

Sustainable and Holistic Management of Irish Ports (SHIP)

Authors: Wesley Flannery, Christina Kelly and Brendan Murtagh



Environmental Protection Agency

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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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Lead organisation: Queen's University Belfast (QUB)

Identifying pressures

As an island nation, Ireland's ports and harbours are of strategic importance and are essential for its local, regional, and national economies. They are vital hubs that connect manufacturers, traders and consumers within global supply chains. Ports also play an important role in sustainable transport, as shipping is the most energy-efficient way to move freight and goods over longer distances. However, ports can also be responsible for adverse environmental, health and social impacts such as air, water and noise pollution; traffic congestion; and damage to terrestrial and marine ecosystems. How these challenges are managed is essentially determined by how ports are governed, and the complex nature of ports and the diverse range of port activities and stakeholders, can make sustainable management challenging. Despite these challenges, ports are key actors in the transition to sustainable development.

The Sustainable and Holistic management of Irish Ports (SHIP) project has investigated how these challenges may be overcome through active research engaging with a wide range of maritime stakeholders and will contribute to national efforts to transition towards sustainability within these sectors.

Informing policy

SHIP evaluated the sustainability of Irish ports and assisted them in the development of a policymaking framework to help Irish ports to minimise and prevent potential negative environmental impacts caused by unsustainable port operation practices.

Developing solutions

The policy framework (Port Framework for Sustainability) developed as part of SHIP includes recommendations and enabling conditions under the themes of port governance, innovation, decarbonisation, port connectivity/linkages, efficiency and investment. The recommendations are presented across three different timeframes for implementation (short, medium or long term). The framework also includes a set of enabling conditions which focus on key actions that ports need to do to ensure that these recommendations can be implemented. These recommendations and associated enabling conditions can be used to inform planning and implementation processes to advance port sustainability in Ireland. The research also identifies gaps concerning the role of particular port stakeholders in developing future sustainability actions and planning for the long term in Irish ports. It is recommended that ports, in collaboration with a diverse range of port stakeholders, identify key actors from the public, private and civil sectors to help them create a vision and implementation plan for their long-term future.

EPA RESEARCH PROGRAMME 2021–2030

**Sustainable and Holistic Management of
Irish Ports (SHIP)**

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EPA Research Report

Prepared for the Environmental Protection Agency

by

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This report is based on research carried out/data from March 2020 to March 2023. 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.

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Executive Summary

Sustainable and Holistic management of Irish Ports (SHIP) was a 3-year project funded under the EPA Research Programme 2014–2020. The overall aim of SHIP was to evaluate the sustainability of Irish ports and assist them in the development of a policymaking framework to help minimise and prevent potential environmental damage caused by unsustainable port operation practices. As an island nation, Ireland's ports and harbours are essential for its local, regional and national economies. The economic contribution of shipping and maritime transport services and operations to the Irish economy reached €1.6 billion in 2021 (see Ireland's Ocean Economy Report 2022). In total, €456 million was generated in gross value added, and it is estimated that 4847 full-time equivalent workers were employed in the industry in 2021. Ports are, therefore, of strategic importance to Ireland and key to regional development. They are also facilitators of economic and trade development and are vital hubs in the global supply chain. Ports also play a vital role in terms of sustainability. Shipping is the most energy-efficient form of transport for moving freight and goods over longer distances. The reduction in emissions achieved by moving freight from road to sea increases in line with the distance over which the freight is to be transported. The complex nature of ports and the diverse range of activities and stakeholders involved can, however, make sustainable management challenging. For example, port activities are likely to expand while ports and shipping are

simultaneously asked to play a role in decarbonising the Irish economy.

SHIP investigated how these issues may be overcome through active research engaging with a wide range of maritime stakeholders and will contribute to national efforts to transition towards sustainability within these sectors. SHIP developed a framework to help minimise and prevent potential environmental damage caused by unsustainable port operation practices over the short, medium and long terms. The framework encompasses a suite of recommendations and enabling conditions under the themes of governance, innovation, decarbonisation, linkages, and efficiency and investment. This framework is based on the findings of the literature review, desktop study of international port practices and active research involving port stakeholders. The research also found that the role of particular port stakeholders in developing future sustainability actions and planning for the long term in Irish ports is unclear. It is recommended that ports, in collaboration with a diverse range of port stakeholders, identify key actors from the public, private and civil sectors to help them create a vision and implementation plan for their long-term future.

This document presents the work completed by the project, including research objectives, methodologies and research findings. It also includes a summary demonstrating the policy relevance of the research findings and recommendations for future research.

1 Introduction

The sustainable development of ports is rooted in the pillars of sustainable development, which embrace environmental, social, governance and economic goals (Ignaccolo *et al.*, 2018). The sustainable development of ports requires the implementation of strategies and activities that meet the current and future needs of a port and its stakeholders while also protecting human and natural resources (Hiranandani, 2014). The main purpose of port sustainability is to seek a safe, well-governed, socially acceptable, energy-efficient and environmentally friendly management approach that can simultaneously maximise available profits (Hakam and Solvang, 2013). Balancing these interests necessitates mediation and open dialogue, meaning that practical and multidisciplinary management techniques are required to integrate socio-economic, legal, technical and environmental practices (Bjerkan *et al.*, 2021; Ignaccolo *et al.*, 2018). Due to its diversity, sustainable port management can involve approaches that range from minimising the negative environmental impacts engendered by a wide range of operational and shipping activities within the vicinity of ports (Narula, 2014; Shiau and Chuang, 2015), to contributing to the enhancement of people's quality of life by supporting port activities to satisfy socio-economic priorities. These include employment opportunities, education for employees and communities, and improving the social stability of the area surrounding ports (Narula, 2014) and maximising the economic performance resulting from implementing sustainable development initiatives without adversely affecting social and environmental development (Cabezas-Basurko *et al.*, 2008).

Globally, ports differ widely in terms of size, from very large container ports to very small fishing ports; ownership, including publicly owned and operated, privately owned and operated, and charitable trust ports; and the range of activities that take place in them, e.g. unloading/loading of cargo and being used as cruise ship or passenger ferry terminals and oil terminals (Frantzeskaki *et al.*, 2014; Gilbert *et al.*, 2014; Lozano *et al.*, 2019; Pettit *et al.*, 2018). Port management is not confined to just portside operations, as ports also fulfil a variety of other

functions. For example, common functions of a port management authority include landlord, regulator, operator and community manager (Acciaro *et al.*, 2014). Port activities contribute significantly to local and regional economies and society, providing a source of economic wellbeing and instilling a sense of place and identity for local and wider communities. Furthermore, ports tend to be managed under different forms of port administration and ownership, i.e. municipal/local government encompassing all regulation and landlord functions or under mixed public and private service provision.

Ports are, therefore, complex systems with varying operations, functions, assets and management mechanisms that are affected by the economy, culture, policies, local communities, geographical locations and wider governance considerations (Lim *et al.*, 2019; Nogué-Algueró, 2020). This makes it difficult to manage and govern ports in an integrated manner. The overall aim of Sustainable and Holistic management of Irish Ports (SHIP) is to evaluate the sustainability of Irish ports and assist them in the development of a framework to overcome potential barriers to sustainable development. This is achieved through a range of objectives that are described in the following section.

1.1 Objectives

SHIP aimed to investigate how barriers to port sustainability may be overcome through active research engaging with a wide range of maritime stakeholders in Ireland. A policymaking framework to help Irish ports to minimise and prevent potential environmental damage caused by unsustainable port operation practices is presented in this final report. This was achieved through the following steps:

- conducting a critical review of current port practices in Ireland, i.e. establishing an evidence base of current status and practices and future trends;
- analysing international case studies of sustainability transitions and, specifically, port sustainability;

- applying insights gained from the above to the Irish port context;
- actively engaging with key port stakeholders in six Irish case studies using “action research”, which entails the co-design and co-creation of a framework for sustainability;
- through experimentation in the Irish case studies, exploring the barriers to and opportunities for using novel technologies and innovative methods to achieve sustainability;
- based on the findings of the above, developing a (transition) framework to advance port sustainability and inform its policy development and implementation in Ireland.

2 Ports and Sustainability

2.1 Importance of Ports

Ports are vital hubs in the functioning of global supply chains handling over 80% of global trade (UNCTAD, 2021). Their infrastructure and facilities act as key nodes linking transport, logistics and stakeholders. As well as facilitating trade, ports provide jobs and serve as links between international markets (Becker *et al.*, 2018; Poulsen *et al.*, 2018). The importance of ports has been particularly evident in recent years as they face trade and transport issues arising from the Covid-19 pandemic and Brexit. Ports have remained the main point of entry for food, medicine and fuel during these turbulent times.

Although port activities are instrumental in supporting the movement of goods and passengers, they face considerable inter-related challenges arising from climate change, decarbonisation, sustainable transport and logistics, and local area development. Many port developments have environmental, societal and economic implications that need to be sustainably managed to ensure that negative impacts are avoided, minimised or mitigated, and that positive outcomes are supported. While maritime transport is the most energy-efficient form of transport for freight and goods over longer distances, CO₂ emissions are projected to increase by anything up to 50% on 2018 levels by 2050 for a range of plausible long-term economic and energy scenarios (IMO, 2021). Decarbonisation and operating more sustainably have come to the fore of the post-pandemic recovery for global maritime transport (UNCTAD, 2021). With current climate projections expected to exceed the agreed targets under the Paris Agreement, unless deep reductions in CO₂ and other greenhouse gas emissions are achieved in the coming decades (IPCC, 2021), the maritime industry and governments will need to play their part and invest in mitigation, adaptation and climate-proofing maritime transport infrastructure and services. Furthermore, given the growing urgency to improve the environmental footprint of transport sectors in general, port authorities have a considerable role to play as the interface between the port, sea and hinterland transport sectors.

Aside from emissions from berthing ships, port activities and transport servicing, port can have other adverse impacts on the environment including air, water, noise and light pollution, traffic congestion, the introduction of invasive species, effects on marine ecosystems such as seafloor erosion, alteration of wave and current regimes, land use change, dredging and impacts of marine accidents and spills, as well as impacts on public health and safety (Carpenter *et al.*, 2018; Hossain *et al.*, 2019; Lim *et al.*, 2019; Nogué-Algueró, 2020). The port sector's expansion of its infrastructure to accommodate the growing demand for shipping and logistics services and growing container vessel size has the potential to further exacerbate environmental effects, including emissions. Port management and governance are, therefore, critical for future sustainable development in this sector. Maintaining core port functions while addressing the issues outlined above requires a holistic governance system.

2.2 Port Governance

Ports are complex systems with varying operations, functions, assets and management mechanisms that are affected by the economy, culture, policies, local communities, geographical locations and conditions, and wider governance considerations. Often ports are managed under different forms of port administration and ownership, including trust ports, semi-state bodies, local government and private ownership. These differences can make port management difficult.

Port governance and management tend to be fragmented, and this is exacerbated by the complexities of international, regional and national regulations. For instance, the International Maritime Organization (IMO) and the EU are responsible for the safety, security and environmental performance of international and European shipping. In the EU, policies are interpreted from the IMO and then adopted by EU Member States through national legislation, which is then transposed through regional and local regulations (Hiranandani, 2014). Different ports, however, may adopt different policies considering the local regulatory, geographical, economic and political

backgrounds (Papaefthimiou *et al.*, 2017). Addressing this complexity and moving towards more sustainable practices will require a collaborative, integrated and multi-sector approach.

Ireland, like many other countries, is recovering from the recent Covid-19 pandemic and the implications of Brexit and is trying to address the major challenges posed by climate change. These crises require building resilience for a more responsive and agile governance system across all transport sectors including maritime and ports, particularly concerning continuity in supply chains. The main policy guiding the development of Irish ports is the 2013 National Ports Policy (DTTAS, 2013). The core objective of this policy is to facilitate a competitive and effective market for maritime transport services. A review of this policy is currently under way to address the unprecedented changes and challenges facing Irish ports, i.e. climate change, Brexit and the recent pandemic. The review aims to put in place a new policy framework to complement wider government policy and help the commercial port sector to meet the needs of the economy, the environment and wider society in the decade ahead (Department of Transport, 2021). The revised National Ports Policy should have regard to the Irish Government's 2021 Climate Action

Plan (Government of Ireland, 2021) and associated update plans, and the Programme for Government, which commits to a 51% reduction in emissions by 2030 and to reach net zero no later than 2050. The review of Ireland's National Ports Policy represents a window of opportunity to identify the barriers facing and opportunities for Irish ports in making a positive contribution to tackling these climate change ambitions while continuing to facilitate a resilient, agile and sustainable maritime transport industry.

2.3 Identifying Challenges and Opportunities for Change

As part of the SHIP project, a range of barriers to and opportunities for change were identified. A deeper understanding of these issues for port sustainability has helped the research team to develop a more realistic and complete framework for sustainability. If underlying issues such as governance fragmentation are ignored and not properly addressed, these problems will persist, and ports will not fulfil their potential. The barriers and opportunities identified by port stakeholders are summarised in Table 2.1. A more detailed discussion on perceived barriers and opportunities is included in Working Paper V – Irish Port Case Studies.

Table 2.1. Summary of barriers to and opportunities for port sustainability as identified by SHIP stakeholders

Sustainability aspect	Barriers	Opportunities
Port governance	<ul style="list-style-type: none"> Insufficient adaptive governance and resilience thinking Lack of integrated governance Unchanged planning and consenting regime 	<ul style="list-style-type: none"> An innovative and adaptive National Ports Policy Multi-sector collaboration Integrated planning and development regime
Innovation	<ul style="list-style-type: none"> Lack of technological guidance Inadequate infrastructure 	<ul style="list-style-type: none"> Availability of local resources and expertise Experimentation and demonstration initiatives (e.g. ethical and sustainable procurement policy, circular economy, nature-based solutions)
Decarbonisation	<ul style="list-style-type: none"> Fragmented approach Perceived cost implications The gap between policy and action 	<ul style="list-style-type: none"> Maximising the potential of renewable energy developments Balanced regional development
Connectivity	<ul style="list-style-type: none"> Environmental impacts from port-related development Inaction on climate change 	<ul style="list-style-type: none"> Supporting coastal communities Sustainable environmental management Positive climate action
Efficiency and investment	<ul style="list-style-type: none"> Dearth of incentives Investment myopia Inefficient use of port land and operations Undervaluing the role of ports and maritime transport in furthering sustainability 	<ul style="list-style-type: none"> Incentivising greater efficiency Investment support A collaborative and sustainable approach to delivering port services Promoting maritime transport as an energy-efficient form of travel and an essential service provider

3 Research Approach

3.1 Methodology

The research approach included an extensive academic literature review followed by an assessment of the sustainability performance of Irish ports and their relationship to the Sustainable Development Goals (SDGs), a desk-based review of good international and domestic port practices, and an evaluation of port sustainability in a selection of Irish port case studies, and concluded with the development of a framework for port sustainability in Ireland. A series of five working papers has been published by the research team (<https://pure.qub.ac.uk/en/projects/holistic-sustainability-performance-assessment-of-irish-portsharb>), each of which coincides with each of these tasks and provides the context and baseline evidence on which the final framework has been developed. Each research task is described in more detail in the following sections.

3.2 Literature Review

Two academic literature reviews were conducted and published in Working Paper I – Port Sustainability and Working Paper II – Sustainability Transitions. For Working Paper I, a structured review of the academic literature on port sustainability was conducted to identify and analyse the main corpus of published work produced by researchers. The review focused on identifying key drivers of change that may affect ports and/or port transitions and good practice examples of holistic port management. Key drivers were characterised using the Political, Economic, Social, Technology, Legal and Environmental (PESTLE) framework. Issues related to the environment are interconnected with the five other areas of politics, economy, society, technology and law. For example, the political drivers of change identified from the literature include the need for ports to respond to national and international efforts to ensure that maritime transport is better accounted for in climate change policies. Economic drivers of port transformations include the continued growth in global trade but also the need to recognise how this does not fit with efforts to address climate breakdown

and the biodiversity loss crisis. Increasingly, the broader social and local responsibility of ports has become a key driver placing pressure on ports to do things differently. This is particularly evident when combined with the need for ports to address negative local environmental impacts, including air pollution. Technological development, particularly in the areas of energy, environmental sustainability and information, has become a major driver of innovation within ports. For example, ports are already using artificial intelligence and the internet of things to improve traffic management. Legal developments, particularly in the area of environmental standards in shipping, are also driving changes within ports. The breadth of these drivers illustrates the complex nature of port management and key issues to be addressed within SHIP.

In Working Paper II, a structured review of the academic literature on transitions was conducted. The review identified four key transition concepts to be explored under SHIP's approach: multi-level perspective (MLP), multi-stage transition, transition management, and technological innovation systems. The MLP provides a conceptual lens through which SHIP can assess and imagine how port transitions materialise within dynamic processes that operate across functional levels. These levels include the landscape level, which is concerned with external forces such as macroeconomic changes that put pressure on sectors to change; the regime level, which consists of the dominant and prevailing practices, rules and patterns of institutions that govern a sector; and the niche level, which focuses on localised areas where innovation can first take root within a sector. The multi-stage concept focuses on the pathway that successful transitions typically follow. Transition management outlines the governance mechanisms for accelerating and steering transitions. Technological innovation systems focus on the innovation systems around technology development and implementation.

These four concepts provided a broad “transitions lens” to be considered within SHIP's methodological approach. However, these concepts are not without

criticism in the literature. In particular, issues around power and political imbalances, injustice and inequity, and inadequate stakeholder participation have been identified within this review. SHIP's methodological approach was therefore designed to identify power imbalances and seek out marginalised stakeholders in fostering and implementing port transitions.

3.3 Assessment of Port Practice in Ireland

Following the methodology design, an evaluation of the sustainability performance of Irish ports and their contribution to the United Nations SDGs was conducted and is presented in Working Paper III – Sustainability Performance of Irish Ports and their Relationship to the SDGs. The evaluation concluded that the relevant sustainability policies for Irish ports reviewed at national, regional and local levels have so far neglected the UN SDGs. From the use of the online SDG Impact Assessment Tool, it was evident that Irish port projects can advance the aims of many of the SDGs, in particular, SDG 9, Industry, Innovation and Infrastructure; SDG 11, Sustainable Cities and Communities; SDG 12, Responsible Consumption and Production; SDG 13, Climate Action; and SDG 14, Life Below Water. In relation to the sustainability performance of six selected Irish ports, it was clear that these ports have designed environmental and energy management systems to follow international standards. All of the ports are currently, or are in the process of, carrying out strategic infrastructure development works, and as a result have conducted, or are currently conducting, extensive environmental, economic and social data collection to accompany major planning applications and compliance requirements. A lot of baseline information has been collated, but it may not be publicly available. A more centrally held port database that encompasses all sustainability-related information, i.e. environmental, energy, economic and social data containing historical, current and projected information, would be useful for identifying sustainability trends and potential impacts over the short and medium terms. It could also be made available through open access platforms for other relevant organisations and the public to avail themselves of.

3.4 Review of International Case Studies of Port Sustainability

Following a desk-based review of international port activity, Working Paper IV – Advancing Port Sustainability was published. This presented a collection of international and domestic port practices exploring how port sustainability might be achieved or advanced in the short, medium and long terms. The working paper (in the form of a manual) included examples of good practice in the areas of decarbonisation, digitalisation, connectivity, innovation, and efficiency and investment.

3.5 Irish Port Case Studies

In Working Paper V – Irish Port Case Studies, two key stages of research involving stakeholder interviews and focus groups are reported. As part of stage 1, interviews ($n=36$) were conducted with key port personnel and external port stakeholders in the following case study ports: Dublin Port Company, Port of Cork, Shannon-Foynes Port Company, Rosslare Europort, Port of Waterford and Port of Galway. These interviews were conducted during the period June–October 2021. The online interviews included specific questions related to historical actions and motivations to increase port sustainability, baseline conditions and priorities, influencers of sustainability, examples of innovation, barriers to and opportunities for port sustainability and drivers of change. The interviews were recorded and the transcripts were analysed for key themes.

Stage 2 involved a more in-depth look at the issues that emerged from stage 1. To investigate these issues further, five online focus groups were conducted with key port personnel from the case study ports and relevant external stakeholders ($n=43$). The focus group format facilitated online interaction with the stakeholders and the examination in more detail of the perceived barriers to and opportunities for port sustainability. The focus group was designed around two prevalent topics that had materialised from stage 1 of the research: (1) the future of Irish ports: innovation and connectivity and (2) port readiness for energy transition. To determine how these issues can progress over the long term in Irish ports, questions on four topics were asked during the focus groups: (1) challenges to port digitalisation and innovation,

(2) port relationship with the local community/hinterland, (3) approach required for “zero emissions ports” or “zero emissions energy hubs” and (4) ports’ access to finance for large infrastructural and “green” developments. The responses from the focus groups helped the SHIP research team to synthesise responses to challenges, opportunities, and potential solutions to the barriers identified.

The information gleaned from these two research exercises (interviews and focus groups) allowed the SHIP research team to identify the main motivations and drivers of change and the barriers and opportunities and to draft recommendations for improving port sustainability in Ireland. Draft recommendations were developed in the following areas: port governance, innovation, decarbonisation, connectivity, efficiency and investment. Each of these themes was presented along with suggested recommendations. These preliminary findings were presented in a discussions paper that was circulated to all research participants and accompanied by an online SHIP Discussion Paper Feedback Survey. The deadline to complete the online survey was 14 September 2022. The findings from this final survey stage formed the basis of the framework that is discussed in this final report.

3.6 Development of a Transition Framework for Port Sustainability in Ireland

As part of the third and final phase of data collection, the SHIP research team reviewed the feedback received from the online survey. As a result of the feedback, the SHIP recommendations were reconsidered, revised and finalised in the following thematic areas: port governance, innovation, decarbonisation, connectivity/linkages, and efficiency and investment. The recommendations were then categorised according to participants’ preferred time frame for implementation (i.e. short, medium or long term) and presented as a roadmap of what they believe needs to be achieved within these time frames to enhance the sustainability of Irish ports. A set of enabling conditions (i.e. what port actors need to do to ensure that these actions are implementable) proposed by the survey respondents was included. The actions to be achieved were designated to specific time frames. However, participants in the research did not propose long-term actions. The final recommendations, therefore, also emphasise the need to develop a process for long-term visioning for ports. The final framework and recommendations are described in Chapter 4.

4 Port Framework for Sustainability

4.1 Recommendations and Enabling Conditions

The SHIP recommendations are presented by thematic area and categorised according to the time frame proposed by respondents for implementation, i.e. short, medium or long term. A set of enabling conditions (i.e. what port actors need to do to ensure that these actions are implementable), as proposed by the survey respondents, is included. These enabling conditions should help the planning and implementation processes to advance port sustainability in Ireland. However, several key areas, such as communication on the benefits of ports and maritime transport, enabling actors and long-term thinking, were not highlighted by respondents and represent gaps that may have to be addressed through the framework in future. These gaps are discussed in section 4.2.

4.1.1 Port governance

The recommendations have been finalised, prioritised and categorised according to their proposed time frames for implementation, and the key enabling actions to achieve them have been mapped. These are summarised in Table 4.1. Some recommended actions are already under way. For example, the Department of Transport (DoT) started a review of the National Ports Policy (2013) in 2023. This will put in place a new policy framework to complement wider government policy and take into account developments at the EU level and internationally, the impact of Brexit, advances in technologies and green initiatives, including offshore renewable energy (ORE) (DoT, 2021). This will involve engaging with Irish ports and relevant stakeholders.

The Ports Coordination Group, which is an offshore delivery task force led by the Department of the Environment, Climate and Communications, the DoT and a project management office, has been established within the DoT. The overall objective of the group is to ensure that ports develop infrastructure to facilitate the ORE sector in line with government policy and foster the growth of the related supply

chain (Houses of the Oireachtas, 2022). Concerning the establishment of the Maritime Area Regulatory Authority (MARA), a campaign to appoint board members got under way in September 2022. MARA will be responsible for regulating development and activity in Ireland's maritime areas. It is also acknowledged that the government is introducing new plans to reform the terrestrial planning system. This includes changes to An Bord Pleanála, i.e. its governance and staffing and may also include setting out statutory timelines for decision-making. This could have implications for permissions for developments within the nearshore area.

4.1.2 Innovation for Irish ports

The recommendations for "innovation" have been finalised, prioritised and categorised according to their proposed time frame for implementation, and the key enabling actions to achieve them have been mapped. These are summarised in Table 4.2.

4.1.3 Decarbonisation

The recommendations for "decarbonisation" have been finalised, prioritised and categorised according to their proposed time frames for implementation, and the key enabling actions to achieve them have been mapped. These are summarised in Table 4.3.

With regard to the production of green hydrogen, a public consultation exercise was carried out from June to September 2022 to gather the views of stakeholders and interested parties to inform the development of a hydrogen strategy for Ireland. This strategy, which builds on EU developments in this area, is expected to be published in 2023 and should address the sustainable use of natural resources, appropriate locations for development, spatial and infrastructural requirements, grid capacity, potential constraints, and implementation and delivery mechanisms.

The issue of grid capacity and power networks around Irish ports was raised by research participants, particularly concerning the accommodation of renewable energy sources and the provision of

Table 4.1. Recommendations and enabling conditions for port governance by 2028 and 2038

Governance	By 2028	By 2038
Recommendations	<p>GR1: Government actions and enabling policy frameworks have been developed to scale up the use of zero-emission fuels, foster collaboration with energy users and suppliers and deploy a transition strategy.</p> <p>GR2: A national ports body has been instigated to co-develop a future vision for Irish ports and identify short- and medium-term priority actions. This group facilitates dialogue, informs policy, seeks investment, and shares knowledge and best practice across ports. As ports are currently constituted, they are independent commercial companies. To fit within the existing port governance framework, the national ports body would have to be constituted in such a way that it does not undermine inter-port competitiveness.</p> <p>GR3: The National Ports Policy has maximised the use of existing brownfields before considering the development of greenfield sites for port expansion or new port development.</p>	<p>GR4: The National Marine Planning Framework and Maritime Area Planning Act 2021 have enabled the adoption of a regional marine planning approach that encompasses strategic port development.</p> <p>GR5: The National Ports Policy includes monitoring and evaluating objectives and targets that are reviewed regularly.</p> <p>GR6: The number of designated tier 1 and tier 2 ports in Ireland has increased in response to an expansion and diversification of port business.</p>
Enabling conditions	<p>GE1: A national ports body should comprise senior port personnel as well as DoT, IMDO and industry representatives. The body should be well resourced and receive adequate support from the ports and maritime sector. This body will meet regularly to identify needs and prioritise actions and will be regularly consulted on maritime matters. The body will have sub-working groups to address specific issues such as technology, environment and energy usage at a more local level, which will also feed into national policy.</p> <p>GE2: The National Ports Policy developed in 2023 will need to specify the process through which the implementation of this new port body is monitored. The body will advise on master planning in ports and the sharing of good practices.</p> <p>GE3: The ports body will need to be represented on MARA.</p> <p>GE4: Master plans need to be developed for each Irish port and should be consistent with national, regional and local planning policy and national sustainable development objectives.</p>	<p>GE5: The approach to regional marine spatial planning that is being developed must acknowledge ports as one of the key connections between land and sea.</p> <p>GE6: A process for the periodic review of the National Ports Policy including monitoring and evaluation of objectives and targets will need to be developed.</p> <p>GE7: The National Ports Policy incorporates revised criteria for ports based on their handling capacity for renewable energy and contribution to sustainability as well as volumes of throughput/tonnage.</p>

IMDO, Irish Maritime Development Office.

onshore power supplies for shipping vessels and other modes of transport in port. It is acknowledged, however, that discussions had commenced between the DoT and EirGrid concerning grid capacity and it is expected that clarification will be forthcoming. To realise the decarbonisation of Irish ports, the ports and shipping industries will have to act in tandem. Port investment in alternative fuel infrastructure and onshore power supplies will be driven by shipping industry demands and when the sector has developed some consensus on the fuels of the future.

4.1.4 Connectivity/linkages

The recommendations for “connectivity/linkages”, hereafter referred to as “linkages”¹, have been

finalised, prioritised and categorised according to their proposed time frames for implementation, and the key enabling actions to achieve them have been mapped. These are summarised in Table 4.4.

Concerning marine protected areas (MPAs) in Ireland, in December 2022 the Irish Government published the General Scheme of Ireland’s new MPA legislation. The scheme provides for the designation and effective management of MPAs and sets out what the proposed legislation, once drafted, will contain. This is a significant step towards Ireland being able to create nationally based MPAs under new legislation and fulfil its commitments to achieving 30% of Ireland’s seas designated as MPAs by 2030.

¹ Research participants and survey respondents highlighted that the term “connectivity” had different connotations in a maritime context. To avoid further confusion, this theme has been renamed “linkages”.

Table 4.2. Recommendations and enabling conditions for innovation by 2028 and 2038

Innovation	By 2028	By 2038
Recommendations	<p>IR1: Irish ports have developed adequate fibre broadband and mobile network access.</p> <p>IR2: Digital and enterprise hubs and zones have been developed around some ports to attract new businesses with expertise in the use of internet of things solutions, data analytics, wireless communication systems and marine robotics, with applications across multiple sectors.</p> <p>IR3: Digital technology and innovative techniques have been promoted to help measure and monitor parameters in the marine and terrestrial port environment, e.g. marine mammals, underwater noise, air and water quality, energy and water usage and dredging activity.</p> <p>IR4: Irish ports have sought funding for innovation projects from European and national sources.</p>	<p>IR5: Regional assemblies have developed a Ports and Harbour Strategy for each region.</p> <p>IR6: The new National Ports Policy supports innovation and digitalisation in Irish ports.</p> <p>IR7: Irish ports have established their own ethical and sustainable procurement policy.</p> <p>IR8: Nature-based solutions have been implemented in future port development activities in addressing climate change as well as social and economic wellbeing.</p> <p>IR9: Irish ports, with government support, have developed an approach to clarify their contribution to a circular economy as part of a national effort to manage the production and consumption of raw materials.</p>
Enabling conditions	<p>IE1: The roll-out of the national high-speed broadband programme and mobile communication services will be key to the sustainable growth of port regions.</p> <p>IE2: A national ports body is established that encourages greater collaboration between Irish ports and international ports and explores examples of best practices. A sub-working group should be established by the ports body to focus on innovation in Irish ports, which could be chaired by the IMDO. Its remit should include seeking access to funding and developing bids, collaborating with state agencies, such as the IDA and Enterprise Ireland, and industry to explore the potential of creating innovation or technology hubs around ports.</p> <p>IE3: Partnerships and collaboration to ensure an integrated approach to the development of the ORE sector and the delivery of the required infrastructure and services will need to be developed. Building on work under way by the IMDO, networks should continue to be established between developers, ports, government departments, the public sector and education and training bodies to facilitate a regional supply chain to support and enhance productivity, innovation, digitalisation and competitiveness.</p> <p>IE4: Irish ports enhance their capacity to apply for and obtain funding for innovation projects from European and national sources. For example, see the European Commission Innovation Fund and European Regional Development Fund. These are highly competitive funding calls, and it would be necessary to enhance the capacity of the ports to apply for them. Assistance could be provided by the relevant government department/ agency with expertise in applying for similar funding.</p>	<p>IE5: Irish ports will need to engage with the regional assemblies and local authorities in the development of port strategies and master plans that align with local planning policy, ensuring sustainable development within local and regional contexts.</p> <p>IE6: Irish ports will need to foster greater collaboration with industry and academia to explore technological options for sustainable port operations. Irish ports will need to seek funding for research, technology and innovation opportunities in partnership with government agencies, academia and industry.</p> <p>IE7: The national ports body will need to explore the development of ethical and sustainable procurement policy based on best practices and national requirements. Recommendations can be included in ports' community engagement strategies.</p> <p>IE8: A clear understanding of how Irish ports could incorporate nature-based solutions in their future development strategies and master plans in accordance with the National Ports Policy is needed. This can be initiated through a review of international good practices.</p> <p>IE9: National circular economy guidance on implementation needs to be developed. Irish ports should then seek to incorporate circular economy principles in their operations and development plans.</p> <p>IE10: The National Ports Policy will need to encourage collaboration between Irish ports and relevant government agencies in developing funding bids.</p>

IDA, Industrial Development Agency; IMDO, Irish Maritime Development Office.

4.1.5 *Efficiency and investment*

The recommendations for “efficiency and investment” have been finalised, prioritised and categorised according to their proposed time frames for implementation, and the key enabling actions

to achieve them have been mapped. These are summarised in Table 4.5.

4.2 Identification of Gaps

Based on the original literature review and international best practices, several gaps have been

Table 4.3. Recommendations and enabling conditions for decarbonisation by 2028 and 2038

Decarbonisation	By 2028	By 2038
Recommendations	<p>DR1: In accordance with the FuelEU Maritime Regulation, the government has assisted zero-emission shipping projects through domestic shipping emissions targets, incentives and support for innovation.</p> <p>DR2: Decarbonising of the Irish fleet to reflect the requirements of “Fit for 55” package is under way. This is supported by a national shipping policy that seeks to decarbonise the Irish shipping fleet by 2050 and includes a pledge for new vessels entering into service in 2030 to have zero emissions when running in Irish ports.</p> <p>DR3: The Irish Government has developed a national hydrogen strategy to provide strategic guidance on issues related to the sustainable use of natural resources, appropriate locations, spatial and infrastructural requirements, grid capacity, potential constraints, and implementation and delivery mechanisms.</p> <p>DR4: Grid capacity and power networks around Irish ports have been enhanced to cater for the accommodation of renewable energy sources and the provision of onshore power supplies for shipping vessels and other modes of transport in ports.</p> <p>DR5: Partnerships between ports and relevant stakeholders have enabled an integrated approach to the timely development of the ORE sector and the delivery of required infrastructure and services.</p> <p>DR6: Government continues to petition the IMO and EU for stricter regulations to reach zero-emission shipping by 2050.</p>	<p>DR7: Government is to assist Irish ports to deliver the infrastructure requirements to service the ORE sector. This concerns policy certainty, advice, guidance and access to resources including EU funding and revenue sources.</p>
Enabling conditions	<p>DE1: The National Ports Policy provides clear guidance on the transposition of the Alternative Fuels Infrastructure Directive and the FuelEU Maritime Regulation into national law.</p> <p>DE2: Decarbonising ports and shipping requires collaboration across the maritime transport and energy sectors, while decarbonising society requires a whole government, industry and societal approach. National climate legislation, carbon budgets and sectoral ceilings ensure that decarbonisation is a priority for all sectors.</p> <p>DE3: An up-to-date study of grid capacity and power networks in and around Irish ports should be undertaken to provide clarification on infrastructure requirements over the short and medium terms to facilitate port decarbonisation activities.</p> <p>DE4: Partnerships and collaboration to ensure an integrated approach to the development of the ORE sector and the delivery of required infrastructure and services will need to be developed. Networks should continue to be established between developers, ports, government departments, the public sector, and education and training bodies to facilitate a regional supply chain to support and enhance productivity, innovation, digitalisation and competitiveness.</p> <p>DE5: Ports should seek to develop a climate/carbon management strategy, mapping out the next 5 years of their journey to becoming low or zero carbon emitters. This should be informed by the National Ports Policy with support provided by SEAI.</p> <p>DE6: The inclusion of shipping in the EU’s Emission Trading System from 2024 will assist in the decarbonisation of the sector. It will make investing in environmentally friendly technology economically beneficial for the shipping sector.</p>	<p>DE7: The development of a National Shipping Policy, in accordance with the Irish Maritime Directorate Strategy, requires the Irish shipping fleet to be decarbonised by 2050 and requires new vessels entering into service in 2030 to have zero emissions when running in Irish ports.</p> <p>DE8: Government provides assistance for zero-emission shipping projects through domestic shipping emissions targets, incentives and support for innovation through demonstration funds.</p> <p>DE9: Ireland’s national hydrogen strategy will provide the framework for Ireland to transition from an importer to an exporter of clean hydrogen. Guidance on forming partnerships with industry and setting out a roadmap will be critical in formulating the hydrogen value and supply chain, i.e. from production to networks and storage and to use across the industry, power and transport as well as developing a thriving hydrogen market including market and regulatory framework and securing economic opportunities including good-quality jobs.</p>

SEAI, Sustainable Energy Authority of Ireland.

Table 4.4. Recommendations and enabling conditions for linkages by 2028 and 2038

Linkages	By 2028	By 2038
Recommendations	<p>LR1: Early and meaningful engagement with coastal communities and NGOs throughout the design, consenting and construction phases of strategic infrastructure developments in and around Irish ports has become established practice.</p> <p>LR2: Community liaison personnel have been appointed within Irish ports to ensure continuous engagement and information sharing about port activities and potential impacts on the local environment and community.</p> <p>LR3: Monitoring of emissions in major Irish ports is conducted to help inform policy and mitigate environmental pollution and adverse impacts on human health.</p> <p>LR4: Irish ports have developed climate adaptation measures within their master plans and in accordance with the National Ports Policy.</p>	<p>LR5: A network of MPAs in Irish waters has been developed, and the implications for ports and shipping have been considered in port plans and policies.</p> <p>LR6: Surveying and monitoring of potential environmental impacts in advance of strategic infrastructure developments and promoting stakeholder working in partnership to share the effort, data and cost of environmental assessments becomes normal practice in response to the National Ports Policy. In particular, noise impact assessments of shipping vessels on marine species are a requirement.</p> <p>LR7: Where feasible, the connection of tier 1 and tier 2 ports to rail infrastructure has been enhanced and adequate road access has been developed.</p>
Enabling conditions	<p>LE1: Irish ports will develop a Community Engagement Strategy that allows communities to interact with ports and highlight their concerns and priorities (especially regarding infrastructure development) and sets out what benefits flow from proximity to the port (including investments), how social enterprises and cooperatives can benefit from social clauses in port procurement and supply chains, governance arrangements for their participation in decision-making, and how commitments that are made are monitored and reported.</p> <p>LE2: Findings from the “PortAir” study should help to inform policy-making on ship-source pollution. Collaboration between Irish ports, the DoT, academia and the EPA is recommended for the monitoring of air emissions in Irish ports.</p> <p>LE3: The National Ports Policy provides guidance on assessing potential climate change impacts and recommending appropriate adaptation measures to ensure the long-term sustainability of port infrastructure.</p> <p>LE4: The findings from the forthcoming Port Capacity Study have been communicated to all port stakeholders and used as an evidence base in the review of the National Ports Policy conducted in 2023. The study determined the sufficiency of overall national port capacity needs for the future. This study provides the basis for short- and medium-term action concerning capacity, infrastructure, facilities and services.</p>	<p>LE5: A properly managed network of MPAs in Irish waters will be developed following the introduction of Ireland’s MPA legislation.</p> <p>LE6: The National Ports Policy should encourage the establishment of local partnerships in advance of strategic infrastructure developments involving Irish ports. This will encourage stakeholders (including the public and private sectors, NGOs and local communities) to share the effort, data and cost of environmental assessments. Early action will reduce delays in data collection and will result in a more transparent development application process.</p> <p>LE7: A more joined-up approach involving the national ports body will enable ports to collaborate with the rail, road and broader regional development networks on sustainability. For example, sectoral policies should align to address emissions in the port, freight–haulage and shipping sectors in a holistic manner.</p>

NGO, non-governmental organisation.

identified concerning enabling conditions, actors and long-term implementation. It is important to recognise and address these omissions to ensure a more sustainable and holistic approach to the future management of Irish ports. These gaps are as follows.

4.2.1 Positive climate action

SHIP participants did not refer to or highlight the opportunities for Irish ports to engage in positive

climate action. Irish ports themselves are not big energy users; however, they do have an important role to play in facilitating decarbonisation activities. For example, they could potentially become energy hubs servicing the ORE and green hydrogen sectors. They could do this through the provision of land, infrastructure, shipping services, and maritime skills and experience. In terms of climate adaptation, Irish ports are located within vulnerable coastal areas that will be subject to sea level rise, increased storminess

Table 4.5. Recommendations and enabling conditions for efficiency and investment by 2028 and 2038

Efficiency and investment	By 2028	By 2038
Recommendations	<p>ER1: A national ports body supports the distribution of port services and promotes the role of Irish ports in the global supply chain and in facilitating a decarbonised society.</p> <p>ER2: The National Ports Policy encourages an all-Ireland ports engagement approach to the delivery of port services. There is a focus on the development of regional ports and their contribution to sustainability on the island as a whole.</p> <p>ER3: Tax rebates/reliefs have been introduced for more sustainable transport actions.</p>	<p>ER4: A review has been conducted of the Merchant Shipping Act and the need to cater for a different classification of vessels and qualifications to service the ORE sector.</p>
Enabling conditions	<p>EE1: Irish ports, through the national ports body, will collaborate with the Irish Government and its agencies, EU agencies and the private sector to investigate direct financial support for the ports sector (particularly in the light of ORE opportunities).</p> <p>EE2: The remit of a national ports body expands to examine the distribution of port services, and to coordinate approaches to customs, health and safety requirements, and port operating hours.</p> <p>EE3: A national ports body can explore best practices on fiscal incentives such as tax rebates/relief for more sustainable transport and liaise with the Irish Government on the introduction of potential schemes.</p>	<p>EE4: A maritime education strategy should be developed to coordinate requirements at secondary and tertiary levels including apprenticeship schemes to address skills shortages in the maritime transport and decarbonisation sectors.</p> <p>EE5: Reviews of, and amendments to, maritime legislation such as the Merchant Shipping Act should be conducted to ensure that they are now fit for purpose and agile enough to meet the future demands of the Irish ports and shipping sectors.</p>

and storm surges that will be challenging to manage and could result in disruptions to operations if not mitigated. Some Irish ports are involved in the Transport Adaptation Stakeholder Group, which provides an opportunity for sharing experience, knowledge and best practice with other transport sectors. Irish ports should also explore networking with international ports on the topic of climate adaptation and the use of natural capital resources and responses to sea level rise. As climate change is the largest, most pervasive threat to society, Irish ports must act now on mitigation and adaptation. The National Ports Policy must provide guidance on how best to implement measures sustainably and holistically.

4.2.2 Energy efficiency

Extensive work has been conducted by Irish ports concerning energy conservation and energy efficiency. Efficiency gains are being achieved through the implementation of a range of measures including energy management, building and facility upgrades, retrofits, changes in transport and better energy procurement, and through behavioural change (SEAI, 2021). Greater energy efficiencies can be achieved through further reductions in energy usage; production

of renewable energy at ports (e.g. photovoltaic installations, anaerobic digestion); application of smart technologies and digitalisation in port logistics, regular maintenance of port buildings, vehicles and handling equipment; and monitoring, measuring and reporting of usage. Irish ports should continue to collaborate with government agencies such as the Sustainable Energy Authority of Ireland (SEAI) as well as industry and academia to explore further improvement in energy efficiency.

4.2.3 Environmental practice

Standards in port environmental management have improved, mostly driven by legislation; however, there are still areas for enhancement. This includes mitigation actions on underwater noise, pollution, particularly single use plastics, and emissions, and continued monitoring and reporting of emissions and impacts. Dredging and underwater noise were highlighted by survey respondents as activities requiring special attention. For example, it was requested that greater guidance on best practices in dredging activities should be provided. Best practice on managing underwater noise was also recommended, with the Port of Vancouver's work

on quantifying ocean noise and identifying the noisiest ships to reduce the impacts of ocean noise on marine species being cited as one example. Under the Maritime Area Planning Act, the Minister may at any time prepare and issue marine planning guidelines. This legislation could be used to develop guidelines on best practices in managing the marine environment and thereby assisting those involved in the development sector.

4.2.4 *Communications on the benefits of Irish ports and maritime transport*

Greater communication of the contribution Irish ports make to sustainable development is necessary. SHIP participants felt that shipping tends to be overlooked as the most energy-efficient form of transport for freight and goods over longer distances. It was highlighted that this fact is not publicised enough. This is important as Irish ports transition from being traditional importers and users of fossil fuels to potentially becoming renewable energy hubs and key facilitators of regional economic development. Furthermore, Irish ports are becoming more socially responsible in terms of their relationship with the surrounding communities. They are often involved in community, environmental, educational and sporting initiatives and facilitate the development of social and physical infrastructure in the area. These many contributions should be publicised to inform citizens of the important role of Irish ports in advancing the economy, society and environment. A national ports body could publicise and market the contribution Irish ports make to sustainable development.

4.2.5 *Research, technology and innovation*

Planning for innovations is challenging given the propensity of technological advancements and the uncertainty over their implementation and potential to become redundant in the future. Research and development programmes, however, can help to identify specific technologies that are interpreted as being sustainable, cost-effective and efficient in their operation. Such programmes involving collaboration with academia, research institutes, industry and ports can be useful in selecting technologies that are capable of offering scalability and can function as integrated solutions that fit the port's size, location and overall needs. Investment in research and

development will be critical to allow these partnerships to form. Networks should be established to scope potential funding sources and to seek assistance in accessing grants for innovation in this sector.

4.2.6 *Additional enabling actors*

A minimal number of enabling actors were proposed by stakeholders to assist in the implementation of the recommendations. These were primarily the Irish Government, DoT, Irish ports, local government, industry and non-governmental organisations (NGOs) with a one-off mention of academia, some state agencies and the EU. Several omissions include the IMO and more consistent reference to EU bodies, including funding agencies and regional assemblies, and local authorities and state agencies including Enterprise Ireland, the Industrial Development Agency, EPA, SEAI, Marine Institute, Higher Education Authority, An Bord Pleanála, Irish Rail, National Transport Authority, Transport Infrastructure Ireland and the Irish Maritime Development Office (IMDO). All these organisations have a role to play in port sustainability in Ireland and should be recognised as future enablers.

4.2.7 *Need for long-term thinking*

This research identified the need to encourage increased demand for long-term action. While longer time frames have featured within the ports' master plans and the Port Capacity Study, the majority of the recommendations were categorised for implementation over the short and medium terms. This is noteworthy given that governance issues concerning port ownership, capacity and growth require imagining beyond the short and medium terms. The findings suggest the need for long-term horizon scanning and future thinking. These approaches are used to inform decision-making, with the general objective of maximising the potential of technological advancements and innovation to flexibly steer towards managed, long-term change. Long-term thinking allows ports to prepare and plan for unknown realities, foster resilience to risk and disruption and encourage adaptation to change. Within sustainability, the pace and extent of political, economic, social, technological, legal and environmental change require a forward-looking approach, an appreciation of complexity and the flexibility to effectively respond to uncertainty.

4.3 Addressing the Gaps

To ensure that the issues raised in section 4.2 were considered before finalising a Port Framework for Sustainability, a research symposium with Irish port stakeholders was held in Dublin on 22 February 2023. The research symposium was one last opportunity to present the draft recommendations and enabling conditions by time frame to port stakeholders and capture their final input. A specific workshop was convened during the symposium to ask the stakeholders the following three questions:

1. Are there any additional actions required to be implemented by 2028, 2038 and 2050? In particular, please have regard to the long term.
2. Are there any additional enabling conditions required to be in place by 2028, 2038 and 2050 to ensure that recommended actions are implemented? In particular, please have regard to the long term.
3. Can you identify the enabling actors who can assist with implementing the specific actions over the short, medium and long terms?

Several of the issues raised by the stakeholders during this event have already been addressed under each of the themes of governance, innovation, decarbonisation, linkages, and efficiency and investment. Under the theme of governance, stakeholders highlighted the need for fiscal mechanisms, balanced regional development, efficient planning and consenting regimes, greater collaboration, multi-scalar considerations, environmental targets, an economic analysis of Irish ports, etc. For the theme of innovation, stakeholders suggested more actions on automation, carbon abatement technology, underwater noise mitigation, international collaboration, etc. For decarbonisation, stakeholders wanted to see more action on the provision of incentives, research and development, legislation, risk management planning, supply chain mapping, consultation and engagement with a wider range of stakeholders, etc. Concerning linkages, stakeholders felt there should be more engagement with communities and environmental NGOs, and suggested that NGOs should be represented on a national ports body if established, and improved dredging and noise mitigation measures, corporate sustainability directive reporting and green shipping

corridors should be implemented with a wider geographical scope. With regard to the theme of efficiency and investment, stakeholders felt that a Maritime Education Strategy should be prioritised, greater engagement with port stakeholders including customers and carriers was necessary and shippers should be rewarded for going beyond meeting standard compliance regulations.

These collective responses validate the overall research findings to date. Two issues, however, persist: the inability to think about the long term or identify key enabling actors. While workshop stakeholders were specifically asked to identify long-term actions and enabling actors, this proved too challenging. This, however, is a significant finding in itself. Workshop stakeholders involved in the management of Irish ports were reticent about planning beyond the short and medium terms. It was suggested that there was a lot of uncertainty concerning zero-emission technologies and fuels, which made it difficult for ports to plan ahead. That notwithstanding, Irish ports, similar to international ports, do consider future port activities and actively draw up master plans for them. For example, the Port of Cork is in the process of developing emerging concepts for its Port Masterplan 2050, while the Shannon-Foynes Port Company recently published a Strategic Review of its Vision 2041. These developments highlight the need to plan ahead despite uncertainties associated with technologies, fuels and infrastructure requirements. Adaptive capacity and resilience should therefore be designed into future port scenarios to allow for greater agility in the future.

With regard to enabling actors, a limited group was identified by stakeholders during the workshop. These included the Irish Government, the EU and local authorities. It was suggested that a dedicated Department of Marine should be established by the Irish Government to manage marine activities in an integrated manner and identify key actors and stakeholders. It is acknowledged, however, that the difficulties of identifying enabling actors as well as thinking about the long term are not unique to the Irish context. At the symposium, two guest speakers presented international case studies, including Norwegian ports and the Port of Aberdeen. Both speakers reflected on similar experiences in their respective countries concerning long-term thinking and collaboration with a wider range of enabling actors;

however, these challenges were not insurmountable. In Norway and Aberdeen, partnerships formed between ports, industry, national governments, local municipalities and communities have been successful in securing funding, developing supply chains, building infrastructure, addressing education, skills and training needs, and investing in innovation and technology. In both countries, ports are planning for an energy transition with visions and concrete plans in place for decarbonisation.

It is recognised, however, that sustainability transitions are long-term and complex processes that require a policy mix, a range of incentives, economic resources, market competencies and capabilities, regulations, spaces, and a need for broader coordination/ collaboration. This will be achieved in Ireland only when a holistic approach to port planning is embraced and fully supported with ports, national government, industry, local municipalities and communities coming together and working collaboratively on a future vision of sustainability.

5 Conclusions and Recommendations

A Port Framework for Sustainability includes a combination of the recommendations and enabling conditions described in the previous section. As acknowledged, gaps have been identified in the areas of (1) positive climate action; (2) energy efficiency; (3) environmental practice; (4) research, technology and innovation; (5) enabling actors; and (6) long-term planning. We recommend that Irish ports should identify potential actions and actors to address these omissions and consider the full suite of recommendations and enabling conditions when designing their own pathways for long-term sustainable development and include appropriate monitoring programmes to track change over time. Linking back to the original literature review on “sustainability transitions” (Working Paper II), key concepts were reviewed including the MLP and transition management.

The MLP describes how transitions materialise through dynamic processes within and across three functional scale levels. These levels are referred to as niches, regimes and landscapes. The landscape level is influenced by external forces such as changes in the macroeconomy, politics, population dynamics, natural environment, culture and worldviews. The regimes are established as the dominant and prevailing practices, rules and patterns of institutions, assembled and maintained to perform economic and social activities. Niches are localised areas where innovation can first take root and comprise individual actors, alternative technologies and local practices. Niches are important, as they provide the seeds for change and are crucial for path-breaking innovations and overcoming path dependencies.

The MLP is a useful analytical concept to help explain both how systems operate and how they change. Local initiatives, pilot studies and research and development projects are all types of experimental niches within the MLP of transitions. Irish ports have the potential to become niches. Landscape forces may exert pressure on existing regimes. Port governance represents a regime. External pressures can lead to cracks, tensions and open windows of opportunity for

niches to break through and contribute to fundamental changes or shifts in regimes. An example of a niche breakthrough is when renewable energy such as green hydrogen is produced and used by ports pressurising current regimes, policies and infrastructure to change.

The identification of enabling actors is therefore critical in the development of a transition pathway for each port. This includes institutions and actors at the regime level such as the IMO, EU and national government. It is necessary to have regard for these actors and how niche activities can influence change. A national ports body that links the Irish Government and local ports with stakeholders from industry, environmental NGOs and local communities will be key to implementing the framework recommendations and enabling conditions. Policy commitment and guidance at the regime level will be necessary to provide strategic direction to individual Irish ports who can then develop their own pathways to reflect local needs, context and stakeholder requirements.

The concept of transition management reflects a new governance approach to facilitate and accelerate transitions through a participatory process of visioning, learning and experimentation. It is a cyclical process that involves five key stages: the development of a transition arena, visioning, experimentation, monitoring and reflexivity. The establishment of a transition arena will be fundamental to identifying the pathway that offers the greatest sustainability potential for each Irish port. Ideally, the transition arena would follow the development of a national ports body. It would essentially be a local ports body or group encompassing actors from the state, market, community and the third sector (unions, NGOs and academia) within the local region that would co-develop a sustainability vision for the port and a transition agenda. The arena group would actively mobilise actors to experiment and execute projects that encourage ideas and actions that bring about positive change, i.e. technology advances, digitalisation and zero-emission innovation. It would then monitor, evaluate and learn from the transition experiments and make adjustments to the vision,

agenda and coalitions based on these outcomes.
These deductions could feed back to the national ports
body and help influence change at the regime level,

i.e. through policy, guidance and investment support
over the long term to ensure a robust, agile and
sustainable port governance system in Ireland.

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Abbreviations

DoT	Department of Transport
IDA	Industrial Development Agency
IMDO	Irish Maritime Development Office
IMO	International Maritime Organisation
MARA	Maritime Area Regulatory Authority
MLP	Multi-level perspective
MPA	Marine protected area
NGO	Non-governmental organisation
ORE	Offshore renewable energy
PESTLE	Political, Economic, Social, Technology, Legal and Environmental
SDG	Sustainable Development Goal
SEAI	Sustainable Energy Authority of Ireland
SHIP	Sustainable and Holistic management of Irish Ports

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 uirbhig;
- > 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 uirbhig 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 ceimiceán 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 inní agus le comhairle a chur ar an mBord.

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