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INFOMAR Foresight Assessment Report

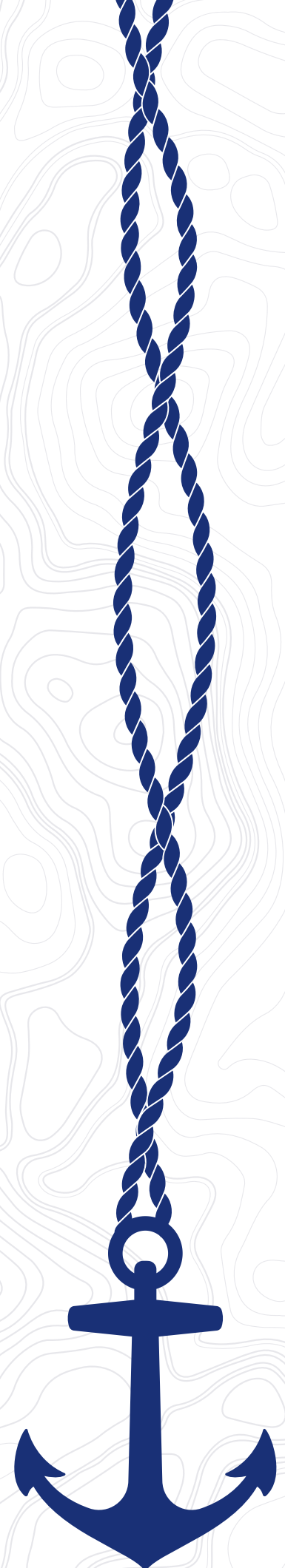
A report commissioned by INFOMAR,
October 2024

MAKING AN
IMPACT THAT
MATTERS

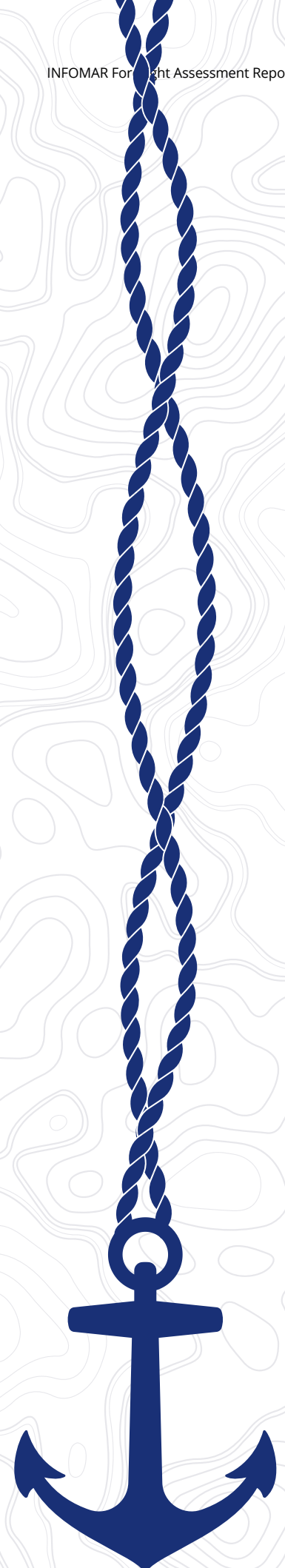
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Forward



This INFOMAR Foresight Assessment report was conducted independently by Deloitte Ireland LLP. The report was commissioned by INFOMAR on behalf of the Department of the Environment, Climate and Communications (DECC) with cooperation and support from Geological Survey Ireland (GSI) and the Marine Institute (MI).



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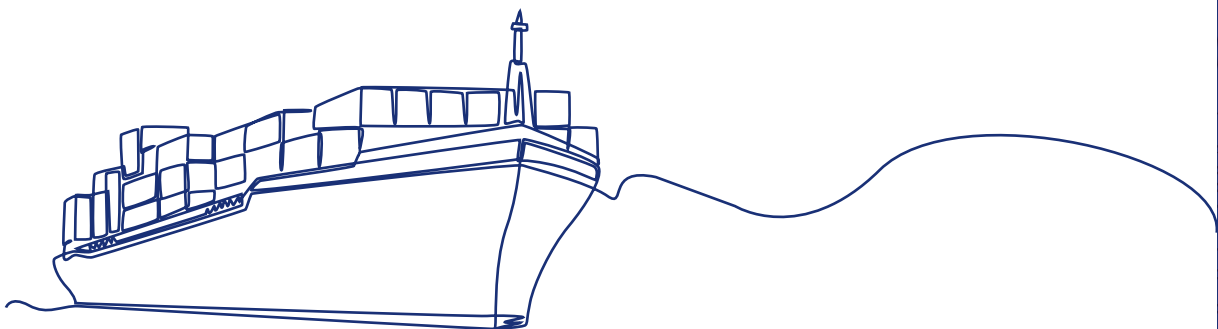
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**An Roinn Comhshaoil,
Aeráide agus Cumarsáide**
Department of the Environment,
Climate and Communications

We would like to take the opportunity to thank representatives from the sponsoring agencies and their partners as well as the extensive list of

stakeholders who engaged with us, the full list of stakeholders that were contacted is contained within the appendix.



Disclaimer

Deloitte Ireland LLP (“Deloitte”) was commissioned by INFOMAR programme partners Geological Survey Ireland and the Marine Institute, with oversight of the INFOMAR Programme Board, in line with the terms set out in our Service Contract dated 29th May 2024 (the “Contract”). This document, which has been prepared by Deloitte, is for the sole purpose of providing an INFOMAR Foresight Assessment report, in line with the Requirements set out below.

This INFOMAR Foresight Assessment is expressly not a strategy document. The report approach focused on pinpointing a range of potential future scenarios, and no assurance provisions can be drawn from the outcomes noted. Deloitte Ireland LLP has relied on data and analysis furnished by management of INFOMAR, the Marine Institute & Geological Survey Ireland and their stakeholders, without audit or verification procedures being applied. To the degree that errors or material omissions in the provision of this relevant data and analysis has occurred, it could alter the results set out herein.

Deloitte will not be responsible to anyone other than the Client in relation to this report. No other party is entitled to rely on this work for any purpose whatsoever and Deloitte accepts no responsibility or liability to any party other than our client in respect of this report or any of its contents.

Foresight Assessment Report Requirements

Deloitte's approach and methodology adopted for this foresight assessment is consistent with schedule B of the Services Contract signed by Deloitte and the Marine Institute on the 29th of May 2024:

Requirements	Tasks	Deliverable
Requirement 2 Undertake a foresight assessment to identify needs, risks & opportunities that INFOMAR can address in the future for the benefit of the state and society.		
In addition to Requirements 2(a) and 2(b) below, the Tenderer should undertake any other activity that they consider will support achieving the overall requirement		
Requirement 2(a) Assess the current policy and socioeconomic framework in Ireland/EU to which INFOMAR knowledge, data, services, and infrastructure currently contribute, and/or could do in the future.	Identify and map out key national/EU strategic and policy informing INFOMAR functions.	Deliverable 2: INFOMAR Foresight Assessment Report
Requirement 2(b) To further assess future INFOMAR related requirements and opportunities, and better inform future effort and resource prioritisation, the Tenderer will coordinate a GDPR compliant INFOMAR stakeholder survey.	Stakeholder survey to identify future INFOMAR support provision to address seabed and/or habitat mapping related service requirements & opportunities.	

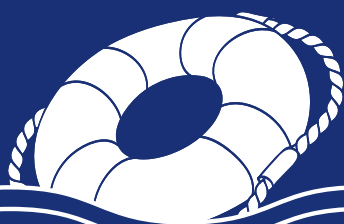
Fieldwork and Review Timing

The INFOMAR Foresight Assessment report has been completed between June and October 2024. Our Foresight Assessment methodology included an extensive review of key documentation supplied by management, stakeholder and Board member interviews, and a series of structured workshops during the timeframe. This report was the second such report completed by Deloitte for INFOMAR from June to October 2024, the first being the INFOMAR Programme Review.



Executive Summary

INFOMAR is a unique scientific capital programme and infrastructure resource of the Irish Government. INFOMAR's ability to acquire scientific marine datasets, to process this data and to publish it in an open-source format has positioned Ireland as a global leader in the field of marine resource management. The programme is in its final stages and having surpassed expectations is due to winddown in 2026. The findings in this report however demonstrate that retaining the programme and its unique infrastructure and knowledge or founding a similar and expanded programme will be indispensable for the Irish Government to meet its international obligations, harness marine resources and develop the blue economy.



Ireland is in position to reap significant opportunities from its territorial waters through careful integrated marine planning. A successor that supports that integrated planning and continues INFOMAR's core mission: focussing on data acquisition, analytics and dissemination, and expanding its benthic habitat and geophysical datasets post-2026 will be required to support a range of future policy initiatives and private sector activities. INFOMAR's capability and culture focused on supporting government policy initiatives and sharing its work and datasets with the public in an open-source format could be built upon and solidified.

INFOMAR's ability to leverage involvement in major EU and international projects facilitates ongoing high-level engagement and provides resourcing that contributes significantly to the delivery of Ireland's international obligations (SOLAS, MSFD, ORE, etc.). As a national resource, the INFOMAR programme represents long-term strategic value to Ireland, through delivery of data, products, skills, and services in the national interest.

Future technological change will enable INFOMAR to build on its current capabilities and enhance its performance. This will enable it to survey and acquire larger datasets, process them faster and enable easier interpretation of these datasets for stakeholders leading to greater impact and return on public spending. Future social and economic trends will be both a source of opportunity and challenge to Ireland. While demographic changes will strain the future fiscal position of the State, demand for resources to power the green transition and net-zero economy could open new economic opportunities for the State. Underpinning the green transition, INFOMAR is a key provider of reconnaissance scale, unbiased, trusted, and independent scientific State-acquired data and advice which is a chief enabler during the scoping and potential site selection phase of offshore renewable energy development.

Legislative and policy trends into the future are such that an expanded programme post-2026, herein referred to in this report as 'INFOMAR 2.0', will be required for the government to meet its European and international obligations, through monitoring, acquisition, and integration

of new data. Environmental initiatives aside, a changing geopolitical environment is spurring on new policy initiatives to secure marine resources and subsea infrastructure that a potential INFOMAR 2.0 programme would be critical to responding to in terms of its data acquisition, processing, and dissemination capabilities.

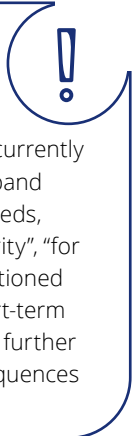
The power of mapping as a policy tool will endure, we cannot manage what we cannot measure and map. INFOMAR has the potential to grow and continue to positively impact multiple economic sectors simultaneously as well as some of our most remote and vulnerable coastal communities. Through supporting a national system of integrated planning and expanded Designated Maritime Area Plans (DMAPS), INFOMAR will be essential to provide the data to inform the State and associated regulator's demarcation and deconflicting of disparate economic sectors as well as competing government priorities, in what will soon become an increasingly crowded marine economic space.

State Agencies and Government Departments that were engaged as part of this INFOMAR Foresight Assessment Report noted that INFOMAR is perceived as a critical public sector entity, and as a purveyor of unique, open source and critical datasets. However, it is in fact a finite time bound jointly managed programme by two public sector bodies with no legal status, and therefore unable to commercialise, freely recruit, or expand. Despite the constraints to the organisational structure, these stakeholders relayed that they would otherwise be forced to outsource to the private sector at potentially greater cost and further delay owing to current procurement processes.

INFOMAR as it is currently constituted, could not fully embrace an expanded remit, and support the Irish government in meeting its future legal obligations and policy initiatives or positively impact multiple economic sectors. A future follow-on strategic review of INFOMAR that considers its governance, organisation structure and capabilities to ensure their fitness for purpose and alignment with wider public policy in the marine sector, is key to the future of this INFOMAR 2.0 or an alternative programme.



Assessed Needs, Risks and Opportunities



The assessed needs, risks and opportunities derived from the core sections 2-4 of this report are listed below. A need can be described as an improvement to an existing process in the future. A risk is an item that will arise in the future but for which there is currently no solution. An opportunity is an area that INFOMAR or alternative programme can expand into and increase its impact. In the Category column, each one of these summarised needs, risks and opportunities are categorised according to the urgency of the issue, i.e., “priority”, “for consideration” or “requires further research”. Priority signifies that the item could be actioned in the short-term, for consideration indicates that an item could be actioned in the short-term after consideration by the INFOMAR Board and public policy decision makers. Requires further research indicates that a topic needs to be explored first to fully understand the consequences of actioning the item.

The following five assessed needs, risks and opportunities were deemed to be important by the INFOMAR Programme Leadership team:

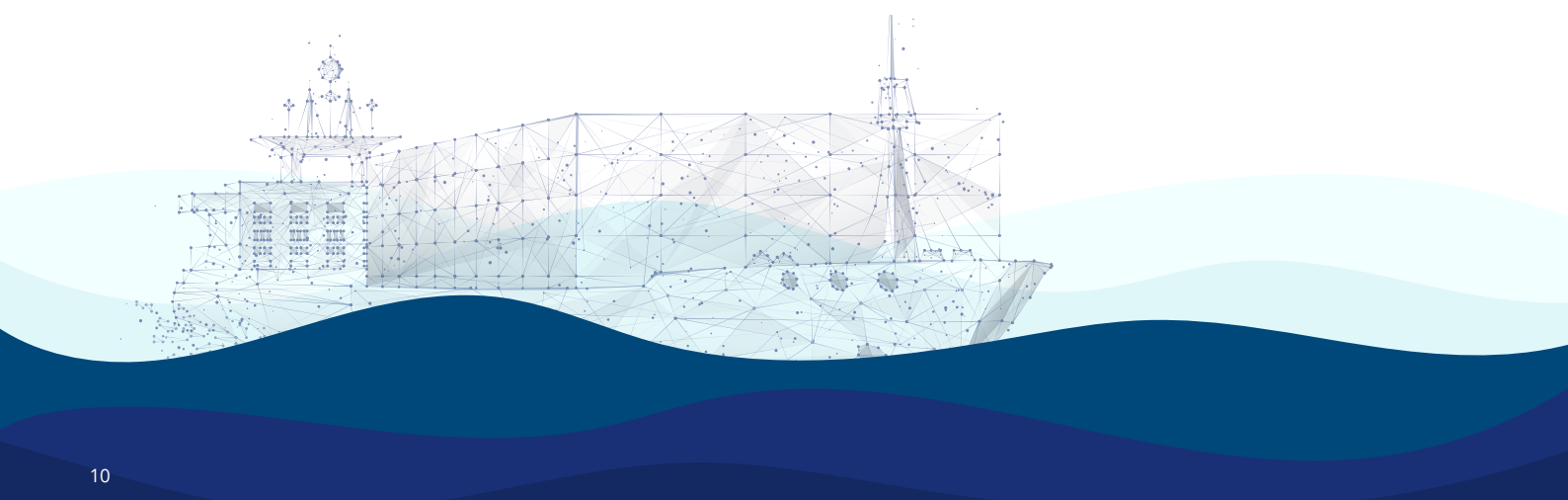
Section	Type	Important assessed needs, risks, or opportunities
3.4.1	Risk	Continued mapping of the nearshore intertidal zones (white ribbon area) due to societal relevance and lack of alternate state data source; continued mapping in areas where data age or quality necessitates a refresh to meet newest hydrographic charting and data currency standards.
3.3	Opportunity	INFOMAR could with DECC as the competent authority for marine planning in Ireland support future data needs for development of a plan-led system of expanded multi-sector DMAPS for the marine environment, enabling integrated marine planning in Ireland.
2.2.2	Opportunity	Investigate as part of a future follow-on strategic review how INFOMAR can align to government climate policy and adopt national climate resilience and the biodiversity challenge as part of its core mission. This would include monitoring approaches and composite product development.
3.1.2	Opportunity	As part of a future follow-on strategic review, INFOMAR 2.0 could explore international best practice in the development, monitoring and protection of subsea infrastructure and impacted habitats. It could explore a formal partnership with industry and/or the State defence and security services to ensure their enforcement.
3.6.1	Risk	Were INFOMAR completed or transitioned without due consideration into a new INFOMAR 2.0 programme, a transition risk would arise whereby valuable data acquisition and management skills and expertise could be lost due to discontinuity of stewardship.



The following are the remaining assessed needs risks and opportunities. They are listed as identified, not ranked in order of importance or potential impact.

Section	Type	Summary needs, risks, or opportunities	Category
2.1	Opportunity	INFOMAR could as part of its management processes formalise undertaking of regular periodic technology scanning to identify future technologies with a view to understanding potential applications and where possible work with Irish start-ups to pilot such technology to maintain INFOMAR and Ireland's global scientific leadership in the sector. The application of AI in the processing of data could be investigated as a priority.	Priority
2.2.1	Need	Explore alternative future finance operating models that could reduce INFOMAR's cost base.	Requires further research
2.3.1	Risk	Identify areas of high-density marine activity (transport, fishing, ORE etc.) and/or high-risk maritime areas and target them for continual monitoring, considering growing projected vessel numbers and the potential demands that will be placed on the State as a result.	Priority
2.3.2	Opportunity	INFOMAR could continue to work with research, industry, and government to understand the geological, geophysical, and benthic habitat datasets that would need to be acquired and processed to help inform Ireland's future position on the controversial issue of rare-earth mineral exploration and exploitation offshore Ireland.	Requires further research
2.4	Need	<p>1. Develop a cross-government legislative monitoring initiative to (a) perform ongoing horizon scanning of future legislation and public policy, and (b) improve understanding of the datasets that will be required from both Ireland and INFOMAR 2.0 to effectively meet future obligations and demands, and</p> <p>2. Implement an associated management plan to (a) prioritise new data needs, and to (b) acquire, manage, and disseminate these data.</p> <p>This will support and lower the cost to the state of compliance with legislative and policy requirements, while helping to ensure that the government receives long-term strategic value from INFOMAR, a trusted provider of state marine data.</p>	Priority
3.1.1	Need	As part of strategic planning towards INFOMAR 2.0, the relationship between INFOMAR, MARA, as the marine enforcement authority and An Bord Pleanála, as the Marine consenting authority, could be explored to see how their expertise can be used effectively and how they can work together formally.	Priority
3.1.3	Opportunity	As part of a future follow-on strategic review, INFOMAR 2.0 could seek to align its strategic goals with government policy on legacy fossil fuel infrastructure such as pipelines and gas fields including its decommissioning, repurposing, or extension.	For consideration
3.2.1	Risk	INFOMAR could seek to understand the range and depth of biological datasets and biodiversity information that will be required of it and Ireland to support policy making and Ireland's international obligations.	Priority
3.4.2	Opportunity	INFOMAR could work in partnership with relevant local authorities, regional assemblies and local industry to develop a national marine tourism, leisure, and heritage strategy, through a coordinated cross-government approach.	For consideration

Section	Type	Summary needs, risks, or opportunities	Category
3.5.1	Opportunity	As part of a future follow-on strategic review INFOMAR could continue to explore the concept of defence interoperability and work with the Irish Defence Forces to understand how INFOMAR's capabilities can complement the security of the state.	Requires further research
3.5.2	Opportunity	Expanding surveying of nearshore area and formal cooperation with the emergency response authorities and the Marine Institute's oceanographic modelling team could improve the outcomes of those who require an emergency response after getting into difficulty in our waters.	For consideration
3.5.3	Need	A future follow-on strategic review of INFOMAR 2.0 needs to assess the Programme's future engagement with key governmental stakeholders such as the DoT, EPA, MARA, DECC & DHLGH Marine Environment, MSFD & OSPAR team and establish it on a more formal footing to maximise public sector synergies and value for money.	Priority
3.5.3	Opportunity	Expanding INFOMAR 2.0's site monitoring capacity, infrastructure and expertise in the future is key to securing such sites and minimising potential pollution or habitat loss impacts.	For consideration
3.6.1	Opportunity	Improving access to research through business partnering and offering of bespoke data products and services could be considered.	For consideration
3.6.2	Opportunity	INFOMAR could develop an ecosystems approach to innovation by convening private and public sector stakeholders together as part of a formal network to leverage scale.	For consideration
3.7.1	Need	INFOMAR could continue to secure the full education value and pipeline of talent by working with the Universities to develop undergraduate and postgraduate offerings for students both from Ireland and from abroad.	Priority
3.7.2	Need	INFOMAR could work with further education authorities to develop conversion or continuous professional development courses, and close skills gaps in the sector.	For consideration
4.0	Need	As part of a future follow-on strategic review, INFOMAR should evaluate its governance, structure, and capabilities to ensure that it can create and leverage opportunities and position itself to mitigate future risks in Ireland's marine sector.	Priority



1.0 Introduction, Context, and Approach

1.1 Introduction

As an island nation it is hard to separate land and sea from our national identity. Our relationship with the marine environment has always been double edged, both a source of opportunity and risk. Ireland was an early mover in recognising the scale, importance, potential, and value of our marine territory, having commenced exploring it in 1996 to determine and establish our territorial boundaries.

Since the turn of the millennium, a focus internationally on resource management and sustainability has driven a desire for careful marine resource management nationally. The INFOMAR programme was founded to survey our marine resources, acquire the data, process it, and disseminate it. This will continue to help government to balance the needs and competing demands of multiple marine sectors, to deconflict them and promote growth in our marine economy. The background of the INFOMAR Programme is set out in the INFOMAR Programme Review report.



1.2 Context

We are living in unparalleled times in terms of economic, social, ecological, and technological change. The 21st century will bring new opportunities and growth, and with that there will be increasing pressure and risks imposed on the marine environment. Business as usual will not be an option if we are to capitalise on these opportunities, manage the pressures, and mitigate the risks. The purpose of this foresight assessment is to understand how INFOMAR, or a successor 'INFOMAR 2.0'¹ initiative can help the State to grow, and sustainably manage a thriving marine future for Ireland.

While the government's National Development Plan 2021-2030 calls for the completion of the INFOMAR programme as one of its strategic priorities (Government of Ireland, 2021), we will see that future demand for INFOMAR's capabilities and functions will increase indefinitely across the public and private sectors, if Ireland is to be able to deliver on its obligations and achieve the current extent of public policy aspirations.

1.3 Approach

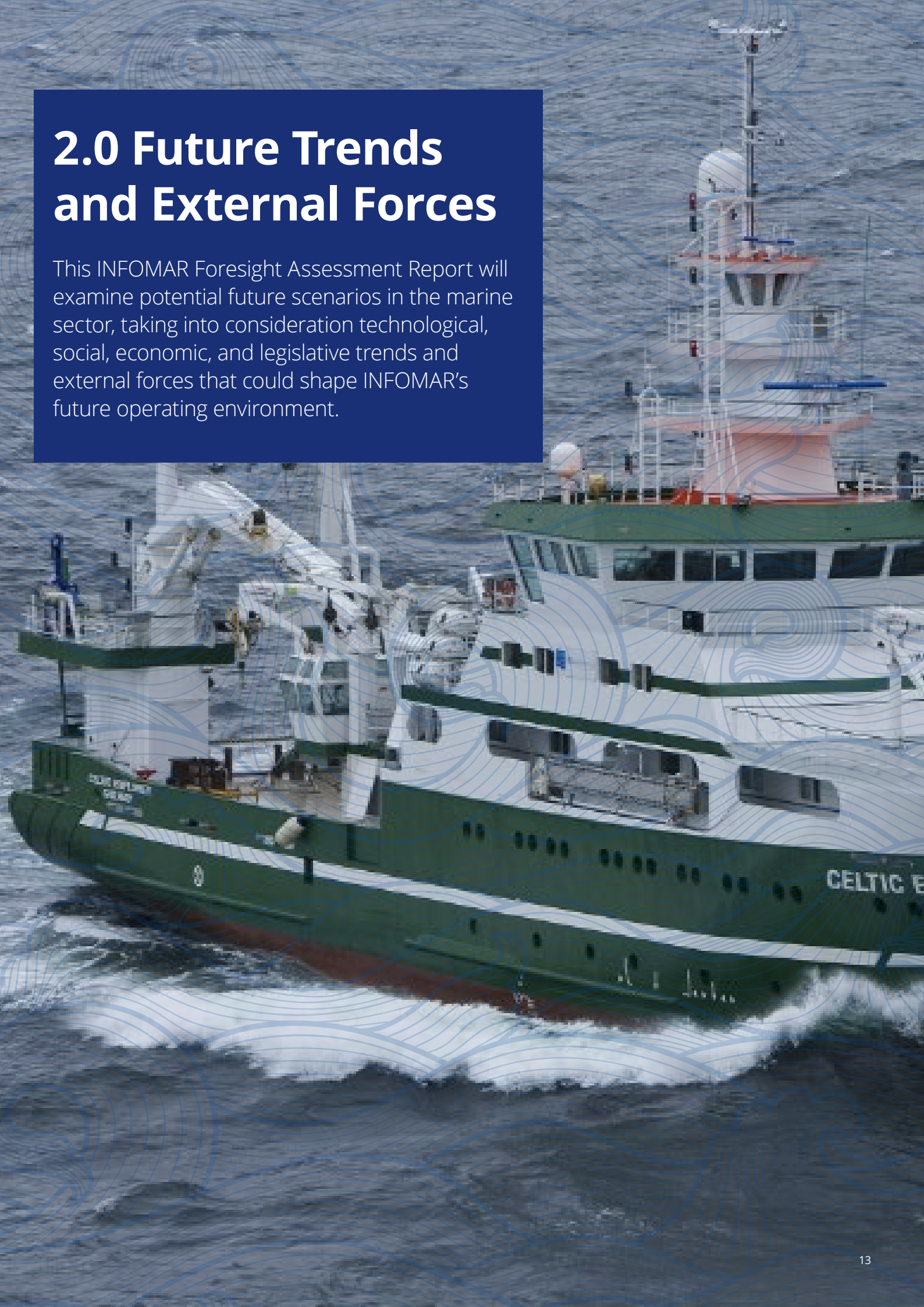
Our approach to this INFOMAR Foresight Assessment report relied on information gathered through a combination of INFOMAR leadership interviews, in-person stakeholder engagements, legacy documentation reviews and desk research involving horizon scanning and online research. A full list of external sources is contained in the Bibliography section of this report. To leverage synergies this INFOMAR Foresight Assessment report was undertaken in parallel with the INFOMAR Programme Review report, but this report is solely focused on the future. This INFOMAR Foresight Assessment report is structured as follows:

- Section 2.0: Future Trends and External Forces: technological, social, economic, and legal issues that will shape INFOMAR or INFOMAR 2.0
- Section 3.0: Future External Economic Impact: how INFOMAR might best positively impact its most relevant external economic sectors in the future.
- Section 4.0: Future Internal Operations: how INFOMAR might change internally in the future to best deliver for the greater good of Irish society considering the potential described in this report.

1. Deloitte does not assume that the current INFOMAR Programme will be extended beyond its current lifespan post-2026. However, our research in addition to consultations with stakeholders indicated the necessity of continued work in this area by the State post-2026. Many stakeholders colloquially referred to this body of work as 'INFOMAR 2.0', a term that we have applied in this report to ascribe activity to once the current programme is wound down post-2026.

2.0 Future Trends and External Forces

This INFOMAR Foresight Assessment Report will examine potential future scenarios in the marine sector, taking into consideration technological, social, economic, and legislative trends and external forces that could shape INFOMAR's future operating environment.





2.1 Technological



Adoption of new technologies and applying them in innovative ways to form new capabilities has been a constant theme of INFOMAR's work. Increasingly sophisticated data acquisition platforms will create additional data processing activity downstream. Deployment of autonomous submersible and surface vehicles will enable INFOMAR to decrease carbon footprint in the future, while increasing data resolution, benthic habitat knowledge, and crew safety.. Recent evolution and cost reduction in satellite data communications will facilitate near real-time shore-based monitoring of at-sea survey activity, as well as data analytics and processing. Continued application of innovative technologies in INFOMAR 2.0, will facilitate de-risking marine spatial planning and development, through access to baseline and time series data of greater resolution and accuracy. This exploratory section will detail some of these new technologies, it will explain how they apply to the marine sector and then apply it to the INFOMAR programme to understand its potential impact. A review of INFOMAR's adoption and operation of existing technology is contained in the associated INFOMAR Programme Review report.

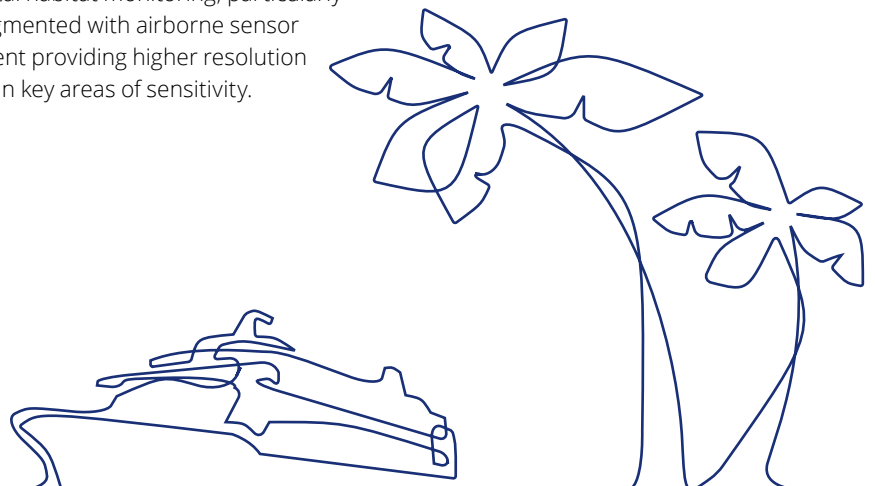
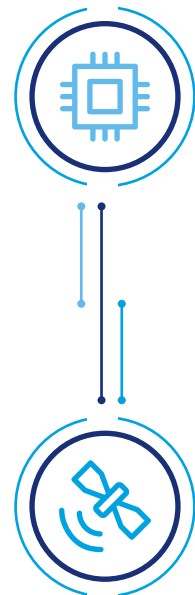
2.1.1 Remote Sensing and Satellite Technologies

Satellite and remote sensing technologies enable remotely located machines and digital systems to understand the world around them and communicate with each other in real-time via a network of satellites orbiting the earth's atmosphere. The existing applications of remote sensing and satellite technologies by INFOMAR is contained within the associated INFOMAR Programme Review report.

In the future such technology could be capable of detecting, monitoring, and surveying multiple aspects of the sea, the seabed, and marine biodiversity, acquiring data at high resolution and enabling assessment of change over time. Innovative sensor deployment approaches can be explored in airborne systems, whether drones or aircraft, seabed deployment on fixed or mobile landers, or sea surface deployment on vessels, buoys, or coastal observation stations, or indeed in space on satellites themselves. Future satellite technology has the potential to enable easier monitoring of the marine environment, allowing repeat surveying in remote waters (Government Office for Science (UK), 2018). In the navigation space

'smart shipping' will be facilitated by the growing use of sensors and satellites, which will provide the industry with real time data and data sharing infrastructure to improve efficiency, navigation, onboard safety and reduce costs and risks.

In the future, such regional mapping could be augmented by a combination of autonomous unmanned survey vehicles, reducing at sea personnel requirements and costs, as well as fuel consumption. Incorporation of satellite data analytics in clear shallow coastal waters could inform targeting of areas of seabed that are susceptible to or have been subject to changing depths (e.g., pre-post storm events) for more comprehensive and accurate vessel targeted hydrographic survey. Satellite data can play a pivotal role in enhancing maritime surveillance, infrastructure security, and environmental and coastal habitat monitoring, particularly when augmented with airborne sensor deployment providing higher resolution datasets in key areas of sensitivity.



2.1.2 Artificial Intelligence

Artificial intelligence (AI) technologies are powerful autonomous Information Technology (IT) processing platforms that are capable of sensing, processing, and actioning information replicating human intelligence. When applied to large datasets they have demonstrated heightened quality and processing speed over their human equivalents. These platforms are expected to dominate narratives on management of quality, productivity, and efficiency across the public and private sector into the future.

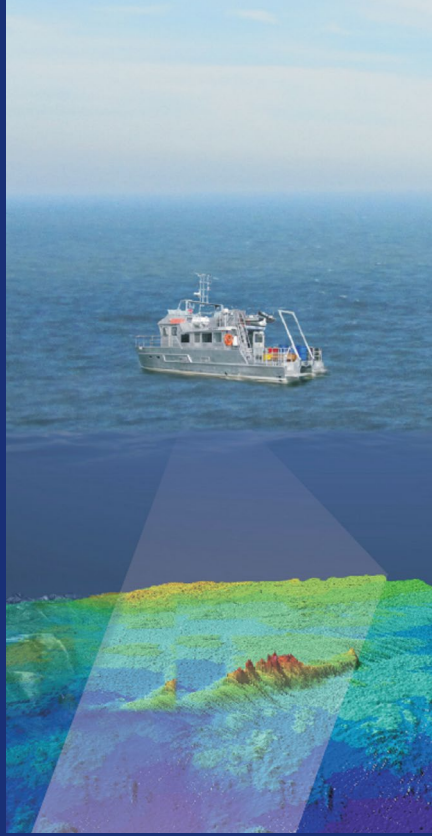
In the marine space, the integration of AI is expected to drive innovation in decision-making processes and operational efficiency, ushering in a new era of intelligent maritime systems, improving the navigation of vessels and the implementation of autonomous shipping (Windward, 2023). This emerging trend has the potential to enhance safety measures within the industry. Analysis of data from ship sensors could be utilised to monitor and automatically identify safety hazards and share information between one another (Netsol, n.d.). It has proven applications within the public sector and has demonstrated value in analysing large datasets and providing interpretations quickly, reducing costs and labour hours, optimising resources for more value-add activities.

AI has the potential to revolutionise safety at sea through inter-vessel data sharing and analytics, satellite tracked floating hazard monitoring, and provision of onboard decision support through analytics of INFOMAR acquired navigation data, projected vessel pathways, wave, tide and current models, and controlled collision avoidance. Intelligent use of already available information will enable vessels to autonomously identify hazards, to navigate around them, enabling safer commercial and marine leisure seagoing activities, particularly in hazardous nearshore waters.

With further research and investigation, AI could in the future completely transform how and where INFOMAR 2.0 processes and interprets its data. Smart monitoring of depth changes and scouring may in the future inform marine infrastructure & heritage management, such as offshore wind turbine foundation maintenance, or shipwreck preservation or collapse and pollution risk management. AI could potentially reduce post-acquisition data processing lead times, and potentially improve accuracy and reduce errors and cost. The backlogs in processing of data were identified as a major pain point by stakeholders, an issue only resolvable presently through additional personnel allocation. In the future, building on recent INFOMAR coordinated AI research application in Geomorphology mapping, end users of INFOMAR data will continue to be able to leverage AI to interpret and deliver more impact from INFOMAR's work. Ultimately AI will make INFOMAR data more accessible, and its application to INFOMAR's data acquisition, processing and interpretation warrants further investigation.

2.1.3 Internet of Things and Autonomous Drones

The twin emergence of Internet of things (IoT) solutions and drones, be they land, sea or air based, is set to transform how mobile machines and computers interact with one another through data networks autonomously. In the marine sector it will further enable autonomous vessel operations, autonomous navigation, remote monitoring, and real-time data exchange between a mothership at sea and its associated drones capable of surveying multiple scientific datasets simultaneously (benthic, geophysical, biological etc.), thereby redefining the capabilities, efficiencies and safety standards of marine operations including seabed mapping. However, this transformation will also expose the sector to heightened vulnerability to cyber-attacks, necessitating



robust cybersecurity measures to safeguard critical maritime infrastructure and data integrity.

In the future INFOMAR data acquisition and updating could become much cheaper and faster with the advent of autonomous drones which while requiring 24-hour shore based technical support and supervision, will potentially reduce the requirements for seagoing crews and their associated onboard support systems for routine operations, though some support personnel will still be required for maintenance and failure scenarios. Although future surveying tools are expected to continue to rise in cost and complexity, the potential for lower cost autonomous deployment coupled with the increasing resolution of their data will facilitate improving existing datasets and models, increasing data access and knowledge in deeper offshore waters, aiding further sustainable development of marine resources and activities and supporting decision making on controversial issues like rare-earth mineral exploration and exploitation on the seabed.

2.1.4 Digital Twinning

Digital Twinning Technology refers to a virtual representation or model of a physical object or piece of infrastructure based on extensive measurement and surveying data by advanced sensors. It facilitates the conversion of real-world physical data into virtual models, enabling the generation of simulations, analysis, and data aggregation. This 'digital twin' enables the extensive use of scenario planning and simulations to analyse performance problems, identify risk and create mitigations and enhancements.

When applied to marine infrastructure such as high-risk ports, shipping lanes, offshore windfarms, subsea cable corridors and high trafficked bays, these digital twins empower more informed decision-making and sustainable planning capabilities. They can also work with other technologies such as AI to simulate and assess community readiness for the impact of rising sea levels and coastal flooding and erosion which will become a more serious problem in the future. The EU is already attempting to develop a digital twin of the Ocean through their Destination Earth Initiative.

The shape, depth and character of the seabed inform oceanographic, ecosystem, and climate modelling. This puts Ireland in a globally unique position to support true digital twin development, both geographically, but more importantly through INFOMAR data richness, quality, and extent, data that will facilitate real-world decision support tool development. Strengthening INFOMAR capacity in the future in satellite and additional remote sensing data will further enhance Ireland's opportunity and role in this space. Contributing accurate and systematically acquired INFOMAR data to digital twins will help de-risk and support policy and decision making across government. Potential applications are endless, including for example scenario assessment for responding to an environmental catastrophe at sea, an accidental sinking in a high traffic area causing national supply chain risks, or investigating how we can make our communities more resilient to extreme climate related weather events. In turn this requires access to contiguous data from neighbouring jurisdictions and Ireland should be well placed for international collaboration and the benefits derived there.

Opportunity: INFOMAR could as part of its management processes undertake regular periodic technology scanning to identify future technologies with a view to understanding potential applications and where possible work with Irish start-ups to pilot such technology to maintain INFOMAR and Ireland's global scientific standing in the sector. The application of AI in the processing of data could be investigated as a priority.



2.2 Social



As a European and Irish exchequer funded programme INFOMAR will continue to be heavily influenced by the social environment through its direct impact on politics and government policy. Societies around the world are changing rapidly and this will have a bearing on government policy as societies including that of Ireland become older, more middle class and increasingly urban.

2.2.1 Demography and Public Finances

Like most developed Western nations, Ireland will face a challenging demographic position over the coming decades. According to the Central Statistics Office (CSO, 2022) the projected Old Age Dependency Ratio, calculated by expressing the population aged 65 years and over as a percentage of the adult population aged 15-64 years, could almost double from a projected 25% in 2027 to 49.8% by 2057.

This trend will put strain on the Irish economy as those entering old age are generally accepted to experience much higher levels of economic inactivity and incur higher spending on healthcare provisions and pensions. This will put pressure on public spending at a time when the proportion of those in the working age population is expected to remain broadly in line with 2022 levels, though there will be some increases in labour participation in the 55-69 male cohort indicating an increased propensity to remain in the workforce (CSO, 2024). For public finance decision makers this will mean increases in social and health spending with a smaller increase in those paying into the social and health security system.

For non-commercial government programmes like INFOMAR which largely depend on exchequer funding this trend will put external pressure on its finances as government priorities are refocused elsewhere to maintain social spending. While it is evident through stakeholder engagement that INFOMAR 2.0 is a requirement, there may be a need for INFOMAR to alter its operating model to maintain and/or expand levels of service. This could include investing in more autonomous robotic technology to reduce its cost base. Alternatively, INFOMAR 2.0 could be forced to downscale in favour of other public spending priorities at a time when it will be needed the most, during a regime of large-scale expansion of offshore wind energy, marine protected area designation and management, and increasing coastal vulnerability and food security challenges. A discussion on existing financing of INFOMAR is contained within the INFOMAR Programme Review report. To date INFOMAR has enjoyed cross party and inter departmental support and therefore it would be essential that any extra funding sought maintains the cross sectoral support enjoyed in the past.

Need: Explore future financial operating models that help reduce INFOMAR's cost base.

2.2.2 Climate Change Public Sector Resilience

According to the EU’s European Strategy and Policy Analysis System (ESPAS - European Strategy and Policy Analysis System, 2024) Europe is the fastest warming continent in the world. Despite reduction commitments and net-zero pledges from most major polluters, projections based on implemented policies show annual greenhouse gas (GHG) emissions increasing well beyond 2040. A 2022 Deloitte article on climate resilient government (Deloitte, 2022) found that climate resilience will be a major theme of government and public policy both nationally and internationally.

The increasing frequency and severity of extreme weather events and associated flooding and economic disruption has instilled a sense of urgency across Irish society. Frequent disruptions to operations, ports, shipping channels, supply chains, and human lives are compelling broader climate action and mitigation plans including modelling for changes in the marine environment that have a terrestrial impact. The cost of inaction is high from an economic, social, and continuity of operations perspective.

INFOMAR 2.0 could be a major contributor to a more climate resilient government in Ireland and could adopt climate resilience and monitoring as part of a renewed mandate to ensure it aligns more to overall Irish government policy.

It already contributes to several climate and biodiversity initiatives undertaken by the government, agencies and NGO’s - a description of which is contained within section 4.2.6 of the INFOMAR Programme Review report. Stakeholders suggested that INFOMAR could work in partnership with other government agencies in the climate space, such as Met Éireann, through continued acquisition and contribution of key marine datasets. These would enable development of more sophisticated storm surge modelling to identify risk, and to forecast the future mitigation needs of coastal communities that are vulnerable to climate change and coastal flooding. Such collaboration will deliver a greater understanding of the changes in our climate and marine environment, and it can work towards acquiring datasets relevant to vital ‘blue carbon sinks’², which can then be protected and monitored against degradation as part of Ireland’s wider climate response and a potential future carbon sequestration strategy. INFOMAR 2.0 would also deliver to management and monitoring requirements for Ireland’s marine biodiversity, through habitat mapping, and spatial distribution assessments. Building on international research ongoing in the H2020 Mission Atlantic project, further application of future climate scenarios to habitat distribution maps of vulnerable marine ecosystems will inform future development and management plans.



Opportunity: Investigate as part of a future follow-on strategic review how INFOMAR can align to government climate policy and adopt national climate resilience and the biodiversity challenge as part of its core mission. This would include monitoring approaches and composite product development.

2. Protected areas of the seabed where large communities of organisms are known to absorb carbon from the earth atmosphere



2.3 Economy



It is evident that INFOMAR’s infrastructure, data & expertise, has the potential to play a critical role in Ireland’s future marine economy, whether hydrography for maritime transport and security, benthic habitat mapping for food security and biodiversity conservation, or geological and geophysical activity for infrastructure development and energy security.

Risk: Identify areas of high-density marine activity (transport, fishing, ORE etc.) and/or high-risk maritime areas and target them for continual monitoring, considering growing projected vessel numbers and the potential demands that will be placed on the State as a result.

2.3.1 Geopolitical Instability, Climate Change and Shipping

According to the OECD by 2050 maritime shipping could triple in volume due to increased populations, wealth, and consumption patterns, with North Atlantic routes retaining their position as the third most trafficked globally after the North Pacific and North Indian Ocean routes (OECD, 2019). This is already having a strenuous effect on global shipping. An article posted in ‘The Economist’ earlier in 2024 noted that seven of the world’s ten biggest shipping companies have suspended transit through the Red Sea, due to attacks on commercial vessels. As a result, far fewer ships are using the Suez Canal, the traditional artery connecting Europe to Asia. Climate change is also having an impact, further compounding geopolitical instability. The volume of trade passing through the Panama Canal, which connects the Atlantic and Pacific Oceans, has declined since 2023, after severe drought lowered the water level. Shipping costs have soared as a result globally (The Economist, 2024). Rising temperatures too are reducing sea ice covering the arctic ocean, opening the possibility of

year-round shipping from Asia to Europe with conventional cargo ships, driven by geopolitical instability at the traditional shipping chokeholds and shorter transit times (Government Office for Science (UK), 2018).

A future combination of expanded Arctic shipping routes, the impact of Brexit on conventional maritime trade routes into the European Union, and greater levels of shipping volumes is likely to result in Irish territorial waters and ports becoming much more heavily trafficked in the coming decades. This could lead to a manageable increase in navigation risks, threats to critical subsea infrastructure and the potential for accidents requiring an emergency response from the State.

In this likely scenario of increased shipping activity and maritime risk, the State will be subject to handling security threats in Irish waters as well as increasing legal liabilities (e.g., pollution arising from vessel sinking due state failure to provide appropriate hydrographic data). INFOMAR 2.0 needs to be able to respond to arising political pressure, whether to resurvey high risk



areas for the provision of safe navigation, or to respond to environmental catastrophes (e.g., oil/LNG tanker sinking) or national maritime emergencies. INFOMAR data, infrastructure, and surveying capabilities need to be retained, whether to assist in the case of vessel or aircraft sinking, to support search and recovery operations, or to inform mitigation actions required following natural or anthropogenic events or activities, be they storm, pollution, coastal erosion or resource exploitation related.

Geopolitical instability resulting from the Russian invasion of Ukraine has brought into sharp focus the vulnerability of subsea infrastructure such as gas pipelines, electricity interconnectors and telecommunication cables. A discussion on the future of Defence is contained in section 3.5 below.

2.3.2 Green Transition and the Demand for Resources

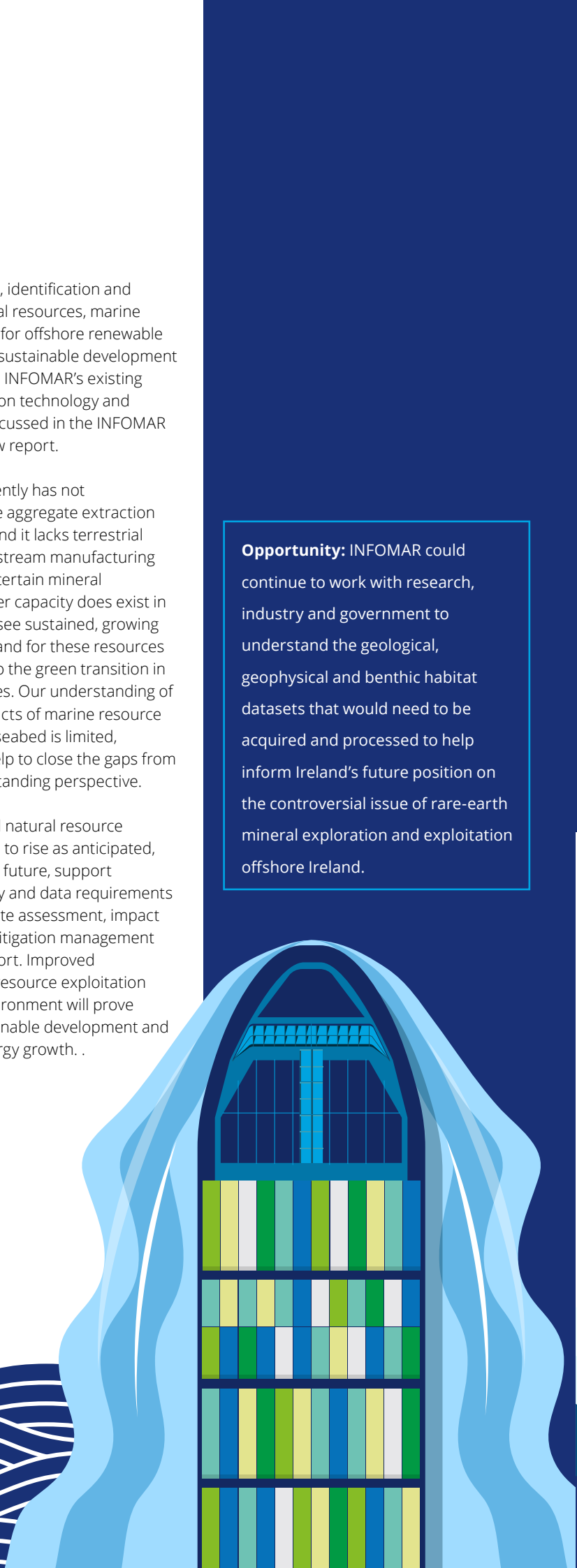
Energy (Section 3.1) & food security challenges, climate change & biodiversity, (Section 3.2) and increasingly fragmented global supply chains are increasingly driving demand from legislators to secure domestic supply chains for resources and commodities such as renewable energy, marine aggregates, and rare earth minerals such as lithium, cobalt etc. The latter resources are required to power renewable energy installations, electric vehicles, digital devices etc., that enable the transition to a net-zero economy. A UK report 'Foresight Future of the Sea' noted that the lack of confirmed deposits in our region reflects a lack of exploration rather than a physical absence.

Future exploration, identification and surveying of natural resources, marine habitats, and sites for offshore renewable energy will inform sustainable development within Irish waters. INFOMAR's existing resource exploration technology and capabilities are discussed in the INFOMAR Programme Review report.

While Ireland currently has not progressed marine aggregate extraction for construction, and it lacks terrestrial refining and downstream manufacturing infrastructure for certain mineral resources, the latter capacity does exist in Europe, and it will see sustained, growing and lucrative demand for these resources which are crucial to the green transition in the coming decades. Our understanding of the biological impacts of marine resource extraction on the seabed is limited, INFOMAR could help to close the gaps from a scientific understanding perspective.

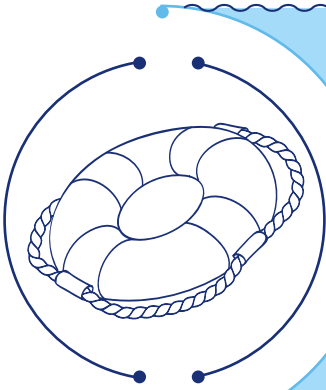
Should energy and natural resource demands continue to rise as anticipated, INFOMAR could, in future, support government survey and data requirements for resource and site assessment, impact monitoring, and mitigation management and decision support. Improved understanding of resource exploitation on the marine environment will prove essential for sustainable development and for renewable energy growth. .

Opportunity: INFOMAR could continue to work with research, industry and government to understand the geological, geophysical and benthic habitat datasets that would need to be acquired and processed to help inform Ireland's future position on the controversial issue of rare-earth mineral exploration and exploitation offshore Ireland.





2.4 Legislative and Policy Trends



INFOMAR in the past has been a crucial policy tool for Irish policymakers in meeting our international obligations and de-risking the marine sector on a proactive basis. Governance in Ireland's marine sector is fragmented and split across several government Departments and Agencies. INFOMAR 2.0 could continue to be a leading, trusted provider of scientific support, technical advice, and key datasets to inform policy and national and international reporting, and most importantly to enable Ireland to abide by our obligations at an international, European, and national level. An overview of INFOMAR's current legislative and policy environment is contained in the INFOMAR Programme Review report. These obligations will grow in number and scale in the future with increased focus on, climate resilience, nature restoration and habitat protection. The scientific and administrative responsibility placed on Ireland by these disparate bodies of legislation will be extensive in nature, and the approach to doing so needs future consideration.

2.4.1 International Level

Ireland, with its coastal location and extensive maritime resources, had a vested interest in establishing clear and universally accepted regulations governing states' rights and responsibilities at sea through the UN Convention on the Law of the Sea³ (UNCLOS) (Department of Foreign Affairs, 2019).

Ireland will have continual legal obligations under several international agreements including the SOLAS Convention to provide hydrographic data to inform navigation charts on an ongoing basis. SOLAS and Chapter V are considered the most vital of all international agreements regarding the safety of commercial vessels, guaranteeing the safety of merchant ships and their crews and preventing marine pollution. INFOMAR 2.0 will be responsible for supplying data to ensure State compliance with the convention. Not doing so would risk Ireland's reputation as an upholder of international law and maritime regulation.

Ireland has also made several international commitments to protect and restore biodiversity in coastal and marine areas, through international agreements such as the Kunming-Montreal Global Biodiversity Framework, the OSPAR Convention governing pollution in the North-East Atlantic, and the Ramsar Convention pertaining to coastal wetlands. As part of these agreements Ireland must identify, protect, monitor, and enhance areas of biodiversity. The capability to acquire biological datasets and publish them to de-risk and support policy making around biodiversity protection exists within INFOMAR, through established co-operation with relevant state agencies (i.e., NPWS, BIM, MI). Proactive engagement by INFOMAR in leveraging funding and partnerships to undertake and deliver large-scale offshore reef habitat mapping surveys (e.g., EMFF SeaRover programme) informed international Vulnerable Marine Ecosystem (VME) reporting to ICES and OSPAR, Deep Sea Fisheries Regulation closures, and expanded Natura 2000 site

3. United Nations Convention on the Law of the Sea available at [UNCLOS+ANNEXES+RES.+AGREEMENT](#)

selection, contributing to Ireland's Marine Protected Area obligations. INFOMAR 2.0 can continue this work in the future, building upon plans in development by the team under the EMFAF funded SeaShelf programme.

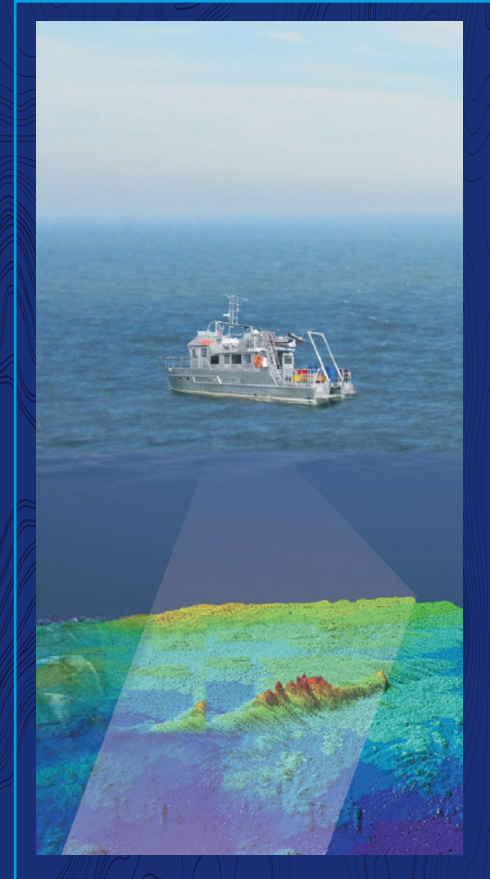
2.4.2 European Level

The European Union will continue to be a major originator of international and European law governing the marine sector which Ireland must contribute and adhere to. Following the international governmental trends on sustainability, environmental protection and biodiversity enhancement, the EU is refreshing and introducing new legislation including the second implementation cycle of the Marine Strategy Framework Directive⁴. A renewed focus on the biodiversity crisis has spurred on the EU Nature Restoration Laws⁵ which have come into effect from August 2024 (European Commission, 2024). The Law will require baseline marine biodiversity datasets, monitoring and reporting from member states. To meet legislation the State will have to prepare a draft national restoration plan by September 2026, deliver restoration in at least 20% of sea areas by 2030 and restore all degraded ecosystems by 2050. INFOMAR has significantly contributed to offshore biodiversity mapping and monitoring work to date on behalf of the State, having delivered large multi-annual offshore reef habitat mapping operational programmes and developed bespoke data dissemination services, in co-operation with state agencies including NPWS & BIM,

through leveraged funding (EMFF/EMFAF).

There will also be a revised Renewable Energy Directive⁶ that calls for the designation of Renewable Acceleration Areas by February 2026, granting accelerated permitting procedures to Offshore Renewable Energy (ORE) projects that cannot exceed 24 months. This could require structured collaboration between INFOMAR 2.0, An Bord Pleanála and MARA. There will also be a possible successor to the Maritime Spatial Planning Directive⁷ and numerous other bodies of legislation such as EMODnet, Habitats Directive⁸ and initiatives like Destination Earth EU, Destination Ocean all of which impose extensive marine data acquisition burdens on Ireland as part of its reporting and management obligations. Offshore mapping and monitoring will require an INFOMAR 2.0 to plan, acquire, manage, interpret, and disseminate relevant marine data for the respective legislation.

Due to the fragmentation of the global economy and supply chain risk which Europe is especially prone to, there is renewed interest at a policy level in industrial strategy, planning, and natural capital. There is a strong desire to create a more resilient single market and source internally many of the critical resources that we currently import and will increasingly depend on to power the green transition (European Commission, 2021). In future there will be stronger interest from the EU in Ireland's marine resources and what they can deliver in terms of security



4. Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) available at [Directive - 2008/56 - EN - EUR-Lex \(europa.eu\)](#)
5. Regulation (EU) 2024/1991 of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation (EU) 2022/869 available at [Regulation - EU - 2024/1991 - EN - EUR-Lex \(europa.eu\)](#)
6. Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652 available at [Directive - EU - 2023/2413 - EN - Renewable Energy Directive - EUR-Lex \(europa.eu\)](#)
7. Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning available at [Directive - 2014/89 - EN - EUR-Lex \(europa.eu\)](#)
8. Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora available at [Directive - 92/43 - EN - Habitats Directive - EUR-Lex \(europa.eu\)](#)
9. Council Decision (CFSP) 2017/2315 of 11 December 2017 establishing permanent structured cooperation (PESCO) and determining the list of participating Member States available at [Decision - 2017/2315 - EN - EUR-Lex \(europa.eu\)](#)

of supply for the single market. This will likely encompass resources like renewable offshore electricity, hydrogen production and the supply of natural resources such as marine aggregates and/or the potential of rare-earth minerals. INFOMAR could assist in resource assessment, site surveying & monitoring, risk management and mitigation implementation for Ireland's permitted offshore activities in the future. Building on the unique systematic baseline mapping resource acquired to date, INFOMAR 2.0 could inform EU best practice in marine monitoring, management, and policy development. In her July 2024 manifesto, recently elected European Commission President Ursula Von Der Leyen outlined the danger for Europe of dependencies on fraying supply chains including "China's monopoly on raw materials essential for batteries or chips" and includes measures such as "simplifying, investing and ensuring access to cheap, sustainable and secure energy supplies and raw materials (Leyen, 2024).

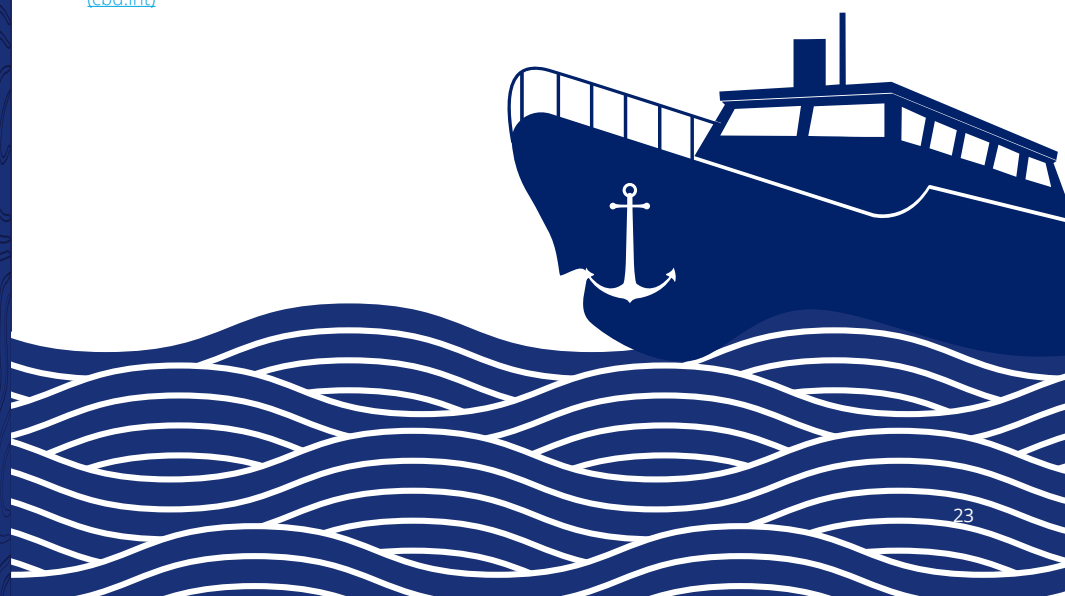
European defence policy is fast evolving in response to the deteriorating geopolitical environment. The EU's PESCO Critical Seabed Infrastructure Protection initiative⁹ aimed at safeguarding crucial seabed

infrastructure from sabotage, terrorism, and espionage is likely the first of many policy initiatives in coming years that will require INFOMAR-like capabilities in subsea surveying and monitoring (Lehane, 2024).

2.4.3 National Level

The government will continue to require a programme like INFOMAR to acquire and publish data to continually support and de-risk policy making in the marine environment. INFOMAR will continue to be a marine data provider helping to deliver Ireland's blue economy¹⁰ ambitions as laid down originally in the Harnessing Our Ocean Wealth plan (HOOW, 2012) and now the National Marine Planning Framework¹¹. Following international trends there will be a renewed focus on marine biodiversity protection and enhancement in Ireland. The government is committed to achieving 30% Marine Protected Area (MPA) coverage of Ireland's Maritime Area by 2030, in line with the Programme for Government, the EU Biodiversity Strategy for 2030, and several international initiatives such as the UN post-2020 Global Biodiversity Framework¹². The Department of Housing, Local Government and Heritage is responsible for developing the Marine Protected Areas Bill which was due for

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9. Council Decision (CFSP) 2017/2315 of 11 December 2017 establishing permanent structured cooperation (PESCO) and determining the list of participating Member States available at [Decision - 2017/2315 - EN - EUR-Lex \(europa.eu\)](#)
 10. The blue economy refers to the sustainable use of ocean resources for economic growth, improved livelihoods, and job creation, while ensuring the health of marine and coastal ecosystems (HOOW, 2012).
 11. National Marine Planning Framework available at [gov - National Marine Planning Framework \(www.gov.ie\)](#)
 12. POST-2020 GLOBAL BIODIVERSITY FRAMEWORK available at [Post-2020 Global Biodiversity Framework \(cbd.int\)](#)



publication in the first quarter of 2024 but has since been delayed. Incoming Marine Protected Areas Legislation will require the integration of existing INFOMAR data with biological datasets that have yet to be acquired. This will identify areas of rich biodiversity, which need to be protected and monitored to ensure their sustainable management. Other forthcoming legislative developments will include the statutory Marine Planning Policy Statement under the Maritime Area Planning Act, the Ocean Environment Policy Statement setting the ambition of the planned Marine Protected Areas Bill.

Given the scale of planned future offshore developments, especially in the renewable sector, the government has defined sustainable management as covering the entire lifecycle of the development including decommissioning. The Maritime Area Planning Act¹³ puts obligations on developers to return sites to a baseline pre-development state. Ongoing INFOMAR capacity will be essential to monitor and/or enforce this process, providing baseline site assessment, monitoring throughout its lifecycle, and oversight of final surveying work to ensure proper decommissioning and restoration of the site has taken place.

Given the dynamic nature of the seabed with mobile bedforms and a changing coastline, the National Marine Planning Framework¹⁴ requires reliable maps that will require an ongoing degree of re-surveying to capture changes, some of which will be accelerated by climate change and increasing storm activity. Likewise, the National Monuments Act¹⁵, focussed on protecting historic shipwrecks and war graves against illegal salvage will require constant monitoring against the growing trend of illegal salvage, valuable metals, or historical artefacts. INFOMAR 2.0 would need to have the capacity to support identification and monitoring of archaeological sites on the seabed.

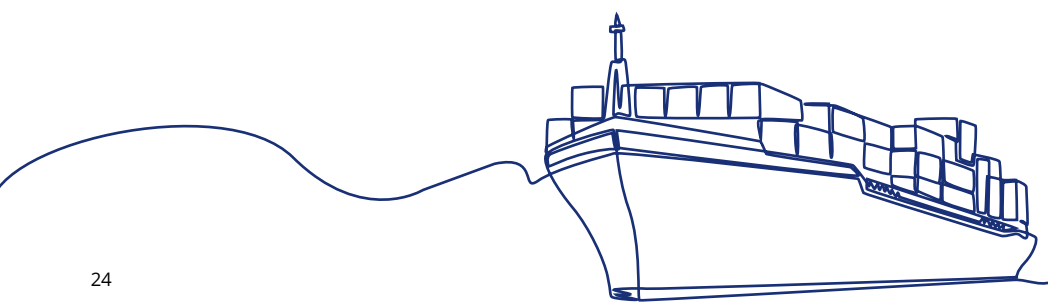
It is anticipated that with current offshore development plans in Ireland, policy makers may soon have to turn their attention to other marine issues including underwater noise reduction, mitigating for pollution risk of aging world war shipwrecks, and real-world delivery of marine biodiversity restoration.

Need:

1. Develop a cross-government legislative monitoring initiative to (a) perform ongoing horizon scanning of future legislation and public policy, and (b) improve understanding of the datasets that will be required from both Ireland and INFOMAR 2.0 to effectively meet future obligations and demands, and
2. Implement an associated management plan to (a) prioritise new data needs, and to (b) acquire, manage, and disseminate these data.

This will support and lower the cost to the state of compliance with legislative and policy requirements, while helping to ensure that the government receives long-term strategic value from INFOMAR, a trusted provider of state marine data.

13. Maritime Area Planning Act 2021 available at [Maritime Area Planning Act 2021 \(irishstatutebook.ie\)](https://www.irishstatutebook.ie/eli/2021/act/12/section/1)
 14. National Marine Planning Framework available at [gov - National Marine Planning Framework \(www.gov.ie\)](https://www.gov.ie/en/publications-and-resources/publication/national-marine-planning-framework/)
 15. National Monuments Act, 1930 available at [National Monuments Act, 1930 \(irishstatutebook.ie\)](https://www.irishstatutebook.ie/eli/1930/act/12/section/1)



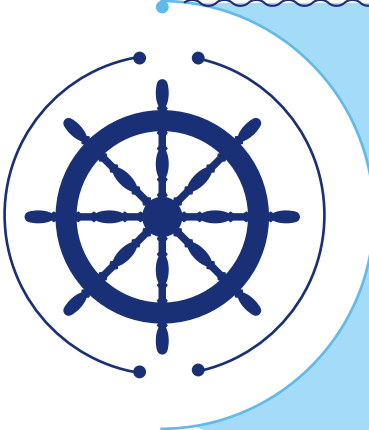
3.0 Future External Economic Impact

In *Harnessing Our Ocean Wealth* (HOOW, 2012) the government set out its original vision to realise the potential of the blue economy in a multi-sectoral approach now continued in the National Marine Planning Framework¹⁶. It includes an integrated enterprise strategy to open specific emerging market opportunities, many of which are being supported by INFOMAR currently as discussed in the INFOMAR Programme Review report. In line with HOOW goals, such as doubling GDP from the marine sector by 2030, it is necessary to consider where marine sectoral opportunities exist for growth. This section of the report will examine each sector in detail to understand future trends and how INFOMAR 2.0 can maximise its contribution to their development and the overall marine economy.

16. National Marine Planning Framework available at www.gov.ie



3.1 Energy and Infrastructure



The government’s Project Ireland 2040, National Planning Framework: National Policy Objective 29 states that it wishes to “Support the sustainable growth and development of the maritime economy” (Government of Ireland, 2018). The Department of the Environment, Climate and Communications is leading the government’s policy charge on climate change. The second strategic goal outlined by Le Chéile 23¹⁷ describes the future need to “transform our energy systems for a net zero emissions future. This will include achieving 70% renewable electricity through increased onshore and offshore wind”. Demand for the capabilities within INFOMAR 2.0 will grow and be called upon to enable execution of these strategic goals through surveying, identification of sites, monitoring, and eventual decommissioning in the long term once the installations have completed their lifecycle.

3.1.1 Offshore Energy

The Government’s Project Ireland 2040, National Planning Framework¹⁸: National Policy Objective 42 aims to support “the progressive development of Ireland’s offshore renewable energy potential, including domestic and international grid connectivity enhancements” (Government of Ireland, 2018). A significant 3.1 Gigawatts (GW) of electricity has been granted in an offtake agreement in the Offshore Renewable Energy Support Scheme¹⁹ (ORESS) round 1 auction of 2023, with construction anticipated soon. Ireland’s ambition to achieve 37 GW of offshore wind capacity by 2050 (compared to a total national output across all energy sources of around 6 GW today) would position the country as a substantial net energy exporter (SEAI, 2024). Ireland has a minimum target of 5 GW by 2030 for offshore wind development (Government of Ireland, 2019).

Hydrographic, benthic habitat, and geophysical seabed surveys are crucial for offshore windfarm development, informing foundation design, wind farm layout optimisation, and risk reduction during installation. They will be essential to demarcate future Offshore Renewable Energy (ORE) development sites for public auction, and to secure optimal energy pricing for the public. The INFOMAR programme and datasets are

highly significant in the site selection and feasibility phase of prospective ORE projects. Future public policy supporting the development of ORE in tidal and wave energy applications will likely demand the services of INFOMAR 2.0 on the horizon. Enhancing future INFOMAR capabilities to provide higher resolution bathymetry, habitat mapping and geophysical data will play a vital role in the development of Ireland’s ORE sector. It is essential to have a precise understanding of water and sediment depth, seabed composition, and sedimentary processes to assess their impact on planned project development. Reconnaissance scale, unbiased, trusted, and independent scientific State-acquired INFOMAR data and advice is a chief enabler during the scoping phase, helping to identify high potential sites for offshore development. ORE developers are required to conduct Environmental Impact Assessments supported by more comprehensive site-scale biodiversity, metocean, geophysical, and geotechnical studies, crucial components to inform detailed foundation and cable laying plans. The INFOMAR datasets will serve as a valuable resource for these assessments to both developers, the Government and Marine enforcement authorities such as MARA, leading to better more transparent decisions.

Need: As part of strategic planning towards INFOMAR 2.0, the relationship between INFOMAR, MARA, as the marine enforcement authority and An Bord Pleanála, as the Marine consenting authority, could be explored to see how their expertise can be used effectively and how they can work together formally.

17. Le Chéile 23 available at gov - Statement of Strategy 2021-2023 (www.gov.ie)

18. National Planning Framework - Ireland 2040 Our Plan (NPF) (2018) available at gov - National Planning Framework - Ireland 2040 Our Plan (NPF) (2018) (www.gov.ie)

19. Offshore Renewable Electricity Support Scheme available at gov - Offshore Renewable Electricity Support Scheme (ORESS) (www.gov.ie)

Opportunity: As part of a future follow-on strategic review, INFOMAR 2.0 could explore international best practice in the development, monitoring and protection of subsea infrastructure and impacted habitats. It could explore a formal partnership with industry and/or the State defence and security services to ensure their enforcement.

3.1.2 Subsea Infrastructure

Undersea telecoms and electricity interconnector cables are critical infrastructure meaning that any damage to them would lead to direct and immediate economic consequences in Ireland. A 2021 report by Vodafone stated that “Data centres in Ireland are supported by an array of subsea cables providing high-speed, low-latency connectivity to mainland Europe, the UK, and North America. Enabled by this international connectivity, Ireland’s data centre industry generated over €7bn between 2010 and 2018 and supported 5,700 jobs in construction and ongoing operation of its data centres” (Vodafone, 2021). The suspected sabotage of the Nord Stream pipelines in the Baltic Sea connecting Russia to Germany in October 2022, has underscored the vulnerability of critical subsea infrastructure including pipelines, telecommunication cables and electricity interconnector cables. The sabotage of the Nord Stream pipelines sparked further discussion about Ireland’s ability to fulfil its wider maritime security obligations (McCabe & Flynn, 2023). Insufficient safeguarding for subsea communication cables was identified as a risk during the public consultation for the National Risk Assessment 2023²⁰ (Department of the Taoiseach, 2023). As the number of these cables and interconnectors increases so too will our vulnerability.

In addition to having the capacity to survey and monitor such infrastructure, INFOMAR could, in the future have an important part to play in any national response to damage inflicted on such infrastructure either intentionally through malice, or unintentionally through fishing and incidents like anchor strikes. INFOMAR could continue to coordinate research to expedite and automate infrastructure assessment or incident site investigations. INFOMAR could also leverage industry and inter-government collaboration in emergency response scenarios, and/

or in supporting State implementation of mitigation measures such as the establishment of Cable Protection Zones as pioneered in Australia and New Zealand. This involves broadly mapping electricity interconnector and fibre-optic telecommunications cable corridors where multiple cables exist, and outlining in support of a regulator what activities can and can’t occur within these zones to avoid activities that could damage such infrastructure as part of an integrated planning approach (Transpower, 2024).

The number of individual subsea infrastructure projects in Irish waters is set to grow substantially. In 2023, Irish and UK officials unveiled a Memorandum of Understanding (MoU) to enhance renewable energy development and electricity interconnection, with the aim of advancing the decarbonisation agenda. By 2027, Ireland’s interconnection capacity is projected to more than triple with the addition of five electricity interconnectors, facilitating the export of wind power. Proposed links include connections to Great Britain, France, Spain, Belgium, the Netherlands, and Scotland. The Celtic Interconnector, set to run between Cork and France, is scheduled to become operational in 2027 (Collum, 2024).

INFOMAR has already demonstrated its value to the sector. The Celtic electricity interconnector cable will facilitate the transfer of 700 Megawatts (MW) of electricity between Ireland and France. Spanning 575km, with 500km of the cable laid under the sea (EirGrid, 2024). The EirGrid interconnector project utilised INFOMAR data to aid in developing the optimal cable route for marine landfall. The resulting marine installation cost savings were substantial, demonstrating how INFOMAR datasets can effectively reduce expenses and expedite development when employed appropriately (Illmatic Energy, 2021).

20. Government publishes National Risk Assessment 2023 outlining top strategic risks facing Ireland available at gov.ie - Government publishes National Risk Assessment 2023 outlining top strategic risks facing Ireland (www.gov.ie)

3.1.3 Decommissioning and Repurposing Fossil Fuel Infrastructure

While INFOMAR 2.0 will be required to support the new green economy, it will also be required to maintain and decommission the legacy economy based on hydrocarbon production. Shipment of hydrocarbons in liquefied natural gas (LNG) and oil could become more common in Irish waters. The government's energy 'Security of Supply'²¹ report published in November 2023, recommended urgent action to secure a 'Strategic Gas Emergency Reserve'. The proposed Shannon LNG import and storage terminal project in the Shannon Estuary is currently in its pre-planning phase and if approved will see shipments of LNG to Irish ports for the first time. Datasets in future will need to be maintained and updated on a more regular basis in proportion to the increased transport risk, and to mitigate the environmental risk posed to the Irish coastline by a major grounding or spill event.

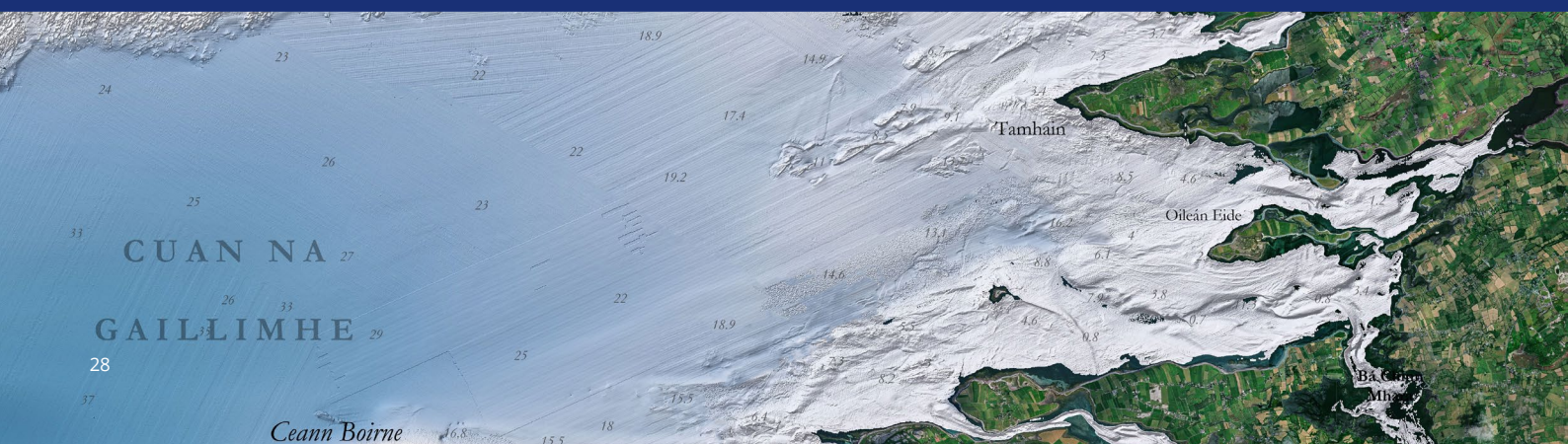
INFOMAR 2.0's capabilities could also be applied to decommissioning of expired legacy gas fields and their associated infrastructure through surveying the site to create a baseline assessment, and monitoring the decommissioning and restoration of sites, to ensure that operators fulfil their obligations. The Department of the Environment, Climate and Communication's (DECCs) 'Le Chéile 23'²² strategy already states in the third strategic goal that it aims to support the "transition to a circular economy - and

support the decommissioning of existing fields". INFOMAR could also support the emerging Carbon Capture and Storage industry, through coordinating and/or undertaking required research and/or surveys, and identifying potential subsea sites for carbon storage, which could potentially leverage decommissioned gas fields or geological features. INFOMAR could also map habitats to provide data helping other agencies to protect and enhance natural marine carbon sinks such as sea grass meadows and kelp beds in Irish waters.

Exploration of seabed natural resources including marine aggregates and minerals could become a key strategic priority of INFOMAR 2.0 through continued data acquisition, integration, and dissemination. The Department noted its intent to engage in exploration and identification of resources critical to the development of the green economy. Its 'Le Chéile 23'²³ strategy notes that the Department wishes to "develop and implement a policy framework for rare-earth minerals exploration and exploitation that supports the sustainable supply of critical raw materials. Effectively research and map our geological natural resources including groundwater, minerals, aggregates, seabed, and geothermal potential to enhance our understanding of Ireland's geological resources and contribute to policy development across Government." INFOMAR's capabilities align with this strategic goal.

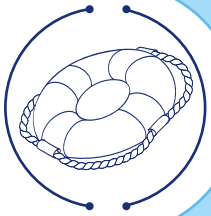
Opportunity: As part of a future follow-on strategic review, INFOMAR 2.0 could seek to align its strategic goals with government policy on legacy fossil fuel infrastructure such as pipelines and gas fields including its decommissioning, repurposing, or extension.

21. Review of the security of energy supply of Ireland's electricity and natural gas systems available at [gov - Review of the security of energy supply of Ireland's electricity and natural gas systems \(www.gov.ie\)](http://www.gov.ie)
 22. Le Cheile 23 available at [gov - Statement of Strategy 2021-2023 \(www.gov.ie\)](http://www.gov.ie)
 23. Le Cheile 23 available at [gov - Statement of Strategy 2021-2023 \(www.gov.ie\)](http://www.gov.ie)





3.2 Biodiversity, Environment and Climate



Faced with an international biodiversity crisis driven by climate change, habitat loss and pollution, Ireland and our international partners have agreed commitments to manage and mitigate biodiversity both on land and at sea. INFOMAR will be crucial to pushing back the needle on biodiversity loss, helping the State to identify changes brought around by climate change in our waters, identifying habitats that support rich biodiversity and thereby enabling their protection, management, and enhancement through a system of monitoring.

Risk: INFOMAR could seek to understand the range and depth of biological datasets that will be required of it and Ireland to support policy making and Ireland’s international obligations.

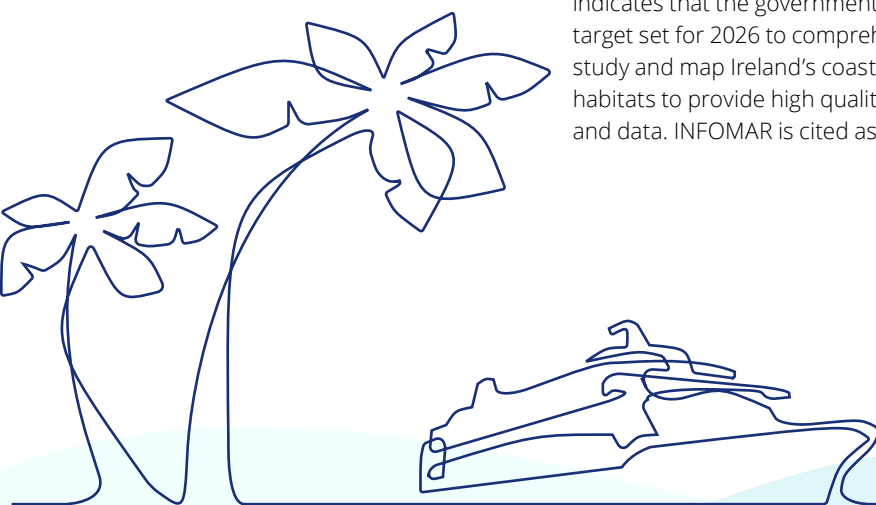
3.2.1 Enhancing Biodiversity

As previously mentioned in section 2.4.1, Ireland has made several international commitments to protect and restore biodiversity in coastal and marine areas e.g., The Kunming-Montreal Global Biodiversity Framework²⁴, the OSPAR Convention²⁵ and the Ramsar Convention²⁶. Surveying marine areas, identifying sites of high biodiversity value, creating a baseline dataset, and monitoring these sites could in future be a major component of INFOMAR 2.0’s future strategy.

Looking to the government’s 4th National Biodiversity Action Plan 2023-2030²⁷, ‘Outcome 2D: Biodiversity and ecosystem services in the marine and freshwater environment are conserved and restored’ indicates that the government have a target set for 2026 to comprehensively study and map Ireland’s coastal and marine habitats to provide high quality knowledge and data. INFOMAR is cited as an indicator

of success, in assessing the percentage coverage of Ireland’s maritime area (National Parks & Wildlife Service, 2023).

The previously mentioned in section 2.4.3, incoming Marine Protected Areas (MPA) Legislation which commits the government to achieving 30% MPA coverage of Ireland’s Maritime Area by 2030, will require extensive data acquisition and the integration of existing INFOMAR data with additional biological datasets as well as geophysical feature enhancement. Ongoing monitoring and surveying of MPAs will be necessary to ensure that the applied protections are delivering on their biodiversity protection and enhancement goals. As indicated in the previous section (3.1.3) Blue carbon sink identification, protection, and monitoring by INFOMAR 2.0 could help Ireland achieve both its biodiversity and carbon sequestration targets.



24. Kunming-Montreal Global Biodiversity Framework available at [15/4. Kunming-Montreal Global Biodiversity Framework \(cbd.int\)](https://www.cbd.int/summit/2022/abstracts/)

25. CONVENTION FOR THE PROTECTION OF THE MARINE ENVIRONMENT OF THE NORTH-EAST ATLANTIC available at [Sintra Statement Paper \(ospar.org\)](https://www.ospar.org/en/declaration)

26. Convention on Wetlands of International Importance especially as Waterfowl Habitat available at [Microsoft Word - current convention text_e.docx \(ramsar.org\)](https://www.ramsar.org/en/convention-text)

27. Ireland’s 4th National Biodiversity Action Plan 2023–2030 available at [gov - Ireland’s 4th National Biodiversity Action Plan 2023–2030 \(www.gov.ie\)](https://www.gov.ie/en/publications-and-resources/publication/irelands-4th-national-biodiversity-action-plan-2023-2030/)

3.2.2 Climate

The Government's Project Ireland 2040²⁸ report outlines in its national policy objective 41b that "In line with the collective aims of national policy regarding climate adaptation, to address the effects of sea level changes and coastal flooding and erosion and to support the implementation of adaptation responses in vulnerable areas" (Government of Ireland, 2018). Objective 41b indicates that the Government intends to proactively address vulnerable areas that will become increasingly prone to coastal flooding and erosion. The Intergovernmental Panel on Climate Change has warned that a 1.5°C temperature rise could result in a global mean sea level increase of around 1m by 2100. Additionally, projections indicate that intensified Atlantic storms may heighten surge events and wave heights, leading to substantial coastal changes. The government established the Inter-Departmental Group (IDG) on Managing Coastal Change to guide key decisions on effectively managing Ireland's coast considering future risks and planning requirements (Department of Housing, Local Government and Heritage & the Office of Public Works, 2023). They created a Technical Working Group to find relevant datasets and research by government bodies for monitoring coastal change. Their findings highlighted bathymetry data (measures the water depth in oceans, seas, or lakes) as captured by INFOMAR as a crucial data source going forward. As the seabed is dynamic, managing coastal change will require future INFOMAR 2.0 to resurvey in key areas of sensitivity.

With much of the Irish population living within 5km of the Irish Coast, coastal flooding will become a major risk factor with rising sea levels and stronger storm surges. Met Éireann relies on INFOMAR data as part of its coastal flooding models. Keeping these models updated in the changing climate will be essential to risk mitigation. Future nearshore surveys (white ribbon areas) and offshore wave measurement could help inform coastal flooding risks and help create a system of alarms that help protect vulnerable coastal

communities against flooding. The National Coastal Change Management Strategy²⁹ (Office of Public Works, 2023) published in October 2023 describes planning around sea-level rise and coastal erosion which may necessitate more inshore surveying work in conjunction with that already being undertaken by the OPW themselves. According to Stakeholders this is expected to start a debate on sediment management at a national level.

3.2.3 Changing Fisheries

As climate and the seabed shifts, so too will our fisheries and marine ecosystems. Expanding related INFOMAR coordinated research will become increasingly important. For example, broadening the ongoing application of future climate scenarios to benthic habitat distribution models (Mission Atlantic, H2020), will identify potential future suitable habitats for vulnerable marine ecosystems, support future marine protected area management, and inform potential changes in fisheries distribution. A changing climate is already bringing new species to our waters and causing others to migrate. Sean O'Donoghue, chief executive of the Killybegs Fishermen's Organisation stated to the Irish Times in 2023 that warming Irish waters were bringing species from warmer climes such as anchovies and sardines while driving other important species like mackerel further northwards (Farrel, 2023). The Marine Institute's Irish Ocean Climate and Ecosystem report noted that in the Northeast Atlantic, sea-surface temperatures have risen by between 0.1 and 0.5°C per decade in the past century and that two staples of Irish fishing Herring and cod are highly susceptible to ocean warming (Marine Institute, 2023). INFOMAR can continue to provide the Department of Agriculture, Food and the Marine with benthic habitat mapping data, information, maps, and models to support their decision process as new fisheries emerge and/or become commercially viable.

Need: The future ongoing relevance and necessity of INFOMAR must be demonstrated to Government and public policy decision makers. INFOMAR data, processing and publication supports a wide variety of essential policy areas relating to climate policy including natural disaster mitigation and changes to fisheries.

28. Project Ireland 2040: Policy Documents available at [gov - Project Ireland 2040: Policy Documents \(www.gov.ie\)](http://gov.ie/Project-Ireland-2040-Policy-Documents)

29. Coastal Change Management Strategy Report available at [gov - Coastal Change Management Strategy Report \(www.gov.ie\)](http://gov.ie/Coastal-Change-Management-Strategy-Report)



3.3 Planning and Policy

Several stakeholders stated that in future INFOMAR outputs could inform the foundation of future marine planning for DECC, facilitating departmental integration of all state plans and policies through a data driven system of regional integrated cross sectoral geospatial DMAPS. INFOMAR has the technical capacity to inform the basis and boundaries of future DMAPS, beyond the scope of input contributed to the South Coast DMAP for offshore wind. Stakeholders are of the opinion that due to extent of recent changes in the planning process, there is currently a lack of cross-departmental coordination in addressing key national plans, and there is a need for an assessment of the current state, desired future state, and existing capabilities, as well as the establishment of priorities. The current DECC implementation of a cross-government successor to the Marine Coordination Group is anticipated to improve coordination and strengthen long term marine planning.

The Project Ireland 2040³⁰: National Planning framework states that “A new streamlined and integrated planning process will be introduced to more effectively manage our marine areas and land-sea interface to double the economic value we gain from our ocean wealth by 2030, and by more beyond that” (Government of Ireland, 2018). INFOMAR capabilities and data will be essential in the future to the drafting of DMAPS which like their terrestrial equivalents, Local Area Plans, overlay sectoral spatial planning in the marine environment. This facilitates de-risking and deconflicting competing planning and policy objectives to create truly multidisciplinary integrated planning. INFOMAR 2.0 in conjunction with the Marine Spatial Planning Unit at the Marine Institute can provide key new data and advice to government in developing future DMAPS. Such DMAPS may allocate marine space to fisheries, aquaculture, energy, cable/ pipeline infrastructure, navigation, and nature conservation in one open and easily accessible resource for the sustainable management of marine resources, balancing multiple policy objectives simultaneously.

INFOMAR’s brand, extensive stakeholder network and marine sector SME knowledge developed through decades of collaboration could be leveraged to ensure that as many stakeholders as possible are brought into the process of drafting the system of regional plan led DMAPS. A

shortfall in stakeholder engagement was muted by economic stakeholders in the drafting of the ORE DMAPS for the Southeast region.

The multifaceted demands on marine planning in Ireland are demonstrated by DECC’s first strategic objective under its ‘Le Chéile 23³¹’ strategy aims for Ireland to achieve recognition as a “leader in climate action – planning and policy relating to offshore wind and wave power is underpinned by INFOMAR including realising the carbon sink potential of our land and marine environments; and using our resources wisely by “making more with less”. INFOMAR datasets will be essential to balancing these objectives of development resources to combat climate change while simultaneously contributing to the protection of ecosystems that contribute to Ireland’s future carbon sequestration and biodiversity targets. There is recognition that this strategic objective focused on planning and policy in the offshore renewable sector will not be achievable without INFOMAR’s capabilities and inputs. There is growing interest in INFOMAR resources from the Local and Regional Authorities as they embark on their next generation of local area plans. The Authorities are responsible consenting authorities for development up to 3km off their coasts and many will be drawing on the expertise of INFOMAR 2.0 in the future to build on their Local Area Plans which become their de facto public policy. The future integration of marine and terrestrial planning by the local and regional authorities indicates a growing sophistication in Irish planning, something that must be supported with resources.

Given the level of strategic ambition in the sector, INFOMAR 2.0 will be required to supply the baseline datasets that inform public policy decisions and help support constructive engagement with the public as to why certain decisions are made. The continued open-source data policy will help support this societal dialogue between public policy decision makers and coastal communities by increasing transparency and reducing the barriers to access scientific datasets and promote interrogation of it. INFOMAR can help groups understand what public policy decisions have been made and more importantly why they have been made, for example, by underscoring why a certain area has been demarcated for protection.

Opportunity:

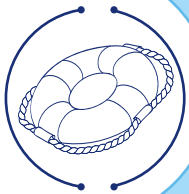
INFOMAR could with DECC as the competent authority for marine planning in Ireland support future data needs for development of a plan-led system of expanded multi-sector DMAPS for the marine environment, enabling integrated marine planning in Ireland.

30. National Planning Framework - Ireland 2040 Our Plan (NPF) (2018) available at [gov - National Planning Framework - Ireland 2040 Our Plan \(NPF\) \(2018\) \(www.gov.ie\)](http://gov.ie/NationalPlanningFramework-Ireland-2040-Our-Plan-(NPF)-(2018)(www.gov.ie))

31. Le Cheile 23 available at [gov - Statement of Strategy 2021-2023 \(www.gov.ie\)](http://gov.ie/Statement-of-Strategy-2021-2023(www.gov.ie))



3.4 Transport, Navigation, Tourism & Leisure, Heritage



How we navigate our waters with vessels will change in the coming years as more precise automated navigation technology and environmental concerns on the impact of shipping conspire to limit the freedom of shipping in our waters. When combined with increased shipping volume brought around by a growing economy, population growth and the impacts of Brexit, we will likely see more congested shipping routes in Irish waters that will increase risk for policy makers.

3.4.1 Future Trends in Shipping and Navigation

Coastal and offshore areas of Ireland are experiencing increased human activity including renewable energy generation, expanding into deeper water. The Government's Project Ireland 2040 report outlines significant investments being made to our ports nationally under its National Policy Objective 40 (Government of Ireland, 2018). These developments and marine conservation restrictions are expected to significantly limit navigable sea-space, constraining the free movement of shipping (General Lighthouse Authorities of the United Kingdom and Ireland, 2022). The Marine Navigation Plan 2040³² highlighted that growing congestion in shipping areas will heighten the need for accurate, precise, and dependable position and navigational data. Mariners need to be informed on their position through robust Position, Navigation and Timing (PNT) technology, and alerted when this information is unreliable (General Lighthouse Authorities, The UK and Ireland, 2024). Updated hydrographic data provision by INFOMAR 2.0 to the UK Hydrographic Office will be essential for marine spatial planning and deconflicting these public policy priorities and competing economic sectors.

Hydrographic data standards (as defined by the International Hydrographic Office) are regularly updated to keep pace with modern technological advances in data acquisition and dissemination of derived products. From January 2029, all new maritime navigation systems will be required to be compatible with the IHO's S100 charting standard which will require

constant monitoring and surveying of changes in the seabed as the charting allows for more real time decision making on safety margins according to specific safety parameters of individual vessels. This will also enable more and more autonomous vessel navigation through enhanced data analysis and confidence in the data sources. INFOMAR datasets will need to be updated through resurveying in seabed areas encompassed by charts utilising S100 charting standards, to meet safe navigation obligations in collaboration with the UK Hydrographic Office who will produce the navigation charts. This will be essential to enable S100 implementation in Irish waters and underpin future autonomous navigation requirements, and to support associated economic growth and reduced carbon emissions.

Safety of navigation remains an international obligation under SOLAS and an ongoing process. Recent incidents such as the March 2021 grounding of the 'Ever Given' container ship across the Suez Canal have demonstrated the vulnerability of our economies to sudden breakdowns at maritime navigation chokepoints. Were a grounding, sinking or spill incident to occur in the approaches to Dublin Port, it would have immediate and serious consequences for Ireland's supply chains and economy. INFOMAR would in future be at the forefront of any response to such an incident in terms of surveying, monitoring, and opening the area for safe passage through the identification of navigation hazards. Ongoing risk based targeted resurveying will be required in high traffic areas and marine bottlenecks to update charting in the future. As vessels, the

Risk: Continued mapping of the nearshore intertidal zones (white ribbon area) due to societal relevance and lack of alternate state data source; continued mapping in areas where data age or quality necessitates a refresh to meet newest hydrographic charting and data currency standards.

32. Marine Navigation Plan 2040 available at [Tri-GLA-Marine-Nav-Plan-2040-web.pdf \(irishlights.ie\)](https://www.irishlights.ie/Tri-GLA-Marine-Nav-Plan-2040-web.pdf)

population and economy continue to grow so too will our port traffic, particularly on the East Coast where the seabed is very dynamic owing to mobile sediments and requires constant resurveying to support safe navigation. To mitigate risk many port authorities globally are engaging in 'digital twinning' exercises which are powered by data sources like INFOMAR to help in scenario planning and disaster recovery.

While INFOMAR has been largely successful in its mission there are outstanding marine environments to be mapped and charted in higher resolution, particularly in the northwest where coastal operations are currently focussed. This is particularly acute in the nearshore and intertidal zone (white ribbon) areas. There are also un-surveyed freshwater areas including navigable rivers and lakes, which while outside of INFOMAR's original scope of work, they significantly influence the coastal marine environment, in particular from a flood risk assessment perspective. Similar to what INFOMAR undertook in the initial years of the programme, Authorities in Northern Ireland are about to embark on a survey project using LiDAR technology for coastal areas which will support a wide range of objectives and sectors including leisure navigation and biodiversity protection. This will be further discussed below in section 4.0.

Stakeholders noted the importance of continuing to address high resolution data gaps in inshore areas to advance prediction models for coastal changes and their impact on various sectors. They stressed that intelligible datasets provided by INFOMAR could drive innovation and enhance prediction models for coastal impacts which will be exacerbated by climate change and whose management will become a key theme of government in the future. Additionally, there was a strong call for INFOMAR to refresh and modernise its data to support coastal models and flood risk assessments.

3.4.2 Tourism, Leisure & Heritage

Many marine leisure sectors such as sailing thrived during the Covid-19 pandemic. In their annual report, Irish Sailing (Irish Sailing, 2023) noted that their 2023 affiliate membership surged to a record circa 24,000 members, with 60,000-90,000 believed to be taking part in the wider sailing community. As it stands today there is no state backed marine tourism and leisure strategy or State agency responsible for same. Working with national tourism bodies, regional assemblies, and local authorities, INFOMAR could help develop the next generation of Local Area Plans to incorporate integrated planning and DMAPS. This could include dedicated zoning for tourism, leisure, and heritage activities such as sailing, surfing, scuba diving, whale watching, leisure fishing etc. The increased certainty and lower risk provided by this zoning could help to create the conditions for investment in these sectors and aligning same with government policy. INFOMAR with Ireland's coastal cities and maritime tradition could also work proactively together in an inter-Departmental effort to develop heritage and tourism offerings using INFOMAR surveying resources. INFOMAR could further investigate subsea heritage sites with a view to showcasing and leveraging them on land as unique heritage and tourism infrastructure, building upon already advanced INFOMAR shipwreck data visualisation services.

In the leisure boating market, digital navigation tools are not required for leisure vessels below 12 metres. Where leisure vessels do have digital charting and navigation tools, there is a risk that the charting data is of poor quality due to a lack of controls, third party authentication and validation. There is also a lack of data for nearshore data (white ribbon areas) where many leisure vessels tend to navigate. Future autonomous drones could make the now onerous and dangerous task of surveying shallower waters much easier and safer. In future INFOMAR 2.0

Opportunity: INFOMAR could work in partnership to develop a national marine tourism, leisure, and heritage strategy in a coordinated approach

could commence a nationwide nearshore seabed and land integration survey using autonomous technology to fully chart the white ribbon areas around our coast, enabling safer tourist and leisure navigation of the coast and islands, while also providing valuable data for coastal vulnerability assessment.

Likewise, surveys of our shallower waters could identify new shipwrecks and archaeological sites that could be surveyed, assessed, and made safe to increase our range of scuba diving sites available for exploration by the tourism market. INFOMAR 2.0 has a role to play in heritage exploration, helping to identify submerged landscapes and assess archaeological potential. Shipwrecks and underwater finds will continue to capture societal interest. Wrecks such as those belonging to the ill-fated Spanish Armada and the RMS Lusitania are of international importance and any work that brings such sites to the public's attention will gain public interest through any medium. INFOMAR 2.0 will be required to support the forthcoming National Strategy for the future protection and management of Ireland's Underwater Cultural Heritage, which is being implemented by National Monuments Service and the National Museum of Ireland.

Heritage attractions such as the Titanic Belfast have taken a digital exhibition approach to underwater heritage which has helped regenerate an entire city district. Its Ocean Exploration exhibition incorporates an INFOMAR staff video interview and an INFOMAR inspired and enabled SME developed data visualisation of the north coast underwater landscape, something easily expanded upon in the future by INFOMAR 2.0. At the other end of the spectrum, projects that have identified underwater heritage sites and have sought to raise them from the seabed and transport them back to dedicated museums on land, have proven themselves to be lucrative heritage tourist attractions such as Stockholm's Vasa Museum, one of Sweden's most popular attractions, the Mary Rose Museum in Portsmouth, UK or the Museum of the Viking Age in Oslo, Norway.

INFOMAR could in future work with conservation groups to help identify and protect areas where there is increased activity from species like dolphins, whales, and sharks as a means of supporting the burgeoning whale watching tourism market which has been lucrative in countries like Norway.

Opportunity: INFOMAR could work in partnership with relevant local authorities, regional assemblies, and local industry to develop a national marine tourism, leisure, and heritage strategy, through a coordinated cross-government approach.



3.5 Defence, Security and Emergency Response



Globalisation, subsea threats, the war in Ukraine and the emergence of the multi-polar world will continue to alter the security risk profile of Irish waters which INFOMAR can contribute data solutions to. Likewise supporting emergency response authorities and helping to uphold the law at sea will require data acquisition capabilities that can be enhanced by INFOMAR's input, enabling scale across the Irish public sector.

Opportunity: As part of a future follow-on strategic review INFOMAR could continue to explore the concept of defence interoperability and work with the Irish Defence Forces to understand how INFOMAR's capabilities can complement the security of the state.

3.5.1 National Security and Cooperation with Irish Defence Forces

As the quantity and importance of subsea infrastructure has grown in recent years internationally so too have the opportunities for bad actors to compromise these assets, resulting in a proportional need for security apparatus to defend against these threats. The seabed has in effect become a new security domain joining the traditional domains of land, sea and air and the newer cyber & space domains. Regionally, subsea defence is moving up the security agenda. In 2023, the UK established a strategic alliance with Norway to address mutual subsea security concerns. Subsequently, in 2024, the UK entered a pact with Norway and four other North Sea nations to safeguard vital energy and communication infrastructure located on or beneath the seabed (OGV Energy, 2024). The UK Hydrographic Office feeds into this agenda through coordinating ongoing surveying and monitoring of subsea infrastructure and remains on-call in response to any damage that might be incurred and require surveying work. The Irish Defence Forces High Level Action Plan³³ specifically mentions 'naval fleet management and replacement', and the development of a 'subsea awareness capability' as two of its seven top priorities for capability development over the lifetime of the plan from 2023-2028 (Department of Defence and Defence Forces, 2023) As mentioned previously insufficient safeguarding of subsea communication

cables was identified as a risk during the public consultation for the National Risk Assessment 2023³⁴ (Department of the Taoiseach, 2023). This highlighted the need for enhanced protection measures and strategic planning to mitigate potential disruptions and security threats to critical communication infrastructure. INFOMAR in collaboration with infrastructure providers and relevant government authorities could support the development of a national monitoring and deterrence approach, in addition to coordinating technical developments in the field through current and future INFOMAR research activity.

Applying the growing international trend of 'defence inter-operability' between the security apparatus of the state and civilian infrastructure in Ireland, could see INFOMAR contribute to addressing the identified risk by providing ongoing classified high resolution seabed mapping, monitoring, and training to the Irish Defence Forces. INFOMAR data could aid the Government in identifying threats and vulnerable areas, and in developing enhanced protection measures for subsea critical infrastructure, potentially under the auspices of the proposed maritime information sharing and exchange system MarSur (Department of Transport, 2019). Additionally, INFOMAR's expertise in marine and geoscientific data could support strategic planning efforts to mitigate potential disruptions and security threats to critical communication

33. High level action plan for the Report of the Commission on the Defence Forces [gov - High level action plan for the Report of the Commission on the Defence Forces \(www.gov.ie\)](http://www.gov.ie)

34. Government publishes National Risk Assessment 2023 outlining top strategic risks facing Ireland [gov - Government publishes National Risk Assessment 2023 outlining top strategic risks facing Ireland \(www.gov.ie\)](http://www.gov.ie)

infrastructure. This would require a more structured relationship with the Irish Defence Forces beyond the ad-hoc arrangements in place now and could involve a future follow-on strategic review, formal business partnering structures and potentially a service level agreement between the Irish Naval Service and INFOMAR to undertake surveying and monitoring work of strategic infrastructure in the long term.

The area is fast evolving and the Oireachtas has recently endorsed a plan permitting Ireland to participate in an EU Common Security and Defence policy initiative aimed at safeguarding crucial seabed infrastructure from sabotage, terrorism, and espionage. The Critical Seabed Infrastructure Protection project is a component of the EU's Permanent Structured Cooperation (PESCO) Framework³⁵ within which Ireland and the Irish Defence Forces are also a member of the Upgrade of Maritime Surveillance project (Lehane, 2024).

3.5.2 Emergency Response

Increased economic and recreational activity in the marine environment will bring more and more people into contact with our waters which will sadly lead to more emergency situations requiring an emergency response from bodies like An Garda Síochána (AGS), RNLI and the Coast Guard. INFOMAR 2.0 will continue to be required to respond to future maritime incidents with other sub-units of State agencies such as the AGS Garda Water Unit. INFOMAR played a critical rapid response role in the tragic Rescue 116 Coastguard helicopter and crew loss, along with AGS, RNLI, Coastguard, Irish Lights, the Navy and the local fishers and community. INFOMAR 2.0's unique expertise will continue to be required to

locate and identify wreckage, aid pollution alleviation, and help in recovery. An SLA between INFOMAR and these emergency response authorities could ensure that INFOMAR has the correct resources when called upon.

While INFOMAR and inter-agency emergency response cooperation to date has been extensive and positive, in future a follow-on strategic review of the potential service & support could inform scoping of a Service Level Agreement with the Department of Defence, a formal structure for future operational collaboration, and help to sustain and improve national capacity in the long run. This could lead to better outcomes for emergency responders as well as those in need of emergency response support.

Future surveying of the uncharted near shore white ribbon areas could help rescue authorities reduce the risk of incurring the same fate as those they are seeking to rescue, by giving them up to date knowledge of the marine environment in the rescue area and alerting them to any additional risks that at present remain unidentified. Enriching INFOMAR data with additional drift mechanics tidal and current data could also improve survival outcomes for victims, enabling their location to be identified sooner from where they can be rescued. Further and perhaps more formal collaboration between INFOMAR and the Marine Institute oceanographic modelling team should be considered in the future in this context.

3.5.3 Upholding the Law

Upholding environmental law in our waters requires enforcement through the AGS Garda Water Unit and subsea investigation capabilities, which are currently provided by INFOMAR. Tackling illegal activities

Need: A future follow-on strategic review of INFOMAR 2.0 needs to assess the Programme's future engagement with key governmental stakeholders such as the DoT, EPA, MARA, DECC & DHLGH Marine Environment, MSFD & OSPAR team and establish it on a more formal footing to maximise public sector synergies and value for money.

35. Council Decision (CFSP) 2017/2315 of 11 December 2017 establishing permanent structured cooperation (PESCO) and determining the list of participating Member States available at [Decision - 2017/2315 - EN - EUR-Lex \(europa.eu\)](https://eur-lex.europa.eu/Decision-2017/2315-EN)

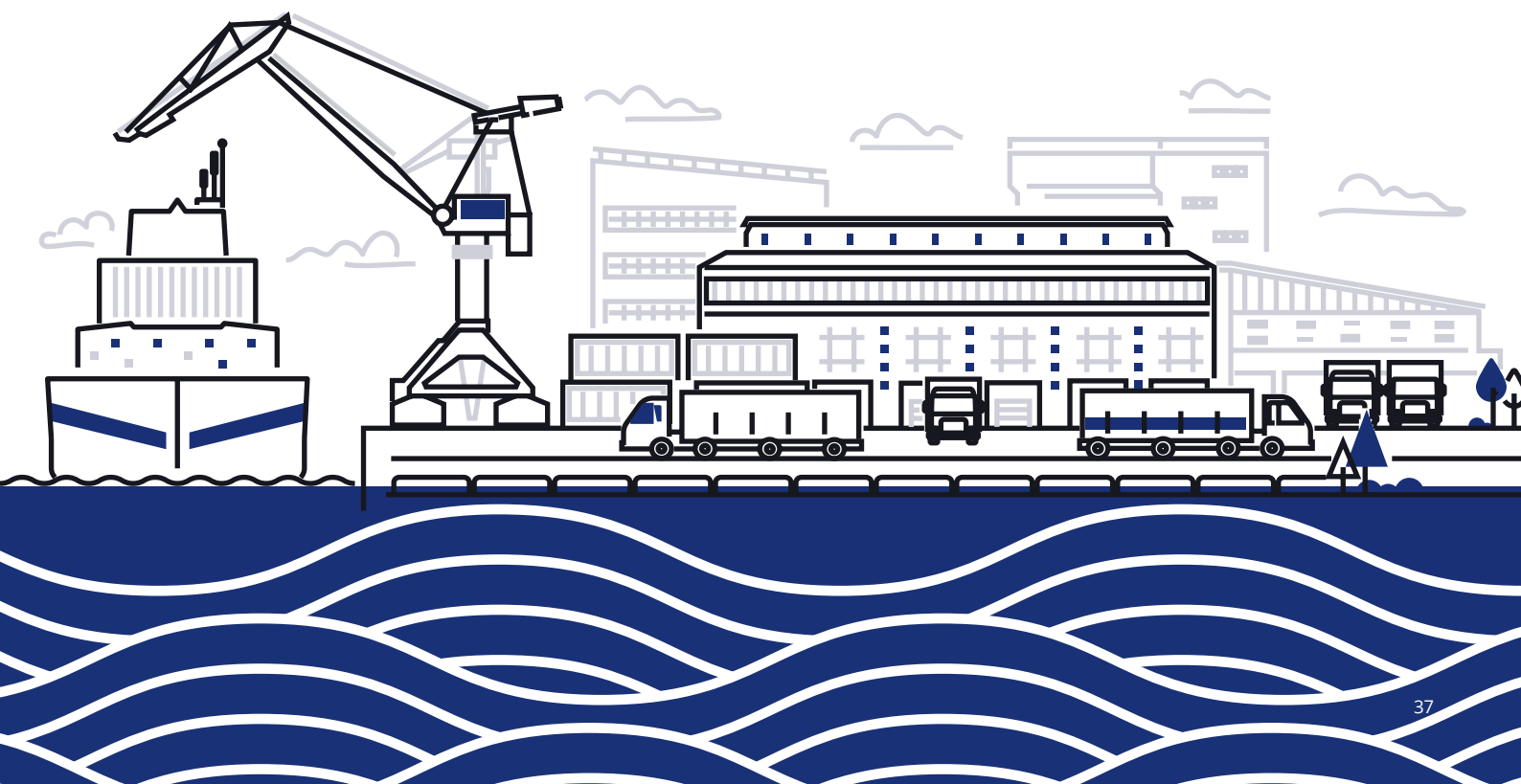
Opportunity: Expanding INFOMAR 2.0's site monitoring capacity, infrastructure and expertise in the future is key to securing such sites and minimising potential pollution impacts.

at sea such as dumping of waste or the intentional sinking of vessels as a means of disposal requires the gathering of evidence, securing of the site and making it safe for navigation. This capability will be required in the future, and INFOMAR is well positioned to continue its rapid response role in support to such incidents.

INFOMAR 2.0 would also be in a strong position to inform the regulation and licensing of dumping at sea as supported by the Dumping at Sea Act 1996. As has been done off the coast of Waterford, INFOMAR's mapping of key benthic habitats can avoid irreparable damage through poor dump site selection, in that case a herring spawning gravel bed was the proposed location, which had the dumping proceeded there would have resulted in capping of the spawning ground with dredge spoil sediment. Such dumping at Sea Permits are often sought to help support large scale infrastructure projects such as ports and tunnels with the disposal of large amounts of construction waste. Such projects are expected to grow in scale over the coming years as outlined in the Government's Project Ireland 2040 report (Government of Ireland, 2018).

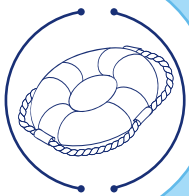
INFOMAR could identify zones where the effects to marine biodiversity and navigation of such dumping at sea are minimised. It could also assist in dump-site monitoring to assess the extent and volume of disposed materials, in support of license compliance. In the wider context and building on planning and policy text in Section 3.1.1 compliance of all future MARA licenses relating to seabed infrastructure emplacement will require expertise to ensure they comply with license conditions, to ensure they are correctly positioned on installation, and/or that the site is re-instated post decommissioning.

INFOMAR scoped and are now coordinating an MI funded Post Doc research project in UCC, to assess the potential environmental risk impact of shipwrecks in Irish waters. Identification of high-risk vessels and/or their munitions, many now degrading world war era wrecks, and developing appropriate mitigation plans is essential to avoid or minimise release of toxic contaminants into the marine environment.





3.6 Research and Innovation



As a capital programme, research has always been to the forefront of INFOMAR's work and will continue to be so as technology and alliances open new frontiers of scientific exploration. While innovation has always happened organically within INFOMAR, a future INFOMAR 2.0 could approach innovation in a more structured fashion.

3.6.1 Research

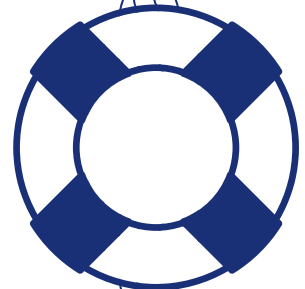
Future strategy in marine research will centre on the soon to be published Marine Research and Innovation Strategy (Ocean Knowledge 2030) which will be published by the Marine Institute in November 2024. In the meantime, INFOMAR has been praised in its communication and collaboration with its intended scientific research community audience, having raised Ireland's research profile internationally through provision of leadership roles in large scale H2020, INTERREG, EMODnet, EMFF & EMFAF research programmes, while also leveraging and guiding the national seabed mapping related research agenda. However there remains a lack of awareness horizontally across the Irish public service of INFOMAR and its research outputs that can help support and de-risk public policy elsewhere. To enhance this policy support, INFOMAR 2.0 programme could resource and develop a system of business partnering, offering bespoke research services and readily intelligible and accessible data products across the public sector, and industry to spur on development. While a business case was previously developed by INFOMAR to increase technical capacity and staffing to increase delivery on value added activity and programme impact, resourcing and effort remained focussed on mapping coverage, with the objective of completing this within the programme timeline. INFOMAR has potential in the future however to leverage this cohesive data, increase focus on research activity and impact, and identify and target cross

government and industry needs. INFOMAR has created some of the most advanced online seabed mapping data visualisation and download services available globally, and it has developed methodologies and processes for incorporating the data into 3rd party commercial software, including fisheries navigation packages. Future consideration should be given to refining INFOMAR data services to align with sector specific DMAPs as they come into planning and evolve, to ensure appropriate data are government ready to inform optimal DMAP development, and industry/consumer ready to inform development planning thereafter.

Intelligent ICT system and process development should ensure the user receives the most effective data and/or products to meet the user application or sectoral requirements. Future INFOMAR R&D requirements scoping in the context of data services should consider two key broad issues:

- i. the incorporation and/or development of time series assessment tools, for bathymetry and habitat change monitoring,
- ii. solutions for evolving regional scale 3D ground models, incorporating sub-surface geophysical and geotechnical data required for ORE development, and capable of rapid and/or automated integration of 3rd party site specific industry/MARA data. In the broader context, with development and human

Opportunity: Improving access to research through business partnering and offering of bespoke data products and services could be considered.



Risk: INFOMAR completed, or transitioned without due consideration into a new INFOMAR 2.0 programme, a transition risk would arise whereby valuable data acquisition and management skills and expertise could be lost due to discontinuity of stewardship.

activity being spatially bound (3D = XYZ - width, height, depth), with their impacts being subject to a changing marine environment, or temporally bound (4D = XYZT, including time), and a decision process being data type, interpretation, or descriptor dependent (D), INFOMAR in its remit to deliver Integrated mapping for the sustainable development of Ireland's Marine Resource, could consider targeting future research towards the concept of 5D mapping, or in effect, transitioning to INFOMAR 5D.

An example of 5D mapping and analysis research is currently ongoing through the H2020 Mission Atlantic INFOMAR led work package, whereby habitat suitability models of cold water corals (Vulnerable Marine Ecosystem) have been derived from INFOMAR bathymetry data, ground truthed with SeaRover ROV coral observation data, and ocean & climate prediction models are now being applied to identify suitable habitats for these VME in future climate scenarios of increasing ocean temperature and acidification. This type of information can help to inform and explain Marine Protected Area designation and/or future management measures, linking the science to public policy, supporting and de-risking the decision process, and steering targeted monitoring activity, in turn reducing monitoring cost and increasing its effectiveness.

A future application for research consideration would be the development and application of models to assess benthic habitat or scouring impact relating to future windfarm installations. Again, through integration of geoscience, bathymetry, benthic habitat and metocean data, and subsequent application of oceanographic models, future scenarios can be investigated for decision support, to minimise environmental impact or engineering challenges relating to site

selection, and to improve infrastructure security and integrity.

It must be cautioned again however that INFOMAR's current constitutional and governance arrangements will prevent it from optimising its research capabilities. The finite project-based governance structure will not be able to attract and retain top research talent, who need certainty in tenure and funding which can be found elsewhere both in Ireland and abroad. Likewise, were INFOMAR wound up post-2026 following completion without a succession strategy, there would be a huge loss to the State of scientific research capability, goodwill, research capacity build, and research infrastructure capital. Likewise, even were the programme extended some transition risk would exist if the programme and its current data infrastructure and expertise were not carried over to a successor INFOMAR 2.0 in full. A future follow-on strategic review of these arrangements will be required to assess the options available to INFOMAR 2.0.

At present there is no clear knowledge management strategy in place to store, maintain, update, and make available to the public existing INFOMAR datasets post its scheduled 2026 completion. Furthermore the 2018 Memo to Government on INFOMAR completion included 2026 as a full survey operations year, so consideration also needs to be given in the strategic assessment on plans, timelines, and resourcing to achieve final product delivery, long term data & products curation post-acquisition, and continuity of service in the delivery of EU research commitments that extend beyond end 2026. The data curation & dissemination aspect will require dedicated resourcing by data analysts who know and understand the datasets and the sector and can work with both, something which INFOMAR currently supports.

3.6.2 Innovation

As a world leader in public sector led innovation and ocean exploration, INFOMAR has been successful in innovating from within. It has constantly adopted new technologies and has successfully responded to new opportunities and risks while its research outputs have been adopted by the private sectors and have spurred on innovation externally. However, despite INFOMAR efforts to secure dedicated resourcing, the lack of a dedicated business development unit has stemmed the potential innovation impact of INFOMAR on the wider Irish economy. Engagement in specific innovation initiatives has drawn heavily on management and field operations personnel, whether funding SMEs to adopt INFOMAR innovation ideas, or delivering a Small Business Innovation Research programme in partnership with Enterprise Ireland. The latter engaged multiple companies, resulted in a new startup SME and the transition of terrestrial SMEs into the marine environment and market, however it proved administratively challenging and proved a very significant management overhead to mentor and liaise with all the entities and manage all the grant contracts involved.

There has been a recognised missed opportunity and lack of resourcing to date for INFOMAR to incubate Irish start-up companies. Many emerging industries require a long-term commitment and certainty for success which is not supported by INFOMAR's current governance. Emerging industries reliant on INFOMAR data are often slow to develop, due to increased costs and lack of direct market associated with innovating in the marine environment. They can also require significant infrastructure investment for

external stakeholders who also require certainty. INFOMAR's current finite lifespan is not conducive to innovation with external partners. However, innovation and collaboration between INFOMAR and the private sector will continue to occur indirectly. Many private sector operators are significant beneficiaries of INFOMAR's disseminated data, particularly geoscience and environmental consultancies. These firms routinely re-use and add value to the free and open data for multiple clients thereby creating new products that generate economic return in the Irish economy. This has been particularly apparent with the recent scale up in the ORE sector.

There is potential in the future for INFOMAR to leverage its brand internationally to support an Irish ecosystems approach to innovation. It may be feasible to scope a networking, business development and marketing role for INFOMAR 2.0, that is not subject to conflict-of-interest challenges. GSI played a key role in the development of the Geoscience Ireland company group to help direct strategy and cross-collaborate to leverage their combined scale. If prioritised and resourced in the future, INFOMAR 2.0 could curate a network of startups drawn from the universities, Enterprise Ireland, and IDA clients to develop innovative marine products and service for commercialisation opportunities in associated SME activities. Strategy assessment of future opportunity could include scoping a business development and research and innovation function and model, for INFOMAR in partnership with responsible agencies to leverage its existing industry, government, and research network, and enable and accelerate Irish SME startup and growth.

Opportunity: INFOMAR could develop an ecosystems approach to innovation by bringing stakeholders together and leveraging scale.



3.7 Education and Training



INFOMAR will be pivotal to the development of human resources in a sector currently plagued by skills deficits. Securing an education pipeline that produces early career professionals will be key to developing the public and private marine sectors in Ireland. Developing other training pathways for entry into the sector through programmes like conversion courses for people with existing complementary skillsets could deliver additional human resources to the sector.

Need: INFOMAR could seek to secure the full education value and pipeline of talent by working with the Universities to develop undergraduate and postgraduate offering for students both from Ireland and from abroad. This could be combined with a graduate employment scheme facilitated by INFOMAR that could help retain the talent in Ireland. Resourcing gaps to deliver and facilitate this training, education and graduate employment should be identified.

3.7.1 Education

INFOMAR has played a vital role in developing skills and talent within the marine sector, contributing significantly to the generation of new employment opportunities in the industry, and to direct training and upskilling in seabed mapping of over a hundred undergraduates and postgraduates. This underscores the importance of INFOMAR's ongoing efforts in the sector, and its achievements towards the goals laid down in the 'Harnessing Our Ocean Wealth – An Integrated Marine Plan for Ireland, Action 23' which specifically highlighted the requirement for INFOMAR to educate Irish graduates. While INFOMAR is now part of the junior cycle curriculum, a Transition Year Student Education Outreach Development Programme is in place, and a third level postgraduate course has been developed and delivered, there remains a gap at third level undergraduate level, which will have to be filled for INFOMAR to secure a complete education and human resource value chain from second to third level education (INFOMAR, 2021).

The marine sector's demand for workers in Ireland and globally is outpacing the available supply, particularly evident in the offshore renewable energy sector's struggle to meet the growing demand for professionals to keep pace with sector growth. Stakeholders emphasised that the sector's expansion is driving an increased

demand for skills in related fields such as ecology and zoology. INFOMAR will be critical to the cultivation of skills and talent in the Marine sector. The pre-requisite infrastructure and data sources are already in place to cultivate a pipeline of talent in the sector. The national and international shortage of hydrographic skills will continue. INFOMAR needs to continue to act as a stable developer of such skills through its pipeline of internships, bursaries, and graduate jobs. Contributing to Ireland's ability to meet the growing demand in the job market for these skills will help to develop both the public and private aspects of the marine sector and economy in Ireland.

Stakeholders urged for increased cooperation between INFOMAR 2.0 and the universities, namely UCC, University of Galway, NUI Maynooth and ATU who already have education offerings in the space, to attract students to the field at undergraduate level. Indeed, INFOMAR and ATU already co-deliver formal field training through its SmartSeaSchool. INFOMAR 2.0 has the potential to increase its pipeline of student upskilling and training particularly in early career development, through cooperation with academia in the offering of placements, internships, and graduate positions. This in turn will help to stimulate a growing pipeline of talent in the sector, which will help drive growth and investment in the long term.

Given the huge shortage of talent globally, a formal education relationship between INFOMAR and an academic institution has the potential to attract large numbers of domestic and fee-paying international students to Ireland, creating an income stream for further research and education opportunities. There is the potential for INFOMAR to be an international training platform.

At a national societal level, it will be important for INFOMAR 2.0 to highlight its key achievements and discoveries of the programme and educate the country at a national level to raise awareness of marine issues and usage of INFOMAR products and services. INFOMAR should seek to leverage and expand its existing seabed mapping course material and in particular its digital lecture and training material to minimise draw on personnel in delivery and expand its reach and impact. This material could also support training and continuous professional development opportunities for new organisations or entities transitioning in responsibility from land to marine, e.g., Local Authorities, MARA, and ABP.

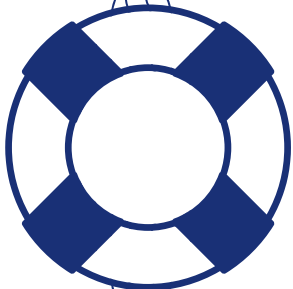
3.7.2 Training

The marine resource sector is facing a skills gap. A 2022 report from the UK-based Institute of Marine Engineering, Science & Technology (IMarEST) identifies the skills gap as the significant challenge for the marine sector in the next decade. One of the challenges raised by marine members is the need for clear career progression (IMarEST, 2022).

Skillnet Ireland is the national talent development agency of Ireland. A recent report from Green Tech Skillnet and Wind Energy Ireland suggests that achieving Ireland’s 2050 offshore wind energy targets could bring in around €38 billion to the Irish economy. The report, “Building our Potential: Ireland’s Offshore Wind Skills and Talent Needs,” provides a comprehensive analysis of the opportunities for Irish businesses in delivering targeted offshore wind energy by 2050. It highlights the need for significant investment in training and skills development to maximise the economic benefit from offshore wind farm development. The report emphasises the importance of developing a significant local skills base and recommends an industry-led approach to skills interventions, government funding to de-risk skills investment, and industry involvement in skills development (Green Tech Skillnet, 2024).

The Department of Future and Higher Education, Research, Innovation and Science has as part of its further education strategy proceeded to build a network of regional ‘Colleges of the Future’ which deliver community-based education to deliver on a broad range of strategic objectives in the local economy (Government of Ireland, 2020). The ‘Colleges of the Future’ networks could be leveraged by INFOMAR 2.0 to close several of the crucial skills gaps being experienced by the sector at present, thereby helping the Government to achieve some of its strategic goals.

Need: INFOMAR could work with further education authorities to develop conversion courses and close skills gaps in the sector.



4.0 Future Internal Operations

Considering the foresight assessment and the range of future scenarios outlined in the previous two sections, the marine environment within which the current INFOMAR programme operates will undergo a transformation in the coming decades. For Ireland to be able to reap the opportunities and mitigate the risks associated with the future, INFOMAR 2.0, will need to change and adapt to this future as a means for the government to support and de-risk policy making. This section will describe some of the potential changes that INFOMAR 2.0 could consider as part of a wider future follow-on strategic review of its governance, organisational structure, and capabilities.



4.1 INFOMAR Governance

A future follow-on strategic review could also examine the legislative footing of INFOMAR. The current phased project-based governance of INFOMAR is an impediment to development of the marine sector in Ireland in terms of private sector investment and retention and development of human resources, all of which require certainty to thrive. As the main employer in the field nationally, INFOMAR's finite lifespan, as of now due to conclude in 2026, has a negative impact on perceived job security, with many of the unique skillsets and capabilities now being lost to the private sector as the conclusion date of 2026 soon approaches. In the meantime, INFOMAR must hire contractors to make up the shortfall, typically with reduced technical capacity, and without the experience to represent Ireland before the international maritime organisations. This weakens Ireland's global footprint and internationally perceived leadership role in the marine sector at a time when securing foreign investment to develop our planned marine infrastructure development is critical. This future uncertainty also impacts the development of relationships with external stakeholders and potential business development opportunities by hampering the development of long-term partnerships. A future follow-on strategic review considering the future operating model and legislative footing of INFOMAR could be considered, examining the options open to the government.

Through the inter-departmental Marine Coordination Group established in 2009 and reconvened as Project Ireland Marine 2040 (PIM2040) this year, Ireland has a track record in working horizontally across government on marine issues, but only at a strategic level. Stakeholders unanimously stated that current governance arrangements are deemed inadequate to cope with the future demands that will be placed on Government. To harness the scale of government resourcing and policy support requirements, strengthening and

leveraging its operational infrastructure and technical expertise capacity is essential. To do so a second tier of inter-departmental cooperation could be formally convened at key programme manager/operational level, to prioritise, align and coordinate effort and resources, and effectively contribute to the overarching integrated marine plan. A future follow-on strategic review of marine governance could also seek to consider the optimal framework and legal status for INFOMAR 2.0 to achieve optimal impact for Government, and perhaps seek to legislate on its relationship with An Bord Pleanála as the marine activity consent authority and MARA as the marine regulatory and enforcement body. Stakeholders unanimously recognised the success and goodwill that INFOMAR as a brand has generated as an innovative public sector led programme developing unique open-source datasets to promote the sustainable development of marine resources. Future Government requirements for INFOMAR 2.0 can only increase, given the predicted increase in development in our Marine environment, the dynamic nature of our seas and their resources, the requirement for a single source of truth, carrying the authority of the State, and the need to 'deconflict' marine sub-sectors and marine development priorities through the provision of unbiased and scientific data and advice. In future, closer INFOMAR cooperation with MARA, the marine regulatory and enforcement authority, and An Board Pleanála, the marine consenting authority through formal legal structures and agreements will be required.

Stakeholders have cautioned against moving away from the INFOMAR brand, as to do so could send wrong signals to the marine sector about the State's long-term commitment and offshore sustainable development plans. It could also undermine confidence in what Ireland has singularly achieved globally and be deemed to portray a lack of recognition of the achievements of the Programme to date.

Opportunity: Build on the success and international recognition of the initial INFOMAR programme by retaining its branding in a future INFOMAR 2.0 programme.



4.2 INFOMAR Organisational Structure

The continued relevance of INFOMAR's organisational structure was noted in our stakeholder engagement. State Agencies and Government Departments noted that INFOMAR is perceived as a public sector entity, and as a purveyor of unique, open source and critical datasets. It is in fact a finite time bound jointly managed programme by two public sector bodies with no legal status, and therefore unable to commercialise, freely recruit, or expand. Despite the constraints to the organisational structure, these stakeholders relayed that they would otherwise be forced to outsource to the private sector at potentially greater cost and further delay owing to current procurement processes. A programme like INFOMAR creates economies of scale, reducing costs to the State, and providing a readily available and accessible platform for sharing across the public and private sector, a platform that otherwise might be lost were data provided by a multitude of disparate providers which may lack open source data policies.

In line with public policy best practice and European Law, INFOMAR 2.0 data should remain open source and free to the scientific community and public alike. However, there is a risk in the maintenance of this policy that INFOMAR 2.0 is seen merely as a baseline data acquirer which can be stood up on an ad-hoc basis, when in fact it should be viewed as an ongoing infrastructure programme where the processing, maintenance, renewal, communication, further development, and creation of high-quality datasets is seen as important as the baseline data acquisition itself. If INFOMAR is viewed as a timebound programme that can be wound down at will in 20-year cycles, its data will become static and its utility & relevance will deteriorate. This will lead to poorer planning and decision making in the future, and it will reduce the legacy benefits of the state investment in undertaking, delivering and completing the programme. A future follow-on strategic review could seek to examine the range of options open to the Government on the future of INFOMAR, potentially putting it on a more permanent footing.



4.3 INFOMAR Capabilities

As the Irish economy continues to grow, new technologies are deployed, and development in the marine environment continues to ramp up, new capabilities will be required of INFOMAR 2.0 that could be considered as part of a wider future follow-on strategic review.

As the number of external stakeholders increases so too will demands for formal structures and business partnering to help foster greater levels of cooperation, efficiency, and impact in its outputs. Formal structures and service level agreements could create dedicated business partners to help spread the dissemination of INFOMAR outputs horizontally across the public sector, while a dedicated business development unit could work vertically in the private sector to create bespoke services and products helping to maximise INFOMAR's contribution and return on investment to the wider Irish economy, making it easier to demonstrate INFOMAR's value.

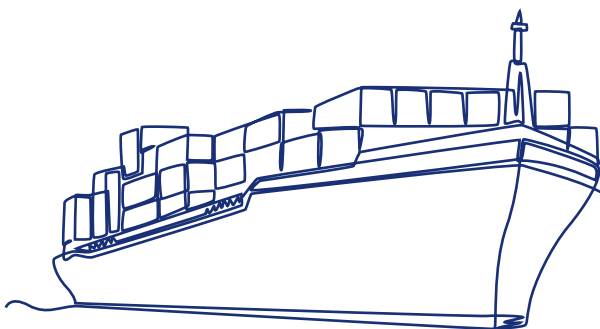
Need: INFOMAR, as part of a future follow-on strategic review should consider its governance, organisational structure, and capabilities to ensure that it is on a permanent legislative footing that reflects its importance and growing responsibility in the rapidly growing Irish marine economy.

Conclusion



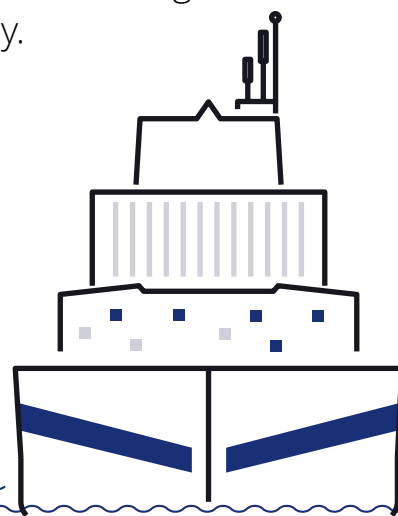
In the drafting of this report approximately 50 Government Departments, State Agencies, Research Institutions, International Partners, and Private Sector partners were invited to participate in our stakeholder engagement across three separate workshops in Galway and Dublin. The engagements lasted for 14 hours of engagement which generated significant original content that was verified with INFOMAR leadership before being inserted into this foresight assessment report. In addition to stakeholder engagement, we also studied dozens of internal and external reports and have cited approximately 45 sources throughout this report.

Based on the consensus of stakeholders and our findings, it is evident that there is a cause for extending and rescoping of the programme into the future. Even over the past twelve months it has been evident that the extent of INFOMAR input into the ORE sector and continued support in helping the Government abide by its international legal obligations indicates that INFOMAR is an indispensable resource to the State. It has continuously proven itself to be an adaptable, agile, and key scientific data purveyor and advisor.



However, we have found that there is scope for improvement and a wider remit to maximise the impact of INFOMAR, this will require a future follow-on strategic review to understand how INFOMAR can transform internally to deliver greater levels of governance, operations and capabilities that are fit for purpose in an extended and rescoped programme. A future follow-on strategic review could inform development of a new strategy with enhanced capabilities to maximise the return on investment in INFOMAR for Ireland. The environment is changing, our legal obligations are expanding, and every relevant government department and marine sector requires trusted marine data, something which only INFOMAR with its data acquisition, processing dissemination capability, infrastructure and rare human resources can provide at scale into the future.

The future forces of technological change, climate disruption, geopolitical unrest and demographic shifts will result in demands on the government that will produce a legislative and policy agenda that will reconfigure the future operating environment of INFOMAR. As indicated in our engagements with stakeholders and research, many marine based sectors have the potential to grow, achieve public policy objectives and contribute to coastal communities; but will increasingly need the capabilities of INFOMAR to acquire datasets, process and publish them to harness the power of integrated planning for the marine environment. INFOMAR and integrated planning can contribute to the deconflicting of the competing economic sectors and public policy priorities ensuring that all can grow sustainably.



Appendix

We would like to thank representatives from the following INFOMAR stakeholder organisations that were invited to contribute their thoughts to this INFOMAR Foresight Assessment report:



Appendix I: Government Departments, State Agencies and Private Sector Businesses that took part in our stakeholder engagement sessions

Department of the Environment, Climate and Communications	UCC	Xocean	MERC Consultants Ltd.
Inland Fisheries Ireland	Lough's Agency	UK Maritime and Coastguard Agency	Seabed 2030
GSI	Aerial Agri Tech	UK Hydrographic Office	The Commissioners of Irish Lights
Waterways Ireland	OPW	Department of Agriculture, Fisheries, and the Marine	BIM
Marine Institute	Department of Housing, Local Government and Heritage	Department of Foreign Affairs and Trade	Met Éireann
MARA	An Bord Pleanála	National Parks and Wildlife Service	Department of Transport
Corio Generation	UCD		

Appendix II: Glossary of acronyms

Section	Type
BIM	Bord Iascaigh Mhara
DMAPs	Designated Maritime Area Plan
CBD	Convention on Biological Diversity
CSO	Central Statistics Office
DECC	Department of the Environment, Climate and Communications
EEZ	Exclusive Economic zone
EPA	Environmental Protection Agency
EU	European Union
GSI	Geological Survey Ireland
IDA	Industrial Development Authority
IHO	International Hydrographic Organisation
IMO	International Maritime Organisation
INFOMAR	Integrated Mapping for the Sustainable Development of Ireland's Marine Resource
INSS	Irish National Seabed Survey
LIDAR	Light Detection and Ranging
LLP	Limited Liability Partnership
LNG	Liquefied Natural Gas
MARA	Maritime Area Regulatory Authority
MARPOL	International Convention for the Protection of Pollution from Ships
MFD	Marine Framework Directive
MI	Marine Institute
MPA	Marine Protected Areas
NDP	National Development Plan
NPWS	National Parks & Wildlife Service
NUIG	National University of Ireland, Galway

Section	Type
NUIM	National University of Ireland, Maynooth
ORE	Offshore Renewable Energy
OSPAR	Oslo Convention for the Protection of the Marine Environment of the Northeast Atlantic
QMF	Quality Management Framework
R&D	Research and Development
R&I	Research and Innovation
RPII	Radiological Protection Institute of Ireland
RNLI	Royal National Lifeboat Institution
RTD	Research, Technology & Development
RV	Research Vessel
SAC	Special Area of Conservation
SLAs	Service Level Agreement
SOLAS	International Convention for the Safety of Life at Sea
SOP	Standard Operating Procedure
UCC	University College Cork
UCD	University College Dublin
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
UN	United Nations
UNCLOS	UN Convention on the Law of the Sea
UNESCO	UN Educational, Scientific & Cultural Organisation
US	United States of America
VFM	Value for Money
WFD	Water Framework Directive
EMFF	European Maritime Fisheries Fund

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INFOMAR Foresight
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Ireland's Marine Resource

An independent report prepared by Deloitte Ireland LLP,
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