understand the influence of the coastal processes at play and model how engineering interventions could mitigate rates of erosion in important sensitive areas.

Key deliverables include:

- desktop GIS platform
- detailed erosion rates derived from orthophotography and drone surveys,
- a Social Coastal Vulnerability Index (SCVI) to assess risk across physical, socio-cultural, economic, and environmental dimensions,
- and pre- and post-winter beach surveys at selected sites.

Engineering analyses involve sediment sampling, large-scale wave modelling, and local beach evolution modelling to project coastal positions up to 2050 and assess mitigation measures.

The project is characterized by strong collaboration, with quarterly coordination meetings involving the Geological Survey of Ireland (GSI) and the Office of Public Works (OPW). The methodology integrates ongoing data collection, regular beach monitoring, and adaptive management, with a plan to update the SCVI cyclically using new orthophotography.

Initial findings indicate that approximately 2–3% of the coastline is highly vulnerable, underscoring the importance of targeted monitoring and intervention. The study demonstrates the value of integrating GIS-based decision support, quantitative modelling, and stakeholder engagement to inform coastal protection strategies. This approach offers a replicable framework for assessing vulnerability, prioritizing resources, and developing sustainable coastal management plans.

Total cost of the project is €189,000 and timescale is from Q4 2022 to Q1 2026.

F.6 Cliffs of Moher Condition Survey and Geohazard Assessments (Source: Clare County Council)

F.6.1 Background

Since 2014, Arup have been commissioned to carry out geohazard assessments of the Cliffs of Moher (CoM). Rising approximately 200 m out of the Atlantic Ocean, the cliffs are a snapshot of a typical geological sequence of a sedimentary basin comprising layers of mudstone, siltstone, and shale.

The CoM is a dynamic coastal environment where wind, wave, and rain erosion are causing the cliffs to recede along with erosion from surface water from steeping topography on the landside of the cliffs. The impact of climate change is evident at the CoM as the rise in frequency and intensity of storm events has resulted in an increased number of rock falls and landslides.

Given the number of visitors to the site every year, and unrestricted access and proximity of the cliff top walkway to the cliff edge, Arup were commissioned to identify the geohazards along the cliff face and edge. This assessment informed the improvement and alignment of existing and new walkways as well as ongoing masterplanning.

F.6.2 Works

Arup's team of geotechnical specialists used a range of digital tools along with visual inspections to create a 3D model of the cliffs, with detailed information which allowed the assessment of the behaviour of the rockmass at the inaccessible cliff edge and face. The 3D LiDAR model was based on a series of visual assessments, field mapping and Unmanned Aerial Vehicles (UAV), topographic and geophysical surveys. The workflow undertaken as part of the CoM geohazard assessment commenced with a visual inspection of the cliff face and top along the entire study area.

Geohazards within the Domains were identified using comparative desk study, walkover information and LiDAR/photogrammetry surveys. The risk rating assigned to each geohazard was based on the level of risk they pose to public safety. Domains which displayed signs of instability and that were near the walkway were considered high risk.

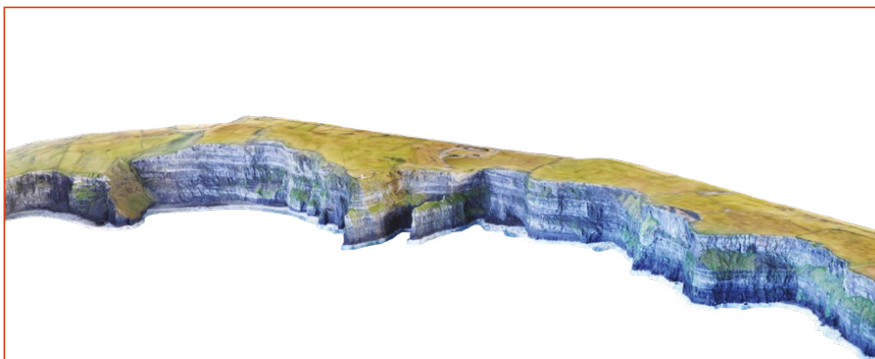


Figure 28 3D model of the Cliffs of Moher

This digital baseline model can be updated through ongoing monitoring and will feed into any design considerations at the cliffs.

Further applications of the model and this dataset include the measurement and monitoring of the potential impacts of climate change from increased storm events at the cliffs along with providing a visual aid for tourists to the Visitor Centre.

Appendix G: Stakeholder/Community Communications

G.1 Check list

The following checklist for LA staff working on coastal change management projects is recommended:

- List of local groups
- List of Local initiatives (planting, etc)
- List of relationships in place (e.g. NPWS) and contacts.

G.2 Local Initiatives and NGO's Shown as Examples to be Considered

G.2.1 Clean Coasts

A nationwide programme run by An Taisce, supporting coastal communities in beach clean-ups, marine litter awareness, and biodiversity projects.

G.2.2 Leave No Trace Ireland

Promotes responsible outdoor recreation and environmental stewardship, including coastal areas.

G.2.3 Coastal Communities Network Ireland

A network of local groups advocating for sustainable coastal management and marine protection. Community Waters Development Fund ([LAWPRO](#))

G.2.4 Heritage Council Community Heritage Grant Scheme

Funding for biodiversity and heritage restoration projects.

G.2.5 Birdwatch Ireland

A national conservation NGO dedicated to protecting wild birds and their habitats, contributing to coastal management by monitoring seabird populations and advocating for the protection of marine and coastal biodiversity.

G.2.6 Irish Whale and Dolphin Group

Conducts research and advocacy to protect marine mammals and their habitats, contributing to marine conservation and informing coastal and marine policy.

G.2.7 Inland Fisheries

[Inland Fisheries Ireland](#) is the state agency responsible for the protection and conservation of Ireland's inland and coastal fish populations, and it ensures that coastal developments do not adversely affect aquatic habitats or water quality.

G.2.8 Irish Islands Marine Resource Organisation

Responsible for promoting sustainable marine resource use and supporting coastal communities through research, education, and outreach. Their role includes contributing to coastal management strategies that balance environmental protection with socio-economic needs.

G.2.9 Fair Seas Ireland

Advocates for the designation and effective management of Marine Protected Areas (MPAs) around Ireland's coast. Their responsibility focuses on safeguarding marine biodiversity, enhancing ecosystem resilience, and ensuring coastal habitats are protected from climate change impacts and human activities.

Appendix H: References

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**Oifigí Réigiúnach um
Gníomhú ar son na hAeráide
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