

# Building Coastal and Marine Resilience in Ireland

Authors: Eugene J. Farrell, Glen Smith, Anne Marie O'Hagan and Martin Le Tissier



# Environmental Protection Agency

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**Knowledge:** Providing high quality, targeted and timely environmental data, information and assessment to inform decision making.

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The EPA is managed by a full time Board, consisting of a Director General and five Directors. The work is carried out across five Offices:

1. Office of Environmental Sustainability
2. Office of Environmental Enforcement
3. Office of Evidence and Assessment
4. Office of Radiation Protection and Environmental Monitoring
5. Office of Communications and Corporate Services

The EPA is assisted by advisory committees who meet regularly to discuss issues of concern and provide advice to the Board.

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## Identifying pressures

The identification and increased awareness of climate change risks to Ireland's coastal communities highlights the importance of building national resilience across socio-ecological and economic systems. This research investigated barriers to the environmental and socio-economic resilience of two coastal communities: Maharees, County Kerry (rural; population c.300), and Youghal, County Cork (urban; population c.8400). In Maharees, coastal erosion and tourism are two primary pressures, while in Youghal pressure from repeat flooding affects the natural and built features of the town infrastructure.

In both locations, as is common across Ireland, community-led efforts to build resilience to climate change are hindered by the absence of an engagement mechanism that recognises the validity of community-determined pathways to resilience, and forums that promote exchange of technical and policy knowledge and understanding to inform decision-making.

This project contextualised climate and development initiatives in both locations using the Intergovernmental Panel on Climate Change (IPCC) opportunity space and climate-resilient pathways approach and provided them with a means to structure and navigate a roadmap founded on community-driven perceptions of a resilient future.

## Informing policy

The need for accelerated action to build climate resilience through risk sensitive planning, advancing adaptation, and risk assessment and management is well known. The effectiveness of Ireland's response to climate change under various existing international, EU and national instruments is contingent on continued information gathering and understanding of impacts across sectors and society. Ensuring that policy responses are coherent across all sectors and are trusted by, and inclusive of, affected communities are key challenges to building coastal resilience.

Across Ireland, the fragmented management of the coast has been a persistent challenge, with numerous departments and public bodies having a remit in the coastal area, exacerbated by policy objectives that often do not align with each other. If left unaddressed, this will continue to result in the unsustainable management of coastal resources and increasing vulnerability of coastal communities.

This project presents two case studies highlighting how climate action and resilience building are operationalised at a local level in rural and urban settings, and how well the existing governance frameworks are suited to supporting building resilience to climate change.

## Developing solutions

Through an adaptation of the IPCC's opportunity space and climate-resilient pathways approach, the project demonstrated a visual and collaborative structure and framework to help coastal communities engage in a process of building resilience and removing barriers to their participation in climate action and adaptation. The pathways approach can lead to roadmaps that build the capacity of local-level socio-ecological systems by providing a structure to discuss knowledge gaps in coastal science, policy, governance and management, and placing these in the context of the process and decisions required to build local-scale resilience.

The project identified key institutional barriers (governance; legal responsibility; stakeholder forum; tourism) and technical barriers (climate adaptation; funding; environmental designation; lexicon of climate resilience and sustainability; erosion and flooding; seasonal tourism) to coastal communities building resilience to climate change.

Our results emphasise the need for the coordination of actions and regional priorities of local authorities for coastal adaptation; the critical need to empower and resource local authorities and communities to manage their coasts; and a coherent national plan to prioritise erosion and flood risks.

**EPA RESEARCH PROGRAMME 2021-2030**

# **Building Coastal and Marine Resilience in Ireland**

**(2018-CCRP-MS.59)**

## **EPA Research Report**

Prepared for the Environmental Protection Agency

by

MaREI, the SFI Research Centre for Energy, Climate and Marine, Environmental Research  
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## **ACKNOWLEDGEMENTS**

This report is published as part of the EPA Research Programme 2021–2030. The EPA Research Programme is a Government of Ireland initiative funded by the Department of the Environment, Climate and Communications. It is administered by the Environmental Protection Agency, which has the statutory function of co-ordinating and promoting environmental research. This project was co-funded by the Marine Institute Ireland.

The authors wish in particular to thank and acknowledge the advice and support provided by Dorothy Stewart (EPA) and Jenny O’Leary (Marine Institute), which has helped to guide the project throughout its implementation.

The authors would like to acknowledge the members of the project steering committee, namely Bill Parker (retired; formerly East Suffolk Council, UK), Michael MacDonagh (Department of Tourism, Culture, Arts, Gaeltacht, Sport and Media), David Dodd (Dublin Climate Action Regional Office), Jim Casey (Office of Public Works), Liam Dromey (Cork County Council), Sean O’Leary (EPA), Alex Grassick (Atlantic Seaboard South Climate Action Regional Office), John Keogh (EPA) and Jenny O’Leary (Marine Institute).

Part of this work was supported by the Navigate project (under Grant-Aid Agreement No. 842 PBA/IPG/17/01 awarded to Dr O’Hagan) and carried out with the support of the Marine Institute and funded under the Marine Research Programme by the Irish government, and by MaREI – the SFI Research Centre for Energy, Climate and Marine (12/RC/2302).

The project team would like to thank all the stakeholders who generously gave up their time to be interviewed and to attend the workshop (Youghal, Co. Cork) that underpinned the co-design process, including representatives from Cumann na Daoine, Youghal Community Development Project; and Youghal Blue and Green Community Network/ Sustainable Energy Communities.

The project team would like to thank the Maharees Conservation Association (Co. Kerry) for sharing their invaluable insights, experiences and recommendations on coastal management.

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This report is based on research carried out/data from March 2019 to June 2021. More recent data may have become available since the research was completed.

The EPA Research Programme addresses the need for research in Ireland to inform policymakers and other stakeholders on a range of questions in relation to environmental protection. These reports are intended as contributions to the necessary debate on the protection of the environment.

**EPA RESEARCH PROGRAMME 2021–2030**  
Published by the Environmental Protection Agency, Ireland

ISBN: 978-1-80009-091-0

February 2023

Price: Free

Online version

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# Executive Summary

Climate change is acknowledged as a “climate crisis” that is a defining challenge for today’s and future generations, including those in coastal communities in Ireland. The aim of the Building Coastal and Marine Resilience in Ireland (BCOMAR) project was, based on the existing governance and policy mechanisms, to provide a structure and framework that could enable coastal communities to develop and navigate a roadmap founded on their own perceptions of a resilient future. The general goal of building a resilient future is considered in the context of the statement:

If the year is 2050 and Ireland, in its capacity as a member of both the United Nations and the European Union, announces that its coastal communities and ecosystems are “climate resilient” and they have “adapted” to climate change, what steps did we make between 2021 and 2050 to achieve this?

Project activities involved:

1. providing a definition and context for building resilience in coastal communities in Ireland;
2. reviewing national, EU and international law, policy and governance settings in relation to climate change, and Ireland’s environment and resilience;
3. reviewing Ireland’s policy on climate change and the juxtaposition of social and environmental responses;
4. outlining the challenges for building resilience;
5. two case studies that addressed how in rural and urban settings climate action and resilience-building are operationalised at a local level, and how well the existing national and regional policy and governance infrastructures were suited to supporting the building of resilience to climate change;
6. providing a process that could be utilised by communities to gain an understanding of their vulnerabilities and to design pathways that build resilience to climate change, with

recommendations on how the goal of a climate-resilient Ireland might be achieved.

The project identified key institutional and technical barriers to coastal communities building resilience to climate change. Through an adaptation of the Intergovernmental Panel on Climate Change’s opportunity space and climate-resilient pathways approach, the project demonstrated a highly visual and collaborative structure and framework to help coastal communities to engage in a process of building resilience to climate change. The approach aims to provide a vehicle to overcome barriers to the participation of local communities in climate action, adaptation and resilience-building, namely by:

- providing a forum to bring all relevant stakeholders together to address the challenges that climate change brings to coastal and marine management;
- providing a structure for discussing knowledge gaps in coastal science, policy, governance and management, and for placing these in the context of the process and decisions required to build resilience;
- building consensus, and recognising departures from consensus, in relation to preferred futures and possible pathways for addressing different interests and priorities within and between the multiple stakeholder groups from the public, private and wider societal sectors.

The approach would help to:

- Build effective local capacity (in the short and long terms): although engaged actors from all stakeholder groups have a sophisticated appreciation of the challenges of climate change, they do not have the framework needed within any forums to structure and discuss their knowledge, exchange new knowledge and enhance existing capacity.
- Chart progress on building resilience: when mapped out visually, the pathways can be used to chart progress or identify where improvements can be made. They can also help to identify decision

points with more and less resilient outcomes and encourage group learning.

- Build consensus on what constitutes “climate resilience”: at any level, the acceptance of a pathway towards a preferred state of future resilience will involve a negotiation process and compromises within and between different stakeholder groups.
- Facilitate forums for discussion between national-, regional- and local-level stakeholders: such discussions could address the relationship between and juxtaposition of higher level priorities and lower level (local) problems.
- Enable access to funding and other resource opportunities: this would allow the willingness

of communities to engage and share their learning, present “best practices”, build a relevant knowledge base and exchange ideas to be exploited.

- Build consistent and persistent links between the goals of society and the economy and environmental concerns: these links are needed to support resilience to climate change.

These outcomes provide a means for coastal communities to develop a shared understanding of what they need to become resilient to, and to design a plan for implementing the transformations needed to overcome the risks and vulnerabilities climate change presents.

# 1 Introduction

In Ireland, climate change is acknowledged as a “climate crisis” that is a defining challenge for today’s and future generations. Impacts that could cause direct and indirect harm to Ireland and its people include significant threats to Ireland’s coasts and coastal communities (Government of Ireland, 2021a):

- rising sea levels threatening land and particularly coastal infrastructure;
- extreme weather, including more intense storms and rainfall, affecting the land, coastline and seas;
- further pressure on water resources and food production systems, with associated impacts on river and coastal ecosystems;
- an increased likelihood and scale of river and coastal flooding;
- changes in the timing of life cycle events for plants and animals on land and in the oceans.

Ireland’s response to the challenge is set out in the Climate Action Plan 2021 (Government of Ireland, 2021a) and the National Adaptation Framework (NAF) (DCCA, 2018a), the latter having the subtitle “Planning for a Climate Resilient Ireland”.

The Paris Climate Conference (21st Conference of the Parties – COP21), held in December 2015, explicitly recognised building resilience as an integral component of addressing the impacts of climate change (UN, 2015). Resilience as an outcome to address the challenges of climate change (Flood *et al.*, 2021a; Le Tissier and Whyte, 2021) through risk-sensitive planning, the advancement of adaptation, and risk assessment and management at the local, national, subregional and regional levels is also identified in the Sendai Framework and the Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda (UNDP, 2016; UNISDR, 2015).

The NAF aims to ensure that local authorities, regions and key sectors can assess the key risks and vulnerabilities associated with climate change, implement actions to build resilience to climate change

and ensure that climate adaptation considerations are mainstreamed into all local, regional and national policies. This is reflected in the adaptation planning of government departments (for example Ireland’s transport sector).<sup>2</sup> The Climate Action Plan 2021 also recognises that the impacts of climate change will be experienced by every individual, household and community in Ireland, and that, given the significant impacts of climate change on coastal settings, coastal communities and maritime sectors will play a significant role in contributing to achieving Ireland’s climate goals.

Research has explored the challenges of managing the transition to coasts and marine environments that are more resilient to climate change in Ireland, and the need for an improved understanding of how climate change will affect ecosystem services (Doran and O’Higgins, 2020; Norton and Hynes, 2018; Norton *et al.*, 2018), including their non-monetary, as well as their monetary, values (Christie *et al.*, 2012; Kelemen *et al.*, 2014). Building resilience is not only a process of developing a technical understanding and solutions, but a process that encompasses decision-making and is defined by frequent changes and adaptations. Understood as a process, the challenge of building resilience can be viewed as a policy-, planning- and science-driven attempt to organise the actions of people. A challenge for building resilience at the coast then becomes one of elucidating a process that provides opportunity for discourse on what defines resilience for a community – be it at individual, local or national level – how that is achieved, and how communities can design a pathway to achieve resilience and assess their progress on that pathway. To play such a role, coastal communities require a process that empowers them to engage in a way that allows them to understand the risks, what will constitute their future resilience and the pathways that they must follow to transition from climate-threatened to climate-resilient communities. Such a process should ensure continued communication and

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<sup>2</sup> See <https://www.gov.ie/en/policy-information/37d691-adapting-to-climate-breakdown/> (accessed 9 September 2022) for a link to sectoral adaptation plans including *Adaptation Planning: Developing Resilience to Climate Change in the Irish Transport Sector* (Department of Transport, Tourism and Sport, undated).



coordination between stakeholders and provide a platform for collaboration and cross-sectoral learning on the social, environmental and economic impacts of climate change. A successful outcome would be to increase awareness of resilience issues and empower communities to take actions at scale to help build resilience in vulnerable marine and coastal areas across Ireland.

Comprehension of the institutional and governance settings for climate change resilience and how coastal communities in Ireland can engage in the process of building resilience underpinned the goals of the Building Coastal and Marine Resilience in Ireland (BCOMAR) project.

## 1.1 Project Aim and Objectives

The aim of the project was to identify features that constitute resilience for coastal communities in Ireland, and how those features might be realised, based on the existing governance and policy mechanisms that pertain to climate change in Ireland. The objectives of the BCOMAR project were to:

- better understand the institutional setting and drivers that promote climate resilience in Ireland;
- develop a procedure and protocol for community engagement and participation in building coastal resilience in Ireland to help communities determine pathways for reaching a condition of social, economic and environmental resilience to the pressures they face as a consequence of climate change.

Project activities sought to provide a structure and framework that could enable coastal communities to develop and navigate a roadmap founded on their own perceptions of a resilient future. The general goal of building a resilient future is considered in the context of the statement:

If the year is 2050<sup>3</sup> and Ireland, in its capacity as a member of both the United Nations and the European Union, announces that

its coastal communities and ecosystems are “climate resilient” and it has “adapted” to climate change, what steps did we make between 2021 and 2050 to achieve this?

## 1.2 Project Implementation

The above objectives were addressed through:

1. providing a definition and context for building resilience in coastal communities in Ireland;
2. reviewing national, EU and international law, policy and governance settings in relation to climate change, and Ireland’s environment and resilience;
3. reviewing Ireland’s policy on climate change and the juxtaposition of social and environmental responses;
4. outlining the challenges for building resilience;
5. two case studies that addressed how in rural and urban settings climate action and resilience-building are operationalised at a local level, and how well the existing national and regional policy and governance infrastructures were suited to supporting the building of resilience to climate change;
6. providing a process that could be utilised by communities to gain an understanding of their vulnerabilities and to design pathways that build resilience to climate change, with recommendations on how the goal of a climate-resilient Ireland might be achieved.

At the community level, this research was severely constrained by the response to the global Covid-19 pandemic, which required the project to move to a virtual setting. In the Maharees, County Kerry, and Youghal, County Cork, we continued research through telephone and email contact with stakeholders (e.g. to conduct an online survey and participatory mapping exercise). This provided an opportunity to initiate local discussions on climate change adaptation (CCA).

<sup>3</sup> An “end” date of 2050 was chosen to reflect the government’s ambition to ensure that Ireland can become climate resilient by 2050 (<https://www.gov.ie/en/policy-information/eb6988-climate-action/>).

## 2 Defining “Resilience”

Achieving coastal resilience to climate change is recognised as a desirable outcome, with both climate management policy and practice increasingly moving towards maximising some form of resilience (Falaleeva *et al.*, 2013; Masselink and Lazarus, 2019). The term “resilience” is increasingly becoming an important constituent of the climate change lexicon (Centre for Climate and Energy Solutions, 2019). However, in management contexts the term “resilience” remains ambiguous and poorly defined, and has a wide range of definitions (Masselink and Lazarus, 2019). In broad terms, this is because resilience and CCA both encompass processes of change (Nelson, 2011), but also, importantly, it is because mitigation and adaptation are two sides of the same coin (Adekola and Clelland, 2020; Denton *et al.*, 2014; OECD, 2021).

### 2.1 What is “Resilience”?

Resilience, in the context of climate change, is often characterised as an “ability”, a “capacity” or a “capability” to make decisions and implement practices and actions at the individual, community and government levels that are effective in mitigating and adapting to the impacts of climate change that individuals, communities and governments face (Centre for Climate and Energy Solutions, 2019).

The origins of the term “resilience” can be traced to the field of ecology in the 1970s, where it was defined as “a measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables” (Holling, 1973). In the context of climate change and global change, resilience has tended to focus on definitions that describe an ability to return (“bounce back”) to an original state, but has more recently been recognised as having different meanings depending on context (Eachus, 2014). Resilience can be described according to the circumstances of different environments, structures, habitats, species, processes and livelihoods.

Examples include:

- the resilience of built environments, referring to the ability of buildings to withstand the forces

of nature, e.g. weather, earthquakes, floods or man-made disasters (Romero-Lankao *et al.*, 2016; Satterthwaite, 2013);

- the resilience of ecosystems, referring to the ability to survive and recover from some perturbation, be that natural or man-made (Côté and Darling, 2010; Hopkins *et al.*, 2016);
- the resilience of governance systems, referring to the flexibility of decision-making processes to accommodate multiple changes affecting multiple stakeholders at multiple levels within the context of an uncertain future (Di Gregorio *et al.*, 2019; Lebel *et al.*, 2006; Termeer *et al.*, 2017);
- the resilience of individual sectors, such as agriculture, to accommodate risk, uncertainty and threats to operations and viability (Burke and Emerick, 2016; OECD, 2018; Simelton *et al.*, 2009).

As Holling’s (1973) concept of ecological resilience has been commandeered within other academic disciplines, its definition continues to change. Masselink and Lazarus (2019, p. 10) stated that: “Coastal resilience is the capacity of the socioeconomic and natural systems in the coastal environment to cope with disturbances, induced by factors such as sea level rise, extreme events, and human impacts, by adapting whilst maintaining their essential functions.”

In this definition, humans are explicitly recognised as an integral part of the system (or environment), and resilience is thought of in functional terms, measured by the services provided. However, the reliance on function over form in this definition is potentially misleading, as it allows for numerous ecological or social regime shifts to occur “under the hood” while maintaining a stable functional state. Ignoring these regime shifts may result in a later catastrophic loss of function if system thresholds are exceeded. It is also implicit within this definition, and others, that the environment exists for human use and that humans are suitably qualified to assess which functions are essential and which are not. This is a value-laden exercise and emphasises that “resilience” is essentially a social construct open to varying interpretations,

and will be driven by people's behaviour coupled with their ability and them choosing to enact change. In turn, this contrasts with the attention that has been focused on climate science and models of the physical environment. The consequence is that relatively little attention is paid to how people make decisions, how information and policies influence decisions, and how decisions and policies influence the outcomes that people care about and that determine livelihoods.

Whatever the context, the resilience of a system can be said to depend on three elements: "(a) the amount of change the system can undergo ... and still remain within the same domain of attraction (that is, retain the same controls on structure and function); (b) the degree to which the system is capable of self-organization (versus lack of organization, or organization forced by external factors); and (c) the degree to which the system can build the capacity to learn and adapt" (Carpenter *et al.*, 2001, p. 766). When addressing (climate change) resilience, it is important to consider the entire socio-ecological system that places humans as an integrated part of most ecosystems, with human behaviour influencing – and being influenced by – human functioning (Berkes, 2002; Fussler, 2007). In this report, coastal and marine environments are considered integrated constituents of the same system, as the exploitation of coastal and marine resources and space, as well as activities directly within the coastal zone, impinge on coastal communities and infrastructure (Bax *et al.*, 2021; Garland *et al.*, 2019; Martínez-Vázquez *et al.*, 2021; SEMRU, 2019; Wenhai *et al.*, 2019).

## **2.2 The Use of the Term “Resilience” in Ireland**

At the governmental level, the use of the term “resilience” is viewed as a proactive expression of community and sectoral engagement in climate action (DCCAE, 2019; Patel *et al.*, 2017). However, the increase in the number of references to the concept of resilience has been accompanied by debate as to what constitutes resilience and whether it is the same for all, for instance individuals, communities and sectors (Eachus, 2014; Nelson, 2011; Patel *et al.*, 2017). Moreover, how resilience can be achieved and what constrains its achievement (e.g. maladaptation or change processes beyond adaptation capacity) are recognised as limiting factors even if what would

constitute resilience is known (Centre for Climate and Energy Solutions, 2019; Denton *et al.*, 2014).

A recent Environmental Protection Agency (EPA) research report (Shine, 2018) states that climate resilience in Ireland can be understood as:

A climate resilient Ireland is on a pathway to sustainable development. That is, climate resilient pathways are being actively pursued that reduce climate change and its impacts, manage risk, and promote sustainable development. This includes a coherent approach to adaptation and mitigation with effective institutions, governance, adequate resources, legal and regulatory frameworks, regular vulnerability assessments, climate action planning (national, sectoral and local level), access to information and strengthened adaptive capacity in place (Shine, 2018, p. vii).

Notably, this report (Shine, 2018) recognises that climate resilience is a pathway (i.e. not a one-time fix) requiring coherence across organisations, and their practices and behaviours, that embraces social, economic and environmental elements and requires the strengthening of adaptation responses at the sectoral and local levels. This, then, provides a starting point for the BCOMAR project.

## **2.3 Identifying Pressures on the Resilience of Ireland's Coastal and Marine Settings**

Resilience is fundamentally tied to risk, which is defined by the Intergovernmental Panel on Climate Change (IPCC) as “the potential for consequences where something of value is at stake and where the outcome is uncertain, recognising the diversity of values” (IPCC Working Group II, 2014). Without risk (changes, shocks, disturbances, etc.), any system can be regarded as resilient. To coordinate CCA actions, vulnerability to risk must be understood. What do we predict might happen? Who or what might be affected? Such questions lie at the heart of attempts to measure and map potential exposure to climate-related risks (Birkmann, 2007). Defining, locating and quantifying potential vulnerabilities or exposure to risks will provide a stronger basis for planning how to mitigate those risks (Gaillard, 2010).

Long-term planning is critical to ensure that all parts of Ireland fulfil their potential and to secure sustainable, or “resilient”, futures that are protected against challenges such as climate change. Addressing this requires the consideration of what changes in climate and social pressures are likely in the coming decades. The Environmental Systems Research Institute projects that the population of Ireland will increase by around one million or 20%, compared with 2016 levels, to almost 5.7 million people by 2040.

Climate change is exacerbating the risks faced by coastal ecosystems and communities related to sea level rise (Box 2.1), leading to flooding, coastal erosion, coastal squeeze and the loss of low-lying coastal systems (Desmond *et al.*, 2017). It will also increase risks related to storm surges and the likelihood of the landward intrusion of salt water. Expected rises in water temperatures and ocean acidification will contribute to a restructuring of coastal ecosystems, with implications for ocean circulation and biogeochemical cycling.

Climate change is a risk because of its effects on socio-ecological systems (Sudmeier-Rieux *et al.*, 2017). Shifts in climatic conditions can have a considerable impact on what people are able to do or access. For instance, in addition to property insurance costs related to vulnerability to flood risks (see Box 2.1), climate change affects logistics (e.g. snow/ice and flooding), farming (e.g. drought), commercial fishing (e.g. storms, fish stock migrations based on sea temperature changes) and access to essential services (e.g. roads becoming impassable). These interactions are complex and sometimes difficult to predict. To identify what is needed for resilience, the measurement and mapping of vulnerability must incorporate the socio-economic circumstances that can determine vulnerability (Meerow *et al.*, 2016; Mehmood, 2016). Vulnerability is extremely context dependent. Who is vulnerable? What is vulnerable? Is vulnerability limited in time or persistent? What is the geographical and human scale of the risk? Defining what would constitute resilience to such vulnerabilities is equally broad. Can coastal residents afford to move to new houses to escape flooding and erosion pressures? Can farmers diversify their production? How well would an isolated community cope with disruption to critical transport infrastructure? Can coastal ecosystems continue to provide their existing ecosystem services?

The 2021 EPA report *Policy Coherence in Adaptation Studies: Selecting and Using Indicators of Climate Resilience* (Flood *et al.*, 2021b) identified a suite of 127 indicators for measuring, monitoring, tracking and communicating climate resilience in Ireland. The indicators address local and national strategic priorities and hazards. The report’s results were derived from an analysis of international best practice in the development of climate change indicators, and the recommended indicators were designed in consultation with key government stakeholders: representatives from Climate Action Regional Offices (CAROs); the Office of Public Works (OPW); the Department of Agriculture, Food and the Marine; the Department of Health; the Department of Tourism, Culture, Arts, Gaeltacht, Sport and Media; the National Parks and Wildlife Service; the Department for Transport, Tourism and Sport; Met Éireann; Irish Water; and the EPA.

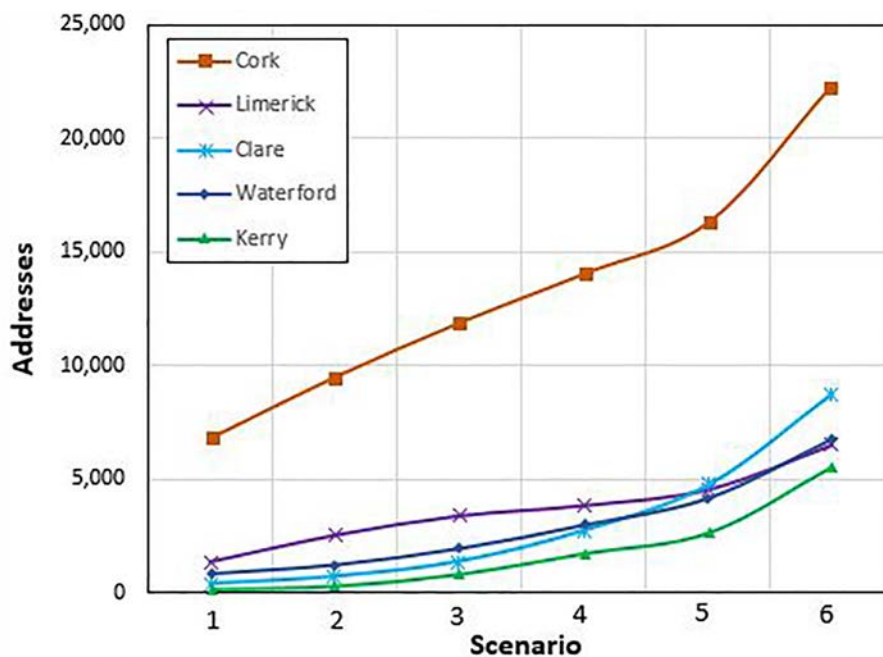
Importantly, all stakeholders were cognisant of the need for the suite of indicators of climate resilience to be designed to capture significant environmental and socio-economic impacts and changes. The impact indicators for coastal flooding and erosion are presented in Box 2.2 as an example. Other examples included in Flood *et al.*’s (2021b) report include indicators for “pluvial and fluvial flooding” and “extreme events”. These indicators provide a very useful starting point for coordinating efforts between national and local governments, which can use them as the focus of participatory research with local communities. Identifying the reasons why erosion or flooding, for example, are occurring requires local knowledge that is best found using local government structures, and the subsequent solutions should, in theory, be designed in consultation with the same local communities.

## 2.4 Responding to Climate Resilience Pressures

Resilience as a concept applies to all facets of the viability and sustainability of communities, and is driven by a range of social, economic and environmental forcing factors that exist independently of climate change. However, climate change will exacerbate pressures and impacts across all forcing factor categories and, therefore, addressing climate change also provides a possible integrating

**Box 2.1. Quantifying sea level rise risk in Ireland**

A recent report (Flood *et al.*, 2020) considered the potential economic impacts, based on the vulnerability of property to flooding, of six sea level rise scenarios on Ireland’s coastal counties (Figure 2.1). The impacts were measured in terms of potential insurance claims for addresses affected by sea level rise. Efforts to quantify risk can inform adaptation and planning actions aimed at reducing the potential impacts of climate change. A 2009 flood event in Cork resulted in insurance claims totalling an estimated €244 million (reported by Insurance Ireland, in Doran *et al.*, 2019). Such events will increase tensions between property owners (both homes and businesses), insurance providers and the government. The expectations of stakeholders are complex, but the authors argue that they will need to be considered in future adaptation policy. The system in Ireland has been reactive to date, rather than being based on projected risks. Despite general praise for Ireland’s Catchment Flood Risk Assessment and Management (CFRAM) models, the authors point to a lack of clarity on how such data “are taken into account when making public and private decisions, such as insurance underwriting, local planning (including in complying with the Planning System and Flood Risk Management Guidelines), infrastructure investment, property development and house purchases”. Research in Ireland has shown that Irish house prices are affected by the release of flood maps but also that the market’s memory of flood events is short (Gillespie *et al.*, 2019). Such results will prompt difficult conversations about how projected flood data are presented in Ireland. At present, this is primarily done through the Office of Public Works (OPW) “FloodInfo” website (<https://www.floodinfo.ie/>). It is interesting to note that the baseline data presented on the FloodInfo maps are relatively sparse when it comes to built infrastructure.



**Figure 2.1. Total numbers of vulnerable addresses in each coastal county under six sea level rise scenarios. Scenarios 1–6 represent sea level rises of 0.5m, 1 m, 2 m, 3 m, 4 m and 6 m, respectively. Source: Flood *et al.* (2020).**

mechanism that will lead to more sustainable outcomes. By understanding risk and vulnerability, it is possible to more accurately gauge a system’s capacity to respond to significant changes, shocks

or disturbances, and acquire resilience (Gaillard, 2010; Proag, 2014). Resilience can be viewed as an outcome that decreases the sensitivity and enhances the adaptive capacity of social, industrial

**Box 2.2. Impact and implementation indicators for coastal flooding and erosion**

**Impact indicators associated with coastal flooding and erosion**

- Coastal erosion rates.
- Extent (km<sup>2</sup>) and grade (euros) of damage to roads as a result of coastal flooding.
- Damage costs (euros) incurred by rail as a result of coastal erosion.
- Coastal flooding damage to property (euros).
- Coastal erosion impacts on built heritage (euros).
- Coastal erosion impacts on protected habitats and species (habitat condition and species impacts).
- Coastal flooding impacts on built heritage (euros).
- Coastal erosion damage (euros) to property.
- Damage costs (euros) incurred by rail as a result of coastal flooding.
- Extent (km<sup>2</sup>) of damage to roads as a result of coastal erosion.
- Damage (euros) to ports/marinas as a result of coastal storms.

**Implementation indicators associated with coastal flooding and erosion**

- Investment (euros) in programmes to monitor and forecast coastal erosion.
- Proactive road drainage maintenance programme (to lessen or prevent coastal flooding impact).
- Investment (euros) in coastal protection/management measures to mitigate the impact of coastal erosion.
- Investment (euros) in coastal protection/management measures to mitigate coastal flooding.

Source: Flood *et al.* (2021b), Tables 5.11 and 5.12, p. 38.

and environmental infrastructures, and mitigates the effects of climate change (Adger *et al.*, 2005). The best indicator of the success of efforts to achieve climate resilience at all levels is how well developed existing networks of social, political, economic and financial institutions are and how well positioned they are to take on the work of effectively identifying and addressing the risks posed by climate change (Satterthwaite, 2013). An examination of these networks provides an indication of the “coping ability” of a system, that is, its short-term capacity to survive, and of the longer term adjustments that need to be made to a system to improve its coping ability (Smit and Wandel, 2006). Socio-ecological systems are complex, and their resilience depends on the adaptive capacity of a number of component parts. For instance, natural habitat and ecosystem management increasingly has to account for climate change impacts (Prober *et al.*, 2019), including the geographical migration of biomes, which has implications for meeting goals of the EU Habitats Directive (DCHG, 2019a). Socio-economic systems will also be required to adapt to shocks that affect their ability to provide

goods and services (Adekola and Clelland, 2020). Time frames are another important consideration to ensure that building resilience today does not compromise resilience in the future. For instance, coastal engineering works could address current erosion pressures but could also exacerbate erosion pressures at the same location in the future and/or at other locations (Cardona *et al.*, 2012; Cooper and McKenna, 2008a,b; IPCC, 2014).

Therefore, building resilience into a socio-ecological system requires a means for organising organisations, institutions and people in a way that allows them to make decisions (i.e. on the way that climate action is governed), based on information about risk, vulnerability and the socio-economic impacts of climate change, that lead to climate action and the building of adaptive capacity. Moench (2014) describes the wide range of actors and processes required to understand vulnerability and to start building resilience. A key message from such a framework is that resilience is conditional upon the recognition that it derives from the engagement of multiple stakeholders with differing interests, the specifics of the system and

interactions across varying domains (i.e. resilience is tied not only to climate change but to other factors as well). Actors and processes that are part of a system require a coordinated governance system, as well as

a solid foundation of scientific and local knowledge, to both understand what would constitute resilience and develop the means to attain it.

### 3 Law, Policy and Governance Aspects of Climate Resilience in Ireland

Climate change poses difficult challenges for governance and societal systems as they attempt to address issues that are often unfamiliar and cross many of the traditional approaches used in the social, economic and environmental management domains (Huitema *et al.*, 2016; Meadowcroft, 2009).

#### 3.1 Context of Resilience in Irish Law

In Irish climate law and policy, “resilience” appears to be synonymous with adaptation. The word “adaptation” is statutorily defined in the Climate Action and Low Carbon Development Act (CALCDA) 2015 as:

any adjustment to –

- (a) any system designed or operated by human beings, including an economic, agricultural or technological system, or
- (b) any naturally occurring system, including an ecosystem, that is intended to counteract the effects (whether actual or anticipated) of climatic stimuli, prevent or moderate environmental damage resulting from climate change or confer environmental benefits (Section 1, CALCDA 2015).

Resilience, although not defined, is referred to in the overall objectives of the Act. This piece of legislation led to the development of the NAF in 2018 (DCCAE, 2018a). The NAF represents a first effort to provide an overarching framework for regions, local authorities and specific sectors to assess the key risks and vulnerabilities related to climate change and to plan how to implement actions to build resilience to climate change. The NAF also

stresses the need for “enhanced coordination of sectors, institutions and processes involved in climate related actions while also providing for an appropriate long-term funding strategy to enable coherent and effective implementation”. It must be reviewed at least once every 5 years. Under the NAF and the subsequent Climate Action Plan (DCCAE, 2019), seven government departments were required to prepare 12 sectoral adaptation plans,<sup>4</sup> in line with CALCDA 2015. These plans were developed during 2018–2019 and were approved by government in October 2019. There is no sectoral adaptation plan for the coast, and coastal issues are covered under several different plans, e.g. plans on biodiversity and flood risk management. It is clear from the sectoral adaptation plans developed that coordination and joint approaches to adaptation actions remain an ongoing activity that can present challenges in different contexts. This is particularly true in the case of coastal areas, not only because there is no specific sectoral adaptation plan for coastal areas but also because there is no national coastal management plan or strategy to guide sectors and regional/local government bodies in their treatment of the coast. This could result in maladaptation actions and impact on a community’s ability to achieve resilience in their coastal areas.

The NAF also requires each local authority to develop its own adaptation strategy, in line with guidelines developed for the sector (DCCAE, 2018b). Thirty-one local authority plans were approved by the associated councils in 2019 and are currently being implemented. This highlights the critical role that local authorities will have in adaptation generally but also demonstrates the critical role that they will have as coastal managers –

4 The sectors and the lead government departments required to prepare sectoral adaptation plans under the NAF are as follows: seafood – Department of Agriculture, Food and the Marine; agriculture – Department of Agriculture, Food and the Marine; forestry – Department of Agriculture, Food and the Marine; biodiversity – Department of Culture, Heritage and the Gaeltacht; cultural heritage – Department of Culture, Heritage and the Gaeltacht; transport infrastructure – Department of Transport, Tourism and Sport; electricity and gas networks – Department of Communications, Climate Action and Environment; communications networks – Department of Communications, Climate Action and Environment; flood risk management – Office of Public Works; water quality – Department of Housing, Planning and Local Government; water services infrastructure – Department of Housing, Planning and Local Government; health – Department of Health.



a reality that is not wholly reflected in the current legal framework for coastal management in Ireland, where jurisdictional constraints could continue to limit the ability of local authorities to be proactive in the management of their adjoining coastal areas (Gault *et al.*, 2011; O'Hagan and Ballinger, 2010; O'Hagan and Cooper, 2001).

As impacts from climate change are exacerbated or become more frequent, this situation is likely to become more problematic, as local authorities can effectively only react to extreme events and their impacts/damage rather than plan proactively and holistically for their coastal regions. The creation and operation of the four CAROs since 2018 might help local authorities to deal with this. The CAROs are organised according to regional area and cover the Atlantic Seaboard North, the Atlantic Seaboard South, the Dublin Metropolitan, and the Eastern and Midland regions. A local authority leads the CARO in each region<sup>5</sup> and coordinates the development of the local authority adaptation strategies, and may be a vital linchpin for ensuring coordination between plans and actions, and for dealing with cross-sectoral issues. This potential oversight function should assist in developing more integrated approaches to coastal management.

### **3.2 Legal Framework for Managing Ireland's Coastal Zone**

Coastal management in Ireland is almost a misnomer, as it tends to refer to specific intervention actions rather than the integrated approach still advocated by the European Commission (Stori and O'Mahony, 2021) as necessary for sustainable development and supplemented by the principles and elements contained in the Council Recommendation on Integrated Coastal Zone Management (ICZM) in 2002 (EU, 2002). ICZM was proposed as an EU legal requirement in the first proposal for a directive establishing a framework for maritime spatial planning (MSP) and integrated coastal management in 2013 (EC, 2013a). This did not enter into force, with the integrated coastal management element being dropped from the proposed directive during the negotiation process. The Directive on Maritime Spatial

Planning (Directive 2014/89/EU) has since entered into force (EU, 2014) and requires Member States to have maritime spatial plans in place by 31 March 2021, but the extent to which the Directive covers coastal areas is minimal at best. Under the Directive, MSP applies from the low water mark to the limits of national jurisdiction (usually 200 nautical miles depending on the baseline location). In implementing MSP, Member States are required to promote coherence between MSP and "other processes, such as integrated coastal management or equivalent formal or informal practices", and take into account land–sea interactions (EU, 2014). In a similar vein, the recitals to the Directive recognise that "healthy marine ecosystems and their multiple services, if integrated in planning decisions, can deliver substantial benefits in terms of... climate change mitigation and adaptation" (Recital 13). Furthermore, recognising that the overall purpose of MSP is to promote sustainable development, the Directive acknowledges that Member States need "at least to ensure that the planning process or processes result in a comprehensive planning identifying the different uses of maritime space and taking into consideration long-term changes due to climate change" (Recital 19). Accordingly, the Directive provides in Article 5 that through maritime spatial plans Member States should aim to contribute to the protection and improvement of the environment, "including resilience to climate change impacts".

#### **3.2.1 Maritime spatial planning in Ireland: the National Marine Planning Framework**

Ireland transposed the provisions of the MSP Directive into law first by regulations in 2016, next by Part 5 of the Planning and Development (Amendment) Act 2018 and most recently through the Maritime Area Planning Act 2021 (MAPA), which was finally enacted in December 2021 and provides both a strengthened statutory basis for marine planning and a new consent process for marine development. A consultation draft of the National Marine Planning Framework (NMPF) was published in November 2019 (DHPLG, 2019), with the final version published on 1 July 2021 (DHLGH, 2021). While the purpose of MSP – and by extension the NMPF – is not to provide a policy for coastal

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5 Mayo County Council in the Atlantic Seaboard North region, Cork County Council in the Atlantic Seaboard South region, Dublin City Council in the Dublin Metropolitan region and Kildare County Council in the Eastern and Midland region.

management or climate change impacts, how it will be implemented within the broader climate action framework, and indeed how it links with terrestrial planning including local adaptation plans, is important. While the first phase of implementation largely focuses on the national level, the NMPF explicitly states that “the Government is committed to the preparation of regional or sub-national plans in future MSP cycles” (DHLGH, 2021, p. 22). This would provide additional scope for more detailed plan-making, stronger links with associated local authority plans and more focused participation. It is anticipated that this will initially take the form of three regional plans to be prepared by, for example, local authority groups linking together on the basis of similar maritime challenges, geography or existing relations.

The NMPF is organised according to overarching marine planning policies (OMPPs) and key sectoral/activity policies, the latter covering 16 specific sectors or uses. In terms of the OMPPs, significant efforts have been made to align these with the requirements of the Marine Strategy Framework Directive (MSFD), essentially covering various aspects of ocean health. Climate change is also covered by an OMPP. This means that, through OMPP Climate Change Policy 1, development proposals need to demonstrate, where possible, how a development will avoid contributing to adverse effects on physical coastal features and will enhance, restore or recreate habitats that provide a flood defence or carbon sequestration ecosystem service. If the proposed development is likely to have a significant adverse effect on these, that effect should be avoided, minimised, mitigated or, as a last resort, justified. This largely follows the standard risk mitigation hierarchy reflected in the statutory environmental assessment processes (Strategic Environmental Assessments (SEAs) and Environmental Impact Assessments (EIAs)). Climate Change Policy 2 development proposals must demonstrate what measures will be included to enable adaptation; demonstrate the most likely impacts of the climate adaptation measures adopted on the coastal area of the proposed development and/or of the adaptation measures adopted by adjacent activities; and, if such adaptation measures are expected to have impacts, demonstrate how those impacts will be, in order of preference, avoided, minimised, mitigated or justified. Recognising that change is constant, the NMPF states that proposals need to demonstrate

not only the resilience of developments over their total lifetime but that this is “based on best available information, including forecasts, at the time of proposal development” (DHLGH, 2021, p. 72).

### **3.2.2 Maritime Area Planning Act 2021**

MAPA seeks to regulate Ireland’s maritime area via an NMPF, new consenting system and new regulatory authority. As outlined above, the NMPF is Ireland’s response to the EU’s MSP Directive, which is re-cast verbatim in this Act. The geographical scope of the Act, and accordingly the NMPF, is from the high water mark seaward to the outer limit of the continental shelf. The Act also provides, in Section 5, for a new “nearshore” area immediately adjacent to the functional area of a coastal planning authority, where the relevant local authority will now also have responsibility for a maximum of three nautical miles seaward of the high water mark. Under this Act, responsibilities in the nearshore area primarily relate to specific development functions rather than coastal management per se. It is not entirely clear whether this extension of functional jurisdiction will extend to other local authority functions such as adaptation planning (see sections 3.1 and 3.3).

The Act provides a statutory basis for the regular publication of a “marine planning policy statement” (MPPS) to set out the principles and priorities of the government in relation to maritime planning. This should have regard to the National Planning Framework, the NMPF, obligations deriving from the United Nations Convention on the Law of the Sea, the MSP Directive, the MSFD, the Birds and Habitats Directives and any current policy of the government relating to maritime planning. There is no explicit mention of climate policy in this statement. The current MPPS, published prior to the enactment of MAPA, however, includes as a strategic principle the need for marine planning to ensure that developments in the marine environment consider ways to reduce greenhouse gas emissions and “have due regard to the impacts of a changing climate” and support implementation of relevant measures contained in the government’s plan to tackle climate breakdown (DCCAE, 2019).

Under MAPA, the Minister for Housing, Local Government and Heritage has the power to issue guidelines and policy directives to supplement

specific provisions if necessary. Public bodies with responsibilities that relate to MSP, or functions related to it, are required to “have regard to appropriate land–sea interactions with a view to promoting integration and coherence between anything arising from such performance and anything arising from the performance by a public body” under (terrestrial) planning and development legislation. This provision should therefore provide a link between MSP and more local-level planning, including county development plans and local area plans. MAPA also provides for the establishment of designated maritime area plans (DMAPs), which can be put forward for the geographical or sectoral area of the maritime area (or both). DMAPs can be proposed by any public body but must obtain ministerial approval. A proposal for a DMAP must specify the objectives of the NMPF that the DMAP will help attain, the geographical area concerned, any protected sites within the proposed DMAP area, the maritime uses concerned, the proposed restrictions or prohibitions, and the evidence base for the DMAP. DMAPs will be subject to both SEA and Appropriate Assessment requirements. It is anticipated that DMAPs will provide a way of taking forward zoning for particular purposes.

MAPA largely replaces the Foreshore Acts, as amended, by replacing foreshore licences and leases with a streamlined system consisting of State consent (a maritime area consent (MAC)) and development permission. The Act specifies that a relevant person does not have to hold 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)” (Section 98(1)).<sup>6</sup>

For the most part, Ireland’s coast has been managed and developed over the past 80 years under the Foreshore Acts 1933–2011, as amended. The original 1933 Act defined the foreshore as the area between the high water mark and 12 nautical miles (Section 1, Foreshore Act 1933). The purpose of the 1933 Act was threefold: (1) to regulate property rights in State-owned foreshore; (2) to protect the public rights of navigation and fishing; and (3) to provide for the granting of

foreshore licences and leases. As such, it was never intended to be a holistic coastal management instrument, and in terms of management it contains provisions relating only to the granting of licences and leases (for development purposes); prohibitory orders (e.g. for the removal of beach material); the restriction or control of public access to the foreshore; and the authorisation of sea defence works. Authorising sea defence works could be an appropriate intervention in cases of severe coastal erosion, and could represent an adaptation action, but this would depend on location. The fact remains however that the Foreshore Act was enacted at a time when climate change was not the issue it is now, so its utility in adaptation and resilience-building is extremely limited. In practice, coastal defence works are administered almost entirely through a separate process operated by the OPW with inputs from local authorities as part of flood risk management.

### **3.2.3 Flood management**

The OPW’s Minor Flood Mitigation Works and Coastal Protection Scheme is the main source of funding for local authorities to address localised flooding and issues related to coastal protection. The scheme focuses on situations where a solution can be readily identified and completed in a short time frame, in the form of hard engineering works. Applications are assessed by the OPW on the basis of specific economic, social and environmental criteria, including a cost–benefit assessment.<sup>7</sup> The questionnaire to be completed for such works asks about the benefits of the proposed scheme in terms of the number of houses, commercial premises and agricultural land at risk from erosion and also how the applicant has factored climate change and sustainability considerations into the design of the proposed intervention measures. Proposals for funding under this scheme must be accompanied by a coastal erosion risk management study that investigates, substantiates and demonstrates the merits of any measures being proposed (OPW, 2012). These studies are not required if the works do not exceed 75 metres and are proposed in

6 See <https://www.irishstatutebook.ie/eli/2021/act/50/enacted/en/html> (accessed 30 September 2022).

7 See the OPW’s Minor Flood Mitigation Works and Coastal Protection Scheme explanatory leaflets and application forms available online: <https://www.gov.ie/en/collection/242647-minor-flood-mitigation-works-and-coastal-protection-scheme-explanato/> (accessed 9 September 2022).

non-sensitive environmental coastal locations (not in or close to designated sites such as Special Areas of Conservation (SACs), Special Protection Areas (SPAs) or National Heritage Areas (NHAs)), provided such locations have had previous erosion protection works constructed at adjacent locations within the same coastal cell and within a range of 3 km; if they are replacement works; or if they are emergency works and imminent and substantial risk to human life or health exists and can be demonstrated (OPW, 2012).

### 3.2.4 Terrestrial planning

The terrestrial planning system set out in the Planning and Development Acts 2000–2020 is also limited in terms of its application to coastal management. The planning acts require local authorities to prepare county development plans and/or local area plans for their functional area. Some county development plans contain chapters on the management of coastal areas, but it is widely known and accepted that the powers of local authorities are limited in respect of coastal management, as their functional area ends at the mean high water mark. An attempt was made to address this through Part XV of the Planning and Development Act 2000, which deals with development on the foreshore. This reiterates the original definition of the foreshore from the 1933 Act but adds that it “includes land between the line of high water of ordinary or medium tides and land within the functional area of the planning authority concerned that adjoins the first-mentioned land”, the intention being that coastal local authorities would have a statutory remit for development in the intertidal area, something that was unclear prior to the enactment of this Act. The planning and development legislation does not contain any other provisions relevant to wider coastal management.

Under Part 19 of the Local Government Act 2001,<sup>8</sup> however, local authorities may make a bye-law if it is in the interests of the common good of the local community (Section 199(2)(a)). Specifically, the section cited permits local authorities to make bye-laws in respect of the foreshore and of coastal

waters adjoining the functional area of that, or the adjoining, local authority (Section 199(6)). The scope of the provisions is quite broad, which enables local authorities to address matters, for instance by prohibiting certain activities (Section 199(3)(c)), regulating the conduct of persons at specified places (Section 199(3)(f)) and levying charges (Section 199(3)(h)), as they see fit. The one stipulation arising from Section 199(2)(a), however, is that bye-laws should not be made in respect of matters that can be subject to a local authority bye-law under another enactment (e.g. in relation to the control of horses or jet skis) or matters governed by other acts or regulations (e.g. the planning code or roads legislation). Bye-laws can also be made for other specific purposes as provided for in separate legal instruments.<sup>9</sup> The number of coastal local authorities using beach bye-laws has increased (MacLeod *et al.*, 2000). While almost all local authority areas now use bye-laws, their introduction and implementation vary in effectiveness because of aspects of enforcement, governance and institutional arrangements (O’Mahony *et al.*, 2012). A key issue is that there is no uniform model or framework for the administration, implementation and enforcement of beach bye-laws across all coastal local authorities. This has a detrimental effect on compliance and perhaps beach management overall.

### 3.3 Linking Coastal Zone Policy to Other Areas of Policy

The coastal zone plays a vital role from the social, economic and environmental perspectives. As a result, it is an area that is the subject of multiple areas of policy and legislation, as illustrated above. Coastal communities have historically been subject to change, through either natural or governance processes, and have been resilient to change in the past. However, more recently there are new two “new” areas of policy that have to be linked to planning and management decisions for the coastal environment and communities (i.e. national and regional (EU) climate change and adaptation policies).

8 See <https://www.irishstatutebook.ie/eli/2001/act/37/enacted/en/html> (accessed 30 September 2022).

9 Control of Dogs Act, 1986 (as amended); National Monuments (Amendment) Act, 1987; Local Government (Water Pollution) (Amendment) Act, 1990; Casual Trading Act, 1995; Control of Horses Act, 1996; Harbours Act, 1996; Litter Pollution Act, 1997; Roads Act, 1993, and Road Traffic Acts, 1961–2006; and Maritime Safety Act, 2005.

### 3.3.1 *Linking coastal zone policy with climate change response legislation*

In relation to climate change specifically, as stated at the outset of this chapter, the government enacted CALCDA in 2015. The purpose of that instrument was to provide for the approval of plans by the government in relation to climate change for the purpose of pursuing the transition to a low-carbon, climate-resilient and environmentally sustainable economy. This Act was amended in 2021 to strengthen specific elements, including a provision for making carbon budgets and sectoral emissions ceilings apply to different sectors of the economy, as well as to provide for local authority climate action plans. The latter were to be in place by September 2022. Under Section 16 of the 2021 Act, each local authority must make a plan that specifies the mitigation measures and adaptation measures it will adopt. These local plans must be consistent with the most recently approved Climate Action Plan and NAF (DCCA, 2018a, 2019), and have regard to the latest national long-term climate action strategy, sectoral adaptation plans and any policies of the Minister for Housing, Local Government and Heritage or the government on climate change. The plans will have a 5-year time frame. The Act does not mention the NMPF or how it relates to other national policies or their objectives.

### 3.3.2 *Linking coastal zone policy to EU legal and policy frameworks*

While the national legal framework is limited in terms of its appropriateness for planning and implementing adaptation actions and achieving resilience, the flexibility of national instruments can also be constrained by wider EU legal requirements. This can be demonstrated by the implementation of the EU Directive on the Conservation of Habitats, Flora and Fauna (92/43/EEC), commonly referred to as the Habitats Directive, which requires the designation of areas that host particular species and habitats as Special Areas of Conservation (SACs,) and that of the EU Directive on the conservation of wild birds (2009/147/EC), commonly referred to as the Birds Directive, which requires the designation of SPAs. Together, SACs and SPAs form the Natura 2000 network. These Directives aim to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements.

Article 6 is one of the most important articles of the Habitats Directive, as it defines how Natura 2000 sites are managed and protected. For clarity, paragraphs 6(1) and 6(2) require that, within the Natura 2000 network, Member States:

- take appropriate conservation measures to maintain and restore the habitats and species for which the site has been designated favourable conservation status;
- avoid damaging activities that could significantly disturb these species or deteriorate the habitats of the protected species or habitat types.

Paragraphs 6(3) and 6(4) of the Habitats Directive lay down the procedure to be followed when planning new developments that might affect a Natura 2000 site:

- Any plan or project likely to have a significant effect on a Natura 2000 site, either individually or in combination with other plans or projects, shall undergo an Appropriate Assessment to determine its implications for the site. The competent authorities can agree to the plan or project *only after* having ascertained that it will not adversely affect the integrity of the site concerned (Article 6.3).
- In exceptional circumstances, a plan or project may still be allowed to go ahead, in spite of a negative assessment, provided there are no alternative solutions and the plan or project is considered justified based on an “imperative reasons of overriding public interest” (IROPI) test. In such cases, the Member State must take appropriate compensatory measures to ensure that the overall coherence of the Natura 2000 network is protected (Article 6.4).

While these measures are critical for biodiversity protection, in some situations they inherently limit wider environmental management, as they are strict and inflexible, and challenging them requires lengthy and costly legal battles. European Commission guidance recognises climate change as an issue of concern. In terms of recommendations, it also acknowledges the challenges associated with establishing conservation objectives in dynamic environments and recommends the following:

- Before setting conservation objectives, it is important to understand how such complex

ecosystems function, how they evolve “morphologically” and how they may be influenced by anthropological pressures and climate change.

- Best available and sound scientific knowledge should be established by competent authorities as a basis for the establishment of nature conservation objectives for such ecosystems.
- Conservation objectives and measures should be based on the assessment of the local conservation status of protected habitats and species, the relative importance of the site for the coherence of Natura 2000 and for the maintenance or restoration, at a favourable conservation status of such habitats and species.
- Conservation objectives should not be static; on the contrary, they need to be adapted to the actual evolution of the conservation status of species and habitats and to the evolution of other ecological factors in a complex and dynamic environment.

(EC, 2019, p.6)

Despite these recommendations, experience on the ground in Ireland shows the problems that can arise from strict interpretation of the Habitats Directive, namely conflict on the ground between local communities, developers, local authorities and the National Parks & Wildlife Service (NPWS) (e.g. in the Maharees, County Kerry, and Doughmore, County Clare). This highlights the need for more social and economic input into the design and determination of conservation objectives, particularly in the context of resilience, as well as more human resources for the responsible authority (the NPWS).

### 3.4 Responsibilities for Ireland’s Coast

The previous section provided a brief overview of some of the legislation pertinent to coastal management and marine management more generally, noting that this has been a rapidly evolving area in the

past 2 years, and that there are still some uncertainties as to where certain responsibilities will lie in future.

Relevant legislation is summarised below:

- **NMPF:** this had limited impact on coastal management in the first phase of implementation but presents opportunities for stronger alignment with local authority climate action plans in the future.
- **MAPA:** this Act entirely reforms the marine regulatory system by establishing a new marine planning system, underpinned by a statutory MPPS, guided by the NMPF, and provides a new development consent regime for Ireland’s maritime area. MAPA largely replaces the foreshore system. It also creates a new “nearshore” area where local authorities have responsibilities extending to three nautical miles beyond the high water mark.
- **Climate Action and Low Carbon Development (Amendment) Act 2021:** this provides a statutory basis for a “national climate objective”, which commits to pursuing and achieving, no later than 2050, the transition to a climate-resilient, biodiversity-rich, environmentally sustainable and climate-neutral economy. The Act introduces a requirement for each local authority to prepare a climate action plan, including both mitigation and adaptation measures, that must be updated every 5 years. Each local authority development plan will also have to align with the authority’s climate action plan.
- **National Coastal Change Management Strategy Steering Group:** this was formed in September 2020 to make recommendations on future structures and roles of government departments to deal with coastal change and to deliver a national coastal change policy, including adaptation strategies, resource implications, and legislative and regulatory change requirements, and a communications strategy to underpin it. This group was due to report on progress in March 2022, but no details were available at the time of writing.
- **EU Biodiversity Strategy:** this requires a significant increase in the number of designated Marine Protected Areas, including a requirement for a third of these to be strictly protected. Consultation has closed on expanding Ireland’s Marine Protected Area network,<sup>10</sup> with new

10 See <https://www.gov.ie/en/publication/135a8-expanding-irelands-marine-protected-area-network/> (accessed 9 September 2022).

legislation on national Marine Protected Areas expected in quarter 3 of 2022. A review of the NPWS, including resourcing and operations within its scope, was published in June 2021 (NPWS, 2021a; Stout and Ó Cinnéide, 2021). This review makes 19 recommendations on reform, including one to develop the service’s marine conservation capacity, and a timeline for their implementation.

Substantial policy changes are arguably further complicated by the multitude of departments and public bodies that have a remit in the coastal area, as shown in Figure 3.1. This illustrates the complexities involved in achieving resilience, especially when you consider that almost all of these bodies are sectoral, with their own governing legislation and policy objectives to meet, objectives that may not necessarily align with each other.

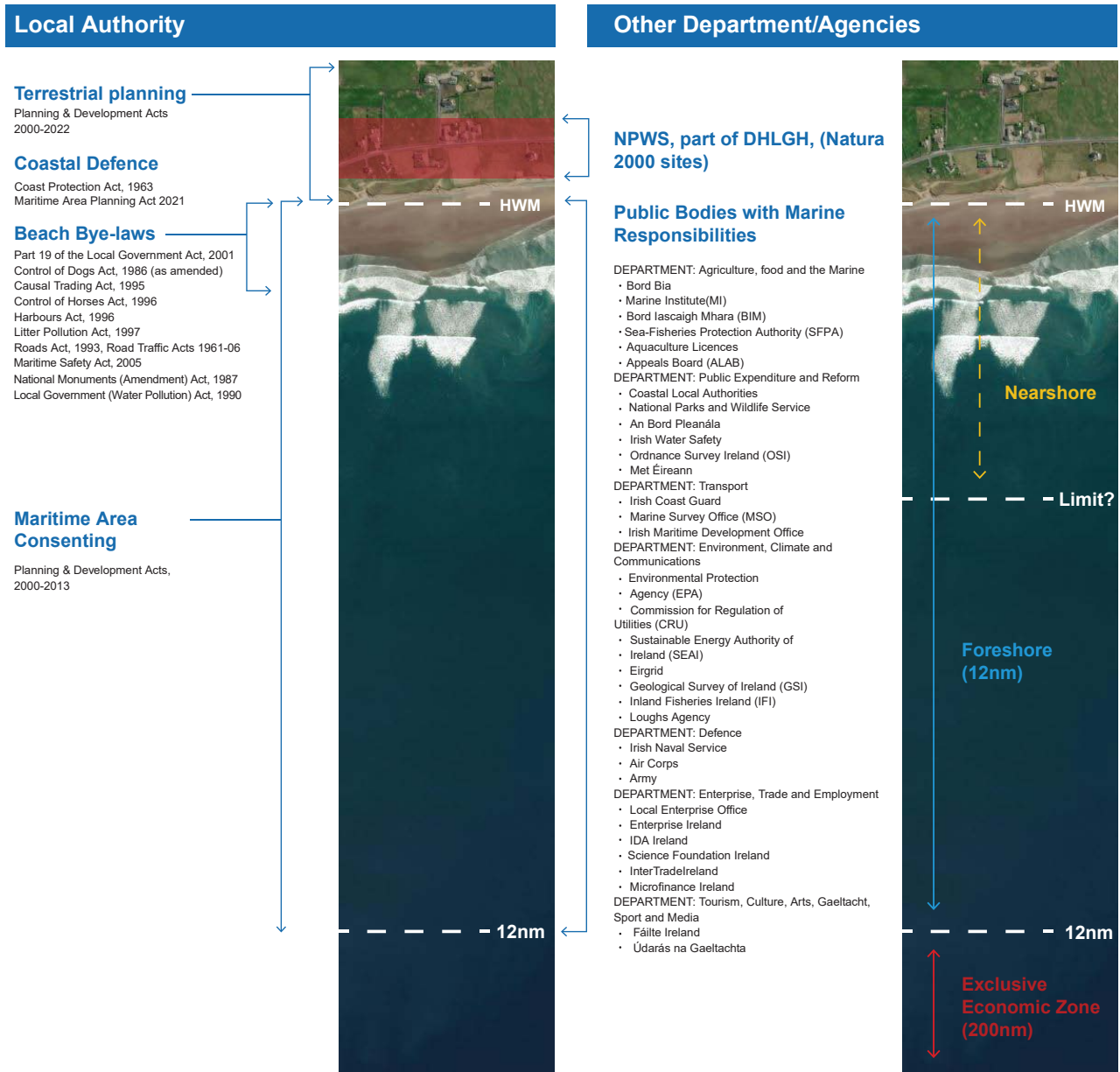


Figure 3.1. List of departments and public bodies that have a remit in the coastal area in Ireland, in coastal and marine waters. The transparent red box at the top of the left-hand panel is a hypothetical Natura 2000 site. DHLGH, Department of Housing, Local Government and Heritage; HWM, high water mark; nm, nautical mile. Map data: Microsoft, TomTom © 2022.

## 4 Ireland's Policy Response to Climate Change

Climate change is already “locked in” to the climate system as a result of past and current levels of greenhouse gas emissions and will continue even if international efforts to reduce emissions are successful (IPCC, 2021). The impacts of human-induced global warming of 1°C above pre-industrial temperatures are already being felt, in the intensity and frequency of some weather extremes. Climate-related risks to health, livelihoods, food security, water supply, human security and economic growth are projected to increase with global warming of 1.5°C, with many impacts predicted to increase in intensity at coastal locations.

In Ireland, as globally, the climate is changing, and the rate of change is increasing (Grant, 2020). Acknowledging the associated pressures has led to growing awareness of the imperative to build resilience to climate change and of the roles that institutions, organisations and individuals must play in elucidating pathways to a resilient economy and society. At a national level, the Government of Ireland has recognised an ambition to develop and implement policies and measures that drive economic and social progress but also improve and safeguard the natural environment for the future.<sup>11</sup> There is also recognition that achieving this ambition needs to involve everyone, including government, individuals and wider society, with all sectors of government and society working together to ensure that Ireland can become climate resilient by 2050.

### 4.1 Climate Adaptation and Resilience Targets in Global and EU Policies

It is important to recognise that Ireland's response to climate change, adaptation and resilience is significantly influenced, and in some cases driven by,

obligations that originate from international and EU policies.

#### 4.1.1 *The international context for climate change resilience*

Ireland is a party to a range of international policies that refer to resilience in the context of climate adaptation:

- The 1992 United Nations Framework Convention on Climate Change (UNFCCC)<sup>12</sup> provides a framework to combat climate change by reducing greenhouse gas emissions and building capacity to adapt to its negative impacts. Establishing the Adaptation Committee, which Parties agreed to set up under the Cancun Adaptation Framework<sup>13</sup> as part of the Cancun Agreements, was a major step towards a cohesive, UNFCCC-based approach to adaptation that includes formulating and implementing national adaptation plans to identify and address countries' medium- and long-term adaptation needs.
- The 2015 Paris Agreement, adopted through Decision 1/CP.21 (UNFCCC, 2015), addresses crucial areas necessary to combat climate change. Article 7 establishes a global goal on adaptation – of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change in the context of the temperature goal of the Agreement. Article 12 addresses climate change education, training, public awareness, public participation and public access to information.
- The United Nations 2030 Agenda (formally *Transforming Our World: The 2030 Agenda for Sustainable Development*) and its 17 SDGs address all three dimensions of sustainability: environmental, social and economic sustainability (UN, 2016). Although arguably all 17 SDGs

11 See <https://www.gov.ie/en/policy-information/eb6988-climate-action/> (accessed 9 September 2022).

12 See <https://unfccc.int/process-and-meetings/the-convention/what-is-the-united-nations-framework-convention-on-climate-change> (accessed 9 September 2022).

13 See <https://unfccc.int/tools/cancun/adaptation/index.html> (accessed 9 September 2022).



have some relevance for adaptation, three (SDGs 13, 14 and 15) have a particularly strong connection to resilience in the context of Ireland's coastal communities and coastal environment (Figure 4.1).

As an overarching mechanism, the 2030 Agenda stresses that society, governments and industry all need to work together at the national, regional and local levels. The SDGs are organised by target and indicator, and are thus driven by results-based monitoring, which in the EU has been distilled into a 102-indicator dataset.<sup>14</sup> The SDGs provide a strong policy connection between sustainable development, climate change and the resilience of coastal zones (Fuso Nerini *et al.*, 2019; Kelman, 2017; Schipper *et al.*, 2021; UNFCCC, 2017). SDGs 14 and 15 specifically apply to coastal and marine environments (Figure 4.1).

#### **4.1.2 The EU context for climate change resilience**

Climate change, adaptation and resilience have been prominent in climate-specific and other areas of EU policy development since the Paris Agreement of 2015. Of particular relevance to illustrating the importance of resilience in coastal communities are the EU Strategy on Adaptation to Climate Change and the EU Atlantic Maritime Strategy.

The European Commission adopted the latest version of the EU Strategy on Adaptation to Climate Change on 24 February 2021, setting out a pathway to prepare for the unavoidable impacts of climate change and to become climate resilient by 2050. Building on the EU's 2013 adaptation strategy (EC, 2013b), the aim of the new proposals is to shift the focus from understanding the problem to developing solutions, and to move from planning to implementation. The latest version of the strategy has four principal objectives: to make adaptation (1) smarter, (2) swifter and (3) more systemic, and (4) to step up international action on adaptation to climate change. It acknowledges that climate change has impacts across all levels of society and all sectors of the economy, so adaptation actions must be systemic and climate-resilience considerations should continue to be incorporated

into all relevant policy fields. It supports the further development and implementation of adaptation strategies and plans, with three cross-cutting priorities: integrating adaptation into (1) macro-fiscal policy, (2) nature-based solutions for adaptation and (3) local adaptation action.

In relation to social, economic and environmental development in coastal regions, the Atlantic Maritime Strategy was adopted in 2011 by the European Commission to support the sustainable development of the blue economy in the EU Member States bordering the Atlantic. In 2013, the European Commission put forward an Atlantic action plan to implement a strategy for a "sustainable, resilient, and competitive blue economy" and then updated it in 2020 as Atlantic Action Plan 2.0 (EC, 2020). The updated action plan states that "marine and coastal habitats should be preserved and valorised, notably with the view to develop new forms of maritime and coastal tourism ... and biodiversity preservation should be the guiding principles to develop more sustainable practices that benefit local development and local employment all over the year" (EC, 2020, p. 8). Pillar IV ("Healthy Oceans and Resilient Coasts") of Atlantic Action Plan 2.0 has the specific goal of building stronger coastal resilience via nine actions (see Box 4.1).

## **4.2 Climate Adaptation Policy in Ireland**

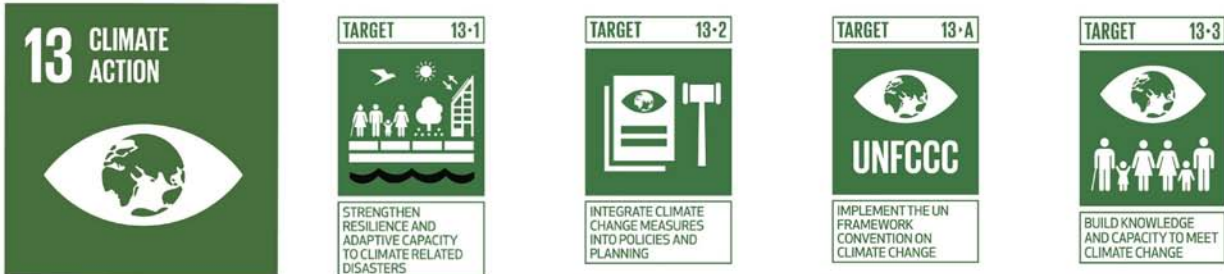
In Ireland, climate adaptation policy has been rapidly evolving since the benchmark report *National Climate Change Adaptation Framework* was published in 2012 (DECLG, 2012; Table 4.1), and has been transitioning from a phase of awareness to the design of actual plans, the creation of statutory frameworks within which to implement these plans, and the coordination of actions and responses on the ground at the local government and community levels. Mainstreaming actions to make progress towards achieving goals while also promoting development is recognised as a challenge for addressing climate change in Ireland (NESC Secretariat, 2012; O'Reilly *et al.*, 2013), particularly in relation to adaptation at the coast (Falaleeva *et al.*, 2013; O'Hagan and Ballinger, 2010; Rupprecht Consult, 2006). The Coastal Climate

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<sup>14</sup> <https://ec.europa.eu/eurostat/web/sdi/indicators> (accessed 9 September 2022).

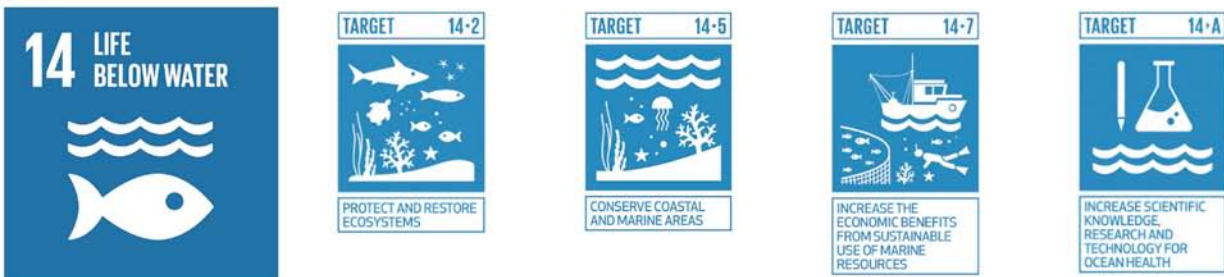
**SDG 13 - 'Take urgent action to combat climate change and its impacts'**

This SDG explicitly considers resilience and adaption in Target 13.1 and the mechanisms and means to achieve resilience through adaptation in three others (Targets 13.2, 13.2 and 13.A) to address the threats posed by climate change.



**SDG 14 - 'Conserve and sustainably use the oceans, seas and marine resources for sustainable development'**

This SDG explicitly considers coastal areas in two of its targets (14.2 and 14.5) but this is also embedded within others (14.7 and 14.A). These targets promote a strong concept of sustainability by addressing protection conservations and management of coastal ecosystems and resources.



**SDG 15 - 'Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss'**

This SDG explicitly considers the reduction in land and natural habitat degradation and the integration of ecosystems and biodiversity values into government actions. Coastal ecosystems are embedded withing multiple SDG 15 targets (15.1, 15.5, 15.8, 15.9 and 15.A).



**Figure 4.1. SDG targets directly relevant to climate change adaptation and resilience.**  
 Source: <https://knowsdfs.jrc.ec.europa.eu/sdg/13>. Creative Commons Attribution 4.0 International (CC BY 4.0) licence.

**Box 4.1. Actions identified in Atlantic Action Plan 2.0 to build stronger coastal resilience**

Demonstrate a comprehensive alert and observing system for increased storms and floods due to climate change

Develop synergies between existing EU infrastructures for coastal observation and protection, as well as for alert and monitoring, and increase the development of *in situ* ocean observatories

Develop test spaces, pilot areas to test methods of coastal protection and promote nature-based solutions

Promote sustainable practices in coastal and maritime tourism

Compile an inventory of national and regional climate change coastal adaptation strategies and measures, linked to the risk assessments and risk management plans, share best practices

Create information campaigns for Atlantic coastal communities

Educate young people and coastal communities on the evolution of the coastline and ways to adapt to sea level rise

Share best practices on the application of maritime spatial planning to coastal adaptation, resilience, and applicable environmental assessments (EIA, SEA, AA [Appropriate Assessment])

Map coastal wetlands for preservation and to monitor their role as carbon sinks

(EC, 2020, p.9)

Adaptation in Ireland (CLAD) study reported by Falaleeva *et al.* (2013) developed a toolkit to support local-level climate adaptation in coastal areas. The aims of the CLAD project were to assess the contextually specific demands of coastal adaptation in Ireland and provide the tools and resources that local authorities and coastal communities might use when initiating coastal adaptation on a local scale. The ineffectiveness of existing management structures for addressing the challenges of integrated coastal adaptation governance was recognised by practitioners. Based on an assessment of coastal climate governance in Ireland, the key barriers to effective coastal climate adaptation in Ireland identified by the study were:

- the fragmentation of institutions and administrative functions with respect to coastal governance;
- ill-defined responsibilities among the actors and institutions involved in climate adaptation;
- short-term planning horizons and linear, top-down management;
- a lack of experience of cross-sectoral cooperation and stakeholder involvement.

There is recognition that the success of adaptation actions will rely on strong cooperation and coordination across all levels of the Irish government to support and promote spatial planning decisions and achieve long-term CCA targets. The promotion of “greener”, “softer” or “sustainable” measures that enable adaptation has to be resourced in terms of both finance and expertise, so that ambitious climate change policies can facilitate change on the ground (Dekker and O’Leary, 2020; Dekker and Torney, 2021). This is especially the case where decision-making occurs within local governance, as planned for Ireland.

CALCDA 2015, the first piece of national climate-specific legislation, was the catalyst for delivering the National Mitigation Plan (NMP), published on 19 July 2017, and the NAF, published on 19 January 2018. The legal framework for achieving the ambitious target of the NMP (net-zero emissions by 2050) was operationalised by the Climate Action and Low Carbon Development (Amendment) Bill 2020 in March 2021. To date, progress towards operationalising the NAF has mainly occurred through a series of mandated CCA plans published between 2018

**Table 4.1. Timeline of relevant CCA policy and events in Ireland**

Date	Milestone	Description/details
2012	National Climate Change Adaptation Framework (NCCAF) (DECLG, 2012)	The NCCAF mandates local authorities and key sectors with the task of planning for the impacts of climate change in Ireland. The non-statutory NCCAF required the development and implementation of sectoral and local adaptation plans as part of the national response to the impacts of climate change. It aimed to ensure that adaptation actions are taken across key sectors and at the local level to reduce Ireland's vulnerability to climate change. The NCCAF was aligned with the EU's Strategy on Adaptation to Climate Change (EC, 2013b).
2012	<i>Local Authority Adaptation Strategy Development Guidelines</i> (Gray, 2015)	Designed to assist local authorities to develop their own adaptation strategies and to ensure that these strategies will complement adaptation plans prepared on a sectoral basis.
2015	Climate Action and Low Carbon Development Act (Government of Ireland, 2021b)	CALCDA provides the legal framework for the preparation, approval and implementation of plans by the government, covering climate change mitigation and adaptation, with the purpose of pursuing the transition to a low-carbon, climate-resilient and environmentally sustainable economy by 2050. This includes the submission of iterative NAFs and NMPs.
2016–2018	Citizens' Assembly on Climate Change: "How the State can make Ireland a leader in tackling climate change"	Ireland sought diverse public viewpoints on climate change policy as part of its Citizens' Assembly on Climate Change; this was one of the first examples in the world of this form of climate-focused public deliberation. The Irish Citizens' Assembly afforded 99 citizens the time, space and structure to deliberate on "How the State can make Ireland a leader in tackling climate change". The 13 climate recommendations agreed on by the citizens were significantly more radical than many expected. They encompassed a suite of sectors, solutions and policy actions. The Joint Oireachtas Committee on Climate Action (JOCCA) was established in July 2018 to respond to each recommendation, with the results of its review forming a firm foundation for the all-of-government Climate Action Plan released in June 2019.
2017	National Mitigation Plan	In August 2020, the Supreme Court unanimously ruled that the government's 2017 NMP was inadequate to address the threat of climate change. A new plan required a "degree of specificity required by law as regards to the measures set out in the Plan to deliver the 2050 objective". This is a matter of law, not policy. The ruling gave "significant weight" to the views of the Climate Change Advisory Council, which is set to be reviewed and strengthened into what will become the Climate Action Council with statutory powers.
2018	National Adaptation Framework	The NAF sets out the national strategy to reduce the vulnerability of the country to the negative effects of climate change and to avail of positive impacts. The NAF mandated a number of government departments to prepare sectoral adaptation plans (12) in relation to the priority areas they are responsible for. Local authorities were also required to prepare local adaptation strategies (31). These strategies will be reviewed at least once every 5 years. Other relevant outputs from the NAF: <ul style="list-style-type: none"> <li>• <b>Climate Ireland:</b> identified as a centralised information resource to support decision-makers in meeting the requirements of the NCCAF and the EU's adaptation strategy (EC, 2013b).</li> <li>• <b>National Dialogue on Climate Action</b> (2017–2019): aimed to create awareness, and promote engagement and motivation to act (locally, regionally and nationally).</li> <li>• <b>Citizens' Assembly:</b> established to consider some of the most important issues facing Ireland's future (see report <i>How the State Can Make Ireland a Leader in Tackling Climate Change</i>; Citizens' Assembly, 2018).</li> </ul>
2018	Project Ireland 2040: National Development Plan 2018–2027 (NDP) and National Planning Framework (NPF)	Sets out a 10-year programme of capital investment aimed at upgrading Ireland's infrastructure, enhancing economic capacity and promoting balanced regional development. The NDP is a pillar of Project Ireland 2040, alongside the NPF. The NPF sets the overarching spatial strategy for the next 20 years and was developed by the Department of Housing, Planning and Local Government (now known as the Department of Housing, Local Government and Heritage).

**Table 4.1. Continued**

Date	Milestone	Description/details
2019	Climate Action Plan 2019	In June 2019, Ireland published the country's most ambitious plan to decarbonise the economy, to respond to what it called a "climate breakdown".  In the Supreme Court case regarding the 2017 NMP, the State brought up the 2019 NMP in its defence. It argued essentially that climate policy continues to evolve, and a much more detailed plan now exists in the form of the 2019 NMP. This led to the NMP being repackaged within the Climate Action Plan 2019. It was noted that recommendations from the Citizens' Assembly 2016–2018 were addressed.
2019	Climate and biodiversity emergency declaration	Ireland was the second country in the world to declare a climate and biodiversity emergency. In May 2019, the Dáil declared a climate and biodiversity emergency. The Climate Action Plan, published in June 2019, acknowledged this and states "The window of opportunity to act is fast closing, but Ireland is way off course. Successful climate action will require profound societal transformation. This will not be possible without citizen engagement at its core".
2021	Climate Action and Low Carbon Development (Amendment) Bill 2020	This Bill will support Ireland's transition to net zero, to achieve a climate-neutral economy by no later than 2050. It will establish a legally binding framework with clear targets and commitments set in law, and ensure the necessary structures and processes are embedded on a statutory basis to ensure that national, EU and international climate goals and obligations are achieved in the short and long terms.
2021	EPA report: <i>Policy Coherence in Adaptation Studies: Selecting and Using Indicators of Climate Resilience</i> . (Flood <i>et al.</i> , 2021b)	Priority climate hazards were identified, through a process of review and stakeholder consultation, as relating to sea level rise and coastal storms, pluvial and fluvial flooding, and extreme events (extreme heat, extreme wind, wildfires, drought and frost). The outcome of the co-design process was the identification of a suite of 127 indicators – 15 are climatological indicators, 23 are impact indicators, 32 are implementation indicators and 21 are outcome indicators.

and 2019 by seven government departments (12 sectoral adaptation plans) and local authorities (31 local adaptation strategies). As these sectors and local authorities in Ireland develop adaptation plans, adopting a coherent and measurable approach to climate resilience is necessary. An extensive body of Ireland-specific literature is now being generated that will feed into any established monitoring framework and will ensure that climate-resilience efforts directly address policy requirements and provide bridging pathways for greater alignment between policies, which is critical. The effectiveness of Ireland's response to climate change under various existing international, regional and national instruments is contingent on continued information-gathering and on understanding the impacts of the response on a sectoral or cumulative basis. It is also imperative that a legal framework to operationalise the NAF is prioritised, covering for instance how local governments can articulate high-level CCA objectives in their organisational strategies, and which implementation instruments will be used to achieve (and monitor) these objectives.

The multifaceted nature of the term resilience has been taken into account in the formulation of national climate change policy in Ireland. The NAF (DCCA, 2018a) considers a number of definitions of resilience from Desmond *et al.* (2017), Folke (2006), the IPCC (2014), Nelson *et al.* (2007) and Shine (2018). With a particular focus on the governance, institutional, planning and monitoring aspects (Shine, 2018), the NAF provides the following definition of climate resilience:

Climate resilience is the capacity of a system, whether physical, social or ecological, to absorb and respond to climate change and by implementing effective adaptation planning and sustainable development (including governance and institutional design) to reduce the negative climate impacts while also taking advantage of any positive outcomes. This will allow the system to either return to its previous state or to adapt to a new state as quickly as possible. (DCCA, 2018a, p. 63)

The NAF strongly recommends a whole-of-government approach with a central role for communities and citizens to ensure the transition to a climate-resilient Ireland (DCCAE, 2018a). This is necessary to ensure both a just and an equitable transition while improving governance at all levels through the increased vertical and horizontal integration of policy and action (Falaleeva *et al.*, 2011). The NAF also emphasises the importance of viewing resilience as a process and the role of local authorities as facilitators and supporters of community-led initiatives to build resilience and adapt. It is not useful to think of resilience as a state or something that we can “achieve”. The physical scientific approach to this process is rooted in efforts to understand (the impacts of) sea level rise, increased flooding and/or erosion, and the increased frequency and intensity of storms, droughts, etc., through scientific observations and direct measurements. Paleoclimatic reconstructions of past trends dating back hundreds of millions of years provide a larger context (Desmond *et al.*, 2017).

National climate change policy in Ireland emphasises the importance of effective planning, governance and institutional design in building resilience. These themes all centre on decision-making and decision-making processes. Scrutinising how climate action is governed, and how decisions are made, is essential. In some cases, these processes may need to be reimagined as we face more extreme climate change impacts. Reimagining governance (and planning) along Ireland’s coasts might increase the “[a]cceptance of alternative land use development parameters”, which “necessitates socially reconstructing political, professional and public presumptions about existing and future development of and activities in coastal zones” (Lloyd *et al.*, 2013, p. 926). Existing evidence suggests that a number of communities in Ireland are already engaged in the transition towards climate resilience with varying degrees of success. There are many benefits to be derived from empowering coastal communities and involving them in decision-making (bottom-up) processes, which can result in policy and plans that are more likely to be acceptable.

Local government is considered by far the best-suited level of government for responding to climate change (Corfee-Morlot *et al.*, 2009; Measham *et al.*, 2011).

However, CCA represents a new area of responsibility for local authorities, resulting in new resourcing demands and challenges in regard to the jurisdictional responsibility (see sections 3.2 and 3.3) of delivering the ambitious CCA programme of government and meeting targets for achieving climate resilience. Without appropriate mechanisms for implementing the NAF, CCA targets to achieve, or at least build, resilience in the coming decades will not be attainable by people “on the ground”.

Following publication of *Local Authority Adaptation Strategy Development Guidelines* (Gray, 2015), follow-up training sessions and regional workshops for relevant staff were held in July, September and October 2016. These were designed to introduce participants to key adaptation principles and provide hands-on experience of adaptation strategy development. The workshops promoted cooperation within the local authority sector while also providing opportunities for local authority staff to share experiences and identify challenges facing the sector. The regional workshops identified some key barriers to effective implementation of adaptation planning processes. These included:

- the requirement for buy-in at all levels of governance and among the general public;
- the need for better coordination between national structures and the local government sector on climate change;
- the fact that adaptation requires political will, viable institutions and effective policy frameworks to ensure coordination among individual actions; there is therefore a need to identify and promote adaptation leadership at all levels of governance;
- the complexity of planning for adaptation, which requires appropriate capacity-building within local authorities and across all levels of governance;
- the need to exploit synergies between individual local authorities (e.g. through the exchange of data, information, case study material) and at all stages of the adaptation planning process.

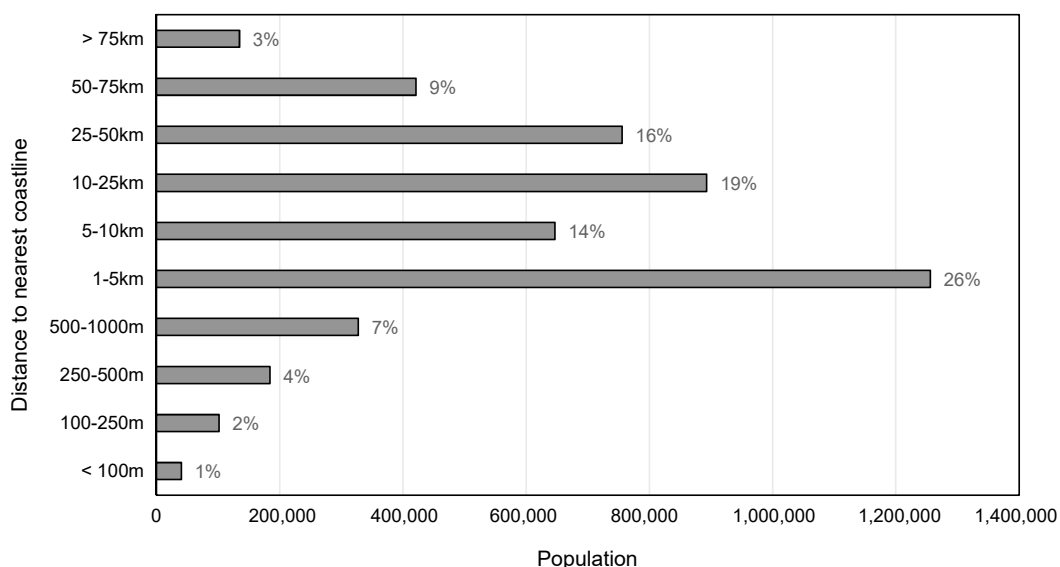
All these barriers remain relevant and require careful consideration during the planning stages to operationalise the NAF among local authorities and government departments and agencies.

## 5 Challenges for Building Coastal Resilience in Ireland

“Coasts” and “marine environment” are considered integrated constituents of the same system, as exploitation of marine resources and space, as well as activities directly within the coastal zone, impinge on coastal communities and infrastructure (Bax *et al.*, 2021; Garland *et al.*, 2019; Martínez-Vázquez *et al.*, 2021; SEMRU, 2019; Wenhai *et al.*, 2019).

Coastal environments are intensively used and subject to multiple anthropogenic pressures, in addition to those imposed by climate change, that challenge the delicate relationship between the anthropogenic uses of coastal space and resources and the ability of the coastal environment to provide those spaces and resources (Masselink and Lazarus, 2019; Nichols *et al.*, 2019; OECD, 2019, 2021b). Balancing this relationship is integral to approaches to adaptation as illustrated by nature-based solutions (or building with nature) strategies (Masselink and Lazarus, 2019; Somarakis *et al.*, 2019; van Slobbe *et al.*, 2013). Ireland is a coastal country with, as at 2016, 40% of its population living within 5 km of the coast, rising to 61% in Cork City and County, and 3.2% living within 100 m of the coast (Figure 5.1).

Ireland has started the process of valuing its coastal and marine ecosystem services (Norton *et al.*, 2018; O’Fatharta, 2019). Norton *et al.* (2018) found that parts of Ireland’s coastal and marine ecosystems could have an economic value that exceeds €3.58 billion per annum. This includes fisheries, aquaculture, genetic materials, water services, coastal defences, habitats, pest and disease control, climate regulation, recreational services, scientific and educational services, marine heritage and aesthetic services. Valuations are likely to underestimate the “real” value of these services, however. The “travel cost method” was applied to the Maharees peninsula in 2019 and determined that daily visitors (an average of 580 visits per day) contribute over €9 million to the local economy during the summer season (Farrell *et al.*, 2020). Embedding ecosystem services in coastal planning leads to better outcomes for people and nature (Arkema *et al.*, 2015), and can provide Irish government departments with a clearer understanding of these services, which helps to inform coastal and marine planning by enabling assessments of the likely outcomes of potential management strategies in the



**Figure 5.1. Population of Ireland by distance to the nearest coastline, 2016. Source: Central Statistics Office (CSO) Ireland; licensed under CC BY 4.0 (<https://creativecommons.org/licenses/by/4.0/>). Available online: <https://www.cso.ie/en/releasesandpublications/ep/p-cp2tc/cp2pdm/pd/#:~:text=There%20were%201.9%20million%20persons,metres%20to%20the%20nearest%20coastline> (accessed 22 April 2022).**

complex, and often conflicting, spaces of coastal and marine environments.

## 5.1 The Role of Biodiversity and Ecosystems in Climate Change Adaptation and Resilience

Assessments carried out by the Irish government have recognised the unique ecosystem processes and extraordinary development pressures within the coastal zone (DCHG, 2017, 2019a; NPWS, 2019; Wall *et al.*, 2020). The most recent national report on the Aichi Biodiversity Targets, *Ireland's 6<sup>th</sup> National Report to the Convention on Biological Diversity* (DCHG, 2019b), states, among many other things, that the majority (85%) of Ireland's listed habitats are considered of "unfavourable" or "bad" conservation status and only 15% of "favourable" conservation status. The overall summary is that Ireland is progressing "at an insufficient rate" and that a "transformational change is required to achieve the vision in the National Biodiversity Action Plan 2017–2021: 'That biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally' [DCHG, 2017]" (DCHG, 2019b, p. 8).

Ireland's coastal and marine environments and habitats are under substantial pressure and face substantial threats, despite their viability and resilience being recognised as integral to the social and economic resilience of Ireland (Figure 5.2) (NPWS, 2019). Although efforts have been made to better manage the coastal zone in Ireland, the social and environmental risks to the integrity of coastal zones remain (Hynes and Farrelly, 2010; Hynes *et al.*, 2014; Norton *et al.*, 2018; Stori and O'Mahony, 2021). Some policy actions seek to address these pressures and threats, and to build ecosystem resilience and enable adaptation to change through effective management plans, coordinated planning, the integration of science-based conservation, and local-level knowledge and governance. In March 2021, the Prioritised Action Framework for Natura 2000 (PAF) in Ireland was published.

National PAFs are: "strategic multiannual planning tools, aimed at providing a comprehensive overview of the measures that are needed to implement the

EU-wide Natura 2000 network and its associated green infrastructure, specifying the financing needs for these measures and linking them to the corresponding EU funding programmes. The legal basis for the PAF is Article 8(1) of the Habitats Directive which requires Member States to send, as appropriate, to the Commission their estimates relating to the European Union co-financing which they consider necessary to meet their following obligations in relation to Natura 2000" (NPWS, 2021b):

- to establish the necessary conservation measures involving, if need be, appropriate management plans specifically designed for the sites or integrated into other development plans;
- to establish appropriate statutory, administrative or contractual measures that correspond to the ecological requirements of the natural habitat types in Annex I and the species in Annex II present on the sites.

Ireland plans to spend €1.14 billion on Natura 2000 sites from 2021 to 2027 (from page 6 of the PAF "Summary of priority financing needs for the period 2021–2027"; NPWS, 2021b). According to the priority financing needs set out in the PAF, €139,074,353 will be required annually from 2021 to 2027 (totalling €1,137,882,697). The report uses an ecosystem typology of eight classes based on the Mapping and Assessment of Ecosystems and their Services (MAES) typology. Each year, "Marine and coastal waters" ecosystems will receive €570,000 (0.05%) and "Rocky habitats, dunes & sparsely vegetated lands" will receive €0 (0%).

## 5.2 Responding to, and Planning for, Resilience Pressures

Planning systems determine the distribution of most human activities within socio-ecological systems. They are used to decide on the location of houses and transport infrastructure, on public access to amenities, schools and hospitals, and on access to – and the use of – natural resources, etc. As such, planning underpins the design and implementation of climate action in practice and involves important decision points, and can be viewed as an opportunity to strengthen resilience pathways. It follows that "resilience" has become a key term in planning theory and practice (Flood and Schechtman, 2014). From



Building Coastal and Marine Resilience in Ireland

Code	Common name	2007 Overall Status	2013 Overall Status and operator	2019 Overall Status and trend	2019 Range	2019 Area	2019 Structure & Functions	2019 Future Prospects
1110	Sandbanks	●	●	=	=	=	=	●
1130	Estuaries	●	▲	▼	=	=	▼	●
1140	Tidal mudflats and sandflats	●	▲	▼	=	=	▼	●
1150	Lagoons*	●	=	▼	=	=	▼	●
1160	Large shallow inlets and bays	●	▲	▼	=	=	▼	●
1170	Reefs	●	▼	=	=	=	=	●
1180	Submarine structures made by leaking gases			=	=	=	=	●
1210	Drift lines	●	▼	▼	=	▼	=	●
1220	Vegetated shingle	●	=	=	=	=	=	●
1230	Vegetated sea cliffs	●	=	=	=	=	=	●
1310	<i>Salicornia</i> mud	●	▼	=	=	=	=	●
1320	Spartinion	●						
1330	Atlantic salt meadows	●	=	▼	=	▼	=	●
1410	Mediterranean salt meadows	●	=	▼	=	▼	=	●
1420	Halophilous scrub	●	▼	▼	▼	▼	=	●
2110	Embryonic shifting dunes	●	=	=	=	=	=	●
2120	Marram dunes (white dunes)	●	=	=	=	▼	=	●
2130	Fixed dunes (grey dunes)*	●	=	▼	=	=	▼	●
2140	Empetrum dunes*	●	=	=	=	=	=	●
2150	Dune heath*	●	=	=	=	=	=	●
2170	Dunes with creeping willow	●	=	=	=	=	=	●
2190	Dune slacks	●	▼	▼	▼	▼	=	●
21A0	Machair*	●	=	=	=	▼	=	●
3110	Oligotrophic isoetid lake habitat	●	▼	=	=	=	=	●
3130	Mixed <i>Najas flexilis</i> lake habitat	●	=	▼	=	=	▼	●
3140	Hard water lakes	●	▼	▼	=	=	▼	●
3150	Rich pondweed lake habitat	●	=	=	=	=	=	●
3160	Acid oligotrophic lakes	●	▼	=	=	=	×	●
3180	Turloughs*	●	=	=	=	=	=	●
3260	Vegetation of flowing waters	●	▼	▼	=	=	▼	●
3270	<i>Chenopodium rubri</i>	●	●	=	=	=	=	●

STATUS: ● Favourable ● Unfavourable-Inadequate ● Unfavourable-Bad ● Unknown

TREND: ▲ Improving = Stable ▼ Declining × Unknown

\* priority habitat. Please note "Spartinion" was not considered post-2007 as this habitat is comprised of non-native species.

Figure 5.2. The status of coastal habitats in Ireland. Reproduced from NPWS (2019). Copyright Government of Ireland. Asterisk indicates a priority habitat that is protected using SAC designations.

a planning perspective, addressing risk is the key driver for building resilience, and understanding and representing perceptions of risk among stakeholders are important (Flannery *et al.*, 2015).

The identification and increased awareness of climate-related risks (Flood *et al.*, 2020) to the Irish coast highlight the importance of building resilience across socio-ecological and economic systems on a national basis. Climate resilience is now widely acknowledged as an appropriate goal of frameworks for designing solutions to address the impacts of climate change and decrease sensitivity to them, and to enhance the adaptive capacity of social, industrial and environmental infrastructures and therefore mitigate the effects of climate change (Adger *et al.*, 2005). The continuing process of economic and social development, with increasing population and a drive for future economic growth, provides the underlying context for the gradually increasing demands and pressures on existing environmental resources. Alongside this, climate change and the impacts of this change pose significant threats to Ireland's coastal and

marine environments, society and economy (Shine, 2018). This will stretch already limited resources. Adaptation action is needed to reduce these future costs and ensure resilience to future extreme events under a changing climate (Gray *et al.*, 2014).

Recognition that climate change, biodiversity loss and degradation of ecosystems are linked and all have devastating consequences for economic and social stability, health and well-being is also leading to recognition that business-as-usual approaches to managing change at the coast are no longer an option.

Instead, approaches that seek to work with natural processes (nature-based solutions – see Box 5.1) are being promoted as ways of better and more sustainably tackling these challenges for building resilience (EEA, 2021). Although awareness of the advantages of nature-based solutions for coastal areas is increasing, engaging with stakeholders is needed to enhance the social acceptability of these solutions and promote their environmental, socio-cultural and economic benefits, as well as their social and health

#### **Box 5.1. Coastal management and nature-based solutions**

An integrated coastal zone management (ICZM) approach requires consideration of the effects of management in one part of the coast and their impact in other areas, as well as consideration of the impact across landscape units rather than political jurisdictions (Portman, 2018). One manifestation of ICZM has been a shift in coastal protection policies and a transition from relying first and foremost on engineering solutions, or grey infrastructure, to relying on blue–green infrastructure or nature-based solutions (NbSs), which advocate the use of natural or semi-natural infrastructure to reduce climate and/or human impacts in a manner that also delivers additional ecosystem services (Deely *et al.*, 2020). NbSs as a concept is being increasingly recognised by practitioners and academics as an indispensable part of the global effort to achieve the SDGs, not least because this management approach addresses multiple SDGs at the same time. The primary benefit of NbSs is that natural solutions can dynamically adjust to external pressures (e.g. rising sea level, increased storminess) and potentially persist when engineered solutions cannot (Möller, 2019). The spectrum of NbSs for coastal management is wide and includes fully natural solutions (e.g. naturally occurring landforms such as beaches, dunes, saltmarshes); managed natural solutions (nourished beaches, vegetated dunes and marshes, artificial reefs); hybrid solutions that combine natural features with engineered features (e.g. marsh-levee systems; dune–dyke systems); and solutions involving “green” structural engineering (e.g. vegetated engineering, chestnut sand fences) (Pontee *et al.*, 2016).

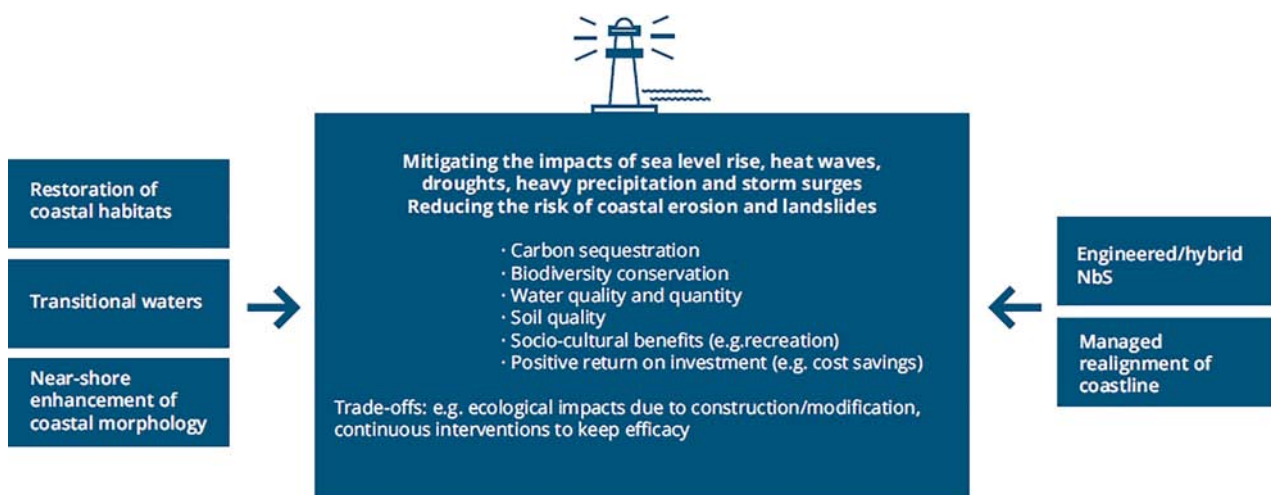
Planners in coastal areas are increasingly acknowledging the value of natural infrastructure options in the context of coastal flooding (Rezaie *et al.*, 2020), and are adopting NbSs. Coastal features, such as sand dunes and wetlands, can provide not only effective protection along the coast, but also important natural habitats (Sutton-Grier *et al.*, 2015). This might be an option where the cost of “holding the line” through grey infrastructure proves higher than the value of the protected land or assets. Natural habitats support biodiversity, which can boost direct provisioning services (e.g. breeding grounds) and cultural services (e.g. aesthetics, leisure activities).

benefits, and to tackle potential stakeholder conflicts in a better way (Figure 5.3) (EEA, 2021).

As an example of the costs, benefits and trade-offs that need to be considered, the challenge of providing protection against the impacts of climate change and sea level rise at the coast (Devoy, 2008) demonstrates the importance of integrating marine and terrestrial planning systems. “Grey” infrastructure, such as seawalls, has long been a popular option for reducing risks from coastal flooding and “holding the line” for coastal communities. However, these solutions can have unintended consequences in neighbouring areas, carry high maintenance costs and provide a false sense of security that encourages planning permission to be granted in areas that would be severely compromised through a breach of the infrastructure. These consequences of grey infrastructure are well known and have led to novel hybrid designs (Firth *et al.*, 2014, and references therein) that are promoted for their ability to enhance biodiversity, or to new conservation strategies using grey infrastructure that cannot be replaced with green solutions (Firth *et al.*, 2020; MacArthur *et al.*, 2020; Naylor *et al.*, 2017). Such considerations emphasise that spatial planning for adaptation and resilience in a coastal setting can succeed only within a supporting governance system that embraces scientific evidence (Adams *et al.*, 2017). This means that, to support coastal adaptation

and resilience to climate change, planning decisions should include a focus on the risks emanating from coastal developments (e.g. ecosystem degradation; reduction and alteration of habitat; impacts on natural processes; increased erosion to adjacent coastline; reduction of visual amenity; contribution to coastal squeeze) (Flannery *et al.*, 2015).

Building resilience to climate change demands that the analysis extends beyond a technical consideration of impacts to include all social and economic dimensions, especially in regard to evaluating possible options that may not then always be predicated on the “best” technical solution. This means that development plans at the national and regional levels should emphasise the opportunities that exist for growth in specific sectors and the socio-economic benefits that accompany this growth, such as the provision of jobs and improved access to facilities and services. Increasingly, these plans also emphasise the consequences of not acting on climate change, based on the potential loss of life, assets and livelihoods. This applies to both climate change mitigation and adaptation (Hornsey and Fielding, 2020; Nicklin *et al.*, 2019). An example of a plan that emphasises these points is provided by the Cork County Council Development Plan and the consultative procedure that accompanied it.<sup>15</sup>



**Figure 5.3. Key nature-based solutions for addressing climate change impacts in coastal areas and their multiple benefits and trade-offs. NbS, nature-based solution. Reproduced from EEA (2021); licensed under CC BY 2.5 DK ([https://creativecommons.org/licenses/by/2.5/dk/deed.en\\_GB](https://creativecommons.org/licenses/by/2.5/dk/deed.en_GB)).**

<sup>15</sup> See <https://www.corkcoco.ie/en/cork-county-development-plan-2022-2028> (accessed 9 September 2022).

Climate change will cause significant changes in the availability and reliable delivery of the coastal and marine ecosystem services, particularly supporting and regulating services, that can greatly influence the options and possibilities for social and environmental resilience at the coast. It is important for policymakers and stakeholders to recognise the limits of planning when faced with the uncertain, complex nature of climate change. In the context of marine spatial planning in Ireland, Carr (2019) recognised that tools must be responsive and adaptive, and support further-reaching responses that address the sources of climate change rather than only responding to its impacts. This requires that “policy makers, sector representatives, stakeholders, and the public must work together. Regulatory tools and incentives can be shaped through deliberations to realise policy goals. The tools must be adaptable and incentives inclusionary, rather than favouring one interest over another, and ultimately successful stewardship of the marine system. Only in this way can Ireland’s ecosystem services and broad public policy responses to help reduce Ireland’s carbon emissions be reliably delivered” (Carr, 2019, p. 12).

### 5.3 Building Resilience at the Community Level

There has been considerable research into the topic of climate resilience in the context of adaptation and communities (Carmen *et al.*, 2022; IPCC, 2022; McNamara and Buggy, 2017). McElduff *et al.* (2013) worked to develop a coastal typology to support planning. Examining coastal decline and regional imbalance, as well as recent development trends, the study provides a preliminary classification of settlements. While acknowledging the difficulty in labelling settlement types, the authors use the following themes to help build a typology: demography, education, health and care, housing, transport, employment and economic activity. Using a set of corresponding indicators, each location can be

described as being retiring, striving, reinventing, expanding, nourishing or prospering. Research on the context of community resilience often does not explicitly include communities but rather includes the systems they depend on; this can lead to disjunction from the lived experience when used to implement practices within communities (Angus and Hansom, 2021). Developing solutions to the problems arising from climate change faced by communities requires processes that enable and facilitate public dialogue in a way that provides for multiple voices and perspectives of shared problems that may not always have shared solutions across all elements of a community (Marks *et al.*, 2022). Although resilience has often been conceptualised with reference to systems in a single domain (e.g. ecosystems or infrastructure systems), coastal resilience is a composite property that emerges from the interplay of diverse natural and human systems (Townend *et al.*, 2021). This can lead to a situation where a gain in resilience for some may result in a loss of resilience for others. To acknowledge these conditions for building community resilience to climate change, the project drew on work addressing participatory approaches for stakeholder engagement (see Lange *et al.*, 2021, for review) that recognised the need for:

- an enabling environment that fosters the exchange of knowledge and understanding to identify shared and individually held challenges that could lead to common or disparate solutions;
- creating legitimacy through consensus-based decision-making on adaptation strategies and measures, increased fairness and increased acceptability;
- implementation processes that involve different views and creating solutions through “actionable knowledge” provided by a diverse group of stakeholders;
- solutions that foster ownership and commitment among stakeholders, as well as increasing their awareness, resources and interrelations.

## 6 Case Studies

Methods for community engagement have been developed as part of research projects (see Revez and Mullally, 2019). Rather than seek to redesign any of these, the focus of the BCOMAR project was to better understand what prevents communities from envisioning, engaging in the development of and participating in establishing pathways towards resilience. A better means for enabling communities to participate in a national debate on resilience to climate change is required, and this will require transformations in economic, social, technological and political decision-making. Such a means should provide a structure that helps communities to understand their current situation and what needs to happen to build resilience; what a trajectory towards resilience could look like; and what decisions would need to be made in the course of achieving that resilience.

In Ireland, strategies and actions need to be pursued now to move towards climate-resilient pathways for sustainable development, while at the same time helping to improve livelihoods, and social and economic well-being, and ensuring responsible environmental management. At the national level, transformation is considered most effective when it reflects a country's own visions (e.g. Ireland's Citizens' Assembly on Climate Change: "How the State can make Ireland a leader in tackling climate change") and approaches to achieving sustainable development in accordance with its national circumstances and priorities. Transformations to sustainability are considered to benefit from iterative learning, deliberative processes and innovation but each requires processes or toolkits to be embedded within management structures, so that they are implemented effectively and monitored frequently.

As outlined in Chapter 4, decision-making responsibilities are well defined at higher governance levels in Ireland. A robust governance system is in place to debate and advise on national and (to a lesser extent) regional climate change policy. One aspect of building climate resilience in Ireland that deserves

more attention is the capacity of communities to inform, make or implement decisions at lower, or local, governance levels. Exploring this setting formed the basis of two case studies that sought to better understand existing organisational and institutional arrangements in coastal communities in Ireland. The purpose of the case studies was to use this knowledge to develop a process that communities could self-employ to understand their current situation and what needs to happen to build resilience, what a forward trajectory towards future resilience could look like, and what decisions would need to be made over the course of achieving that resilience.

An overview of the two case studies is provided in Table 6.1, which includes details of the processes used for engagement with each community during the BCOMAR project. The case study locations differ in terms of their rural and urban classifications, the local perception of climate risks and the length of time in which strong participatory processes have been in place.

The implementation of the case studies was constrained by the Covid-19 pandemic, which restricted access to, and engagement with, local communities of the Maharees and Youghal. The information that informed the project's analysis was largely gleaned from a synthesis and re-evaluation of previous work with communities, especially for the Maharees, available literature and virtual meetings. Our interpretation of the information was validated offline with key stakeholders from each case study area.

### 6.1 Case Study 1: The Maharees

The Maharees (Na Machairí) peninsula is a low-lying tombolo<sup>16</sup> on the north side of the Dingle peninsula in County Kerry (Figure 6.1). The tombolo separates Brandon Bay and Tralee Bay, and connects the two villages of Fahamore and Kilshanning to the mainland (total population: approximately 250).

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16 A tombolo is a sandy isthmus that is a deposition landform by which an island becomes attached to the mainland.

**Table 6.1. Summary of community analysis and engagement with community groups in the BCOMAR project**

Characteristic	Maharees, Co. Kerry	Youghal, Co. Cork
<b>Social and economic</b>		
Population	Rural population: 250	Urban population: 8339
Largest age cohort(s)	0–18 years (22%); >65 years (22%)	25–44 years (27%)
Unemployment	9%	11%
Deprivation index	–1.1 (based on electoral division)	–7.98
Top employment sectors	Professional services; commerce and trade; agriculture, forestry and fisheries	Professional services; commerce and trade; manufacturing
<b>Key environmental designations</b>		
SACs	SAC 002070: Tralee Bay and Magharees Peninsula, West to Cloghane SAC 002261: Magharees Islands	SAC 2170: Blackwater Estuary
SPAs	SPA 004153: Dingle Peninsula SPA SPA 004188: Tralee Bay Complex SPA	SPA 4028: Blackwater Estuary
Proposed NHAs (pNHAs)	pNHA 002070: Tralee Bay and Magharees Peninsula, West to Cloghane	pNHA 000072: Blackwater River and Estuary pNHA 000078: Ballyvergan Marsh
Ramsar Sites		Ramsar No. 836: Blackwater Estuary
<b>Community groups</b>		
	Maharees Conservation Association (MCA) CLG (formed in 2016)	Youghal Socio-economic Development Group (formed in 2007)  A high-level tourism strategy group Local Enterprise Office Cumman na Daoine, Youghal: Blue & Green Community Network (formed in 2021) Youghal Chamber of Tourism and Development Youghal4All South and East Cork Area Development Partnership CLG “My Town, My Plan” community training programme (established 2019)
<b>BCOMAR engagement<sup>a</sup></b>		
	Semi-structured interviews with MCA leaders (2019–2021) Co-presentation with MCA at workshops and stakeholder meetings (2019–2021) Co-creation of coastal management plans with MCA leaders (2019–2021)	Anonymous survey (September 2020) Attended three public consultations (December 2019 to March 2020) Formal and semi-structured interviews with community leaders (2019–2021) Document analysis (2019–2021)

<sup>a</sup>Planned workshops with the communities were restricted by the public health restrictions introduced during the Covid-19 pandemic.

### 6.1.1 *Environmental, social and economic settings of the case study site*

The Maharees is an area of outstanding natural beauty and hosts unique and protected species and habitats within a coastal landscape predominantly composed of sandy beaches and dunes. The peninsula lies within or adjacent to SAC 2070 “Tralee Bay and Magharees Peninsula, West to Cloghane” (which has the highest

number of protected habitats (16) and third highest number of protected species (28) of any area in the country), SAC 2261 “Magharees Islands”, SPA 4153 “Dingle Peninsula SPA” and SPA 4188 “Tralee Bay Complex SPA” (Figure 6.2). The southern section of the tombolo has extensive coastal dune habitats and rare, diverse wildlife. The only exceptions to sand dune cover are two caravan parks and a 10-ha raised



**Figure 6.1. Location of the Maharees peninsula, Co. Kerry, and photograph of peninsula taken from uplands to the south of the area. Photograph: Michael Diggin. Inset image: Bing Maps 2022.**

inland area of sea buckthorn that was planted in the late 1970s by Kerry County Council (KCC) to combat erosion.

The northern section of the tombolo lies on limestone pavement. Because of its coastal location, the sandy soils in the Maharees are light and have a high lime content, which makes them very suitable for vegetable growing. The land still retains fields with plough-drill patterns from a bygone era, when a thriving small-scale farming industry drove the local economy. Successful farming practices still exist today but are on a much smaller scale than before. In the past four decades, socio-economic forces have resulted in a transition away from farming and fishing, to focus upon the provision of tertiary goods and services for tourism and recreational visitors to the area. This social change has had a dramatic impact on the coastal

landscape, and people have observed a migration of activities from land towards the sea (Ryan, 2016). The area has a new commercial pulse that hinges on water recreation activities such as surfing, sea kayaking, windsurfing, paddle boarding, sea safari, waterparks and diving, and access to the facilities that support these.

### **6.1.2 Evidence of existing absence of and future threats to resilience**

The socio-economic and environmental resilience of the Maharees is compromised primarily as a result of two sources of pressure, namely tourism and erosional changes to the shoreline (see MCA, 2020). Although there are linkages between the two, the impacts of tourism are predominantly felt during the summer



**Figure 6.2. The Maharees peninsula lies within SAC 2070 “Tralee Bay and Magharees Peninsula, West to Cloghane”, SAC 2261 “Magharees Islands”, SPA 4153 “Dingle Peninsula SPA” and SPA 4188 “Tralee Bay Complex SPA”. SAC and SPA boundaries were extracted from NPWS map viewer; <https://www.npws.ie/maps-and-data>. The material featured on this site is subject to Government copyright according to the Copyright and Related Rights Act, 2000.**

months, while the erosional impacts are predominantly felt during the winter months. Climate change will exacerbate both pressures through warmer summers, increasing tourist potential, and sea level rise and increasing storm frequency and intensity, exacerbating erosional forces on the shoreline.

#### *Tourism in the Maharees*

The title “water sports mecca” should be a reason to celebrate, and a reason to continue to promote the area internationally, but a lack of basic amenities to facilitate the increased numbers of people accessing the shoreline has led to widespread dune degradation and conflict between landowners, residents and visitors. Overcrowding due to tourism is especially a problem during the peak summer months (June to August), as the area does not have the capacity to host a large influx of short-term visitors. The travel industry in Ireland has invested heavily in growing visitor numbers using initiatives like the Wild Atlantic Way; however, this has not been matched with adequate planning or investment to address the impacts on the rural communities that host these visitors. This has led to multiple conflicts on the ground resulting from the competing interests of visitors,

landowners, residents and business owners in the area (Farrell, 2018; Farrell *et al.*, 2020). The impacts take many forms in the Maharees and include, but are not limited to, congestion on the narrow roads; wild camping, fires and parking on dunes; illegal dumping; and trespassing on private land. Every year, visitors and local residents in the Maharees highlight the paucity of amenities and lack of management. These issues not only impact the visitor experience, and hence the sustainability of tourism as an industry, but also cause resentment among the local community who observe their land being damaged every year by trespassing visitors and campers.

#### *Shoreline erosion in the Maharees*

Left unmanaged, the increased human activity from tourism has been accelerating the destabilisation of the fragile dune ecosystems that are already highly vulnerable to Atlantic storms and suffering chronic erosion. Climate change will exacerbate the resulting erosional pressures on the shoreline of the Maharees. Historical shoreline analyses (Farrell *et al.*, 2016) illustrate that the dunes have retreated by over 40m in the past 45 years, with increased erosion rates observed in recent years. The retreating dune



system is the only line of defence from the storms that frequently flood (as a result of storm surges) or block (by blowing sand deposits) the single access road to the peninsula. For example, this road was cleared 17 times by KCC in winter 2015–2016. This had serious implications for the daily commuting of the residents and for their health and safety in terms of emergency service access. The long-term existence of the tombolo is at risk given climate change projections of rising sea levels combined with the potentially increasing intensity of north-east Atlantic storms. The long-term resilience of communities living on the Maharees peninsula will depend on how they can, or are enabled to, adapt to future climate change and its ensuing social pressures.

### **6.1.3 *Responding to threats to resilience in the Maharees***

The Maharees Conservation Association (MCA) was formed in February 2016 in response to both climate threats and the pressures on the socio-economic and environmental fabric of the Maharees. The group evolved from community-lived experiences of the pressures and threats they face and because there was no apparent mechanisms for their voices to be heard within existing systems of local government and national agencies. The efforts of the MCA, which have received significant national recognition in the media and other outlets, have led to significant and impactful actions to mitigate some of these impacts through sustained and targeted coastal management actions (Table 6.2 and Figure 6.3). These actions have been successful in the short term and provide a window to what the future managed coastal landscape could encompass in Ireland.<sup>17</sup>

### **6.1.4 *Sustaining progress towards resilience in the Maharees***

The MCA has proposed and/or implemented a suite of solutions (see Table 6.2) and, through engagement with local, regional and national stakeholders, provided an exemplar of how locally led activity can support

higher levels of governance responsibilities and obligations that seek to:

- help Ireland meet global, EU and national biodiversity and climate targets;
- facilitate effective coastal management that builds resilience using bottom-up approaches.

The MCA has recognised that, despite its success since forming in February 2016 in addressing immediate issues, its efforts have led neither to permanent solutions nor formal empowerment to manage their situation and determine their own resilience pathways. Continued community mobilisation will undoubtedly help to maintain current efforts (despite costs to local residents in terms of mental stress and workloads), but, without a means to co-design and implement a sustainable, integrated and enforceable coastal plan for the peninsula, any socio-economic and environmental resilience of the Maharees is unlikely to be sustainable. A mechanism to co-design such a plan is necessary both to enhance the efficacy of local activity and to bridge gaps in coherency between the local, regional and national levels of governance.

## **6.2 Case Study 2: Youghal, County Cork**

The town of Youghal is located in the east of County Cork at the estuary of the River Blackwater, which forms the border with County Waterford (Figure 6.4).

### **6.2.1 *Environmental, social and economic settings of the case study site***

Youghal has a rich 800-year heritage and a current urban population of about 8339 (2016 census; Cumann Na Daoine, 2018). This population rises to almost 12,000 if the rural “hinterland” is included. The social demographics of the town show some trends towards an aging population and a social deprivation index,<sup>18</sup> of –7.98, that is higher than the national average. These features have been shown to reduce adaptive capacity (and hence resilience) in other

<sup>17</sup> See <https://www.caro.ie/news/nature-based-solutions-webinar> (accessed 9 September 2022).

<sup>18</sup> The deprivation index uses 2011 data on factors such as income, employment, education and skills training.

**Table 6.2. Challenges addressed by community-led actions (bottom-up approaches) in the Maharees, Co. Kerry**

Challenge	Description
1. Wind-blown sand hazard	The only road in and out of the Maharees had to be cleared of wind-blown sand on 17 occasions during winter 2015–2016. The MCA worked with NPWS, KCC and University of Galway geographers to install chestnut fencing in April 2017. The road has not been blocked since.
2. Dune degradation and/or loss	There were (and still are) multiple areas in the Maharees where significant degradation and/or loss of dunes due to human activities was, and still is, occurring. The human impacts largely stem from unmanaged access routes, parking, illegal trespassing, wild camping, fires and dumping. To manage the area, the MCA used a nature-based solution (marram grass planting) along with implementing access control and signage measures. The dunes have been successfully restored in the targeted areas.
3. Lack of amenities	The Maharees peninsula contains the longest continuous beach-dune system on the Wild Atlantic Way, stretching 11 km along Brandon Bay. Despite this accolade, the area has only one public parking area for approximately eight vehicles. There are no public toilets along the entire stretch of shoreline. The lack of basic amenities has led to chronic dune degradation due to illegal parking, trespassing and camping. The MCA has worked with local landowners and KCC to establish a temporary car park in a private field that is designated a SAC and is near the Blue Flag beach, and to police the area to remove illegal campers.
4. Flooding	Flooding hazards, mostly from rain water, affect the Maharees peninsula in multiple locations during the winter months. The farmland can be covered in water for extended periods (weeks to months) and the local community takes action by clearing drains so the floodwaters can recede. The MCA has worked with KCC to replace sluice gates and dredge channels to allow floodwater to drain.
5. Lack of awareness and education	The MCA has worked to promote awareness of and education in the biodiversity and heritage of the entire peninsula. The signage promotes compliance by enabling visitors to understand why they are being asked not to park or camp in areas that lie within Natura 2000 sites and on private land. The guided tours and trail maps provide experiences for adults and children and opportunities to learn about plant and animal species that are unique to the peninsula.
6. Partners and networks	The MCA has been very successful in building working partnerships with key stakeholders including landowners, business owners, the local authority, local councillors and TDs, the NPWS, An Taisce Clean Coasts, MTU, University of Galway and the Gardaí. These relationships are critical to support nature-based solutions, education programmes and enforcement.
7. Funding	The MCA has obtained funding from many sources (An Taisce Clean Coasts, BIM, FLAG, LEADER, Local Authority Waters Programme, KCC Community Support Fund, Tidy Towns Waters and Communities Award, Local Agenda 21, KCC Kerry Community Awards, Heritage Council, Local Agenda 21 Fund, KCC Councillors' allocation and fundraising events) to purchase materials and professional services to implement community-led actions, including information signs (on biodiversity, heritage, conservation, and access and camping regulations), fencing, other signage, species-spotter guides, binoculars and hand lenses, trowels, swimming buoys and heritage books.
8. Research	The MCA has been extremely proactive in supporting and promoting external researchers in the peninsula, in particular staff from MTU and University of Galway. The MCA has supported surveys of residents and visitors and experiments designed to increase understanding of the short- and long-term coastal evolution of the peninsula and to identify community concerns about and solutions to climate risks and tourism seasonality.

**BIM, Bord Iascaigh Mhara (Seafood Development Agency); FLAG, Fisheries Local Action Group; MTU, Munster Technological University; TD, Teachta Dála (Member of Dáil Éireann).**

communities (UNDESA, 2017). The 2018 Community Development Resource Centre Profile report (Cumann Na Daoine, 2018) outlines some of the problems facing Youghal caused by a substantial fall in industrial production.

The socio-ecological setting of Youghal is largely defined by its estuary location. The area is highly valued for its natural habitats and comprises a Ramsar Site, an SPA and a SAC (Doran and O'Higgins, 2020). The estuary is relatively shallow and "the land

throughout the [river] catchment is primarily used for agriculture, with the dairy industry being the primary economic activity" (Doran and O'Higgins, 2020, p. 3).

Anecdotal evidence collected during this project strongly suggests that the "Celtic Tiger" economic boom of 1995–2007 largely bypassed the town of Youghal. This has resulted in some local socio-economic hardships that still linger today. The rich natural and cultural heritage of Youghal forms the basis of ongoing efforts to develop the local tourism industry as a central thrust

	
<p>Sand fences installed in April 2017 to prevent sand deposition on the road</p>	<p>Dune restoration using a nature-based solution (marram grass planting)</p>
	
<p>Signs to raise awareness of dune fragility and control access</p>	<p>Signs to raise awareness of trespassing and wild camping</p>
	
<p>Temporary car park provided during the peak visitor months (June–September)</p>	<p>Promoting local coastal heritage using trail maps</p>
	
<p>Targeted dune areas successfully restored using a combination of a nature-based solution (marram grass planting), fencing to control access and signage to promote awareness</p>	

**Figure 6.3. Examples of community-led actions to build resilience in the Maharees, Co. Kerry. Photographs: Eugene Farrell.**



**Figure 6.4. Aerial photograph of Youghal looking north-north-east. The River Blackwater in the background marks the boundary between Counties Cork and Waterford. The wetland and estuary systems have environmental designations (Ramsar Site, SAC, SPA and proposed NHA). Photograph: Kevin Dwyer, AIPPA. Inset image: Bing Maps 2022.**

to innovate and plan for a more sustainable future. A recent plan outlined some of the key local assets and opportunities. *Youghal – A Heritage-led Vision to the Next Decade* (“the Heritage Plan”) was compiled by the Youghal Socio-economic Development Group (YSEDG) as a means of showcasing the town as “a place in which people want to live, work, visit and invest” (YSEDG, 2019). The plan outlines the town’s natural, cultural and built heritage assets, including the Raleigh Quarter; St Mary’s Collegiate Church; the Clock Tower;

Youghal Eco Boardwalk on the beach; natural heritage sites including Keane Eco Park, Youghal Quayside and Blackwater Estuary, and the wetland ecosystems along Slob Bank; and various festivals. Several events are held to help celebrate the local heritage, including the Moby Dick Festival (June), the Queen of the Sea Festival (July), the Youghal Mackerel Festival and the Medieval Festival (both August), Youghal Celebrates History (September) and Youghal Spooktacular (November).

### 6.2.2 Evidence of existing absence of and future threats to resilience

The socio-economic challenges and opportunities outlined above do and will continue to impact on the resilience of communities in Youghal. Climate change will exert additional pressures that will drive environmental change and be manifested through flooding and will impact on both natural and built features and the infrastructure of the town. A survey distributed by the BCOMAR project (see Appendix 1) found that respondents believed that climate change would impact on their environment in six key ways: (1) flooding from rainfall, (2) flooding from storm surge, (3) coastal erosion, (4) wind damage, (5) extreme cold and (6) extreme heat. However, the survey also suggested confusion between the impacts of climate change and of non-climate-related local issues and pressures.

### Flooding in Youghal

Five substantial coastal flood events have occurred in the past two decades in Youghal – one in 2004, one in 2012, two in 2014 and one in 2020 – and they affected key areas in the town centre. Flood reports collected by the OPW show that Catherine Street, Market Place and Graffan Street flood every 1 or 2 years. There is a relatively predictable geographical pattern of coastal floodwaters in central Youghal (Figure 6.5). It is also worth noting that these patterns were apparent in two flood reports published 10 years apart. It seems that little has been done to alter or improve these patterns in the decade between the two flood reports, and predicted climate change-induced sea level rise and storm surges will exacerbate and potentially increase the extent and duration of flooding impacts in the future.

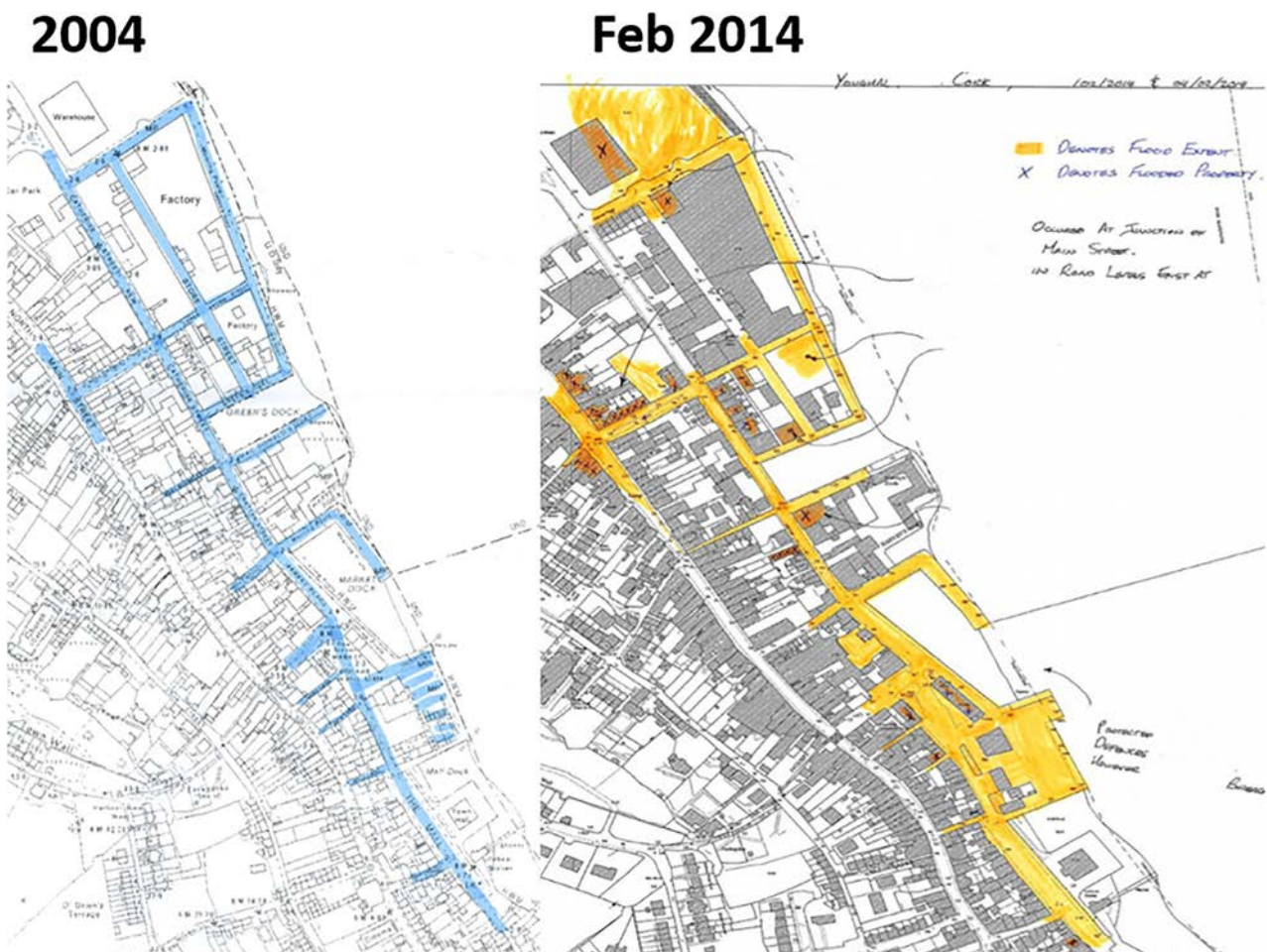


Figure 6.5. Commonly flooded roads in Youghal in 2004 (left) and 2014 (right). Source: OPW (data available at: <https://www.floodinfo.ie>). Copyright Government of Ireland.

This regular floodwater pattern is partly a result of the fact that much of the centre of Youghal is built on low-lying land, a lot of which is reclaimed from the sea (see area marked in red in Figure 6.4). It is also worth noting that the low-lying agricultural land/wetlands beyond that reclaimed area are also subject to flooding and could be at risk of habitat loss.

#### *Climate- versus non-climate-related pressures in Youghal*

The above-mentioned community survey (see Appendix 1) indicated that there were some differences in what people perceive should be priorities, that is, whether needs arising from climate change should take precedence over other local needs or vice versa. Local priorities other than climate change that can be seen as competing with climate change for resources include providing more socio-economic regeneration, investment and opportunities.

Work to develop opportunities in a coastal town like Youghal is likely to be affected more regularly by climate change than similar work in non-coastal or larger towns. It follows that the town might need to diversify. The tourism industry is a good example of this need. Tourism is both a leading industry in Youghal and also a well-researched threat to socio-ecological systems (Hunter, 2002). However, another perspective on this is that tourism could be used as a driver for climate adaptation. The locally conceived Heritage Plan supports Fáilte Ireland's ambitious growth plans for tourism in the country as a whole, and in the area (YSEDG, 2019). The lack of attention to climate issues demonstrated in this vision for Youghal suggests that more significant drivers – or enablers – might be required for climate action.

#### **6.2.3 Responding to threats to resilience in Youghal**

In common with the Maharees, actions in Youghal have tended not to be directly associated with climate change and/or resilience, but nevertheless lead to, or have the intention of leading to, outcomes that would confer resiliency. For instance, a number of bodies are involved in conceiving and/or supporting various initiatives to help develop tourism in Youghal in different ways, including:

- Cork County Council (and City Council);
- YSEDG;

- a high-level tourism strategy group;
- Fáilte Ireland and Tourism Ireland;
- the Heritage Council;
- Enterprise Ireland;
- the Local Enterprise Office;
- Youghal Credit Union;
- Cumman na Daoine, Youghal;
- Youghal Chamber of Tourism and Development;
- Youghal4All;
- South and East Cork Area Development Partnership CLG (SECAD).

The Heritage Plan also sets out various strategies with which to capitalise on the town's assets (YSEDG, 2019). In combination, such initiatives (Table 6.3 and Figure 6.6), which attract wide participation, although principally having a socio-economic purpose, could be coupled with climate-related actions to confer broad resilience on Youghal and integrate across areas of policy. This highlights the importance of ensuring broad awareness of the wide range of initiatives and actions at a local level and, by extension, the challenge of connecting climate change issues to other local initiatives. Doing this is necessary to secure local "buy-in" to adaptation measures.

#### **6.2.4 Sustaining progress towards resilience in Youghal**

Improved resilience in Youghal is likely to be achieved by engaging local residents in the topics that they feel are important to the town, as expressed through existing initiatives. An example is the "My Town, My Plan" community training programme initiative (Figure 6.7). The initiative is funded through the European LEADER approach, which supports community-led local development (CLLD) and aims to promote development in four core topics:

1. developing community/social enterprise;
2. moving from ideas to validation;
3. legal structures and governance;
4. developing "My Town, My Plan" strategic planning processes.

The plan that emerges from the process is not a statutory one but one that can serve as a strong signal of intent to statutory bodies.

In the context of climate change, the survey conducted in Youghal (Appendix 1), on developing and applying

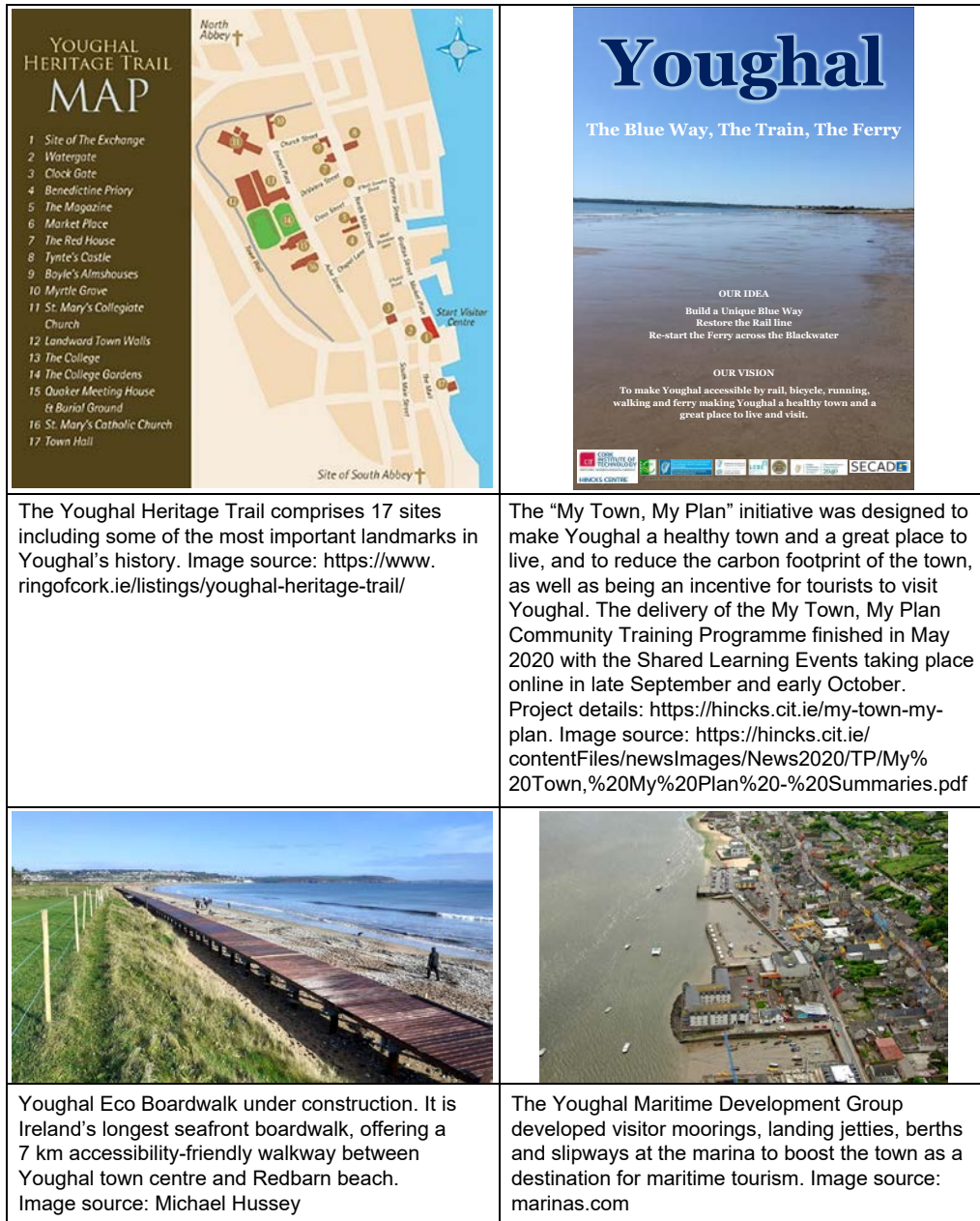
**Table 6.3. Challenges targeted by community-led actions (bottom-up approaches) in Youghal, Co. Cork**

Challenge	Description
1. Preserving local assets and opportunities	The Heritage Plan was compiled by the YSEDG (2019) as a means of showcasing the town as “a place in which people want to live, work, visit and invest”. The plan outlines the town’s natural, cultural and built heritage assets, including the Raleigh Quarter; St Mary’s Collegiate Church; the Clock Tower; Youghal Eco Boardwalk on the beach; natural heritage sites including Keane Eco Park, Youghal Quayside and Blackwater Estuary, and the wetland ecosystems along Slob Bank; and various festivals.
2. Integrating across areas of policy	As well as climate-related policy, other areas of policy and related guidance intersect with actions that will have a direct effect on developing resiliency, such as: <ul style="list-style-type: none"> <li>• <i>People, Place and Policy – Growing Tourism to 2025</i> (DTTS, 2015);</li> <li>• the manual <i>Sharing our Stories – Using Interpretation to Improve the Visitors’ Experience at Heritage Sites</i> and toolkit <i>Ireland’s Ancient East – Growing International Sales</i> (Fáilte Ireland, 2012);</li> <li>• <i>Policy Proposals for Ireland’s Towns</i> (Heritage Council, 2015);</li> <li>• Cork County Development Plan 2015–2022 (Cork County Council);</li> <li>• <i>Walking and Cycling Strategy for Youghal (Active Travel Town) Strategic Recommendation Report 2013</i> (Cork County Council).</li> </ul>
3. Loss of town centre identity	Youghal suffers, like similar towns, from a migration of amenities and facilities out of town, threatening the sense of place and community.
4. Flooding	Flooding hazards from the sea and rain water affect the town and adjacent low-lying land.
5. Linking investment to resilience	Attracting investment to support local development or initiatives tends to be dependent on defining specific problems or opportunities (and terminology), rather than vague terms such as “building resilience”. Local inhabitants might talk about the need for a new school or more parking facilities but not consider that these are part of overall resilience.
6. Partners and networks	In employing a framework such as ICZM, building forums or processes to bring all the relevant stakeholders together is challenging. The lack of such forums or processes locally, involving all stakeholders, is a critical gap and is a barrier to utilising existing capacity to pursue opportunities and direct it towards climate issues.
7. Lack of awareness	Addressing the lack of knowledge of climate change risks and opportunities facing Youghal requires more collaborative learning events.
8. Linking funding to resilience	The development of Youghal’s capacity to attract and host tourists is both an enabler of and a barrier to building resilience. Clearly, Youghal has experience of attracting funding. However, the pressures of tourism on socio-ecological systems are not considered in many of these activities.
9. Utility of research	Local stakeholders are keen to engage in challenges and opportunities at the local level but support from research can often conflict with local priorities, and the use of research approaches and terminology can be disengaging.

greater capacity to address climate change, focused on improving flood defences; dredging sea sediment in dock areas; improving awareness of climate change impacts; and ensuring that the planning system works to prevent the locking in of future risk through the construction of seafront developments in Youghal. Historical records of Youghal provide an example of how adaptation to the current and future impacts of climate action at the coast might garner wide support if it directly benefits a popular or well-funded asset or industry. An engineering report (Allanson-Winn, 1904) of local coastal erosion and flooding issues from the beginning of the 20th century observed the “condition of the foreshore” near Clay Castle since 1898 and stated, “[w]ithout being alarmist, I have no hesitation in saying that if immediate steps are not taken those interested in Youghal run a grave risk of sustaining

losses which may be as sudden as they are serious” (p. 145). The engineer observed that there was no “heavy and well defined” shingle bank to protect much of Youghal’s surrounding areas and as a result “it hardly needed an expert’s eye to detect the danger of an imminent inundation of some 600 acres of low-lying land, through which the G. S. & W. Railway runs on its entrance to the Youghal terminus” (Allanson-Winn, 1904, pp. 144,145).

Two key elements emerge from this engineering report that remain just as relevant in the present day. The first is that naming a key asset that is at risk (the railway line and 600 acres of land) is a useful way to raise the profile of coastal erosion and flooding. If these processes are seen as a threat to a key industry, asset or sector, this can help to build



**Figure 6.6. Examples of community-led actions to build resilience in Youghal, Co. Cork.**

momentum for taking mitigating or adaptive action. Expanding the capacity in Youghal to attract and cater for more tourists is communicated almost solely in terms of opportunities, which is the right approach for attracting investment. However, it will become ever more necessary to acknowledge the potential climate impacts of development ideas and to consider how climate change impacts might be safeguarded against. For example, there are plans to construct a greenway on the old railway line between Youghal and Middleton in a bid to attract more domestic and international tourists. This route is at risk today, as it was over a

century ago, and the risk is likely to increase as a result of rising sea levels and the increasing frequency and intensity of storms. It seems that some planning processes and decisions still fail to acknowledge this risk. The second, related, point is that disagreement over how the cost of adaptation actions should be financed is not a modern problem. The existing embankment (which was partly expanded by the addition of wooden groynes in 1891) did partially fail in 1899, much as the report's author had predicted. The six key stakeholders (the county, the town of Youghal, the railway company, the landowners, the owners of



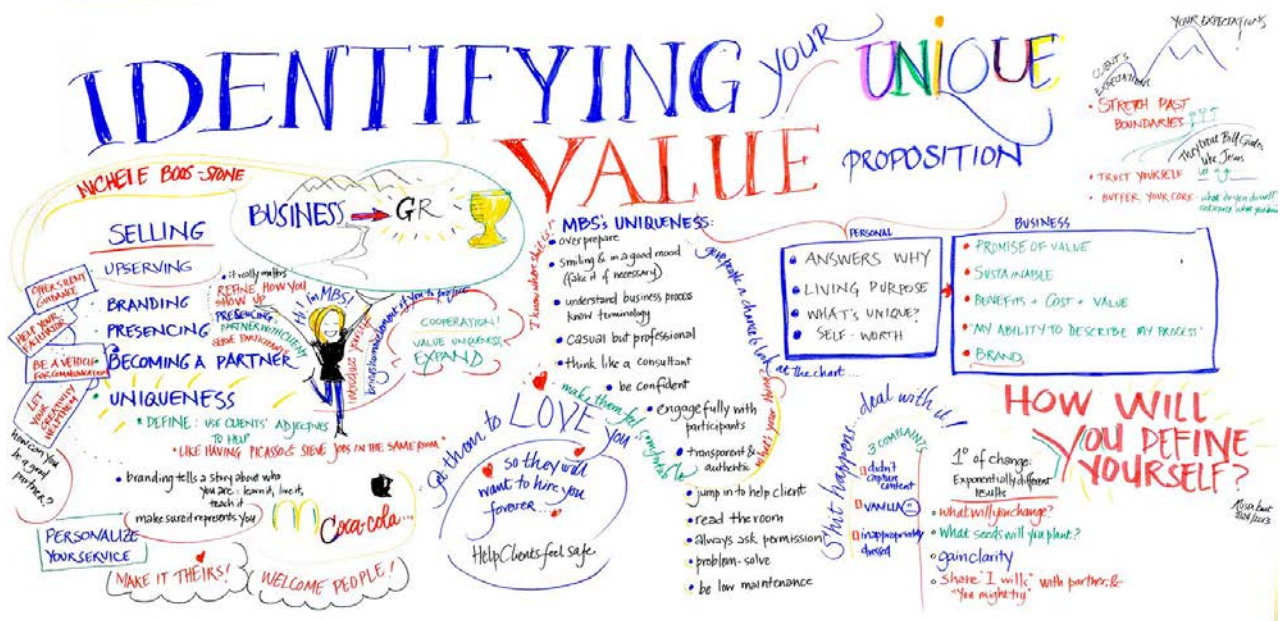


Figure 6.7. The intention and expected outcome of the My Town, My Plan training programme was to positively impact on the innovative development of a cohesive town plan for the future. At a personal level the programme was designed to positively impact on knowledge, leadership, management and teamwork skills. At a community level the programme was designed to positively influence the community's competence and capability to inform themselves, evaluate options and make collaborative decisions. This will enable the communities to create viable and sustainable community/ social enterprises and develop an appropriate town plan for the future, with a clear sense of how the plan is supported with the appropriate legal structure and governance. Source: Michele Boos-Stone (available on flickr: <https://www.flickr.com/photos/ifvp/9363957943>) under Creative Commons licence: <https://creativecommons.org/licenses/by-nc-sa/2.0/>.

house property and the government) disputed the proportion of the cost that should be borne by each for engineering a possible solution. There followed a “period of masterly inactivity” in the summer of that year during which “the sea was not idle” and the shingle bank breaches worsened (Allanson-Winn, 1904, p. 146). Some sandbags were added but no significant steps were taken to improve the situation. The work was finally commissioned in January of 1900, but this was retrospective and the significant damage already caused to the original embankment could have been spared.

Depending on the way resilience is interpreted, Youghal can be described as having done more or less to build resilience. The community has worked tirelessly and quite successfully to ensure that the town remains an attractive place to visit. Tourism is very important to the town and underpins its socio-economic resilience. From a CCA perspective,

however, very few actions have been taken. Despite the problems with coastal flooding and past damage to assets such as the boardwalk and properties, very few local initiatives focus on CCA.

### 6.3 Case Study Outcomes

The Maharees and Youghal represent very different coastal settings and communities; however, together, the case studies provide an illustration of the barriers and challenges faced by coastal communities. Although some resilience-related features are locally specific, there are some commonalities between the two sites that could inform the design and implementation of a process for building resilience in coastal communities in Ireland. These commonalities centre on the language of resilience and the capacity for communities to be able to meaningfully engage in processes of building resilience to climate change.

### 6.3.1 *The language of “resilience”*

A key outcome of both case studies is the issue of the lexicon used in the discourse between “experts” and community members. It is interesting to note that the term “resilience” was not used much in the local meetings that we observed. Despite the prevalence of the term “resilience” in research, policy, development plans and industry, the findings from the case studies suggest that it is not particularly useful for engaging local stakeholders in the topic of adapting to climate change. Local stakeholders indicated a preference for five alternative concepts: green, heritage led, regeneration, investment and opportunity. In fact, we regularly received requests throughout the research project to define resilience in both written and verbal communications with stakeholders. When we did provide definitions – partly informed by Irish policy – the term was often perceived as vague and of limited use. This perception can have several negative impacts on identifying potential climate actions at the local level.

First, every actor can interpret resilience differently. In the case of Youghal, we were told in one interview that “if an organisation like IronMan chooses to come here, if Cork County Council can invest so much ... then the town can be called resilient”. Other community members did not necessarily view the investment by IronMan as a boost to local resilience, even if they welcomed the investment and the opportunities that have arisen from it. While investments such as this might have the effect of building resilience, they are typically communicated in a much more pragmatic way by all sides. The same criticisms have been levelled at catch-all terms such as “sustainable development”.

Second, stakeholders tended to interpret resilience as a binary term, that is, that someone or something can be regarded as “resilient” or “not resilient”. This demonstrates the value of viewing resilience as a journey or pathway, rather than an absolute attainment. Moreover, one community group representative pointed out that labelling a town or community as “not resilient” might be regarded as an insult.

To help address understanding of the use of the term “resilience”, the project produced a short brochure that could be used as part of engagement efforts with local community members (Appendix 2).

### 6.3.2 *Requirements for building the local capacity needed to engage with building resilience*

The case studies demonstrated the complexity of engaging communities in building resilience and the challenges of not only engaging the various interest groups that exist within a community but also ensuring that communities have the capacity to engage with the complex policy landscape that is associated with climate change and adaptation and needed to build resilience. These barriers and challenges can be categorised as follows.

#### *Building the capacity needed to engage in horizontal and vertical governance*

Building resilience requires coherence across all dimensions of governance, especially in the context of climate change, which affects all aspects of society, the economy and the environment. A consequence of this for local communities is an overwhelming spectrum of government departments, agencies and other public and private sector interests whose actions and/or responsibilities can impede or facilitate the wishes of communities to both define and enact their vision of resilience (see Figure 3.1). In the absence of a holistic coastal management instrument, there is a need to build forums that link communities and stakeholders and allow them to discuss their learnings and “best practices”, share relevant knowledge and exchange ideas to co-design actions at a local level that will build horizontal cohesion (Smith *et al.*, 2021). Such forums could also facilitate vertical coherence, by providing a single point of contact between communities and agencies from local to national level, including research institutions and the private sector, and empower local communities.

Aligned to a mechanism that provides local communities with the institutional means to engage is giving local communities the opportunity to apply for funding that will allow them to better contribute and engage in governance and policy relating to coasts, climate change, adaptation and resilience.

#### *Comprehension of the knowledge base underpinning climate change and identifying options*

It is difficult for communities to untangle the web of information and criteria that have to be considered and

used to make informed decisions that will enhance their resilience. This is particularly difficult in relation to deciding between options that are associated with different time frames and levels of sustainability. For example, in the context of mitigating coastal erosion and flooding, the “traditional” approaches of hard defences provide relatively quick relief from the problem but are very costly and unsustainable in the longer term, whereas nature-based solutions are more cost effective and sustainable but are slower to provide relief. Another example of something communities must consider is the role of and opportunities and constraints provided by existing policy mechanisms. This is illustrated by the Natura 2000 designations, which can constrain local actions and contradict decisions designed to build resilience.

It is necessary to use a lexicon that is not shrouded in technical language to facilitate communication between all stakeholders (see Appendices 2 and 3), so that the information and requirements contained in policies at all levels, including at the EU level, can be understood by all.

## **6.4 Case Study Conclusion**

Both case studies have exemplified the drive and capacity for local communities to engage with the challenges they face and that compromise their resilience to current and future shocks. Such participation is not limited to climate change but also applies to other pressures that collectively impact on a community’s capacity for sustainable development. Resilience, although a debated term, describes a unifying approach across all development-oriented topics by providing a focus that centres on outcomes and moving from describing the threats faced by communities to describing how they build resilience (Le Tissier and Whyte, 2021).

A key facet of implementing the NAF is to provide structures and mechanisms to empower communities to make change by identifying pathways that will build resilience. The findings of the case studies led to the overarching conclusion that the challenge, therefore, is to develop a means and process that enables and facilitates such engagement among communities founded on an evolving a pathway. An awareness of, and the sequence and timing of, the decisions they need to make (and/or contribute to making) to build future resilience is critical to developing such a pathway.

## 7 Determining Climate-resilient Pathways

While the BCOMAR project focused on resilience to climate change, it is important to remember that achieving this will enhance resilience across all spectrums of society, the economy and the environment. Considering resilience in addressing climate change, and wider sustainable development, provides a conceptual approach that covers the full spectrum of shocks, stresses, disturbances and risks, to reflect the range of risks that might affect a system. The application of resilience pathways recognises societies' choices to address constituent elements that increase their exposure and vulnerability to change over short- and long-term horizons.

Organising the actions of people who fall into different groups, some with shared and others with independent interests, and some with conflicting interests, requires a framework to coordinate and facilitate discourse that will enable the development of climate-resilient pathways (IPCC, 2014). If resilience is a journey or process, it is within the opportunity space that this journey takes place and it is the decision points that determine how this journey takes place. The nature of these decision points – the timing of these and who is involved – is a question of governance; in this case, of how climate action is governed in Ireland. As part of the Fifth Assessment Report of the IPCC, Denton *et al.* (2014) reviewed the transformational changes (human institutions, technological and biological systems, social processes and other) required for climate-resilient pathways in society to achieve sustainable development, stressing the urgent need to act now rather than postponing responses. They state that “[t]he pursuit of climate-resilient pathways involves identifying vulnerabilities to climate change impacts; assessing opportunities for reducing risks; and taking actions that are consistent with the goals of sustainable development” (p. 1112). They emphasise the role of society and our capacity to manage risk and to decrease vulnerability through mitigation, adaptation and decision-making. In response to the question of whether or not there are things that we can be doing now to put us on the right track towards climate-resilient pathways, they respond: “Yes. Climate-resilient pathways begin now, because it is time to consider possible strategies that would

increase climate resilience while at the same time helping to improve human livelihoods and social and economic well-being. Combining these strategies with a process of iterative monitoring, evaluation, learning, innovation, and contingency planning will reduce climate change disaster risks, promote adaptive management, and contribute significantly to prospects for climate-resilient pathways” (p. 1123).

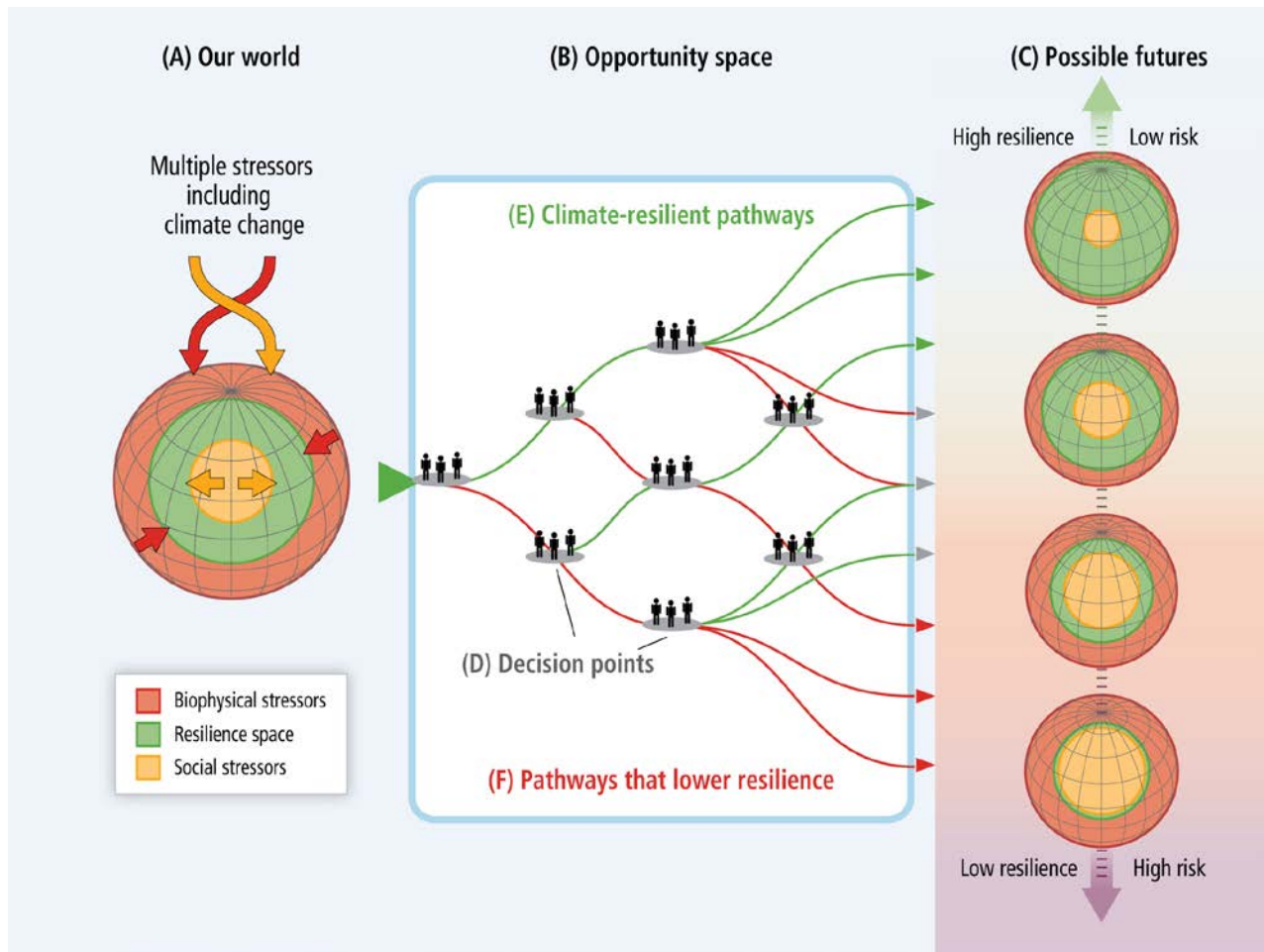
In Ireland, strategies and actions need to be pursued now to move towards climate-resilient pathways for sustainable development, while at the same time helping to improve livelihoods, social and economic well-being, and responsible environmental management. At the national level, transformation is considered most effective when it reflects a country's own visions (e.g. Ireland's Citizens' Assembly on Climate Change: “How the State can make Ireland a leader in tackling climate change”) and approaches to achieving sustainable development in accordance with its national circumstances and priorities.

Transformations towards sustainability are considered to benefit from iterative learning, deliberative processes and innovation, but each of these requires processes or toolkits to be embedded within management structures so that they are implemented effectively and monitored frequently. The case studies provide guidance on how resilience can be employed as an integrating mechanism that will lead to more sustainable outcomes across the social, economic, environment and governance pillars of sustainable development (Hawkes, 2001; Schutte, 2009). It is generally agreed that adaptive capacity for climate change is best developed at the local authority level in Ireland (Falaleeva *et al.*, 2011; Flannery *et al.*, 2015, 2016). Falaleeva *et al.* (2011) provide a useful, detailed analysis of the “governance architecture” (Biermann *et al.*, 2009) for coastal climate adaptation in Ireland. More recent studies support these findings (O'Mahony *et al.*, 2020). Falaleeva *et al.* (2011) also argue that the top-down approach to coastal governance is both a useful and inhibiting characteristic, while also lacking the flexibility necessary for governing CCA.

The IPCC (2014) has proposed that building resilient pathways can provide iterative, continually evolving

processes for managing change within complex systems, to contribute to the goal of sustainable development (Figure 7.1). The climate-resilient pathways approach fits well with outcomes from the literature and legislative analysis and case study outcomes as a means to structure a form of engagement that can help communities to understand their current situation and what needs to happen to

build resilience, what a trajectory towards resilience could look like, and what decisions would need to be made in the course of achieving that resilience. The visualisation in Figure 7.1 supports engagement and discussion with and between stakeholders, so they can analyse decisions made (or not made) and the pathways that have led to more (or less) climate-resilient states. It is a useful way to scrutinise mistakes



**Figure 7.1. Opportunity space and climate-resilient pathways. (A) Our world is threatened by multiple stressors that impinge on resilience from many directions, represented here simply as biophysical and social stressors. Stressors include climate change, climate-variability, land use change, degradation of ecosystems, poverty and inequality, and cultural factors. (B) Opportunity space refers to decision points and pathways that lead to a range of (C) possible futures with differing levels of resilience and risk. (D) Decision points result in actions or failures-to-act throughout the opportunity space, and together they constitute the process of managing of failing to manage risks related to climate change. (E) Climate-resilient pathways (in green) within the opportunity space lead to a more resilient world through adaptive learning, increasing scientific knowledge, effective adaptation and mitigation measures, and other choices that reduce risks. (F) Pathways that lower resilience (in red) can involve insufficient mitigation, maladaptation, failure to learn and use knowledge, and other actions, and they can be irreversible in terms of possible futures. The area of research interest for the BCOMAR project lies within the opportunity space (B) with a focus on decision points (D) that lead to different climate-resilient pathways (E, F). Source: IPCC ([https://www.ipcc.ch/site/assets/uploads/2018/02/WGII\\_AR5\\_FigTS-13.jpg](https://www.ipcc.ch/site/assets/uploads/2018/02/WGII_AR5_FigTS-13.jpg)).**

that were made or opportunities that were missed, as well as actions that proved decisive and beneficial.

To investigate the utility of a climate-resilient pathway approach, the findings from the case studies can be used to explore how decisions taken – and decisions not taken – have affected how resilience has evolved in Irish landscapes in two locations. Although the process of engagement in the challenges faced and the responses described in the case studies were not based on building resilience or resilience pathways, they can be retrospectively analysed and reinterpreted based on the model illustrated in Figure 7.1.

### 7.1 Climate-resilient Pathways for the Maharees

The Maharees community has worked hard to tackle obvious and tangible climate change threats, has mobilised to address challenges and has developed links with other stakeholders including KCC, the NPWS and National University of Ireland (NUI) Galway. Figure 7.2 provides a retrospective analysis of this process of engagement and the activities carried out to address the structural integrity of the tombolo,

and thus community access to and from the peninsula, which had been undermined during extreme weather events. Work has focused on preserving and enhancing the protective sand dunes.

In this case, the community mobilised to install dune fences to prevent the peninsula’s only access road from being blocked. The stressor in this case was the climate, specifically sustained high wind speeds that were blowing sand from the beach over the dunes and onto the road. The MCA met with KCC, the NPWS and coastal scientists based at University of Galway in October 2016. The MCA presented its plan to install dune fences to mitigate sand deposition on the road. The MCA installed the dune fences (purchased by KCC) in April 2017. The road has not been blocked since. The decision point within the opportunity space is represented by the first “stakeholder meeting” in October 2016, which was also the first time the community worked successfully on a single project in partnership with KCC, the NPWS and University of Galway. It is important to recognise that this stakeholder meeting was held on the dunes and, on reflection, the MCC presented two pathways (using different terms) to KCC and the NPWS. The first

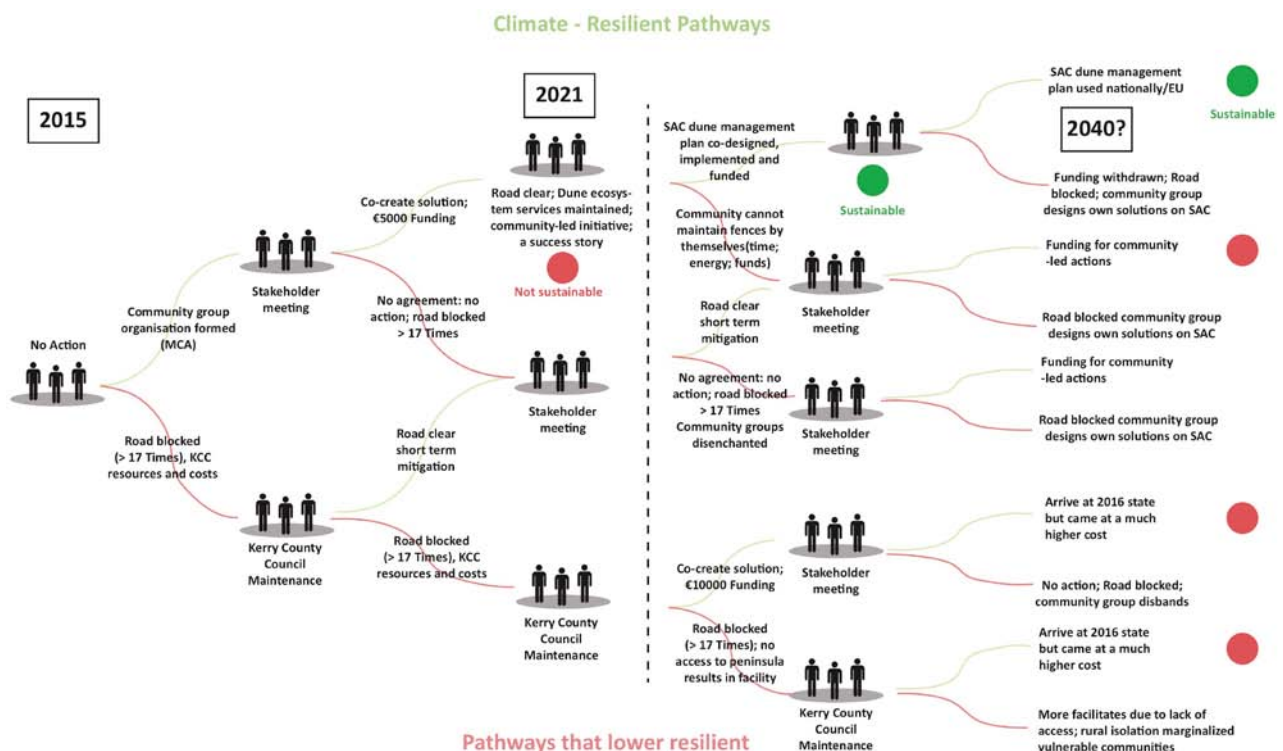


Figure 7.2. Opportunity spaces and climate-resilient pathways for community-led action to mitigate the wind-blown sand hazard in the Maharees, Co. Kerry. The filled red circle labelled “not sustainable” is the current state (2015–2021).

pathway, no action, would have led to continued road blockages and could have – based on the worst-case scenario – eventually led to an avoidable fatality if emergency services could not access the peninsula.

The MCA also illustrated how dune fences could prevent sand deposition on the road and maintain dune ecosystem services. This latter approach was attractive to both KCC (freeing up resources) and the NPWS (dune health maintained), and was subsequently approved and funded (materials only). Although the process did lead to a resilient outcome and illustrated which decisions and pathways should be avoided, the fences have required maintenance by local volunteers since they were first installed (dug out in 2018 and 2019; new fence installed on most seaward side in 2020). The constant need for community action to maintain this solution is neither sustainable nor fair but the community has no other option given the low-resilience, high-risk scenario of no action or non-maintained fences.

By using the climate-resilient pathways approach, it is possible to reinterpret the situation and design options

for a pathway that could lead to a more sustainable outcome that is less of a burden for the local communities of the Maharees (Figure 7.3). This leads to a sustainable model (filled green circle in Figure 7.3) that is based on a pathway where the DHLGH and the NPWS work with KCC and the local community to co-design an SAC site management plan that is fully resourced and includes funds to pay local volunteers to install and maintain these nature-based solutions. Should this pathway not be followed, the approach can be used to predict what pathways might result instead.

In this case, the stressors were reinterpreted as unmanaged human activities (mainly) and chronic shoreline erosion that will lead to dune degradation and significant dune loss. Although the dunes are eroding naturally from winter storms, the dune blowouts caused by human activities will expedite this shoreline retreat and lead to low-resilience, high-risk scenarios. The current state (filled red circle labelled “not sustainable” in Figure 7.3) is based on engagement with the MCA. Their sustained efforts come at a huge price in terms of the resources used and the mental and physical energy expended.

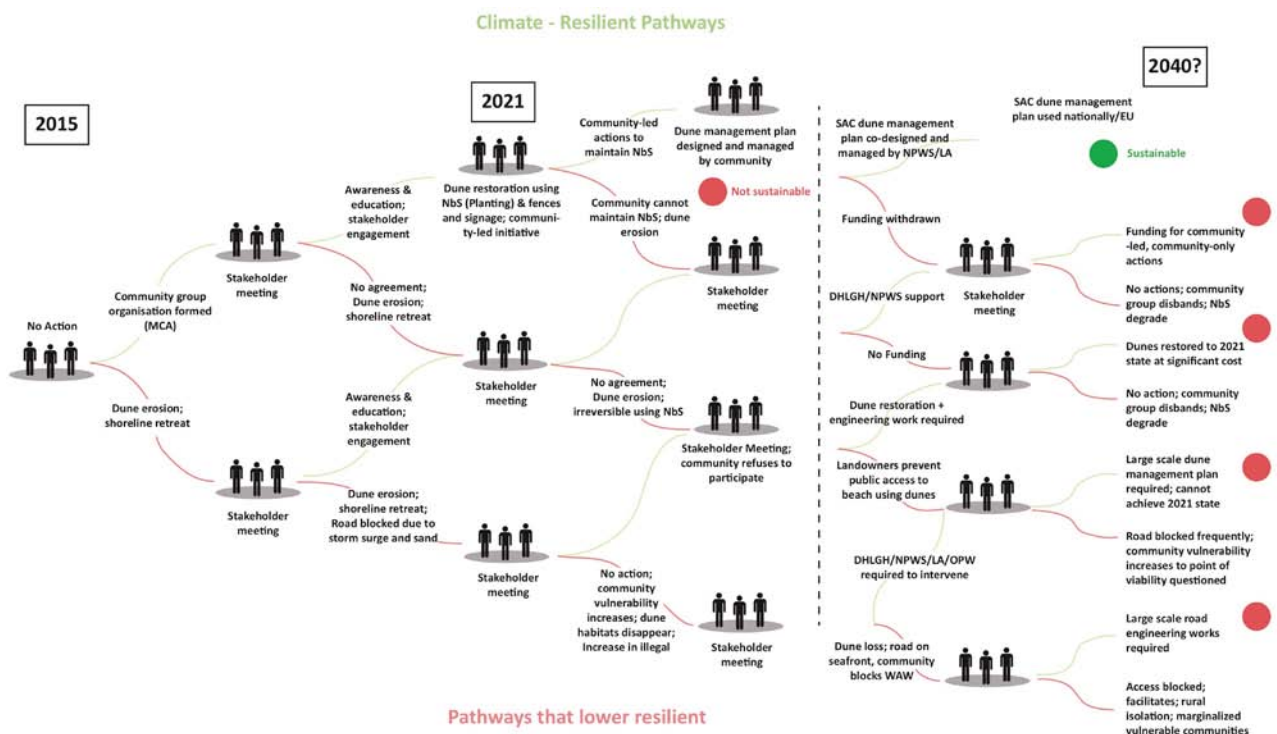


Figure 7.3. Opportunity spaces and climate-resilient pathways for community-led action to mitigate coastal erosion and dune habitat degradation in the Maharees, Co. Kerry. The filled red circle labelled “not sustainable” represents the current state (2015–2021). LA, local authority; NbS, nature-based solution; WAW, Wild Atlantic Way.

## 7.2 Climate-resilient Pathways for Youghal

The example of decisions taken – and of decisions not taken – at the end of the 19th century in Youghal can be reinterpreted in the context of resilience pathways, to better understand the decisions that were made and reflect on what would have happened if alternative decisions had been made (Figure 7.4). The yellow line in Figure 7.4 traces the actual series of events that unfolded. More resilient pathways could have been followed, and enough knowledge existed to do so, but worse, less resilient, choices could also have been made. Unfortunately, procrastination and unwillingness to meet the (pre-emptive, smaller) costs prevailed at times. It is also possible to draw up lists of enablers and barriers that determined how likely it was that certain pathways would have been followed, some of which have also been included in Figure 7.4.

We have found no evidence that the groynes on Claycastle beach have been improved since the flurry of activity at the beginning of the 20th century. In fact, there have been calls in recent times to make these

improvements (O’Riordan, 2018, 2020). However, in Figure 7.4 we have posited some further decisions that could have been taken after the period covered by the report (Allanson-Winn, 1904). This is a useful way to learn from past solutions and past mistakes when pondering possible pathways that modern Youghal could take. It also demonstrates how coastal geomorphology might impact on the feasibility of important assets and activities. In the past, the important asset was a railway line; today, important assets might include the greenway or Eco Boardwalk.

An analysis of the current circumstances and options that face Youghal allows potential resilience pathways to be mapped out (Figure 7.5). We have done this in the context of building resilience to climate change in the town, i.e. by applying a climate “lens”. The ideas presented in Figure 7.5 demonstrate the utility of the resilience pathways approach for stakeholders, giving them a visual tool to explore and discuss possible future scenarios and shed more light on what a more climate-resilient Youghal could look like. These scenarios and the actual decisions made might be

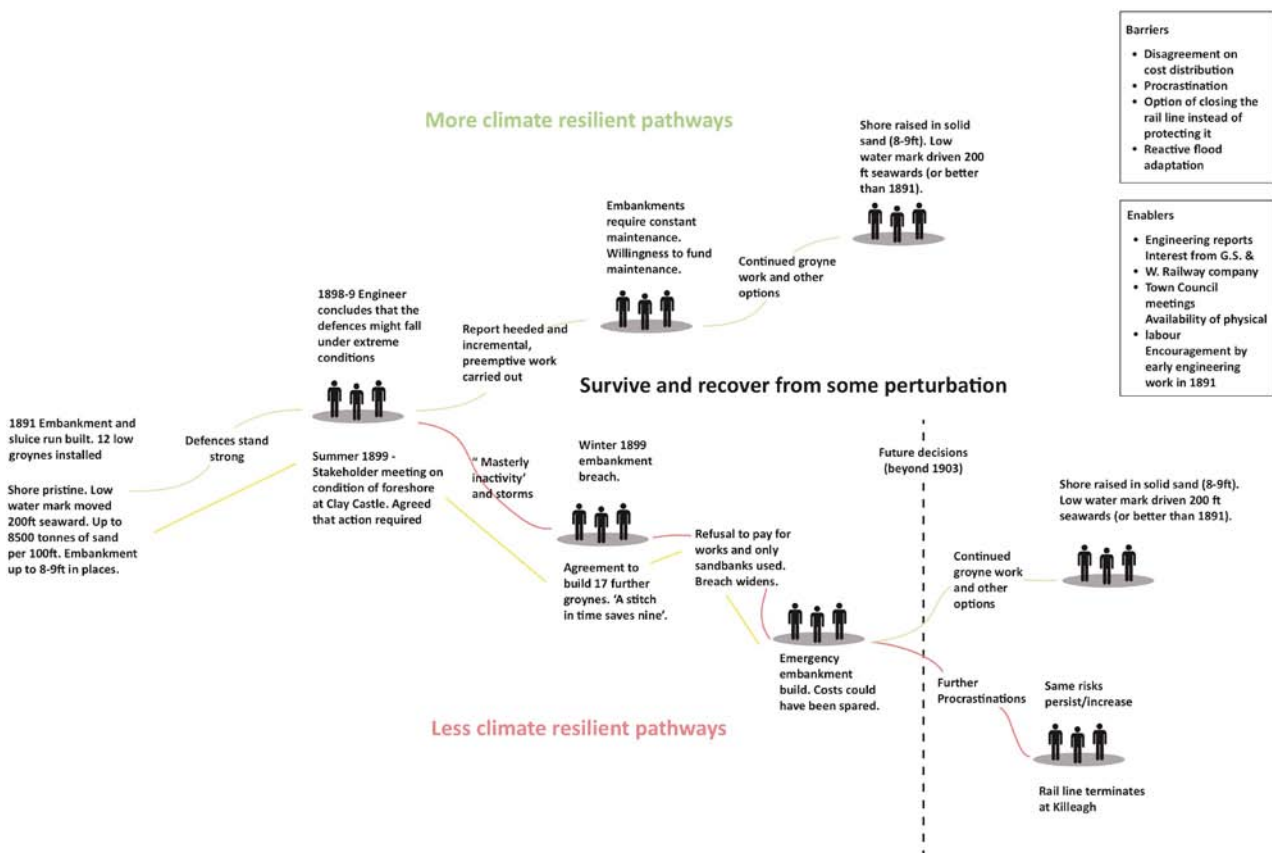


Figure 7.4. Example 1 of resilience pathways in Youghal: decisions taken during coastal embankment breaches in 1899–1903. The yellow line traces the actions and events that occurred.



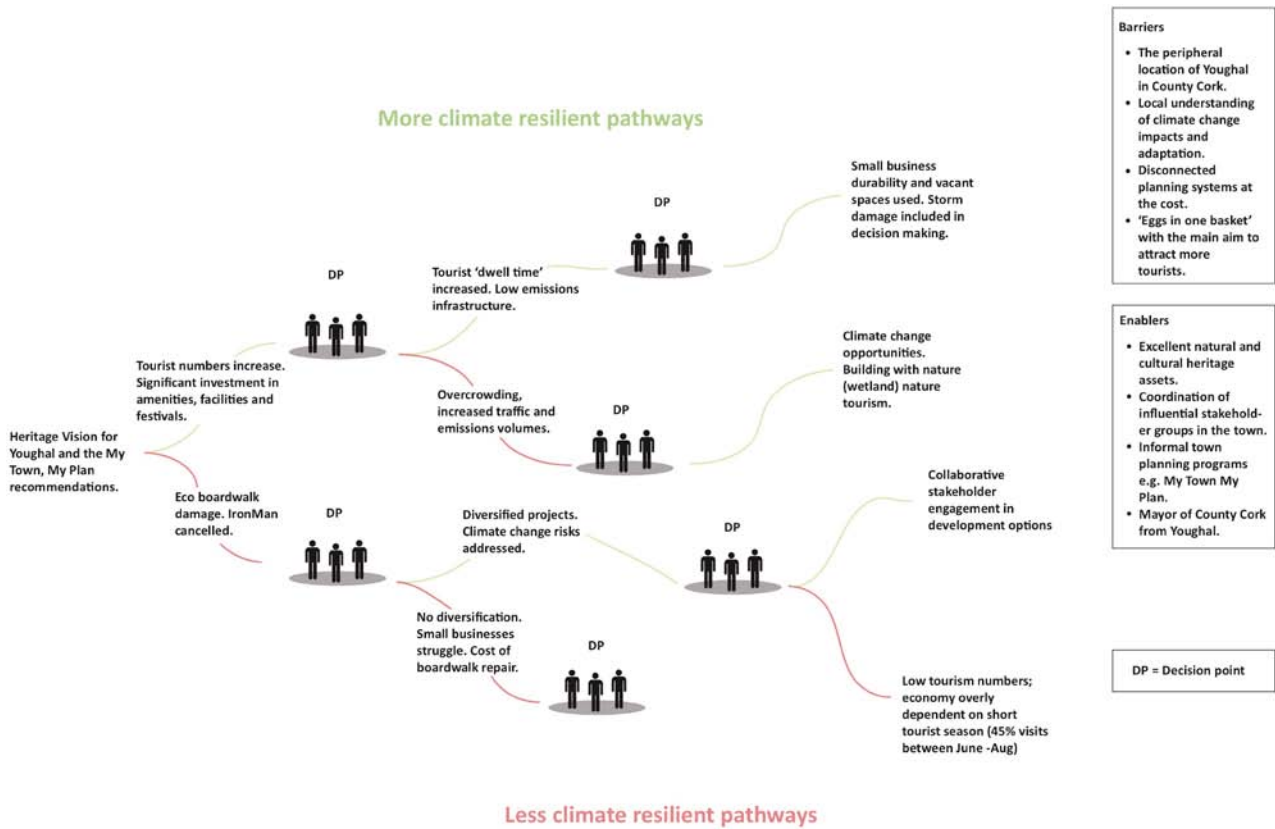


Figure 7.5. Example 2 of pathways from Youghal: choices facing Youghal residents today.

very different in reality; however, a useful experiment would be to explore different future scenarios with local stakeholders in workshops. The results of the

Imagining 2050 and Coastal Communities Adapting Together projects propose how this might be done, including through the increased use of online tools.

## 8 Recommendations and Conclusions

As clearly outlined at the Paris Climate Conference in 2015 (COP21), the international community must do more to build climate resilience through risk-sensitive planning, advancing adaptation, and risk assessment and management at the local, national, subregional and regional levels. Climate resilience has a range of meanings in different contexts and can be interpreted in different ways. At both the European and national levels, the prevailing policy direction is to view resilience as a process and to emphasise the role of local authorities and of providing support to enable communities to build resilience and capacity to adapt to climate change (Centre for Climate and Energy Solutions, 2019).

### 8.1 Challenges for Climate Adaptation and Building Resilience for Coastal Communities

The unique ecosystem processes and extraordinary development pressures within the coastal zone lead to an explicit connection between the status of coastal ecosystems and resilience to climate change (USAID, 2009). Understanding localised vulnerabilities and opportunities in the context of climate and social changes can help to ensure that the significant investment in climate adaptation is used wisely. A persistent challenge in Ireland has been the fragmented management of the coast that, if left unaddressed, will continue to result in the unsustainable management of coastal resources and the increasing vulnerability of coastal communities.

The governance landscape in relation to climate change and climate action is complex (Fitzgerald, 2019), falling within the remit of all government departments and public bodies and affecting all corners of society and the economy and the viability of the environment to provide goods and services that society depends on. However, not all parts of government, society, the economy and the environment will be equally affected by climate change. In fact, some may benefit, leading to a “wicked” problem of winners and losers, especially in the context of policy outcomes (Dolan and Walker,

2006; FitzGibbon and Mensah, 2012; Jakobsson *et al.*, 2018; Levin *et al.*, 2012; Oliver-Smith, 2009).

For coastal communities, this is an overwhelming and daunting landscape to become part of, but it is critical that they do become part of it if they are to play a part in local, regional and national resilience-building and climate action in Ireland. Engagement with coastal communities over the course of the BCOMAR project has identified a number of key institutional barriers that operate at a local level and options – or enablers – for overcoming them (Table 8.1).

A key challenge for the assimilation of information and knowledge in the context of resilience is how to integrate it with other bodies of knowledge. This is difficult, partly because different thematic/topic areas become dominant in the public debate over time and often vie with each other for dominance at any given time. At an international level, the discourse on sustainable development tends to be broken into discrete topic areas, e.g. climate change, biodiversity and health, but the lived experience is the integrated whole, encompassing all topic areas. In practice, what this means is that, at the local level, a focus on a particular topic, to the exclusion of others, can have a detrimental outcome, enhance potential areas of local contestation over priorities and dilute the capacity for communities to act as a cohesive whole. This therefore requires the reorientation of analysis and engagement so that topics such as climate change and adaptation become embedded within a wider discussion of visions for future sustainable development. Engagement with coastal communities over the course of the BCOMAR project has identified a number of key technical barriers that operate at a local level and options – or enablers – for overcoming them (Table 8.2).

The concept of climate-resilient pathways has proven extremely useful for contextualising initiatives in both case study locations to identify, understand and discuss potential solutions for addressing both institutional and technical barriers to climate adaptation, and hence resilience to climate change. The resilience pathways approach provides a framework for discussing the challenges faced by coastal communities, the opportunities that emerge,

**Table 8.1. Identification of institutional barriers at a local level, among coastal communities consulted during the BCOMAR project, and possible solutions for overcoming them**

Area	Institutional barriers	Institutional enablers
Governance of the coast	The multitude of departments and public bodies with a remit for the coastal area have their own governing legislation and policy objectives that do not align with each other (see Figure 3.1).	The National Coastal Change Management Strategy Steering Group (formed in September 2020) can make recommendations on future structures and roles of government departments in dealing with coastal change; the CAROs (formed in 2018) coordinate the actions and regional priorities of local authorities for coastal adaptation.
Legal responsibility for the coast	Local authorities are currently not adequately resourced or, in many cases, do not have jurisdiction to deliver the climate adaptation actions needed to support their organisation or communities to achieve climate resilience.	MAPA provides for a new “nearshore” area, where local authorities will have responsibilities that extend three nautical miles beyond the high water mark.
Coastal stakeholder forum	Unlike some other communities, which have groups that support resilience-building (Local Authority Waters Programme; Irish Uplands Forum; Natura & Hill Farmers Association; Community Wetlands Forum), there is no organised or funded body to support actions to build resilience among coastal communities.	In January 2021, the Coastal Life Collective (CLC) emerged from the MCA network. The CLC comprises over 20 communities in Donegal, Sligo, Mayo, Galway, Clare, Kerry, Cork and Dublin, sharing common challenges on their coasts. The CLC has the potential to grow and link communities to the CAROs or lead to a new forum to address the juxtaposition of higher level (national) priorities and lower level (local) problems and provide access to relevant stakeholder knowledge and funding.
Tourism	Recent successful marketing initiatives by Failte Ireland (e.g. Wild Atlantic Way; Ancient East) are increasing the number of visitors to the coast and also increasing the pressure on socio-ecological systems.	Faillte Ireland’s new development plans for tourism focus on actions to disperse visitors from high-density hotspots (e.g. Youghal and the Maharees, which are easily accessible from Cork city or Dingle) and develop visitor experiences based on environmental awareness. In 2021, Failte Ireland awarded €19 million to 22 locations around Ireland to develop state-of-the-art facilities for outdoor water-based activities to boost the tourist appeal of rural locations.

and how decisions can impact on the ability of coastal communities to survive and recover from some perturbation. The key benefit of the resilience pathways approach is that it does not attempt to prescribe a preferred outcome but rather provides a framework to facilitate engagement across horizontal and vertical dimensions of governance. It also provides a means to explore how the outcomes of other projects, such as *Imagining 2050*<sup>19</sup> and *Coastal Communities Adapting Together*,<sup>20</sup> can apply to coastal communities in Ireland.

## 8.2 Recommendations

Resilience will be achieved through continuous and collaborative engagement between relevant

stakeholders (government, industry, communities and individuals). The National Dialogue on Climate Action<sup>21</sup> has been designed to actively engage stakeholders and empower communities at a local level. The application of resilience pathways provides a framework to structure such engagement within and across stakeholder groups and lends itself to a workshop setting (Appendix 3). This contributes to creating an aspiration to build long-term resilience and CCA, as outlined in the NAF and National Planning Framework.

The resilience pathways approach is a highly visual and collaborative process for engaging with local communities and government departments and agencies to identify key vulnerabilities to climate change impacts and to assess opportunities for

19 <https://www.ucc.ie/en/imagining2050/> (accessed 9 September 2022).

20 <https://www.ccatproject.eu/> (accessed 9 September 2022).

21 <https://www.gov.ie/en/publication/4bf2c-national-dialogue-on-climate-action-ndca/> (accessed 9 September 2022).

**Table 8.2. Identification of technical barriers at a local level, among coastal communities consulted during the BCOMAR project, and possible solutions for overcoming them**

Area	Technical barriers	Technical enablers
Climate adaptation	In March 2021, the Irish government approved the Climate Action and Low Carbon Development (Amendment) Bill 2020, putting Ireland on the path to net-zero emissions by 2050. This emerged from the NMP as part of CALCDA 2015. The NAF was also part of this Act but is being implemented much more slowly as a result of confusion about what adaptation actions are to be considered and how they will be measured.	In 2021, the Climate Change Advisory Council Adaptation Committee (formed in 2016) started a review of how adaptation can be achieved and measured within coastal communities. A 2021 EPA report identified a suite of 127 indicators for measuring, monitoring, tracking and communicating climate resilience in Ireland (Flood <i>et al.</i> , 2021).
Funding	Ireland requires a comprehensive coastal asset inventory to identify and value the natural capital and the ecosystem services provided by its coastal margins across the full range of services (cultural and recreation, provisioning, regulatory and supporting). This step can highlight the value for money of capital investments in these locations.	Outcomes reported in Norton <i>et al.</i> (2018) and O’Fatharta (2019) on valuing Ireland’s coastal, marine and estuarine ecosystem services and blue ecosystem services can be advanced and extended to include terrestrial coastal ecosystems.
Environmental designation	The management of Natura 2000 sites is viewed by communities as “preservation” and not as “conservation”, leading to the chronic degradation and disappearance of priority habitats and the exclusion of communities in co-managing these areas.	Ireland has a template for Natura 2000 site management plans, drafted in the late 1990s by Dúchas, the Heritage Service, but this has never been implemented for varying reasons. New plans can engage with the dynamic, socio-economic, cultural and regional aspects of site management as described in the BCOMAR case studies.
Lexicon of climate resilience and sustainability	Despite the prevalence of the term “resilience” in research, policy and development plans, the findings from the case studies suggest that it is not particularly useful for engaging local stakeholders on the topic of adapting to climate change. The term is vague, ambiguous and, potentially, contentious.	There is real value in viewing resilience as a journey or pathway, rather than as an absolute attainment. There is also a preference to use alternative concepts in discussions when engaging with communities, e.g. green, heritage led, regeneration, investment or opportunity.
Coastal erosion and flooding	Coastal erosion and flooding are critical factors in the vulnerability of coastal communities. Nature-based solutions offer potential in many locations, and local communities have shown willingness to engage in these actions. Currently, information is lacking on best practice, government support structures (responsibility and funding) and permissions (e.g. on what can be done and where).	In May 2021, the Atlantic Seaboard North CARO facilitated a report by Natural Capital Ireland (2021) on nature-based solutions workshops delivered to five local authorities (Donegal, Galway City, Galway County, Mayo, Sligo). The case studies show that community-led and group-led nature-based solutions can reduce flood and erosion risks. In 2021, the OPW engaged with the BCOMAR project and has shown a willingness to consider nature-based solutions within their remit for the Minor Flood Mitigation Works and Coastal Protection Scheme.
Seasonal tourism	Local communities do not have appropriate infrastructure, services and facilities to host visitors during the peak summer tourist season. Short- and long-term tourism strategies lack sustainability imperatives and consideration of environmental and community viability. Key resources might include clear signage (on parking, facilities, environmental education, code of conduct), litter wardens, dog wardens, environmental or biodiversity officers, and Gardaí. Gaining access to these resources is currently very challenging because of the frameworks of funding and enforcement in which they operate.	Many communities around Ireland are engaging with local authorities in relation to beach access facilities, traffic management and enhanced enforcement activity. In 2021, An Taisce considered the potential for the long-term development of a seasonal beach steward programme that would complement their existing efforts in relation to Clean Coasts and Flag Award Beaches and would be implemented in partnership with local authorities, e.g. alongside the lifeguard programmes. The beach steward programme could play a role in education, visitor experiences and enforcement.

reducing risk. The resilience pathways shown in Figures 7.2–7.5 present a series of options based on community engagement that illustrate how decision points within opportunity spaces can lead to states of higher (or lower) resilience and lower (or higher) risk. Such an approach prompts discussions on past and future actions in relation to a particular threat or opportunity and makes the connections between agents, systems and institutions needed to build resilience, as outlined by Moench (2014). The approach can provide a vehicle to help overcome barriers to the participation of local communities in climate action, adaptation and resilience-building, namely by:

- providing a forum to bring all the relevant stakeholders together to address the challenges that climate change brings to coastal and marine management;
- providing a structure for discussing knowledge gaps in coastal science, policy, governance and management, and for placing these in the context of the process and decisions required to build resilience;
- building consensus, and recognising departures from consensus, in relation to preferred futures and possible pathways for addressing different interests and priorities within and between the multiple stakeholder groups from the public, private and wider societal sectors.

### **8.3 Conclusions**

Employing the resilience pathways approach will help to address the concerns and challenges identified in the literature and policy review carried out during this project, and also the concerns of and challenges identified by the local coastal communities, local authorities and CAROs, and the project steering committee. The resilience pathways approach will help to:

- Build effective local capacity (in the short and long terms): although engaged actors from all stakeholder groups have a sophisticated appreciation of the challenges of climate change, they do not have the framework needed within any forums to structure and discuss their knowledge, exchange new knowledge and enhance existing capacity.

- Chart progress on building resilience: when mapped out visually, the pathways can be used to chart progress or identify where improvements can be made. They can also help to identify decision points with more and less resilient outcomes and encourage group learning.
- Build consensus on what constitutes “climate resilience”: at any level, the acceptance of a pathway towards a preferred state of future resilience will involve a negotiation process and compromises within and between different stakeholder groups. Tied to this is the need for agreement on the measures (indicators) that will be used to monitor progress and to identify deviations from preferred pathways. This provides the opportunity to use resilience indicators (Flood *et al.*, 2021b) to both identify pressures on and threats to resilience and monitor the effectiveness of measures designed to regain resilience.
- Facilitate forums for discussion between national-, regional- and local-level stakeholders: such discussions can address the relationship between and juxtaposition of higher level priorities and lower level (local) problems. This can build clarity on roles and responsibilities across and between levels of governance, as well as on the most appropriate courses of action to take, for instance on the use of grey versus green (e.g. using nature-based solutions) coastal defences.
- Enable access to funding and other resource opportunities: this would allow the willingness of communities to engage and share their learning, present “best practices”, build a relevant knowledge base and exchange ideas to be exploited, and enable them to take action locally. This approach can remove multiple barriers preventing or stalling community-led actions and hasten the implementation of the NAF.
- Build consistent and persistent links between the goals of society and the economy and environmental concerns: these links are needed to support resilience to climate change. For instance, the Atlantic Maritime Strategy (Atlantic Action Plan 2.0) recommends that “marine and coastal habitats should be preserved and valorised, notably with the view to develop new forms of maritime and coastal tourism... and biodiversity preservation should be the guiding principles to develop more sustainable practices that benefit local development and local employment all

over the year” (EC, 2020, p. 8). This approach will support and provide a platform for outcomes reported in Norton and Hynes (2018), Norton *et al.* (2018) and O’Fatharta (2019) for valuing Ireland’s coastal, marine and estuarine ecosystem services, with the caveat that the focus on blue ecosystem services be extended to include terrestrial coastal ecosystems.

That climate change will have irrevocable impacts on society, the economy and the environment is beyond question (IPCC, 2022). In the context of

resilience, this means that coastal communities need to develop a shared understanding of what they need to be resilient to and design a plan for implementing the transformations needed to overcome the risks and the vulnerabilities climate change presents. The climate resilience pathways framework of the IPCC (2014) adapted in this study presents ideas for mobilising the large numbers of actors and resources required for CCA. The objective is to understand local vulnerabilities and begin to make the connections between the agents, systems and institutions needed to build resilience, as outlined by Moench (2014).

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# Abbreviations

<b>BCOMAR</b>	Building Coastal and Marine Resilience in Ireland
<b>CALCDA</b>	Climate Action and Low Carbon Development Act
<b>CARO</b>	Climate Action Regional Office
<b>CCA</b>	Climate change adaptation
<b>CLAD</b>	Coastal Climate Adaptation in Ireland
<b>CLC</b>	Coastal Life Collective
<b>COP21</b>	21st Conference of the Parties
<b>DMAP</b>	Designated maritime area plan
<b>EIA</b>	Environmental Impact Assessment
<b>EPA</b>	Environmental Protection Agency
<b>ICZM</b>	Integrated coastal zone management
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>KCC</b>	Kerry County Council
<b>MAC</b>	Maritime area consent
<b>MAPA</b>	Maritime Area Planning Act 2021
<b>MCA</b>	Maharees Conservation Association
<b>MPPS</b>	Marine planning policy statement
<b>MSFD</b>	Marine Strategy Framework Directive
<b>MSP</b>	Maritime spatial planning
<b>NAF</b>	National Adaptation Framework
<b>NbS</b>	Nature-based solution
<b>NHA</b>	National Heritage Area
<b>NMP</b>	National Mitigation Plan
<b>NMPF</b>	National Marine Planning Framework
<b>NPWS</b>	National Parks & Wildlife Service
<b>NUI</b>	National University of Ireland
<b>OMPP</b>	Overarching marine planning policy
<b>OPW</b>	Office of Public Works
<b>PAF</b>	Prioritised Action Framework for Natura 2000
<b>SAC</b>	Special Area of Conservation
<b>SDG</b>	Sustainable Development Goal
<b>SEA</b>	Strategic Environmental Assessment
<b>SPA</b>	Special Protection Area
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>YSEDG</b>	Youghal Socio-economic Development Group



# Appendix 1 Youghal Community Survey

In addition to examining official flood data, we also engaged with local residents on the topic of climate change risks in Youghal. Given the challenges of arranging in-person workshops during the Covid-19 pandemic, we decided that an anonymous digital survey would be the most appropriate way to gather this information. We produced a survey using the Google Forms platform and the questions were divided into the following sections: understanding climate change; looking ahead; and about you (basic information that could not be used to identify individuals). The survey was distributed through Youghal social media sites, including Facebook, and the website of the Community Development Resource Centre. We advertised this research through an interview on the very popular radio station Community Radio Youghal (CRY). For reasons of data protection and in accordance with the UCC's ethical guidelines, we restricted participation to those aged 18 or older. We received 40 responses to the survey. This low number was partly down to timing, with the survey being announced in the early stages of the Covid-19 pandemic.

The majority of respondents to the survey believed that the climate in Youghal is changing, but with varying degrees of certainty (Figure A1.1A). Fifteen per cent (of the 40 respondents) subsequently stated that climate change is a top priority (our highest category) for the town, with a large majority (72.5%) agreeing that they were "very concerned" about the issue (Figure A1.1B). A further 10% were "concerned". More specifically, we asked respondents about the impacts of climate-related risks (Figure A1.1C). More than 30 respondents (out of the 40 in total) believed that climate change has impacted their environment in any number of six key ways: (1) flooding from rainfall, (2) flooding from storm surge, (3) coastal erosion, (4) wind damage, (5) extreme cold and (6) extreme heat. Wind damage and flooding from rainfall were regarded as the most frequently occurring climate-related risks. Based on these impacts, there was overwhelming support to "act now" on climate change, with 32.5% suggesting that action should take precedence over other local needs and 60% supporting action that is balanced with addressing other local needs. Building resilience in Youghal might be best encouraged in the context of existing local challenges, and perhaps in existing discussion groups.

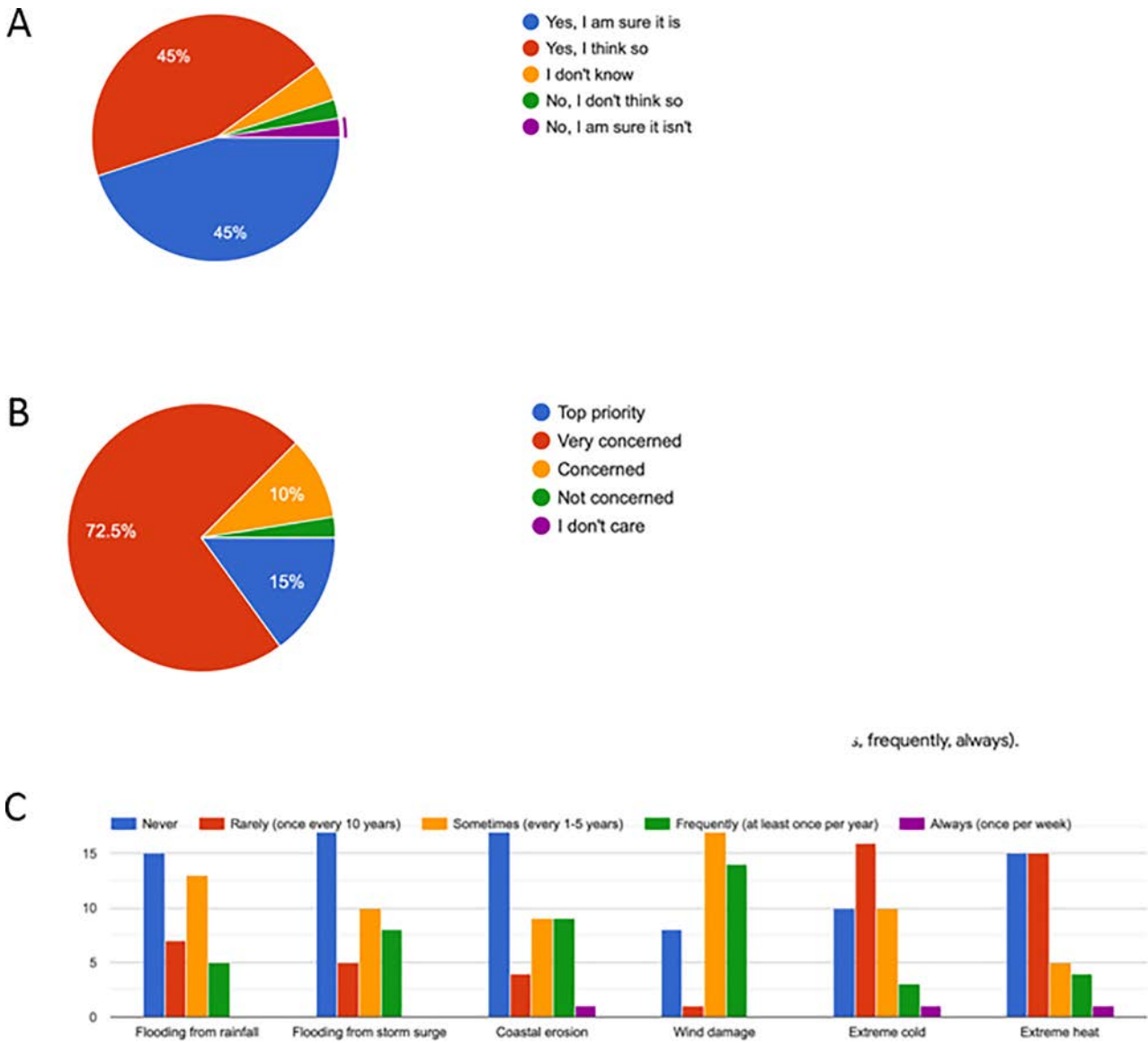


Figure A1.1. Responses to the following questions in the Youghal community survey. A. Do you think the climate in Youghal is changing? B. How concerned are you about the impacts of climate change? C. Have you ever been impacted by the following climate-related risks: flooding from rainfall, flooding from storm surge, coastal erosion, wind damage, extreme cold, extreme heat?

## Appendix 2 Informatic Explaining the Concept of Resilience



### THE ISSUE OF CLIMATE CHANGE FOR YOUGHAL

You may have heard terms such as **risk**, **adaptation** and **resilience** used when talking about climate change. This informatic explains what these terms involve in practice for you, your family and community and how you think about climate change and what it means for you.

#### SO WHAT'S IT ALL ABOUT?

In August this year an international report was published that said that climate change was already happening causing changes, including sea level rises, melting polar ice and glaciers, heatwaves, floods and droughts. These changes are leading now, and continuing into the future, inevitable and irreversible more extreme and widespread weather events. We have seen this through the flooding in Germany, Switzerland, Belgium and the Netherlands just this summer.

#### SO WHAT DOES THIS MEAN FOR IRELAND?

Also in August this year, Ireland's Environmental Protection Agency published a 2020 Climate Status report that said that Ireland is getting warmer and wetter due to climate change, meaning more extreme weather events such as drought and flooding. Around our coasts, sea levels around Ireland have risen by approximately 2-3mm per year since the early 1990s meaning more coastal erosion and flooding are likely.

#### SO WHAT'S THE DEAL FOR ME?

This means everyone from individuals, families, communities and the country have to start thinking about how they are going to cope with changes that are now real and happening – at the coast, how do we ensure that our towns and cities do not get flooded, how do we ensure that our road and rail infrastructure is going to stay good and how are we going to deal with extreme rainfall, sea flooding and storm surges as well as coastal erosion? And if any of these things happen, will I be able to deal with it?

We need a "more aggressive approach to the problem i.e. more public meetings to make the people aware of the problems we are facing" so that we can "work together and not separate, as members of the Youghal Blue & Green Community Network".

#### HOW DO WE PREPARE?

Questions that individuals, families and communities need to ask in order to determine whether they are 'climate change ready' are:

**What is at risk?** = What we have that is vulnerable to change? Does that matter to us if it were lost/damaged?

**Is adaptation possible?** = If things change, can we cope? Would we be able to deal with and overcome the pressure change would bring to us?

**Do I/we have resilience to climate change?** = Are we able to cope with the changes and/or can make changes to the way we do things and make changes to the things we have?

**Do we have resilience to climate change?** = Are we able to cope with the changes and/or can make changes to the way we do things and make changes to the things we have?

“We can increase coastal defences but that is a stopgap measure, we could try to address climate change more forcefully” so that “flood protection should not be band aid fixes. A sustainable long term flood plan needs to be made.

**If it is possible to answer these questions, then....** If we are so that we are either able to carry on our lives as before or modify our lives in a way that we can accept the things that are different, then we are resilient to climate change.

The BCOMAR project carried out a survey to try and find out where the residents Youghal were in regard to the issue of climate change and how resilient they were. The results told us that:

### HOW CONCERNED ARE THE RESIDENTS OF YOUGHAL ABOUT CLIMATE CHANGE?

- 9 in 10 residents in Youghal have experienced a change in weather that they attribute to climate change and that this is concerning and a priority.
- The changes most often cited as impacting on people were wind and flooding damage with coastal erosion, sea levels, storm intensity and frequency as well as habitat loss also identified.
- Residents identified the beaches and board walk as well as other environmental features such as the mudlands and greenways as well as roads as most threatened.
- Interesting assets associated with safety and quality of life, such as the fire station, waste treatment were considered less of a concern whilst shops and property were considered important especially in the context of flooding.
- More than 9 in 10 Residents believe these changes should be accounted for as part of local needs assessment and local planning?

### DO THE RESIDENTS OF YOUGHAL THINK ANYTHING CAN BE DONE ABOUT CLIMATE CHANGE?

- Resident are split roughly 50:50 when it comes to thinking if climate change can be dealt with.
- Those who think something can be done are focussed on building flood defences, awareness raising and changing planning regulations and guidelines.
- 6 in 10 think that planning related to coastal history and culture – one of the towns best future opportunities – is poor with not enough resources (people and funding) committed to promoting the opportunities for Youghal to develop a distinct identify and sustainable future.

### RECOMMENDATIONS RE NEXT STEPS:

We will hold workshops with key stakeholder groups to explore their preferred future and build pathways to achieve that future.

MaREI will help facilitate a planning process, to enable workshops and develop communication materials to explain the process



# Appendix 3 Informatic for Community Workshops



## YOUGHAL COMMUNITY WORKSHOPS FOR BUILDING CLIMATE RESILIENCE

### WHAT IS RESILIENCE TO CLIMATE CHANGE?

Climate change poses a significant risk threatening the lives and livelihoods of people. These risks cannot be reduced to zero and individuals, communities, businesses and government must learn to cope with the consequent changes. Climate resilience is the ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate. Improving climate resilience involves assessing how climate change will create new, or alter current, climate-related risks, and taking steps to better cope with

### WHY CLIMATE RESILIENCE MATTERS?

When an asset or service is impacted by climate change it can become affected to the extent that it drops below a tipping point whereupon existing processes are unable to recover it back to its original level and a permanent loss will be experienced. Building resilience can raise the threshold where an asset or service will become affected by climate change and / or make recovery processes more robust such that they are able to recover to their original condition.

### WHAT WILL CLIMATE RESILIENCE ACHIEVE?

If we become resilient to climate change, then we will have achieved:

1. Financial, technical and institutional foundations that allow us to develop to a safer and more secure future that is flexible to known and unknown changes and challenges.
2. Individuals, communities, public and private sectors that have the right support mechanisms to achieve their development goals.
3. Understanding of how land use and infrastructure needs to be planned to be resistant to change.
4. The ability to 'bounce back' from shocks when they do occur.
5. Coping strategies across social, economic and environmental features of our local landscape.
6. Understanding on how to monitor progress towards resilience and strategies to adapt to unforeseen changes.

### WHAT IS THE PROCESS FOR BUILDING RESILIENCE?

Building resilience means improving conditions to what we have and the way we do things so that our social, economic and environmental systems can accommodate future disruptions. The process is often presented as a series of steps as shown.



For this step process to work it is important that communities:

1. Discuss and understand what their existing 'resilience status' is today,
2. Discuss and agree what would be (i) a preferred, (ii) acceptable and (iii) unacceptable future options with projected changes in climate change and climate-related hazards, and
3. Are able to identify the steps and decisions that will need to be made in order to move from the situation today to preferred and acceptable future options, whilst avoiding the unacceptable option.

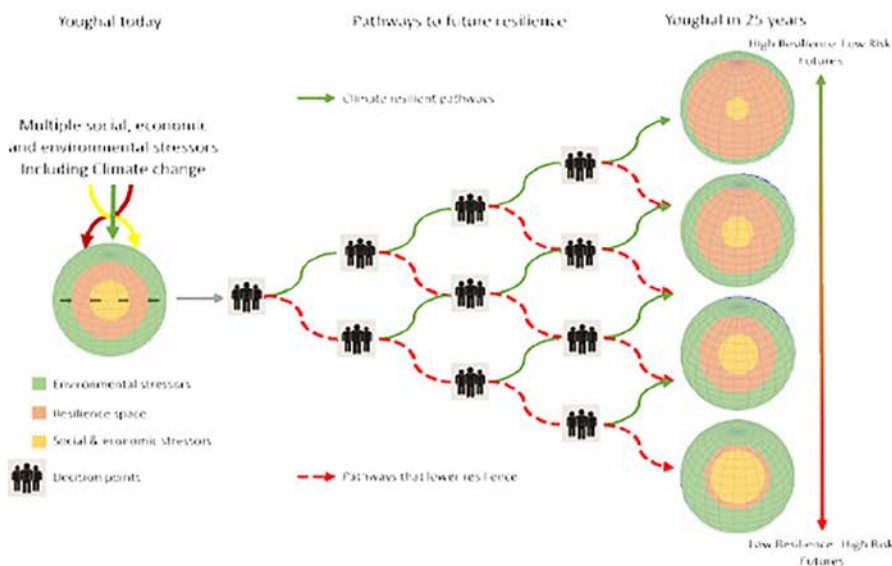
## WORKSHOPS FOR BUILDING COMMUNITY RESILIENCE

The workshop activity that is planned is designed to provide a practical setting for you to be able to discuss with others how you assess your current resilience, how that resilience may become compromised by climate change and how you can relieve any adverse impacts to your and your community's resilience.

The structure of the workshop is based on 3 simple questions:

1. Where are we at in terms of our current resilience to climate induced change?
2. What would we think would describe our resilient position to the anticipated climate changes in 25 years time?
3. What are the decisions that need to be made, and in which order do they need to be made, in order to progress from the level of resilience we have today to the level of resilience we need in the future?

This process that will be followed in the workshops is shown in the diagram below.



Communities in Youghal, like elsewhere, are threatened by multiple stressors that impact on our resilience to climate change. Our current levels of resilience may not be adequate to the changes happening now, and also ones that may happen in the future. Mapping out pathways to future resilience provides us the opportunity to think about decisions that may need to be taken and what the implications of those decisions may be on managing the risks that climate change brings and enhancing or decreasing the level of resilience we need to adapt to the anticipated situation that climate change may impose on our communities, economy and environment in the future.



# An Gníomhaireacht Um Chaomhnú Comhshaoil

Tá an GCC freagrach as an gcomhshaoil a chosaint agus a fheabhsú, mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaoil a chosaint ar thionchar díobhálach na radaíochta agus an truaillithe.

## Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

**Rialáil:** Rialáil agus córais chomhlíonta comhshaoil éifeachtacha a chur i bhfeidhm, chun dea-thorthaí comhshaoil a bhaint amach agus díriú orthu siúd nach mbíonn ag cloí leo.

**Eolas:** Sonraí, eolas agus measúnú ardchaighdeán, spriocdhírthe agus tráthúil a chur ar fáil i leith an chomhshaoil chun bonn eolais a chur faoin gcinnteoireacht.

**Abhcóideacht:** Ag obair le daoine eile ar son timpeallachta glaine, táirgiúla agus dea-chosanta agus ar son cleachtas inbhuanaithe i dtaobh an chomhshaoil.

## I measc ár gcuid freagrachtaí tá:

### Ceadúnú

- > Gníomhaíochtaí tionscail, dramhaíola agus stórála peitрил ar scála mór;
- > Sceitheadh fuíolluisce uirbigh;
- > Úsáid shrianta agus scaoileadh rialaithe Orgánach Géinmhodhnaithe;
- > Foinsí radaíochta ianúcháin;
- > Astaíochtaí gás ceaptha teasa ó thionscal agus ón eitlíocht trí Scéim an AE um Thrádáil Astaíochtaí.

### Forfheidhmiú Náisiúnta i leith Cúrsaí Comhshaoil

- > Iniúchadh agus cigireacht ar shaoráidí a bhfuil ceadúnas acu ón GCC;
- > Cur i bhfeidhm an dea-chleachtais a stiúradh i ngníomhaíochtaí agus i saoráidí rialáilte;
- > Maoirseacht a dhéanamh ar fhreagrachtaí an údaráis áitiúil as cosaint an chomhshaoil;
- > Caighdeán an uisce óil phoiblí a rialáil agus údaruithe um sceitheadh fuíolluisce uirbigh a fhorfheidhmiú
- > Caighdeán an uisce óil phoiblí agus phríobháidigh a mheasúnú agus tuairisciú air;
- > Comhordú a dhéanamh ar líonra d'eagraíochtaí seirbhíse poiblí chun tacú le gníomhú i gcoinne coireachta comhshaoil;
- > An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaoil.

### Bainistíocht Dramhaíola agus Ceimiceáin sa Chomhshaoil

- > Rialacháin dramhaíola a chur i bhfeidhm agus a fhorfheidhmiú lena n-áirítear saincheisteanna forfheidhmithe náisiúnta;
- > Staitisticí dramhaíola náisiúnta a ullmhú agus a fhoilsiú chomh maith leis an bPlean Náisiúnta um Bainistíocht Dramhaíola Guaisí;
- > An Clár Náisiúnta um Chosc Dramhaíola a fhorbairt agus a chur i bhfeidhm;
- > Reachtaíocht ar rialú ceimiceáin sa timpeallacht a chur i bhfeidhm agus tuairisciú ar an reachtaíocht sin.

### Bainistíocht Uisce

- > Plé le struchtúir náisiúnta agus réigiúnacha rialachais agus oibriúcháin chun an Chreat-treoir Uisce a chur i bhfeidhm;
- > Monatóireacht, measúnú agus tuairisciú a dhéanamh ar chaighdeán aibhneacha, lochanna, uiscí idirchreasa agus cósta, uiscí snámha agus screamhuisce chomh maith le tomhas ar leibhéal uisce agus sreabhadh abhann.

### Eolaíocht Aeráide & Athrú Aeráide

- > Fardail agus réamh-mheastacháin a fhoilsiú um astaíochtaí gás ceaptha teasa na hÉireann;
- > Rúnaíocht a chur ar fáil don Chomhairle Chomhairleach ar Athrú Aeráide agus tacaíocht a thabhairt don Idirphlé Náisiúnta ar Gníomhú ar son na hAeráide;

- > Tacú le gníomhaíochtaí forbartha Náisiúnta, AE agus NA um Eolaíocht agus Beartas Aeráide.

### Monatóireacht & Measúnú ar an gComhshaoil

- > Córais náisiúnta um monatóireacht an chomhshaoil a cheapadh agus a chur i bhfeidhm: teicneolaíocht, bainistíocht sonraí, anailís agus réamhaisnéisiú;
- > Tuairiscí ar Staid Thimpeallacht na hÉireann agus ar Tháscairí a chur ar fáil;
- > Monatóireacht a dhéanamh ar chaighdeán an aeir agus Treoir an AE i leith Aeir Ghlain don Eoraip a chur i bhfeidhm chomh maith leis an gCoinbhinsiún ar Aerthruailliú Fadraoin Trasteorann, agus an Treoir i leith na Teorann Náisiúnta Astaíochtaí;
- > Maoirseacht a dhéanamh ar chur i bhfeidhm na Treorach i leith Torainn Timpeallachta;
- > Measúnú a dhéanamh ar thionchar pleananna agus clár beartaithe ar chomhshaoil na hÉireann.

### Taighde agus Forbairt Comhshaoil

- > Comhordú a dhéanamh ar ghníomhaíochtaí taighde comhshaoil agus iad a mhaoiniú chun brú a aithint, bonn eolais a chur faoin mbeartas agus réitigh a chur ar fáil;
- > Comhoibriú le gníomhaíocht náisiúnta agus AE um thaighde comhshaoil.

### Cosaint Raideolaíoch

- > Monatóireacht a dhéanamh ar leibhéal radaíochta agus nochtadh an phobail do radaíocht ianúcháin agus do réimsí leictreamaighnéadacha a mheas;
- > Cabhrú le pleananna náisiúnta a fhorbairt le haghaidh éigeandálaí ag eascairt as tasmí núicléacha;
- > Monatóireacht a dhéanamh ar fhorbairtí thar lear a bhaineann le saoráidí núicléacha agus leis an tsábháilteacht raideolaíochta;
- > Sainseirbhísí um chosaint ar an radaíocht a sholáthar, nó maoirsiú a dhéanamh ar sholáthar na seirbhísí sin.

### Treoir, Ardú Feasachta agus Faisnéis Inrochtana

- > Tuairisciú, comhairle agus treoir neamhspleách, fianaise-bhunaithe a chur ar fáil don Rialtas, don tionscal agus don phobal ar ábhair maidir le cosaint comhshaoil agus raideolaíoch;
- > An nasc idir sláinte agus folláine, an geilleagar agus timpeallacht ghlan a chur chun cinn;
- > Feasacht comhshaoil a chur chun cinn lena n-áirítear tacú le hiompraíocht um éifeachtúlacht acmhainní agus aistriú aeráide;
- > Tástáil radóin a chur chun cinn i dtithe agus in ionaid oibre agus feabhsúchán a mholadh áit is gá.

### Comhpháirtíocht agus Líonrú

- > Oibriú le gníomhaireachtaí idirnáisiúnta agus náisiúnta, údaráis réigiúnacha agus áitiúla, eagraíochtaí neamhrialtais, comhlachtaí ionadaíochta agus ranna rialtais chun cosaint comhshaoil agus raideolaíoch a chur ar fáil, chomh maith le taighde, comhordú agus cinnteoireacht bunaithe ar an eolaíocht.

## Bainistíocht agus struchtúr na Gníomhaireachta um Chaomhnú Comhshaoil

Tá an GCC á bainistiú ag Bord lánaimseartha, ar a bhfuil Ard-Stiúrthóir agus cúigear Stiúrthóir. Déantar an obair ar fud cúig cinn d'Oifigí:

1. An Oifig um Inbhuanaitheacht i leith Cúrsaí Comhshaoil
2. An Oifig Forfheidhmithe i leith Cúrsaí Comhshaoil
3. An Oifig um Fhianaise agus Measúnú
4. An Oifig um Chosaint ar Radaíocht agus Monatóireacht Comhshaoil
5. An Oifig Cumarsáide agus Seirbhísí Corparáideacha

Tugann coistí comhairleacha cabhair don Gníomhaireacht agus tagann siad le chéile go rialta le plé a dhéanamh ar ábhair inmí agus le comhairle a chur ar an mBord.

## EPA Research

**Webpages:** [www.epa.ie/our-services/research/](http://www.epa.ie/our-services/research/)

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