



**Opergy**  
Group



# **Evidence Review: Drivers and Pressures Affecting the UK Marine Environment**

March 2024

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This evidence review has been compiled and reviewed by Opergy Ltd. on behalf of the Office for Environmental Protection. The views expressed in this report are those of Opergy, based on evidence gathered from stakeholders.



# Executive Summary

The Office for Environmental Protection (OEP) issued a Call for Evidence in November 2023, posing five key questions exploring the drivers, pressures and data gaps affecting the achievement of Good Environmental Status (GES) in UK marine waters. This ran until 31<sup>st</sup> January 2024.

This report details the feedback received in response to the call and subsequent comments gathered during stakeholder workshops. It is clear from this that more work is needed if GES is to be achieved within the UK's marine waters, with both industry and climate change proving especially detrimental to the condition of the marine environment.

A total of 24 responses were received from a host of different groups – non-governmental organisations (29%), academia and research institutes (25%), public bodies and Statutory Nature Conservation Bodies (SNCBs) (21%), independents (17%), industry representatives (4%) and special interest/lobby groups (4%).

Opergy Limited was commissioned to undertake an independent review and analysis of the feedback received. This involved an initial first stage, where a manual review and assessment of each of the submission documents was carried out, drawing out the drivers, pressures, impacts and suggested actions needed to achieve GES, as well as the data and monitoring gaps mentioned. This was supplemented with further categorisation within the AI NVivo tool, allowing comparison and consolidation of the key themes arising.

From this, commercial fishing, offshore energy production, climate change and pollution/release of contaminants were the most frequently cited stressors impacting the achievement of GES in the UK's marine waters. Invasive species were also considered a key pressure. These are contributing to impacts such as biodiversity loss, habitat disturbance and physical damage to the seabed.

Respondents put forward views on what can be done to help overcome these pressures and avoid these impacts, with a number of action categories suggested – notably natural habitat and ecosystem creation and restoration; actions to address non-native species; actions to minimise pollution and release of contaminants; and actions that can help avoid impacts from commercial fishing. There was also an opportunity to put forward views on where data and evidence gaps are inhibiting the achievement of GES, with data on seabird and mammal species, biodiversity data in relation to different habitats, especially benthic ones, fisheries data, and offshore energy data most frequently referenced among respondents.

Following this initial assessment work, the research team held a series of interactive workshops with stakeholder groups to verify feedback and gather further insights into the issues raised within the Call for Evidence. This corroborated initial findings, with consensus again being that climate change and commercial fishing are major pressures, alongside offshore energy development and pollutants and contaminants.

What has been clear throughout this research is the complexity of the marine environment. Analysis of the responses shows the interconnectedness of different marine stressors, with human activities of all kinds having wide reaching impacts and implications for marine health, bringing cumulative impacts that potentially accelerate or accentuate those pressures. Likewise, corrective actions and initiatives to minimise impacts are often developed and implemented for one impact area or industry in isolation, leading to missed opportunities for collaboration and coordination, as well as potentially unintended consequences elsewhere.

A holistic approach is therefore needed to achieve GES in UK marine waters. This means strategic consideration and planning centered on considering impacts and implications across terrestrial, coastal and marine environments. It also means the nature and climate crises need to be tackled together, with it clear from responses and stakeholder engagement that climate change is an overarching pressure on the marine environment.

It therefore falls on governments across all UK administrations to drive forward initiatives that can support the achievement of GES. This may include new and improved policy and regulations – especially those relating to marine spatial planning and the rollout of offshore wind – as well as enhanced enforcement of existing regulations governing activities and industries that impact the marine environment. Responses did also acknowledge the importance of other actors in bringing about positive change, with points raised on the need to solve a disconnect between people and the marine environment, while better data collection and monitoring will only further help to enhance delivery of GES.

Recommended next steps for the OEP therefore include:

- The OEP continuing to hold government bodies to account – this could include coordinating and articulating the findings and outputs of other actions and forums looking at different and specific areas of marine health. It would see the OEP bring together these efforts and evidence to share a consistent picture with central and devolved governments.
- A mapping exercise to articulate the roles and responsibilities of wider government departments and SNCBs to support alignment of and communication to government across the devolved administrations for the purpose of achieving Good Environmental Status in the UK's marine waters.
- The OEP developing close relationships with complementary organisations to initiate joint work to gather evidence, or develop suggested actions in relation to improvements to marine health, such as with the Climate Change Committee.
- Opergy suggest OEP publish the feedback received through responses to the Call, and continue their engagement with the UK government to highlight key issues where focus should be placed in approaching the review and update of the UK Marine Strategy.
- A focus on GES indicators that are performing poorly in relation to meeting their targets, with consideration of a holistic system-based approach throughout
- Support for wider efforts to achieve greater alignment on data sharing.
- Continued engagement with stakeholders to work towards achieving GES in UK marine waters.

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# 1 Introduction

Between December 2012 and December 2015, the publication of the UK Marine Strategy Parts 1-3 was intended to mark a significant step towards achieving GES; designed to set out a framework for assessing, monitoring and taking action across UK seas. Despite this, evidence shows limited progress to date, with only four of fifteen GES descriptors achieved according to Defra's 2019 update. There are also concerns surrounding the sufficiency of available data, limiting the ability to draw firm conclusions about the state of the marine environment in many areas. With the next UK Marine Strategy assessment due to be published in 2024, targets for the next cycle of this important strategy must be realistic and sufficient to drive action to deliver and maintain GES across the UK marine environment.

The OEP is a public body, created in November 2021 under the Environment Act 2021<sup>1</sup>. Its work covers England, Northern Ireland, and reserved matters. The OEP's principal objective is to contribute to environmental protection and the improvement of the natural environment by holding government and other public authorities to account.

The OEP ran a Call for Evidence between November 2023, and January 2024. This report details the assessment of that Call, which explored drivers, pressures and data gaps affecting the achievement of GES in UK marine waters. The assessment has included analysis of written feedback received in response to the Call, as well as comments gathered during stakeholder workshops hosted to build further evidence in contribution to this work. Further details of the Call and approach to this assessment are provided in Chapter 2 – Assessment Methodology.

The OEP issued its Call for Evidence to support its assessment of the range and importance of drivers and pressures that impact upon the achievement of GES. It also covered the steps which should be included in the next cycle of the UK Marine Strategy to achieve GES, and the data needed to enable those steps to be both implemented and effectively monitored<sup>2</sup>. Feedback and evidence received, and analyses through this piece of work will be used to directly influence OEP's feedback to government on achievements to date in terms of GES, and on the next cycle of the UK Marine Strategy.

Furthermore, it is the intention that feedback received through this Call for Evidence will inform and drive the OEP's own activities in the coming years to drive positive change on critical issues that are impacting the marine environment.

In advance of the Call for Evidence, the OEP commissioned Opergy Limited to undertake an independent review and analysis of the feedback received. This report has been compiled by the research team at Opergy to present the complete outputs and findings of this analysis. It describes the key stressors on the marine environment as highlighted by respondents to the Call, details the proposed actions to strengthen progress towards GES in UK marine waters, as well as suggested gaps in data and monitoring in this area. The report closes with a chapter presenting concluding thoughts and suggestions for OEP moving forwards.

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<sup>1</sup> [www.theoep.org.uk/what-we-do](http://www.theoep.org.uk/what-we-do)

<sup>2</sup> OEP Corporate Plan 2023/24 to 2025/26. Available at: <https://www.theoep.org.uk/report/oep-plans-focus-nature-recovery-water-quality-and-effective-governance>

## 1.1 The Concept of GES in the Marine Environment

The origins of ambitions to reach GES in UK marine waters stretch back to 2008, when the European Parliament and Council sought to establish a framework for community action in the field of marine environmental policy<sup>3</sup>. Within this, it required Member States to put in place necessary management measures to achieve GES in their marine waters by 2020.

The European Marine Strategy Framework Directive (MSFD) defines GES as being achieved in marine waters that are ecologically diverse and dynamic; clean, healthy and productive within their intrinsic conditions; and that are being used at a sustainable level, safeguarding the marine environment for uses and activities by both current and future generations. This means that the structure, functions and processes of the constituent marine ecosystems, together with the associated physiographic, geographic, geological and climatic factors allow those ecosystems to function fully and to maintain their resilience to human-induced environmental change. Marine species and habitats are protected, human-induced decline of biodiversity is prevented, and diverse biological components function in balance. It also means that hydro-morphological, physical and chemical properties of the ecosystems, including those properties which result from human activities in the area concerned, support the ecosystems as described – anthropogenic inputs of substances and energy, including noise, into the marine environment should not cause pollution effects.

The MSFD set out that marine strategies shall be developed and implemented in order to protect and preserve the marine environment, prevent its deterioration or, where practicable, restore marine ecosystems in areas where they have been adversely affected. They should also prevent and reduce inputs in the marine environment with a view to phasing out pollution to ensure that there are no significant impacts on, or risks to, marine biodiversity, marine ecosystems, human health or legitimate uses of the sea.

To determine whether GES has been achieved at a European level, the framework listed 11 qualitative descriptors as detailed in table 1. It tasked member states – including the UK at the time – with incorporating the aspirations of the Directive into their national law through the following timebound milestones:

1. Establishing comprehensive environmental targets and indicators to guide progress towards achieving GES (by July 2012)
2. Establishing and implementing coordinated monitoring programmes for ongoing assessment of GES (by July 2014)
3. Developing programmes of measures designed to achieve GES by 2020 (by December 2015)
4. Implementing that programme of measures (by December 2016)

The outputs of each of these activities in all member states should be reviewed and updated on a six-yearly basis. This means that those environmental targets and indicators that the UK would go on to establish in the Marine Strategy Part One (discussed overleaf) have since been used as milestones to confirm whether GES has been achieved in the UK.

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<sup>3</sup> 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) (Text with EEA relevance) - <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32008L0056>



Table 1 Indicating the 11 qualitative descriptors for GES as outlined in the European Parliament's Marine Strategy Framework Directive (2008)

|            |  |
|------------|--|
| <b>D1</b>  | <b>Biological diversity</b> is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic, and climatic conditions.                                  |
| <b>D2</b>  | <b>Invasive species</b> introduced by human activities are at levels that do not adversely alter the ecosystems.   |
| <b>D3</b>  | <b>Populations of all commercially exploited fish and shellfish</b> are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock.  |
| <b>D4</b>  | All elements of the <b>marine food webs</b> , to the extent they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity. |
| <b>D5</b>  | <b>Human-induced eutrophication</b> is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters.  |
| <b>D6</b>  | <b>Sea-floor integrity</b> is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.  |
| <b>D7</b>  | Permanent alteration of <b>hydrographical conditions</b> does not adversely affect marine ecosystems   |
| <b>D8</b>  | Concentrations of <b>contaminants</b> are at levels not giving rise to pollution effects.  |
| <b>D9</b>  | <b>Contaminants in fish and other seafood for human consumption</b> do not exceed levels established by community legislation or other relevant standards.   |
| <b>D10</b> | Properties and quantities of <b>marine litter</b> do not cause harm to the coastal and marine environment.   |
| <b>D11</b> | Introduction of <b>energy</b> , including underwater noise, is at levels that do not adversely affect the marine environment.  |

In 2010, the UK implemented The Marine Strategy Regulations 2010<sup>4</sup> through which it set a requirement of the UK taking action to achieve or maintain GES in its waters by 2020. It also saw the requirements of the MSFD transposed into UK law. The Marine Environment Regulations amendment in 2018<sup>5</sup> clarified that that UK and EU legislation relating to the marine environment, especially the marine strategy, will continue to be operable after the UK left the EU.

The UK government has since gone on to make a series of publications, the first coming in December 2012 – the UK Marine Strategy Part One: UK Initial Assessment and GES<sup>6</sup> as the first part of a strategy to set out how the UK will move towards GES in its seas by 2020. This provided an initial assessment of the state of the UK's seas, proposals for characteristics of GES in the UK's marine waters, and proposals for more detailed GES targets and indicators, which would allow the UK to measure progress towards achieving GES.

The UK Marine Strategy Part Two: UK marine monitoring programmes<sup>7</sup> came out in August 2014, setting out the monitoring frameworks to track progress towards GES targets and indicators. A

<sup>4</sup> The Marine Strategy Regulations 2010 - <https://www.legislation.gov.uk/ukSI/2010/1627/contents/made>

<sup>5</sup> The Marine Environment (Amendment) (EU Exit) Regulations 2018 - <https://www.gov.uk/eu-withdrawal-act-2018-statutory-instruments/the-marine-environment-amendment-eu-exit-regulations-2018>

<sup>6</sup> UK Marine Strategy Part One: UK Initial Assessment and Good Environmental Status (December 2012) - <https://www.gov.uk/government/publications/marine-strategy-part-one-uk-initial-assessment-and-good-environmental-status>

<sup>7</sup> UK Marine Strategy Part Two: UK Marine Monitoring Programmes (August 2014) - <https://www.gov.uk/government/publications/marine-strategy-part-two-uk-marine-monitoring-programmes#full-publication-update-history>

year later, the UK Marine Strategy Part Three<sup>8</sup> was published, setting out a programme of measures to help achieve or maintain GES.

As stated with in the MSFD, these documents are required to be reviewed on a six-year basis – with an updated assessment for Part One<sup>9</sup> published in October 2019. This featured 60 indicator assessments spanning marine species and habitats, as well as the key pressures impacting them. It found that the UK had been successful in largely achieving GES for eutrophication, hydrographical conditions, contaminants and contaminants in seafood. However, there was a more mixed picture for marine mammals, fish populations and food webs, as well as for marine habitats. It also conceded more was needed to understand and protect bird populations, while measures to tackle invasive species and marine litter need more time to take effect.

Table 2 shows the full assessment of different indicators for GES as indicated in the latest UK Marine Strategy Part 1 (2019), with green indicating GES has been achieved, yellow meaning GES has been partially achieved, and red meaning GES has not been achieved. The accompanying arrows suggest an improving situation if pointing up, a stable or mixed situation if horizontal, and a declining situation if the arrow is pointing down.

This was followed by an update to Part Two – the monitoring programmes<sup>10</sup> – in October 2022, while an updated programme of measures is yet to be published, despite the government pledging to do so “by the end of 2022”<sup>11</sup> which was a statutory deadline. With the latter not forthcoming, the focus now is firmly on a 2024 assessment of progress towards achieving GES within the UK Marine Strategy Area. This assessment is to set out whether the UK has achieved GES and will set new targets for the next cycle of the Marine Strategy.

Whilst an important driver for improving the marine environment, the UK's Marine Strategy Regulations contain one element of range of commitments and targets for the marine environment, including international agreements, national policies and commitments of England and devolved administrations. For example, COP15 – the UN's biodiversity conference, held in December 2022 in Canada – saw the adoption of the Kunming-Montreal Global Biodiversity Framework<sup>12</sup>, a landmark deal which sought to protect a third of the planet for nature by 2030. This committed countries to ensuring at least 30% of coastal and marine areas are effectively conserved and managed through protected areas and other effective area-based conservation measures by 2030, as well as having at least 30% of areas of degraded terrestrial, inland water and coastal and marine ecosystems under effective restoration by the same timeframe. That is an international target to which all four UK governments have committed – each responsible for its delivery in their own nations. In England, the Environmental Targets (Marine Protected Areas) Regulations 2023 target at least 70% of protected features in Marine Protected Areas (MPAs) in England being in favourable condition by 2042, with remaining protected features in a recovering condition. Whilst this may be key to addressing pressures in specific protected areas only, GES applies to all UK waters. In the context of these commitments across the UK, and in light of the 2020 target to achieve GES in the UK's marine waters having been missed, it is crucial to ensure

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<sup>8</sup> UK Marine Strategy Part Three: UK programme of measures (December 2015) -

<https://assets.publishing.service.gov.uk/media/5a80330040f0b6230269218c/marine-strategy-part3-programme-of-measures.pdf>

<sup>9</sup> UK Marine Strategy Part One: UK Updated Assessment and Good Environmental Status (October 2019) -

<https://www.gov.uk/government/publications/marine-strategy-part-one-uk-updated-assessment-and-good-environmental-status>

<sup>10</sup> UK Marine Strategy Part Two: UK updated monitoring programmes (October 2022) -

<https://assets.publishing.service.gov.uk/media/63a08d10d3bf7f37598edab2/uk-marine-strategy-part-two-monitoring-programmes-2021.pdf>

<sup>11</sup> Marine Strategy part three: programme of measures - <https://www.gov.uk/government/consultations/marine-strategy-part-three-programme-of-measures#full-publication-update-history>

<sup>12</sup> COP15: Nations reach 'historic deal' to protect nature - <https://www.bbc.co.uk/news/science-environment-64019324>

coherence of targets and delivery mechanisms across the country to ensure collective GES goals can be met.

Table 2 shows the indicators used in the UK's Marine Strategy. Whereas the Marine Strategy Framework Directive includes 11 indicators, it can be seen here there are 15. This is due to significant overlap between biodiversity, food webs and sea-floor integrity, with the decision made to develop targets for different species groups – cetaceans, seals, birds and fish, and habitats – pelagic and benthic<sup>13</sup>.

Table 2 indicating the assessment of the status of achievement of GES Indicators as provided by the UK Marine Strategy: Part 1 update of 2019

| Descriptor                         | Environmental Status in 2018 | Descriptor                     | Environmental Status in 2018 |
|------------------------------------|------------------------------|--------------------------------|------------------------------|
| D1 & D4 - Cetaceans                |                              | D4 - Food Webs                 |                              |
| D1 & D4 - Seals                    |                              | D5 - Eutrophication            |                              |
| D1 & D4 - Birds                    |                              | D7 - Hydrographical Conditions |                              |
| D1 & D4 - Fish                     |                              | D8 - Contaminants              |                              |
| D1 & D4 - Pelagic Habitats         |                              | D9 - Contaminants in Seafood   |                              |
| D1 & D6 - Benthic Habitats         |                              | D10 - Marine Litter            |                              |
| D2 - Non-indigenous Species        |                              | D11 - Underwater Noise         |                              |
| D3 - Commercial Fish and Shellfish |                              |                                |                              |

<sup>13</sup> [Marine Strategy Part One: UK Initial Assessment and Good Environmental Status \(2012\)](#) – UK government

## 2 Assessment Methodology

### 2.1 Call for Evidence

The OEP's Call for Evidence<sup>14</sup> commenced on 29<sup>th</sup> November 2023 and closed on the 31<sup>st</sup> January 2024. The Call was published on the OEP's website. Additionally, stakeholders were identified through purposeful sampling by the OEP and Opergy and informed of the Call via email. The OEP requested responses be submitted via online survey software (Citizen Space), or as a written submission to the OEP directly via email.

The Call posed 5 key questions across three topic areas, which explored drivers and pressures affecting the condition of the marine environment, actions that can be taken to achieve GES, and the availability of relevant data and monitoring programmes to measure the progress towards GES. For the remainder of this report, we summarise and assess the responses to the Call for Evidence across the three topic areas.

#### 2.1.1 Topic 1: Drivers, Pressures & Impacts affecting the UK Marine Environment

1. What are the key drivers and pressures affecting the achievement of GES in UK marine waters?
  - a. How should drivers and pressures be prioritised? For example, by the scale of impact. What evidence supports any such prioritisation?
  - b. Over what period (short <5yrs, medium 5-15yrs, long term 15+yrs) and spatial area do these pressures and drivers have their affect?
  - c. How many of these drivers and pressures are transboundary?

#### 2.1.2 Topic 2: Actions Needed to Achieve GES

2. What actions are needed to deliver GES in UK marine waters?
  - a. What are the trade-offs that need to be taken into consideration, or opportunity for synergistic actions, and how long would it take to deliver them?
3. What are the barriers and opportunities to addressing pressures and drivers through these actions?
  - a. What pressures will not be or only partially addressed through these actions?

#### 2.1.3 Topic 3: Data Gaps and Monitoring of Marine Health

4. Where are the gaps in the available data and evidence that need to be filled to ensure achievement of GES can be monitored and actions are effectively identified, and implemented?
  - a. What evidence is available to identify those gaps?
  - b. What aspects of existing monitoring programmes undertaken by the UK administrations are working well to fill those gaps, and what aspects could be improved?
5. What additional actions are required to fill any data gaps and how long would it take to deliver them?
  - a. What are the barriers and opportunities to addressing data gaps through said actions?
  - b. What evidence supports these actions?

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<sup>14</sup> <https://www.theoep.org.uk/report/oep-launches-call-evidence-support-good-environmental-status-ges-uk-marine-waters>

## 2.2 Defining Terms

To ensure consistency across the responses to the Call for Evidence and in the analysis presented in this report, it is useful to clearly define key terms referenced throughout this document. Below in Figure 1 we provide a clear definition of the key terms 'Drivers', 'Pressures' and 'Impacts'. These definitions are consistent with those used by the OEP in their annual Environmental Improvement Plan monitoring report, the most recent iteration of which was published in January 2024<sup>15</sup>, and are based upon the frameworks adopted by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)<sup>16</sup> and the European Environment Agency (EEA)<sup>17</sup>.

Applying these definitions ensures consistency across the body of work developed by or on behalf of the OEP.

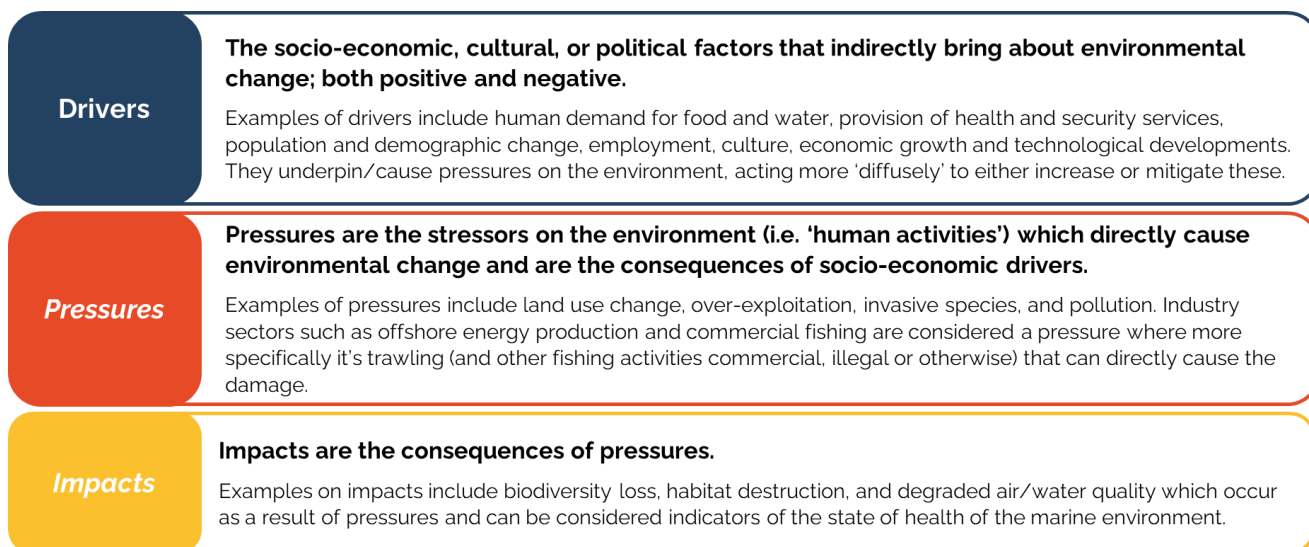


Figure 1 Definitions of the terms Drivers, Pressures and Impacts used throughout this report to describe stressors affecting the state of health of the marine environment.

## 2.3 Methodology for Assessing Call for Evidence Responses

The assessment of submissions to the Call for Evidence was undertaken in its entirety by a research team provided by Opergy Limited. Regular updates on the progress of the analysis were provided to the OEP client team during the assessment and reporting phase.

The analysis of all submissions was undertaken in two stages. Firstly, a detailed manual analysis was undertaken of all answer documents submitted through the Call. Secondly, an overview analysis was undertaken of all citations, supporting documents and evidence referenced through the responses. To support the analysis, and aid qualitative and mixed method research, the research team utilised the specialist software programme NVivo.

### 2.3.1 Stage 1 – Assessment of Call submission documents

The initial analysis of the submission documents was undertaken manually. Submissions were assessed to draw out all drivers, pressures, impacts, suggested actions needed to achieve GES,

<sup>15</sup> [Government remains largely off track to meet its environmental ambitions, finds OEP in annual progress report | Office for Environmental Protection \(theoep.org.uk\)](https://www.theoep.org.uk)

<sup>16</sup> Models of drivers of biodiversity and ecosystem change | IPBES - <https://www.ipbes.net/models-drivers-biodiversity-ecosystem-change>

<sup>17</sup> Environmental indicators: Typology and overview | EEA - <https://www.eea.europa.eu/publications/TEC25>

and data and monitoring gaps mentioned. These were analysed thematically within the NVivo software, where all response statements could be compared and consolidated to highlight and group similar points under each topic and question area. This provided an organised list of key themes mentioned under each question, and a clear list of response documents that made comment on each theme.

To ensure appropriate thematic analysis, the codes were independently reviewed by the research team lead and amended to remove duplication or incorrect classification across themes. With a revised and finalised list of codes, each response document was then manually assessed a second time by a different member of the research team for quality control purposes. This ensured that the initial coding was undertaken consistently across all response documents, with correction and re-categorisation occurring as necessary.

Having undertaken this coding exercise twice, the analysis and key findings were written up and are detailed through the remainder of this report.

### **2.3.2 Stage 2 – Assessing supporting documents and referenced evidence**

Following this first stage assessment of the written submission documents, analysis was undertaken of the supporting documents and references provided throughout responses.

A full list was manually compiled in Microsoft Excel of all the supporting evidence referenced, with these also categorised according to the type of document they were (e.g. peer-reviewed journal articles, news articles, legislation, policy papers, or reports). This resulted in a list of 339 pieces of evidence which, due to time constraints, would have been impractical to manually review in full. Therefore, each document was uploaded to the NVivo tool where Artificial Intelligence (AI) assisted autocoding was carried out. A sentiment analysis was also undertaken, assessing the documents for the use of language and tone through their content – assessing whether they were very negative, moderately negative, moderately positive, or very positive. Sentiment analysis utilises terminology and language trends, either by paragraph or by sentence – sentences in this case – to determine the emotional tone of the messaging. It is noted that AI has been utilised here to support analysis of the large number of supporting documents. Its findings are indicative and not exhaustive, however serve to provide an overview of the content and tone of the supporting documentation provided.

From this, a manual analysis was then undertaken of a selection of the supporting documents referenced and cited – the Opergy research team selected those that were referenced by multiple respondents and those identified by the AI led sentiment analysis as being the most negative and most positive in tone. Within the time available for this review, the research team selected a sample of 30 supporting documents – approximately 10% of the supporting material submitted.

The key findings from this manual analysis have been written up and detailed in Chapter 7 - Supporting Evidence.

## **2.4 Verification Workshops to Test and Validate Findings**

Following assessment of the feedback and evidence received through the Call, the research team facilitated a two-part series of online interactive stakeholder workshops to gather further feedback on the issues raised within the Call for Evidence.

A workshop invite list of key stakeholders was jointly compiled by the OEP and Opergy team, with emphasis placed on additional organisations representing industrial users of the marine environment. Workshop invitations were distributed directly to 149 individual invitees representing

89 organisations. All organisations or individuals who submitted a written response to the Call were included in the invite list.

Each of the online workshops was three hours in duration and spaced one week apart. The sessions were designed as a series, with participation of attendees to both sessions encouraged but not mandatory. The workshops incorporated summary presentations, facilitated open discussion, breakout discussions and targeted question and answer elements. Interactive tools including instant polling and live comment capture functions were used in each session to encourage and collect valuable and insightful feedback. Attendees gave their informed consent in order to attend these workshop sessions.

The objective of the first workshop, held on 11<sup>th</sup> March 2024, was to test and validate the feedback gathered through the Call for Evidence. It sought to ensure the feedback received adequately covered the key issues for consideration in achieving GES in UK waters, as well as ensuring a broad representation of views across different marine stakeholders and users. Opening with a recap of the main objectives and questions explored through the Call, the session went on to share a summary of the key feedback received through responses. An open discussion was then facilitated to explore in further detail the drivers, pressures, and impacts affecting the UK's marine health. This was followed by discussion regarding scenario planning and future steps to achieving GES in the UK's marine waters, followed by an exploration of current gaps in evidence and monitoring.

Discussion in the workshop was facilitated by breakout rooms which gave attendees the opportunity to provide feedback in smaller groups. A breakout room was held to discuss each of the two main topics of the first workshop: actions that should be taken to limit the impact of the four main marine drivers and pressures identified in the Call; data and evidence gaps. A number of questions were posed for each topic during the presentation to prompt responses.

The second workshop, held on 19<sup>th</sup> March 2024, was a follow-up session built directly upon the feedback received through the open Call for Evidence and the first workshop. Via discussion and guided exercises, the project team explored in greater depth, the themes and issues raised, seeking to identify practical and actionable interventions to move towards GES in UK marine waters. The session focused on the four marine pressure areas highlighted most frequently in the written feedback received: Climate Change, Pollution/Contaminants, Commercial Fishing, and Offshore Energy Production.

A summary of the feedback regarding each of these pressure areas was presented before discussion was opened to the whole group; several questions were provided regarding each area to prompt discussion. The key themes and ideas raised during the discussion have been collated and incorporated into this report.

An interactive voting system was incorporated into the workshop which allowed attendees to rank the most frequently cited marine pressures in order of priority to be tackled. This provided good graphical representation of the views of a broad range of stakeholders within the marine environment. They were then offered the opportunity to expand on their reasons for ranking the pressures as they did.

## 2.5 Describing Call for Evidence Responses

Through this research the project team assessed feedback and evidence provided by a wide range of stakeholders representing groups with a variety of different views and experiences on the state of the marine environment and activities impacting this. Throughout this report the feedback gained has been kept anonymous, however for clarity and transparency we outline the contributing organisations here.

There were a total of 24 written responses received through the Call; 7 submitted through the online survey form and a further 17 submitted via email.

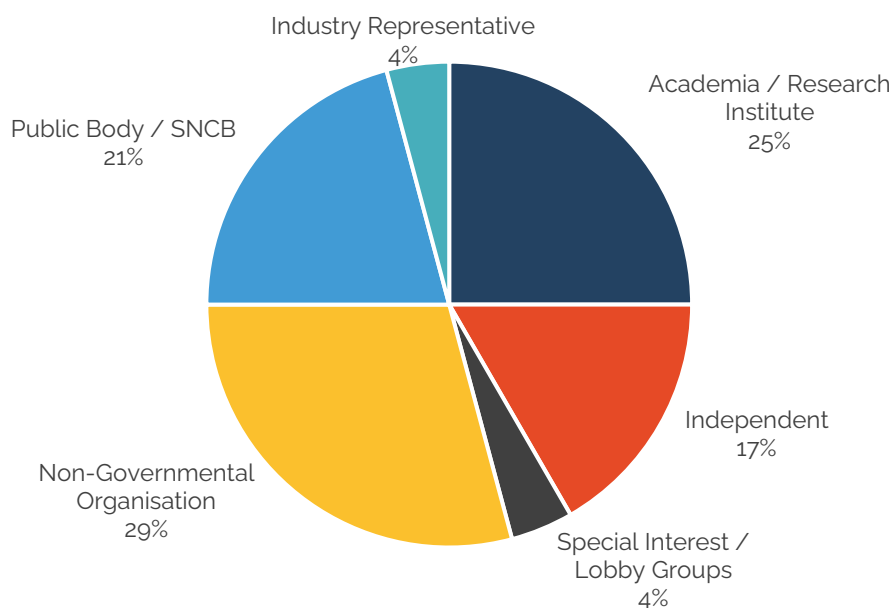


Figure 2 Chart indicating the stakeholder groups submitting written responses through the Call for Evidence

As indicated in Figure 2, the majority of feedback was provided by non-governmental organisations (NGOs) and public bodies or Statutory Nature Conservation Bodies (SNCBs). There was also a good response rate from academic/research institutes with inhouse expertise in the marine environment.

It was observed that the content of the written responses focussed most heavily on articulating the respondents' feedback on the drivers and pressures affecting the marine environment, as well as on their suggested actions to achieve GES – topics 1 and 2 addressed by the Call questions. There was less commentary and feedback provided discussing data gaps, monitoring, and action needed – topic 3 addressed by the Call questions.

The Call requested the responses be well referenced with supporting evidence. Across the responses, a considerable number of references and supporting documents were used to support claims that were made. **339 supporting documents or references** were cited – with multiple responses referencing the same evidence to substantiate their submissions. This included peer-reviewed journal articles, reports – including research/scientific reviews, policy reports, news articles, legislative documents and reviews relating to development of laws, consultations and consultation responses, and webpages which often summarised findings of different pieces of research and analysis or introduced different programmes that have been set up with the intention of contributing to GES of the UK's marine waters. The proportion of each type of supporting document referenced is depicted in the chart below.



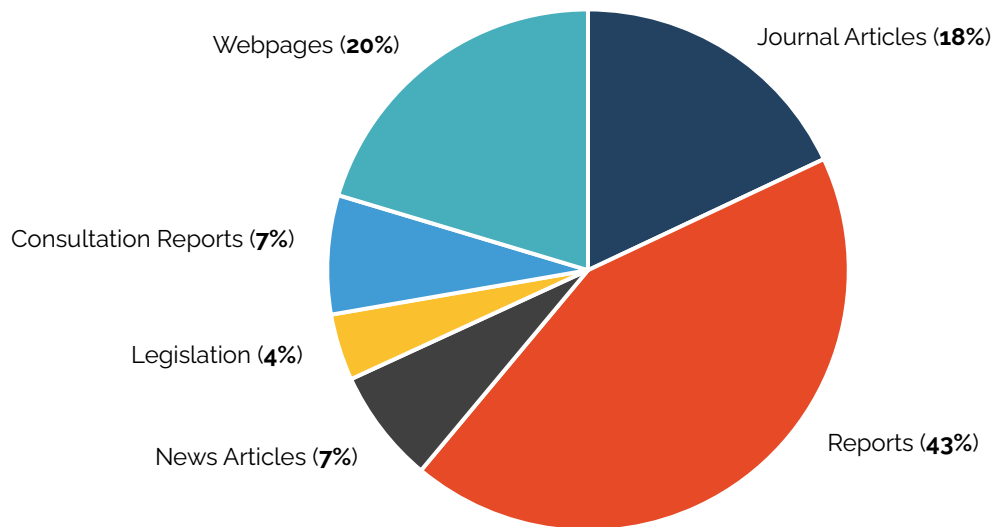


Figure 3 Indicating the key categories of supporting information provided through written responses to the Call.

Figure 4 shows how responses were weighted in terms of tone, and it is clear that most were balanced between "moderately negative" and "moderately positive". Non-governmental organisations appear more negative in tone, whereas public bodies and SNCBs along with academia and research institutes are slightly more positive. It is noted however that this sentiment analysis should be considered within the wider context of the Call in which the questions were deliberately framed to identify drivers, pressures and barriers to intervention that are limiting achievement of GES, as well as gaps in the data and monitoring currently available. This may have influenced the tone and content of the responses to be more negative.

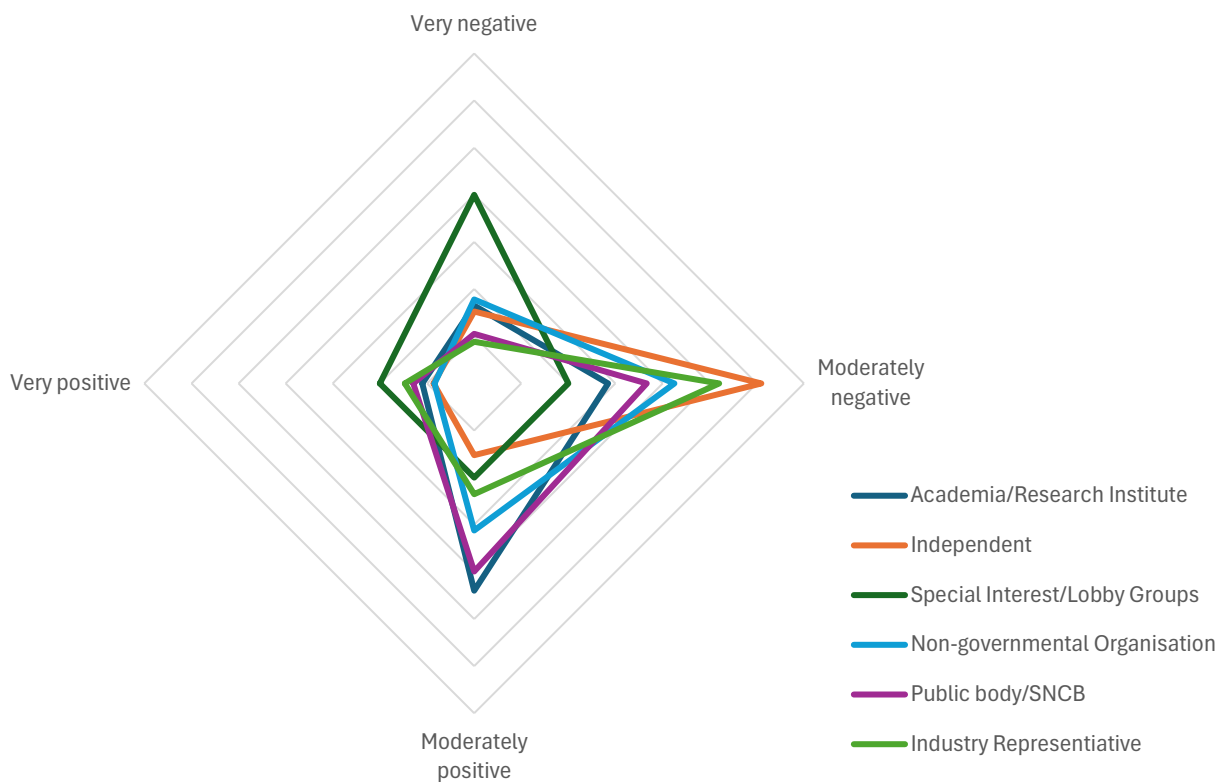


Figure 4 Sentiment analysis presenting sentiment of written responses from each stakeholder group.

The workshops had good representation from a broad range of sectors. Across the two workshops, there was representation from 33 different organisations, a number of which had multiple attendees. Of these attending organisations, 12 were NGOs, 8 were public bodies or SNCBs, 6 were industry representatives, another 6 were from academic or research institutes, and one was from a special interest or lobby group. The proportions are represented in figure 5.

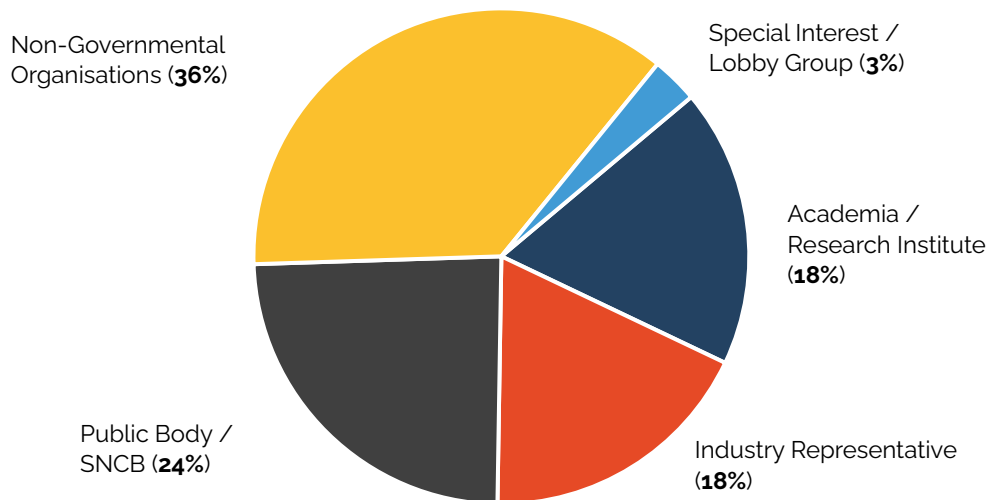


Figure 5. Chart indicating the stakeholder groups across both workshops.

The first workshop had 35 attendees from 32 different organisations – excluding those from Opergy and the client organisation. The second workshop had 24 attendees from 22 unique organisations – 4 of these had not been present at the first workshop.

24 of the 33 unique organisations that had representation at the workshop did not provide a response to the Call – this comprises 72% of attendees. The workshops, therefore, provided a valuable opportunity to gather insight on the issue of achieving GES from an even broader range of stakeholders. As with the Call responses, the majority of representatives were from NGOs. However, we did note greater proportional representation of participants from industry at the workshops when compared to the Call respondents.

### 3 Assessing Drivers and Pressures Affecting Achievement of GES

The first topic area explored through the Call sought to highlight the key drivers and pressures affecting marine health. This chapter explores the feedback received by all respondents in this area. For ease of reference, Box 1 re-states the specific questions on this topic posed by the Call.

#### BOX 1: CALL QUESTIONS ON DRIVERS AND PRESSURES AFFECTING ACHIEVEMENT OF GES

1. What are the key drivers and pressures affecting the achievement of GES in UK marine waters?
  - a. How should they be prioritised e.g, by the scale of impact. What evidence supports any such prioritisation?
  - b. Over what period (short <5yrs, medium 5-15yrs, long term 15+yrs) and spatial area do these pressures and drivers have their affect?

Through analysis, the research team identified 1 driver, 36 pressure areas and 10 impacts which were explicitly highlighted across all Call responses. The schematic diagram provided in Figure 6 demonstrates the wide variety of drivers (in navy blue), pressures (in orange) and impacts (in yellow) suggested. The arrows included in this chart indicate the linkages and causal relationships between the drivers, pressures, and their impacts as they were described by Call respondents. It is recognised that there may be additional relationships between the pressures and impacts highlighted, however only those explicitly described by respondents have been articulated here.

Across the responses to the Call, the only driver which was specifically mentioned was that of government policy and enforcement. Two aspects highlighted within this driver were ineffective management and unsustainable development.

Considering the number of respondents independently highlighting each pressure area, the most frequently mentioned pressures were commercial fishing, offshore energy production, climate change and pollution/release of contaminants, which were each discussed by 9 of the written responses (38%). Presence of invasive species was also considered a key pressure amongst 7 respondents (29%). The amount of commentary within the responses which was devoted to discussion and explanation of each pressure area is represented in the block diagram in Figure 7. This chart indicates the greatest proportion of content on marine environment pressures was provided in relation to pollution/release of contaminants, commercial fishing, and offshore energy development (including offshore wind and other offshore energy generation technologies).

Impacts were mentioned less frequently than drivers and pressures across the responses, with biodiversity loss, habitat disturbance and physical damage to the seabed mentioned most commonly. Figure 8 indicates the relative volume of discussion on each of the marine impact areas highlighted.

This chapter explores and describes in further detail the drivers, pressures and their impacts discussed through the Call responses through the subheadings provided below.

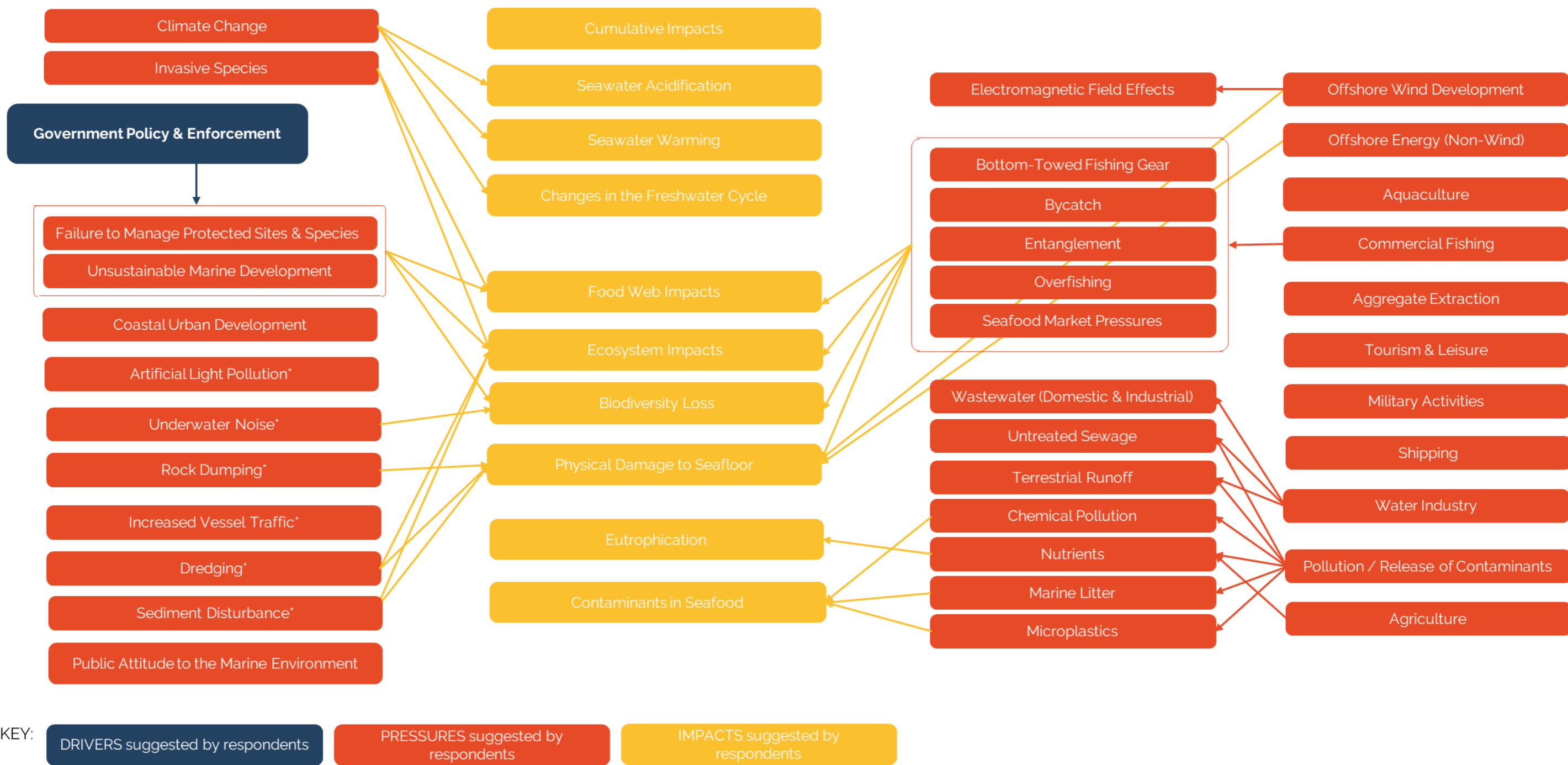


Figure 6 Schematic diagram indicating the wide variety of drivers, pressures and their related impacts highlighted through Call responses. The asterisk (\*) beside several of the pressures indicates these pressures may be linked to numerous other pressure areas shown elsewhere on the diagram however for visibility all linkages have not been depicted.

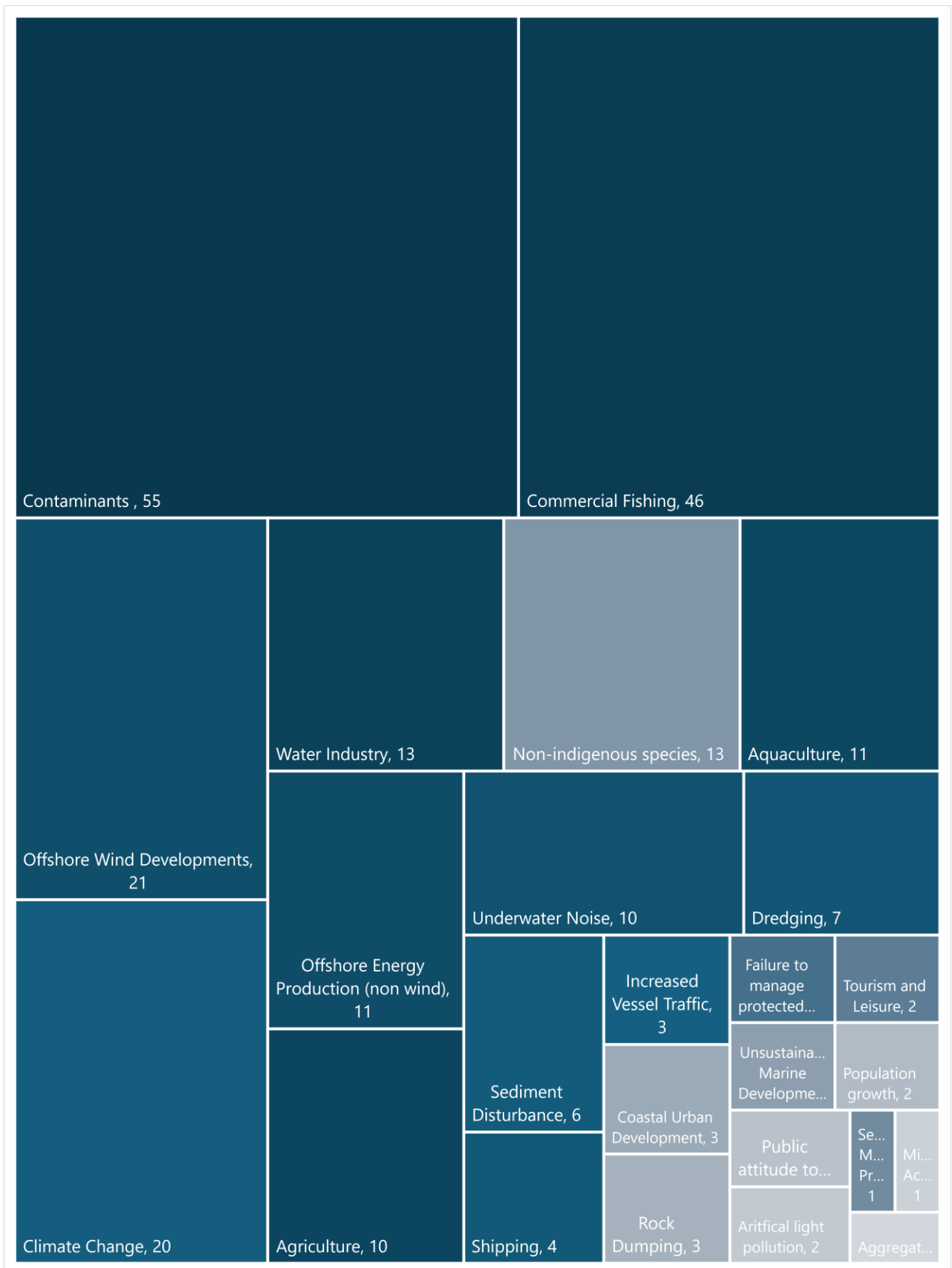


Figure 7 Block diagram indicating the volume of discussion provided across the range of pressures on the marine environment – category name and number of references made to this pressure through the Call responses shown

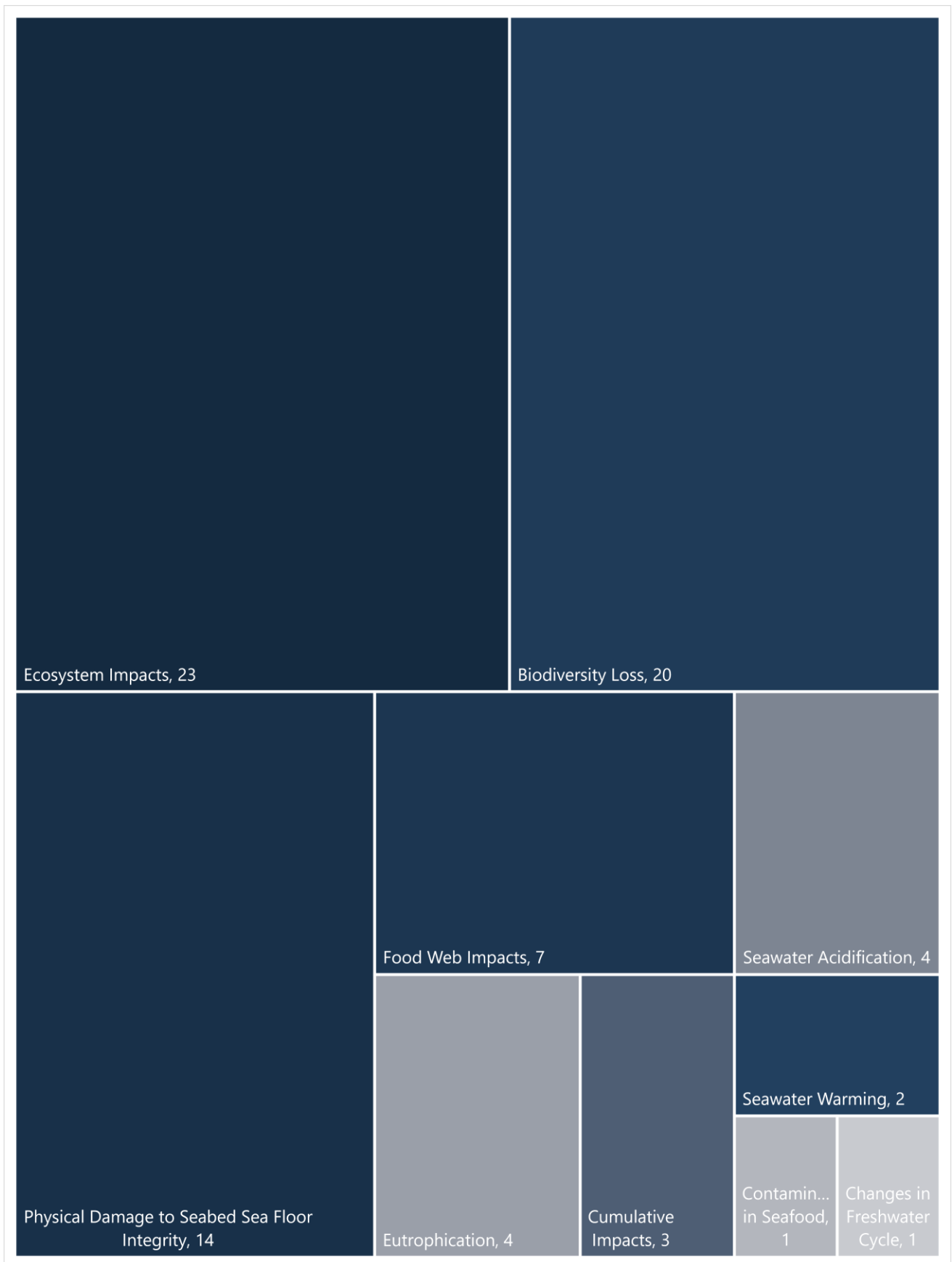


Figure 8 Block diagram indicating the volume of discussion provided across the range of impacts on the marine environment – category name and number of references made to this impact through the Call responses shown

### **3.1 Drivers of Environmental Change**

Whilst numerous drivers could be inferred by the pressures and their impacts mentioned by Call respondents; food and energy production and security for example, only one driver area, as defined above, was clearly articulated in responses received. Government policy and enforcement was highlighted by respondents as a means of driving change in the marine environment, either positively through regulatory actions and enforcement, or negatively through inaction in this regard.

Concerns were raised over failure to meet statutory requirements through policy and legislation, which is expected to hinder the ability to achieve GES in the marine environment. This was most strongly articulated in responses describing the situation in Northern Ireland. In one response, evidence for this is drawn from NI Executives' failure to meet targets within the Biodiversity Strategy for NI (2015-2020), leading to subsequent failure to deliver the strategy's objective of halting and reversing declines in the natural environment.

In addition to insufficient protective measures, several respondents noted a lack of political will to actively restore our seas. This was indicated by several respondents, who suggested that an inappropriate licensing system, hindering the development of restoration projects, and promoting a habitat-by-habitat approach rather than the more effective seascape approach. This level of inaction rings as a clear theme throughout most of the responses and is suggested as a major underlying cause for declining marine health and failure to meet GES targets. For one respondent this is illustrated by the lack of publication of the Programme of Measures for the previous iteration of the UK Marine Strategy, consulted on in 2021. Furthermore, failure to effectively manage unsustainable fishing practices is viewed as another symptom of this political inaction.

A belief shared by many of the respondents to the Call is that these issues are compounded by ineffective communication and coordination. An unclear hierarchy of legislation relevant to marine management and decision-making results in complicated discussions around competing government priorities. This lack of clarity prolongs decision processes and diverts energy and resources that go into nature recovery. This has all served to halt delivery of key funding sources, such as the Maritime and Fisheries Fund (MFF), which is particularly damaging at a time when a lack of alternative funding mechanisms are available to support the recovery of the marine environment.

### **3.2 Pressures Impacting the Marine Environment**

#### **3.2.1 Commercial Fishing**

Throughout the responses, "unsustainable fishing practices" was a frequently mentioned pressure, with many respondents suggesting adverse impacts of this industry on marine health. In particular, the industrialisation of the fishing industry was noted as greatly detrimental to the marine environment, with larger vessels producing more emissions and having various effects including the creation of underwater noise. One response cites the IPBES who recognise unsustainable fishing practices as the most significant driver of decline of marine biodiversity in the past 50 years.

A number of specific elements of the fishing industry were highlighted by respondents as particularly harmful, the predominant issue being the process of bottom trawling or use of other bottom-towed fishing gear. Recent studies were referenced in the responses which highlight the impact of bottom trawling fishing gear: not only is there an immediate impact on benthic habitats and fish stocks, but research has suggested that bottom trawling itself is responsible for the

emission of up to 370 million metric tons of CO<sub>2</sub> to the atmosphere per year globally, which in itself contributes to ocean warming and acidification<sup>18</sup>.

Additionally, there is a physical impact of bottom trawling on benthic habitats and the achievement of GES in this area. One respondent cites the 2020 Scottish Marine Assessment, which notes that physical disruption of the seabed from fishing pressure is one of the main obstacles to achieving GES for seabed habitats. It is noted that in 2022, 88,894 hours of bottom trawling fishing was carried out inside UK offshore MPAs protected for benthic features. Respondents suggest that, if greater protections are not placed on these vulnerable areas, it is unlikely that the damage caused to this habitat and the species that depend on it will be reversed.

Linked to bottom trawling are the issues of bycatch and entanglement. Bycatches are the unwanted fish species that are caught by fishermen who are looking for other specific marine species. Entanglement within fishing nets is a cause of decline within a number of marine mammal populations. Both of these factors can dramatically alter food webs and directly or indirectly result in the decline in population of various marine species. Reduced prey numbers as a result of bycatch and overfishing have knock on effects for marine mammals and seabirds – bycatch in fisheries is noted as the second most important threat to seabird population health globally; a pressing issue for marine health given that 47% of all seabird species globally exhibit declining population trends.

### **3.2.2 Offshore Energy Production**

Energy was another key theme to emerge from responses to the Call for Evidence, with offshore wind and general offshore energy production highlighted by 9 responses independently – or 33% of written submissions.

Regarding offshore wind, much of the rhetoric within the responses drew on how the sector is expanding at a rapid pace which, while necessary given the climate crisis, is proving problematic because of the current limitations of the planning system. Increased offshore wind development, in conjunction with greater use by other marine sectors is resulting in a spatial squeeze. Others referred to the overall deployment of offshore wind as “poorly planned”, thus further contributing to the increasing pressure the UK’s seas already find themselves under.

Reference was also made to the risk offshore wind presents to seabirds, particularly in terms of displacement and the risk of collision. Similar was said of marine mammals in terms of displacement, but also regarding how offshore wind can impact them through underwater noise, particularly that associated with turbine deployment.

Comment was made on how the impacts of offshore wind are additive to other marine energy industries and will continue to be so unless other pressures are either removed or reduced.

Others noted offshore energy production leading to a loss of habitat and proving a disturbance in spawning or feeding grounds, which is leading to fish breeding at lower rates and within waters that are less suitable, as well as once more the issue of underwater noise.

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<sup>18</sup> Atmospheric CO<sub>2</sub> emissions and ocean acidification from bottom-trawling, Atwood et al. (2023) <https://www.frontiersin.org/articles/10.3389/fmars.2023.1125137/full>



### **3.2.3 Climate Change**

Climate change was cited as one of the largest pressures on marine health by many of the respondents to the Call for Evidence. A large number of impacts associated with climate change have been cited including the rise in global average sea temperature which will continue to alter species distributions as species migrate to cooler, northerly waters, leading to changes in predator/prey interactions, the effects of which will cascade down the food web altering the marine environment on an ecosystem scale. Ocean acidification is another impact of climate change that will directly affect the ability of a large range of marine species to create calcium carbonate-based shells.

Another impact associated with climate change that will directly affect a huge range of marine species cited by respondents is the intensity and frequency of extreme weather events. Such patterns and events are noted to impact marine health over varying time scales, from severe weather wiping out breeding seabird colonies in a few hours to long-term changes in prey availability due to ecosystem change. Respondents noted that all of these impacts mentioned could have dramatic effects on many aspects of marine biodiversity, including species distribution, population dynamics, food webs, and ecosystem function.

Several responses highlight the difficulty of achieving GES with the ever-increasing pressures associated with climate change affecting the marine environment's ability to adapt.

### **3.2.4 Pollution / Contaminants**

Chemical pollutants were a big element cited by respondents for pollution and contaminants - from various sources, including household chemicals (cleaning and pesticides) to trade waste discharged through major wastewater treatment works. The impact that such chemicals can have on the environment in low concentrations was noted, with the example provided of the fatal effects of 6PPD from car tyres on coho salmon. The persistence of these chemicals was also highlighted as an immediate concern, with their effects in combination often being unknown but with the potential for synergistic or additive effects from multiple chemicals found in the same environment - a cocktail effect.

Additional concerns were raised regarding wastewater and nutrient pollution from terrestrial run-off. In particular, diffuse contaminants from agricultural run-off are a concern, with a buildup of nitrates being a difficult problem to overcome. Such pollutants are now ubiquitous in the environment and will take decades to tackle. However, reductions to levels of pollution have been noted, and there is now 85% less nitrogen and 80% less phosphorus entering the water environment through wastewater than there was. Contaminants arise from other sources of run-off from hard surfaces in urban development, which run to the sewers and to the sewage treatment works (or storm overflows) and then to inshore marine waters.

Other marine contaminants raised by respondents include the persistent pressure of marine litter and microplastics. One respondent cites a 2022 marine litter report, which identifies there to be nearly 5,500 items of litter per km of beach in the UK, 90% of which is plastic (microplastics and macro-plastics). Greater focus on microplastics shows that they are currently at their highest levels ever recorded in the ocean and can cause particular problems in the contamination of seafood. In the marine environment, chemical contaminants that are associated with microplastics act as carriers for pollutants and are toxic for marine wildlife.

Various sources are highlighted for this pollution, including industry such as fisheries, and marine traffic. However, multiple responses note the disproportionate volume of litter that comes from terrestrial sources. Up to 80% of marine litter is estimated to come from land and reaches the sea

via inland waterways. Thus, it is posited that policies tackling terrestrial litter, such as greater treatment of urban and industrial wastewater from inland centers and activities, could greatly ease the pressure on the marine environment.

All of these sources of pollution are being exacerbated by urbanisation of coastal zones, driving increased freshwater and wastewater runoff. This highlights the connectivity of land and sea and demonstrates that land-derived anthropogenic pollution can influence the marine environment.

### 3.2.5 Other Pressures

The above sections summarised the most frequently referenced pressures across the Call for Evidence responses. Here we outline numerous other pressures that were mentioned less frequently.

Notable others included **government policies** and **regulatory issues**, with respondents making reference to how policies have either failed, do not go far enough, or regulation is not being enforced to a sufficient degree.

For example, comment was made on how there being an unclear hierarchy of legislation relevant to marine management and decision-making is resulting in complicated discussions around competing government policies which, in turn, is leading to longer decision-making processes, while diverting energy and resources away from nature recovery.

Some responses drew on the lack of a publication of an updated Programme of Measures under the Marine Strategy as particularly problematic. It was described as a "worrying message" and something that could delay action, thus making the delivery of GES in the UK's marine waters "increasingly challenging".

There was also a focus in the responses on how there is often a lack of consistency between the treatment of the nature and climate emergencies, despite them being so interlinked.

For example, responses drew on how there is leasing of seabed for offshore wind development in designated MPAs and the fact that the government has recently brought forward the Offshore Petroleum Licensing Bill 2023-24. The fact there is a general lack of recognition of the role a healthy marine ecosystem can play in helping to address climate change was also referenced in the responses.

Elsewhere, the **aquaculture industry** was highlighted as another pressure stifling the UK's ability to achieve GES in its waters, leading to negative impacts such as ocean squeeze, habitat loss and disturbance, and the input of contaminants and invasive species into the water.

## 3.3 Prioritising Drivers and Pressures

7 of 24 total responses suggested a method of prioritisation for action. Various suggestions for methods of prioritising drivers and pressures were raised in the responses. One respondent noted that in the OSPAR Quality Status Report Thematic Assessment for marine mammals, pressures were ranked by scale of impact. The notion to prioritise pressures by the scale of their impact was echoed by five of the seven responses that suggested a method of prioritisation. Evidently, there is a shared belief that the most benefit can be sought from actions that target the pressures that have the biggest impact. Further to this, it was noted in another response that the scale of pressures could be informed by data modelling outputs. Targeted scientific studies and literature

reviews can be used to identify pressures and quantify the scale of their impact. Long-term monitoring could support this and further quantify the efficacy of management actions.

Other methods of prioritisation were also suggested, such as location, longevity, and variation of the pressure or impact. In the case of longevity, it was suggested that permanent or long-term pressures should be weighted much more heavily than those that are transient and have proven recovery rates. Regarding location, it is suggested that areas of particular sensitivity are prioritised, such as MPAs – an idea suggested by several respondents. These suggestions are caveated with the idea that priorities will likely need to change and adapt with environmental changes caused by global warming. Rising temperatures, extreme weather events, and ocean acidification are three examples of significant pressures that will continue to increase in severity, and thus actions to ameliorate their effects may need to increase in priority as time passes.

One respondent referenced the River Basin Management Plans (RBMPs), in which many measures are prioritised according to availability of funding, and subsequently the timeframe in which they can be delivered. The implication in this instance is that more affordable actions can be delivered faster and should thus be sought out first. This sentiment was shared by another respondent who suggested that immediate pressures should be alleviated first with quick, specific conservation action, after which broader marine recovery of species and habitats should be prioritised.

In one response, work has been cited that aimed to link marine activities and pressures to each GES descriptor and associated targets. Based on this work, it is suggested that the ability to provide evidenced links between how a proposed activity can potentially influence the achievement of a GES target and/or Indicator could be an important component in prioritising said activity. In the same way, pressures could be filtered by relevant GES considerations, and actions can then be suggested which target those pressures with most links to pertinent aspects of GES.

### **3.4 Summarising Drivers, Pressures, and Impacts**

Within the commercial fishing industry, unsustainable practices – particularly trawling – are highlighted as major contributors to marine biodiversity decline. Offshore energy production, especially wind, is expanding rapidly but faces concerns about planning issues, seabird and marine mammal displacement, collision risks, and underwater noise. Climate change is identified as a significant pressure on the marine environment, with rising sea temperatures, ocean acidification, extreme weather events, and a plethora of other stressors all effecting marine biodiversity. Pollution, including chemical contaminants, nutrient runoff, and marine litter, all pose serious threats to marine ecosystems, either directly, via introduction of harmful chemicals, or indirectly, via degradation of habitat or disruption to food webs.

From these responses, it is clear how interlinked these pressures appear to be. Many fall under similar drivers, some pressures can be attributed as a driver of another pressure, and many also result in similar impacts. Climate change, for example, while a pressure itself, is also a driving force behind the need for more offshore wind development. In turn, increased offshore wind development – another pressure – can drive and shift other stressors, such as forcing commercial fishing operations to be displaced in a way which will lead to new impacts on the marine environment.

There was a clear emphasis from the respondents on the pressures that the marine environment is facing, as opposed to the factors that are driving these pressures. Of the drivers that were discussed in the responses, the significance of inaction was highlighted over specific actions that

were harming our ability to achieve GES. Evidently, there is a widely held belief that much greater priority needs to be given to maintaining the health of our marine ecosystems, with robust policies and funding mechanisms put in place to support this goal.

Another final theme amongst the responses was the need for joint consideration to tackle the nature and climate crises simultaneously. These two emergencies are deeply interlinked but responses suggested that current approaches to tackling them have not been entirely coordinated. Recent research demonstrates that carbon stored in our seas can be re-released in the atmosphere if disturbed; but instead of greater protection for these blue carbon hotspots, responses suggest there has been further leasing for offshore wind development within England's MPAs.

## 4 Actions Needed to Deliver GES

The second topic area explored through the Call sought to identify practical and deliverable actions to deliver GES in UK marine waters. The specific questions on this topic area are re-stated in Box 2.

### BOX 2: CALL QUESTIONS ON ACTIONS TO ACHIEVE GES

2. What actions are needed to deliver GES in UK marine waters?
  - a. What are the trade-offs that need to be taken into consideration, or opportunity for synergistic actions, and how long would it take to deliver them?
  
3. What are the barriers and opportunities to addressing pressures and drivers through these actions?
  - a. What pressures will not be or only partially addressed through these actions?

Based upon a thorough assessment of the responses provided, a variety of actions were suggested, for delivery by governments, marine users and interested stakeholders. Actions were grouped into initiatives addressing the same pressure or impact areas, then organised to identify the same or similar interventions highlighted through more than one response. This resulted in actions grouped into nine categories.

The action areas suggested by the greatest number of written responses include those grouped under natural habitat / ecosystem creation and restoration (33% of responses), invasive species, pollution and release of contaminants, and commercial fishing (each mentioned by 25% responses). Other less commonly mentioned actions were offshore energy development actions, agricultural actions, removal of redundant industrial / artificial seabed structures, underwater noise limitation, and improved communication, collaboration, and engagement. Table 3 shows the number of responses suggesting actions in each theme or group of actions.

Figures 9 – 10 present a schematic diagram presenting the variety of actions suggested (in teal), categorised under the pressure areas (orange) which they were suggested to address. Some remaining actions which could not be clearly linked to only one pressure area are grouped under other relevant categories (shown in grey boxes). The schematics, presenting actions in no particular order, are intended to demonstrate the breadth of actions suggested and highlight the detailed.

In addition to these groups of actions, some key themes were identified which were mentioned in relation to several of the categories mentioned above. These included suggestions for improved governance and regulation, and increased funding and resourcing especially for research and monitoring activities.

The amount of commentary that responses devoted to discussion and explanation of each of the action areas was particularly notable. Figure 11 provides a block diagram indicating the relative

volume of explanation across the written responses spent discussing each of the identified action areas. This chart indicates the greatest proportion of content discussing marine actions to achieve GES was devoted to actions related to governance and regulatory activity and commercial fishing actions.

Table 3 Identifying number of actions suggested by written responses across each topic areas

| Action Area   | No Actions Suggested | % of responses    |
|---|----------------------|-------------------|
| Actions to Minimise Pollution / Release of Contaminants'    | 21                   | 25% (6 responses) |
| Address Invasive Species                                    | 9                    | 25% (6 responses) |
| Underwater Noise Limitation                                 | 5                    | 13% (3 responses) |
| Natural Habitat / Ecosystem Creation & Restoration          | 4                    | 33% (8 responses) |
| Offshore Energy Development Actions                         | 5                    | 17% (4 responses) |
| Commercial Fishing Actions                                  | 15                   | 25% (6 responses) |
| Agricultural Actions  | 3                    | 13% (3 responses) |
| Removal of Redundant Structures from the Marine Environment | 3                    | 13% (3 responses) |
| Communication, Engagement & Collaboration                   | 3                    | 21% (5 responses) |
| Governance & Regulatory Actions                             | 25                   | 25% (6 responses) |
| Research & Monitoring Actions                               | 5                    | 17% (4 responses) |
| Greater funding and resourcing                              | 8                    | 28% (7 responses) |



Figure 9 Schematic diagram indicating actions highlighted through the Call for Evidence responses, grouped under similar themes or pressure areas they are intended to address. Themes and actions are listed in no particular order.



Figure 10 Schematic diagram indicating actions highlighted through the Call for Evidence responses, grouped under similar themes or pressure areas they are intended to address. Themes and actions are listed in no particular order.



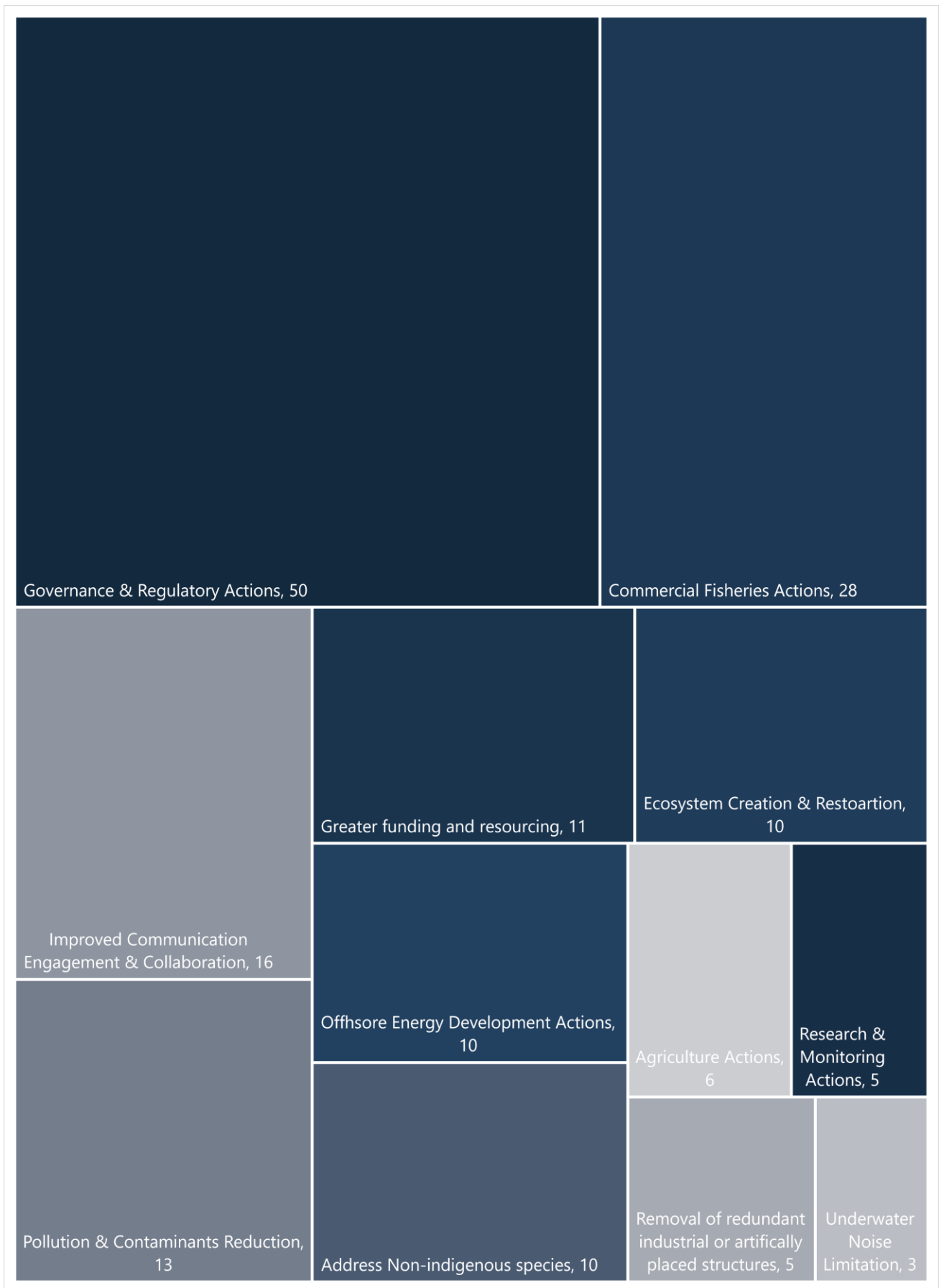


Figure 11 Block diagram indicating the volume of discussion across the range of action areas – category name and number of references made to this action area through the Call responses shown

## 4.1 Ecosystem Creation and Restoration

An important group of suggested actions to move towards GES were those targeted at habitat or ecosystem creation, recovery and restoration. Actions under this theme were highlighted in 8 of the 24 responses (33%).

Responses communicated that for the achievement of GES, and of the challenging objectives enshrined in wider policies such as the Environmental Improvement Plan (EIP), significantly increased habitat protection, creation and restoration projects are required at scale and at pace. Responses introduced the concept and importance of 'active ecological restoration' whereby initiatives go beyond just stopping the damaging activity, but also include management strategies to reverse damage and return habitats/ecosystems to their previous functioning state.

In particular, actions around the protection and restoration of seabird populations were identified. The adequate management and maintenance of existing seabird nesting habitats, and the creation of new habitats were cited by 4 responses.

Developing seabird conservation strategies to address declining seabird populations in each of the four administrations were considered by some responses as being long overdue and of critical importance to establish a clear framework to address the drivers and pressures impacting seabird populations. These strategies should include measurable and timebound commitments, tailored to each country's needs, and ideally be agreed and put into action in the short-term before the end of 2024.

A number of examples of ongoing and previously successful habitat and ecosystem restoration projects were highlighted as producing important results that restore our seas to a thriving, healthy and well-functioning state. These include:

- Ulster Wildlife's (UW) native oyster restoration programme project to tackle invasive species on Rathlin Island,
- The Environment Agencies' (EA) ReMeMaRe Programme with the aim to significantly increase the scale and pace of practical estuarine and coastal habitat restoration activity in England, including support for the creation and delivery of local restoration action plans,
- RSPB's Life Raft project working to protect NI's most important seabird colony from invasive non-native rats and ferrets which are threatening the future of Puffins, Guillemots, Razorbills and other seabirds.

The importance of sharing best practice from such projects and prioritising their replication and/or expansion to other geographies was suggested by a number of stakeholders. Some responses indicated a need for greater resourcing and capacity building for such initiatives being required if they are to be scaled up and make a difference to GES achievement across the UK.

Some challenges in achieving these actions were recognised. Firstly, in relation to the development of active restoration strategies, it was noted that methods for the active restoration of marine ecosystems and their natural processes are currently extremely limited. Responses suggest that innovation is needed to trial new approaches to active restoration and identify new means of driving the rewilding of our seas, including in the subtidal environment. It was also highlighted that far greater resources are needed, both in funding and in personnel, to scale up and deliver habitat restoration plans and activity on the ground.

One respondent suggested the need to develop more meaningful ecological indicators based on the Driver Pressure State Impact Response framework. The framework assumes a chain of causal links beginning with driving forces, through to pressures, to states and then impacts on

ecosystems, human health and functions, before leading to political responses<sup>19</sup>. Ecosystem models developed through this have allowed for objective evaluations of responses. Following systematic quality assurance, this has then led to levels of uncertainty. More meaningful indicators could avoid this.

## 4.2 Actions to Minimise Pollution & Release of Contaminants

As recognised in the Chapter 4, several respondents to the Call for Evidence highlighted that a large reduction in pollutants and chemicals entering the water system is needed if the marine environment, particularly within protected sites, is to achieve favourable condition and meet GES. In total, 6 different respondents offered practical actions to reduce pollution and release of contaminants of different kinds into the marine environment. These are outlined below.

### 4.2.1 Marine Litter

Three responses offered actions to identify and tackle the sources of marine litter, all of which centered almost exclusively on expanding legislation and regulation to improve sustainability in the packaging and waste industries.

Respondents suggested government action at a UK-scale to commit to delivering collection and packaging reforms, specifically its Deposit Return Scheme. Actions to extend measures to ban entirely, or impose strict market restrictions, on commonly littered items were also proposed, building on the ban of single use plastic.

Some responses suggested that action should be taken to extend the use of Extended Producer Responsibility (EPR) legislation, imposing a responsibility on producers to actively consider and manage their products and packaging at end of life. Extension of these schemes to include litter recovery (or payment towards recovery), particularly in relation to terrestrial litter in coastal areas, and for Fishing and Aquaculture gear was considered critically important and achievable within the immediate to short term.

Waste and lost equipment from the fishing industry was considered a particular issue by some respondents to the Call, who argued for strictly mandated measures requiring lost fishing gear reporting and fishing gear marking guidelines. Two responses requested the immediate publication of the Abandoned, Lost or Otherwise Discarded Fishing Gear (ADLFG) report and increased funding for fishing for litter and end of life fishing gear recycling at ports nationally.

In more general terms, responses called for a renewed focus on re-use alongside recycling across all industrial and domestic activity, encouraging a drive towards a more circular economy.

### 4.2.2 Micro Plastics

According to several respondents, microplastics now constitute one of the biggest contaminants in the marine environment, particularly in relation to seafood. One response cited research from the World Health Organisation<sup>20</sup> suggesting concern is growing around the risks to human health as a result of nano-sized plastics (<150µm) entering the food chain in greater quantities. Two respondents discussed specific actions to reduce this area of marine stress.

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<sup>19</sup> Driver-Pressure-State-Impact-Response Framework – FAO <https://www.fao.org/land-water/land/land-governance/land-resources-planning-toolbox/category/details/en/c/1026561/#:~:text=The%20DPSIR%20framework%20assumes%20a,leading%20to%20political%20%27responses%27%20>

<sup>20</sup> WHO calls for more research into microplastics and a crackdown on plastic pollution – World Health Organisation [WHO calls for more research into microplastics and a crackdown on plastic pollution](#)

Two respondents suggested an increased effort into developing monitoring protocols for micro-plastics, and that the UK Government should establish new monitoring regimes for macro-, micro- and nano-plastics across all pathways including terrestrial, freshwater and marine to ensure we can understand and tackle the issues of plastics in the marine environment.

One respondent noted that whilst monitoring of this area is important, research to better understand the effect of microplastics once released into the environment, and crucially their effect on human health through ingestion via seafood, is drastically needed. It is noted that the World Health Organisation have also called for greater research in this area. From this work, strict regulations should then be put in place to prevent seafood reaching the point of unsafe levels of contamination.

#### **4.2.3 Minimisation of Nutrients, Chemicals and Bacteria**

Several respondents suggested actions specifically targeted towards understanding and minimising the presence of nutrients, chemicals, and bacteria in the marine environment. Many of the respondents referencing this area suggested more extensive monitoring of the presence of these contaminants in the marine environment, particularly in the case of persistent chemicals, in order to understand and prevent their impacts. It was noted that in the latest round of the Marine Strategy monitoring, the current issues caused by legacy persistent chemicals were highlighted. One respondent identified efforts to determine the origins and implications of nutrient transportation around the coast. Another suggested a detailed review of chemicals present in rivers and sewage treatment works to understand and trace pollutants to both point and diffuse sources.

Whilst monitoring can help us understand the extent of the problem, and (with greater access to ecotoxicology information demonstrating their significance for the ecology of receiving waters) the likely severity of the impacts, several responses noted that to prevent the problem escalating we must understand the sources of this pollution and implement strict regulatory actions to minimise their release into the environment in the first place. One respondent stressed that a singular focus on preventing this type of marine pollution may be unlikely to deliver adequate improvements in many areas where multiple sources are identified.

Only one respondent offered a specific action to directly prevent further contaminants entering the marine environment, suggesting a move towards a Poly- and perfluoroalkyl substances (PFAS) free economy. This respondent also suggested building on action planning developed to date by the Wildlife and Countryside Link to better protect humans and the environment from the impacts of chemical substances in the marine environment.

#### **4.2.4 Land Use Change for Water Quality**

One respondent discussed the potential implications of land use change on water quality. This response cited the use of Catchment Sensitive Farming (CSF) which, in past examples, has contributed to a between 5-22% reduction in monitored nutrient, sediment and Faecal Indicator Organism (FIO) concentrations in monitored marine environments.

The respondent called for the creation of a holistic, strategic policy response from government in terms of land use for water quality.

#### **4.2.5 Regulation of Water Quality and the Water Industry**

Through the Call responses, respondents discussed a need for action to tackle the issue of water quality, not only through minimising diffuse and point sources of pollution, but also through addressing issues in maintaining water quality across the water industry via more effective regulation.

One respondent called for action to maximise the role of water companies in generating solutions to water quality issues. The 2024 price review – a process led by Ofwat setting out how to deliver better outcomes for customers, the environment, and wider society, establishing targets to drive up performance over a 5-year period was considered one opportunity to support this. The introduction of a Technically Achievable Limit (TAL) for nutrient neutrality catchments was also suggested by one respondent as a specific measure that will help to address water company impacts on nutrient pollution, as well as incentives and finance for new collaborative approaches to addressing upstream water quality issues, such as Nature Based Solutions (NBS). Furthermore, respondents suggested consideration of the wider use of Special Nature Conservation Orders (SNCOs) and Water Protection Zone (WPZ) managed by the Environment Agency as measures that could prove vital legislative tools focused on specific water quality issues.

Several respondents highlighted a need for a review and update to the UK Chemicals Strategy, including phasing out the most hazardous chemicals from all consumer uses that are not essential to society; adopting grouping approaches to groups of similar chemicals; addressing the cocktail effect; and developing a fit for purpose monitoring and alert system. The UK Government committed to publishing the Chemicals Strategy by the end of 2023, but respondents highlighted that this is yet to be released, calling for immediate release of the updated strategy with an accompanying timetable of relevant legislation.

#### **4.2.6 Public Attitude and Awareness**

One respondent suggested raising public awareness to reduce pollutants entering UK waterways and the marine environment; "as a society we need to place more value on water; to reduce pollutants entering our waterways and the millions spent on removing them through water treatment".

### **4.3 Actions to Address Invasive Species**

Six respondents discussed management of invasive species or invasive species in their responses. It was highlighted that once established in an environment, invasive species can spread at a rapid rate and become extremely difficult to control and/or remove. Particular examples of non-native Pacific oysters and seabirds were mentioned in the responses provided.

In terms of what respondents felt needs to change going forwards, recommended actions included the monitoring and effective management of Invasive species that are likely to cause the greatest disturbance to native priority species to be prioritised, such as for the Pacific oyster. Responses also stated that Natural England's Rapid Survey protocol should be rolled out as a citizen-science programme to support management of invasive species, and effective and regular monitoring programmes should be funded at UK invasive species hotspots.

Several respondents noted the importance of biosecurity measures and suggested they should be implemented to prevent future introduction of invasive species. It was noted that there is a need to ensure collaboration and cooperation across island locations, whilst maintaining the preventative and early detection response measures that are currently in place at internationally important seabird islands – these ensure that they remain free of mammalian predators. Similarly, when it comes to islands, non-native predator management must be enhanced though this should also happen in mainland areas of high importance to national seabird populations.

In the responses there were suggestions for dedicated funding for new and extended projects, including LIFE Raft by the RSPB in partnership with the Rathlin Community, Causeway Coast and Glens Heritage Trust and the Department of Agriculture Environment and Rural Affairs (DAERA) on

Rathlin Island, which is hoping to achieve similar results through removing invasive non-native rats and ferrets that have an impact on seabird populations. There needs to be a commitment from DAERA to the strategic development and resourcing of a Northern Ireland seabird island biosecurity programme. Measures should also include control of non-native vegetation. Efforts should also ensure the successful implementation of the Ballast Water convention, with this including resourcing for monitoring and compliance, while political will must be improved and financial backing too to elevate the profile and status of Pathway Action Plans and Biosecurity Plans. This would replace the weaker, piecemeal approach of current management measures.

Changes need to be made to the Habitats Regulations 2017 and associated habitats regulations assessment guidance. There were also calls to update the UK Marine Strategy Part 3 Programme of Measures for D2 to include actions, while an assessment is also needed of how effective management of marine invasive non-natives has been. Natural England's recently published audit, review and prioritisation of biosecurity planning in England was cited as an example, with it including detailed suggestions and highlights how many existing measures rely on voluntary efforts. Another called for the effectiveness of biosecurity measures in place on seabird islands in the UK to be assessed, and their continuous improvement to be ensured.

Further suggestions include funding an invasive species inspectorate as this would prevent invasive species transmitting through the ports, while the UK government should immediately commit to a date for the Seabird Conservation Strategies. This should include biosecurity measures.

## **4.4 Underwater Noise Limitation**

Three respondents recognised that loud, low and mid-frequency impulsive sounds, as well as continuous low frequency sounds, introduced into the marine environment through human activities need to be reduced to the extent that they do not have adverse effects on marine ecosystems and animals at a population level. These responses also recommended the following actions to minimise and mitigate underwater noise:

### **4.4.1 Improved monitoring of underwater noise and animal responses**

Respondents called for understanding of non-impulsive noise levels, which will mainly come from vessels, to be continuously improved with a relevant specific target or threshold set for both impulsive and non-impulsive noise. Monitoring and evaluation of proposed Ministry of Defence (MOD) noise mitigation options should be required in the upcoming Highly Protected Marine Areas (HPMAs) Guidance for public authorities. This will ensure that proposed measures are reducing noise and protecting the marine mammals affected by it. There were also calls for an ongoing review and monitoring of the licensing and enforcement of the use of Acoustic Deterrent Devices (ADDs) for mitigation. These ADDs should not be licenced unless they have been shown to be effective for their stated purpose and have no negative impacts on other species.

### **4.4.2 Development of noise mitigation methods**

There needs to be more focus on advanced mitigation methods. This includes Noise Abatement Systems, such as bubble curtains, to limit injury or disturbance from potentially harmful noise sources in offshore development. This should be considered as part of marine licence conditions. Measures should be used to reduce noise, especially during construction of marine infrastructure, potentially including a decibel limit for impulsive noise such as piling. Efforts should also look to reduce continuous noise from shipping. High intensity sonar usage should be avoided in all areas of importance to cetaceans, with deep diving species, such as beaked and sperm whales, known to be particularly vulnerable.

#### **4.4.3 Improved guidance, regulations and enforcement of underwater noise**

Respondents said that there needs to be improved management and enforcement to ensure underwater noise and disturbance does not surpass the SNCB noise thresholds in the Southern North Sea Special Area of Conservation. Further improvements should be made to the forward planning capability of the Marine Noise Registry, while the Joint Nature Conservation Committee's guidelines for minimising the risk of injury to marine mammals from geophysical surveys, pile-driving and explosives needs to be updated.

One respondent suggested including the removal of unexploded ordnance using low-order methods rather than the traditional high-order detonation methods in explosives guidance. A decibel limit was recommended as an implementation for all offshore wind construction through the Offshore Wind Environmental Standards workstream. This would help lower underwater noise and ensure it does not exceed the UK's own noise thresholds. A mechanism should be identified to incentivise developers to reduce their noise inputs for the purpose of noise alone. For example, any such mechanisms should always be tied to impacts to biological receptors.

It was suggested that an approach similar to what was adopted in Germany in 2013, where noise limits have been used to manage underwater noise, could be implemented. These sound limits should be placed on all impulsive noise generating activities, ensuring that impacts on sensitive species are minimised. Harbour porpoise special areas of conservation should be protected from activities generating very loud impulsive noise. This would include pile driving and seismic surveys. The International Maritime Organisation (IMO) Guidelines for ship quieting should be promoted and applied for all shipping. This should include adopting suggestions that were found in Defra's Continuous Underwater Noise Study. This found that nearly every MPA is polluted in some way by continuous noise. The IMO's suggestion to identify the noisiest vessels that would benefit most from quieting technologies and mandating noise reduction techniques, such as vessel speed limits in certain locations, should be part of this. It could be incentivised through offering reduced port fees for ships that are compliant.

It was also recommended that a UK-wide strategy is drafted and implemented to ensure that noise reduction technology is implemented around the UK's quickly expanding ports. Once more, this could be incentivised through reducing fees or leaseholds for port expansion or guaranteed fast-track status in the planning system.

## **4.5 Commercial Fishing Actions**

In the analysis of drivers, pressures and their impacts, commercial fishing was considered a critical pressure on the marine environment by a number of respondents to the Call for Evidence. Likewise in the description of actions to minimise impacts and move towards GES, activity related to the management of commercial fisheries were also referenced strongly by 6 respondents who noted several actions to work towards GES.

### **4.5.1 Modernised and environmentally conscious methods of fishing**

Fishers should look to transition towards less damaging gear and increased species selectivity. This should form part of an overall drive to lower impact practices. There also needs to be technological innovation and financial assistance to support this. Further suggestions include reduced spatial footprint of dredging and bottom trawling fishing methods in inshore seas around the UK, with calls for its complete exclusion across all or the at least the majority of MPA sites. The government should also publish measures that will ensure protection from damaging fishing methods in all offshore MPAs by autumn of this year (2024).

#### **4.5.2 Bycatch Management, monitoring and reporting**

Bycatch repeatedly cropped up as a pressure, with respondents calling for bycatch management in damaging fisheries; for the UK government to introduce mandatory bycatch monitoring that is phased over several years; and for fully documented catch reporting, including bycatch, through technologies such as Remote Electric Monitoring (REM). This involves the use of cameras and sensors onboard vessels and is one of the most cost-effective tools that fisheries managers have for delivering reliable fisheries data and for making informed management decisions. Its usage should be widely incentivised and, where required, subsidised to support uptake across the sector.

Effective measures need to be introduced to eliminate and monitor seabird deaths from bycatch in fishing gear. The call also saw a recommended action of operationalising the UK Bycatch Mitigation Initiative with ambitious, timebound targets to minimise and, where possible, eliminate sensitive species bycatch. There would need to be adequate resources supporting this to make it happen.

Further suggestions here included implementing known mitigation options and best practice solutions to tackle bycatch, especially for longline fisheries; for increased support for fishers to innovate and trial new measures and gears to minimise bycatch; to increase monitoring of bycatch, helping to improve confidence in bycatch estimates; for the development of a bycatch risk framework to identify higher risk fisheries and appropriate mitigation measures; and for all fish activity to be fully documented, monitored and integrated with other marine planning and conservation measures at sea. In Northern Ireland, this would require the rollout of Inshore Vessel Monitoring Systems (I-VMS) on all vessels under 12m, as well as the introduction of REM for all vessels as key monitoring and enforcement tools. Doing this would create transparency and sustainability of fishing activity, including addressing evidence gaps for bycatch.

#### **4.5.3 Protection of key species and habitats from the impacts of commercial fishing**

Respondents called for efforts to ensure existing sites for prey species supporting seabird populations, as well as essential habitats for spawning and juvenile fish are effectively protected, with additional sites introduced where needed across the UK MPA network. Other actions include protecting forage fish biomass by improving the methodology for adopting scientific advice on prey species to ensure appropriate numbers are set aside; for sites with seabird prey species as a feature to be designated, effectively protected and managed; and for the inclusion of species that are key to marine food webs into protected species lists.

#### **4.5.4 Engagement and collaboration**

Efforts around engagement and collaboration recommended by respondents included financial assistance and support for fishing activities that are co-located within offshore energy spaces as part of the just transition planning. There also needs to be greater engagement and collaboration with the fishing industry across all sectors to fisher and NGO collaboration, support the industry to embrace sustainability. This will ensure fishers are gaining a sense of ownership over marine environmental health.

#### **4.5.5 Financial Assistance**

In a bid to ensure sustainable practices are sustained in the long-term, the commercial fishing industry will need secure, prolonged sources of funding, allowing them to innovate, adopt new



technology and approaches, and to upskill. In Northern Ireland, it was noted immediate funding is needed through the MFF<sup>21</sup>, which is currently delayed.

#### **4.5.6 Improved Legislation**

There were also plenty of calls for improved legislation, such as an improved statutory framework for fisheries management. As it stands, the Fisheries Act 2020 provides no legal obligation to achieve the objectives within it. Three years since its establishment, the Fisheries Management Plans (FMPs) are yet to be delivered, while there is no plan to address bycatch. Without these, it was noted the UK will not be able to achieve GES for birds (D1, D4).

Another respondent pointed out that while the framework within the Fisheries Act is positive, it still lacks a legally binding duty on fisheries administrations to achieve its objectives<sup>22</sup>, which include fish and aquaculture activities being environmentally sustainable in the long-term, and fish and aquaculture activities being managed using an ecosystem-based approach, within a specific timeframe. The Act and associated frameworks have not yet delivered the policies and measures required to tackle pressures from fishing activity. There were also calls for effective legislation and implementation procedures to be put in place, enabling sustainable and climate friendly fishing to address fisheries interactions with blue carbon habitats.

An ecosystem-based approach to fisheries management was recommended, whereby healthy ecosystem level components and processes are recognised as vital for good fish population management and used to inform decision making. FMPs need to be introduced for all commercially exploited stocks beyond the already proposed 43, with priority given to depleted and data deficient stocks. There was a call for FMPs for seabird prey species, including key forage fish, such as herring, sprat, sardine and Norway pout. Further calls included for a forage fish strategy to be developed with plans for monitoring in place, as well as for a forage fish policy to be developed to implement an ecosystem approach to fisheries management decisions that considers the importance of prey for seabirds.

Further suggestions included ensuring any exploitation is sustainable through licence management and controls, while the UK Bycatch Mitigation Initiative requires significant improvements in terms of detail, ambition and delivery. Specifically, the latter needs to detail mitigation measures to reduce bycatch for urgent implementation, with robust, independent monitoring and binding timelines to ensure actions are both timely and effective. By contrast, it was noted that in Northern Ireland, DAERA implements bycatch mitigation management plans across the whole of the Northern Ireland fishing fleet.

## **4.6 Offshore Energy Development Actions**

Four respondents to the Call for Evidence suggested actions in relation to offshore energy development. These suggestions ranged from the sensitive placement of future offshore wind assets to prevent habitat loss and seabird collisions to the provision of greater investment into innovative technologies for energy generation and climate mitigation.

Two respondents highlighted the need to adopt a nature positive planning approach to offshore wind that frontloads action for nature. This could include developing strategic and ecologically

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<sup>21</sup> The MFF is a funding scheme which will support private applicants in fisheries, inland waters, aquaculture and maritime sectors. The fund provides support for sustainable development within the fishing and aquaculture sectors and conservation of the marine environment, alongside growth and jobs in coastal and marine related sectors. The purpose of the scheme is to provide England with a financial support mechanism to the fisheries, inland waters, aquaculture and maritime sectors.

<sup>22</sup> Fisheries Objectives – Fisheries Act 2020 - [Fisheries Act 2020 \(legislation.gov.uk\)](https://www.legislation.gov.uk)

meaningful compensation measures at an early stage of development of the offshore wind project, which would be based upon stakeholder collaboration.

Improved monitoring of the marine environment, and specifically of the impacts of offshore renewables, was suggested to improve understanding of the cumulative and in-combination impacts of an increasing number of offshore wind assets in UK waters. Continuation and implementation of the Offshore Wind Enabling Actions Programme (OWEAP) and Offshore Wind Evidence and Change (OWEC) programme were highlighted by one respondent as important programmes to support this.

Finally, one respondent suggested a more strategic approach to future development of offshore wind energy, via coordinated and shared enabling infrastructure. Development of an integrated offshore grid was suggested as a viable solution to significantly reduce export cable lengths and associated disturbance of the seabed and marine environment.

## **4.7 Agricultural Actions**

As seen in the Chapter 4, intensive and unsustainable agricultural practices undertaken on land were considered by some respondents as presenting a key pressure on the UK marine environment, through nutrient runoff, use and disposal of plastics, and spread of avian flu and other diseases. Three respondents to the Call for Evidence offered specific actions to minimise the negative impacts of on-land agricultural activities on the marine environment.

Improved agri-environment schemes with significantly increased spatial coverage were highlighted as an opportunity by one respondent. It was suggested that upcoming amendments to the schemes present a significant opportunity to deliver more restoration at greater scale. The new Combined Environmental Land Management Offer includes a range of new and amended options for coasts, as well as options for inland environments which can provide indirect benefits to coastal and marine ecosystems. Moreover, the Landscape Recovery projects represent an opportunity to deliver ambitious restoration at a system scale, and work is ongoing to encourage inclusion of coastal/marine themes in future rounds.

Strengthen measures around the disposal of plastics in agriculture, and ensure that, alongside advice offered (through CSF and Agri-Environment Schemes), enforcement of existing regulations to farming in terms of water quality and nutrient runoff are undertaken where there is evidence of poor practice. It was recognised that CSF currently contributes to a 5-22% reduction in monitored nutrient, sediment and FIO concentrations.

## **4.8 Removal of Redundant Industrial/Artificial Structures**

As a final suggestion in relation to industrial activities offshore, one respondent specifically mentioned the need for removal of redundant industrial or artificial structures and modifications from marine environments. It was suggested that there should be action to drive research, investment and innovation in active recovery (methods to actively restore marine ecosystems and their natural processes), which currently remain extremely limited.

## **4.9 Communication, Collaboration & Engagement**

One theme considered particularly important in approaching improvements to the status of the marine environment was a need for much greater communication, collaboration, and

engagement between a number of stakeholders. Actions specifically suggested to achieve this, included efforts to facilitate co-location of marine users, such as offshore wind developers and fisheries, as well as improved collaboration and partnerships across industries.

One respondent suggested the creation of a North Sea Marine Biodiversity forum that could provide a platform for transboundary communication, knowledge sharing and the development of complementary management efforts for marine species and habitats. Another suggested improved communication, collaboration and partnerships around strategic monitoring programmes, data collection and data sharing which could support more efficient data and knowledge management.

Finally, some respondents cited a need for action to improve public attitudes to the marine environment. It was thought that an improved public awareness around the degradation of the marine environment would support better management of the stressors and impacts highlighted above. Education schemes through schools, improved public access to marine ecosystem services, and development of citizen science projects in coastal communities were suggested as potentially effective actions in this space.

#### **4.10 Governance and Regulatory Actions**

Looking at what must happen to achieve GES, significant attention was given to the need for stronger regulatory enforcement and better governance. This was referenced consistently across several of the action areas referenced above.

For example, respondents want to see the adverse impacts of the commercial fishing sector, offshore wind and other developments in the marine environment limited with strict regulation on noise and location. This would require robust monitoring and equally robust enforcement.

The need for better management of the marine space and MPAs in particular was also highlighted several times. For example, some responses called for a whole systems approach with accompanying management and monitoring plans. A step-change was said to be needed in the approach to managing natural processes. This will call for a greater emphasis being placed on preserving and restoring natural function, as well as having people and businesses being considered part of nature rather than separate. Clear leadership is therefore needed around restoration and risk management activities. Effective planning policy that can integrate terrestrial planning with marine plans is also required in order to incentivise the use of nature-based solutions wherever possible.

The idea of ending isolated approaches to marine management was raised in other responses, which noted that action on climate and nature should be integrated. This would mean government must define opportunities to develop strategic and ecologically meaningful compensation; enable strategic monitoring of the marine environment to improve understanding of the most important places for nature and the impacts of offshore renewables; establish government-led action to address the state of the seas which would include effective spatial planning that can ensure offshore renewable developments minimise any harm to marine diversity; and for there to be strategic, holistic and truly spatial marine planning.

Respondents also highlighted the need for better implementation of existing mechanisms. For example, the enhanced biodiversity duty placed on public authorities through the Environment Act 2021. Specifically, this called for public authorities to agree policies and specific objectives based on that consideration. Implementing the enhanced biodiversity duty properly, according to responses to the Call for Evidence, would see improved conservation outcomes and could make

a contribution to achieving GES. The Environment Act 2021 itself was cited as an example of how delivery of statutory targets for marine biodiversity can be a means of promoting action to enhance nature recovery.

Other responses pointed to the importance of delivering the current government commitment of managing fishing in all English MPAs by the end of 2024, as well as the designation of new HPMAs sites. Both actions were considered key to giving certainty to sea users and minimising the impact of unsustainable fishing practices, while also ensuring development is located in the right place.

Elsewhere, there was a call to extend the 13 byelaws that ban bottom trawling in MPAs designated for their reef features across the whole of the MPA site, as well as immediately reviewing bottom trawling practices across the entirety of the MPA network. Building on this, it should also place restrictions through a condition on the 1,000 plus EU and 1,000 plus UK fishing vessel licenses in 2024 in UK waters that do not currently have any restrictions for bottom trawling practices in MPAs.

There was also acknowledgement on how greater changes to policy and planning are potentially needed to enable activities that can improve the environment. This is especially the case when they are not linked to commercial outputs.

Some responses suggested this would include reforming the marine planning system. This would be to ensure it is better suited to effectively deliver goals within the Marine Strategy and Marine Policy Statement. To achieve this, an overarching vision for the seas should be established and roadmap developed, setting out the steps to achieve GES and reach net zero.

There were also calls to reform the UK Marine Strategy Programme of Measures, focusing on proactive action and recovery instead.

The below table runs through a "Wishlist for Government", highlighting specific actions advocated for by respondents to the Call in relation to specific pieces of legislation, as well as comments on specific areas where respondents felt policy and legislation needs strengthening.

Table 4 A 'Wishlist' for Government, featuring specific areas of policy and legislation recommended by respondents as needing improvement or strengthening

| Legislation/Policy area          | Wishlist   |
|----------------------------------|--|
| <b>UK Marine Strategy (UKMS)</b> | <p><i>Comments raised around 2015 Programme of Measures failing to drive scale and pace of change to reverse declining trends and only contributing to improving understand of, rather than condition of marine environment.</i></p> <p><b>Restructuring UKMS to facilitate and drive action</b> moving beyond just "signposting" measures to require competent and relevant authorities to act.</p> <p><b>Ensuring any updates clearly state contributions each management measure will or should make</b> to delivery of GES.</p> <p><b>Improving reporting cycles</b> to allow timely improvements.</p> <p><b>Consistency of targets and indicators</b> across relevant frameworks, ensuring more efficient monitoring.</p> <p><b>Inclusion of proxy indicators for management footprints</b> as it is not necessary to monitor every indicator all the time to justify action.</p> <p><b>Optimise application of new and existing legislation</b> through Programme of Measures, including clarification of legal pathways and instruments to drive a reduction in pressures and support ocean recovery in wider seas.</p> |

|   |  |
|---|--|
|   | <p><b>Renew Marine Policy Statement</b> and associated marine planning and licensing instruments, ensuring all legislation, policy and management tools are fit-for-purpose and deliver marine nature recovery.</p>  |
| <b>UK Fisheries Act</b>                 | <p><i>Comment from an NGO respondent was made on how only landings are commonly recorded, although the “bycatch objective” of the UK Fisheries Act requires “catches are recorded and accounted for” across the commercial fishing sector.</i></p> <p>Therefore, <b>greater enforcement of this policy</b> is needed, with the respondent suggesting <b>Remote Electronic Monitoring</b> be implemented as a means to ensure UK bottom trawl and scallop dredge fleet better understand exactly what is caught and where. This should also be made <b>publicly available data</b>.</p>   |
| <b>Habitats Regulations Assessments</b> | <p><b>Stronger enforcement of regulatory processes</b> in relation to appropriate assessment of likely significant impacts at Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Marine Conservation Zones (MCZs).</p>  |
| <b>MPA Management</b>                   | <p><i>Comments from respondents on how the MPA system needs to recognise in many plans it is protecting ecosystems that are already severely degraded, meaning the baseline for recovery is already flawed.</i></p> <p><b>Expanding the MPA network and OECMs to cover 30% of the marine area.</b></p> <p><b>Implementing effective MPA management</b> through the implementation of fisheries byelaws and marine licensing.</p> <p><b>Linking fisheries and conservation</b> in policy and management, considering the two are dependent on one another.</p> <p><b>Investment in monitoring sentinel MPAs</b> and then using the results to implement management measures more broadly.</p> |
| <b>UK Chemicals Strategy</b>            | <p><i>One NGO respondent highlighted UK government’s commitment to publishing Chemicals Strategy by the end of 2023, but noted this is still outstanding.</i></p> <p><b>Publish Chemicals Strategy</b> as it could be an important vehicle to addressing chemical pollutants entering and impacting on the marine environment</p>  |
| <b>UK Waste and Resources Strategy</b>  | <p><b>Launching the Deposit Return Scheme (DRS)</b> which has been delayed.</p> <p><b>Recognising and using Extended Producer Responsibility</b> as an important tool.</p> <p><b>Legislation to incentivise voluntary action to clear quantities of litter washed up on shore</b> which could include modest payments.</p>   |
| <b>Water Resources Act 1991</b>         | <p><i>Respondents noted the fact there is no legal power to regulate sea water or outer estuarine abstractions, with the requirement for a water abstraction license under the Water Resources Act 1991 based on whether the water being abstracted is taken from a source of supply. The open sea and outer estuarine waters are not defined as sources of supply. Therefore abstractions that could damage estuarine, coastal and marine ecosystems are not regulated through the abstraction licensing system.</i></p>  |
| <b>Data Sharing Plans</b>               | <p><i>A central government data sharing platform across the marine space for environmental indicators was something recommended by the National Infrastructure Commission. Defra had also agreed to publish a plan about how they would create such a platform by 2025.</i></p>  |

|                               |   |
|-------------------------------|---|
|                               | <b>Update from Defra on progress for a marine data sharing platform.</b>  |
| <b>Licensing improvements</b> | <p><b>Implementing consideration of GES for all descriptors as a formal part of the consenting process</b> for licensable activities, considering there is currently no legal requirement to do this.</p> <p><b>Developing a legislative framework</b> to address lack of information about other activities available during marine licensing decisions.</p> <p>Adapting licensing regime to <b>incentivise seascape scale restoration projects</b> where multiple habitats are co-restored and their positive interactions mutually benefit one another, stabilising and potentially accelerating ecosystem recovery.</p> |

#### 4.11 Funding and resourcing

As noted in several action areas stated above, another common theme to emerge out of the responses was that of the need for greater funding and resourcing, with this directed to everything from monitoring, developing technologies and upskilling the workforce.

It was suggested that current funding rules make it hard to combine funding aimed at improving natural habitats and processes in a holistic manner from catchment to coast. This results in siloed thinking, ocean blindness and fragmented project implementation. This fails to take into account wider benefits upstream or downstream.

Other responses drew on the need for alternative funding mechanisms that can support ambitious and innovative actions that enable the recovery of the marine environment. It was said that government should facilitate investment and support for innovation in emerging technologies too.

This includes funding surveying and monitoring of different species, as well as backing technology that enables sufficient levels of monitoring for different species. Reference was made to how there has been a long-term lack of investment in data collection, meaning the UK's evidence base across its waters and beyond, spanning location, distribution and condition of species and habitats is insufficient. It was emphasised that a step change is needed and would prove transformative for nature, while increasing certainty for industry and marine planners.

Continuity of funding also came up in terms of a means of achieving greater alignment between monitoring outcomes across government agencies, industry and academia.

#### 4.12 Understanding Trade-offs and maximum acceptable impact levels

The respondents to the call were asked to consider any particular trade-offs that may need to be managed between necessary anthropogenic activities and unavoidable environmental impacts. Six responses commented on specific trade-offs and the consideration needed through their management.

The siting of offshore energy developments, and their future development in general, was considered a trade-off in 4 responses. The pivotal role of offshore renewable energy in achieving the UK's net zero targets was well recognised, however the impact of such infrastructure offshore should none the less be managed and maintained at what could be considered acceptable levels.

Two responders also highlighted the need for trade-offs between protecting and recovering benthic habitats and pursuing economically sustainable commercial fishing activities. Better co-

location with other marine users, enabling more efficient use of marine space was cited as a potential opportunity to manage these trade-offs effectively.

In the case of offshore energy, commercial fishing and other examples of human activities or impacts offshore, responses mentioned the key consideration in managing trade-offs is the achievement of a suitable balance between cost and minimising environmental impact. It was suggested that in many cases the incentives to invest in mitigation measures for environmental damage, or to avoid an industrial activity in an area altogether to preserve the environment, may be insufficient to encourage the necessary investment in mitigation measure to reduce or prevent environmental impact. This is reinforced by the consistent suggestion to increase regulatory restrictions and improve existing enforcement measures applying to industrial and polluting activities mentioned throughout this chapter.

Several respondents commenting on trade-offs highlighted that judging acceptable levels of marine impact would be necessary to best manage these trade-offs sustainably. However, noting a reoccurring theme throughout this report, a lack of clear evidence of the real impact of many activities on the marine environment and its wide range of receptors was considered a real issue in managing trade-offs effectively. Respondents commented that, at present, for many activities it was not possible to understand and evidence the degree to which a particular activity could be pursued whilst keeping adverse environmental impacts to an acceptable level. Indeed, some respondents felt that what an acceptable level of impact looks like was also unclear.

Responses also highlighted the complexity of our marine environment and the activities that are dependent on it, stressing the importance of understanding cumulative impacts across all human activities affecting the health of the marine environment. The importance of taking a systems approach to managing trade-offs was stressed.

#### 4.13 Summarising Suggested Actions to Achieve GES

Responses offered a wide variety of actions needed to deliver GES, with around 50 action areas in total mentioned across nine different categories of activity. There was an emphasis on how addressing singular pressures on their own risks missing the complexity and subtleties of responses when pressures act cumulatively and have an impact on the environment. Identifying and evaluating mitigation measures through an in-combination approach was considered preferable to fully address existing pressures on the marine environment.

From looking through the recommended actions, there were four overarching themes that appeared across all categories of action:

- **Funding and resourcing:** to help monitoring, develop technologies, upskill the workforce and support ambitious actions for environmental recovery. Alternative funding mechanisms to support innovative actions that can enable the recovery of the marine environment were referenced too.
- **Holistic management:** the importance of greater communication, collaboration and engagement among stakeholders were highlighted. This could include the creation of platforms for transboundary communication and the development of complementary management efforts. As part of this, there is a need to understand and manage trade-offs between necessary human activities and environmental impacts through a systems approach that can sustainably manage them.
- **Research and monitoring:** strengthening these activities was noted as a path to delivering GES.

- **Governance and regulation:** stronger regulatory enforcement, such as in the water sector, and better governance across management of the marine environment, such as integrating terrestrial and marine planning are examples of more being done around governance and regulation that will help achieve GES. The implementation of nature-based solutions was cited as well.



## 5 Data Gaps and Monitoring Marine Health

The third topic covered by the Call asked respondents to consider the gaps in data or evidence on marine environmental status. The specific questions on this topic are re-stated in Box 3.

### BOX 3: CALL QUESTIONS ON DATA AND MONITORING

2. Where are the gaps in the available data and evidence that need to be filled to ensure achievement of GES can be monitored and actions are effectively identified and implemented?
  - a. What evidence is available to identify those gaps?
  - b. What aspects of existing monitoring programmes undertaken by the UK administrations are working well to fill those gaps, and what aspects could be improved?
3. What additional actions are required to fill any data gaps and how long would it take to deliver them?
  - a. What are the barriers and opportunities to addressing data gaps through said actions?
  - b. What evidence supports these actions?

In addressing this topic area, responses to the Call clearly articulated that developing and maintaining a clear understanding of the state of the marine environment is challenging.

It should be noted that not every respondent answered this question, though from those that did, three main areas were identified where respondents felt gaps in data and evidence are particularly problematic. These were **species and biodiversity** data – referenced across four responses –, **fisheries** data – referenced in three responses – and **offshore energy** data, though predominantly **offshore wind** – cited in seven of the responses.

This chapter addresses feedback received in each of these areas specifically, then goes on to describe feedback received in terms of barriers to improving monitoring, data collection and evidence compilation. Finally, we describe the actions needed to achieve better data collection and utilisation as suggested by respondents to the Call.

### 5.1 Species and biodiversity data gaps

The descriptors of GES as per the UK Marine Strategy that must be monitored relating to species include **biological diversity** being maintained, with the quality and occurrence of habitats and the distribution and abundance of species being in line with prevailing physiographic, geographic and climatic conditions (**D1**), and that all elements of **marine food webs** are occurring at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and retention of their full reproductive capacity (**D4**).

Further areas include that sea-floor integrity is at a level that ensures the structure and functions of the ecosystems are safeguarded, with benthic ecosystems especially not being adversely

impacted (D6), and that the permanent alteration of hydrographical conditions does not have a negative impact on marine ecosystems (D7).

Across responses, four that answered the question cited issues with species and biodiversity data that are making it harder to achieve GES. This included representatives from across industry, academia and conservation bodies, with a particular focus on seabirds especially. Notably, based on the most recent UK Marine Strategy Part One update from 2018, birds were noted as an area where GES has not been achieved and the situation is declining.

#### **5.1.1 Seabirds**

With seabirds facing a declining situation, inadequate data will only make attempts to reverse this all the more challenging and inadequate data is what the Call for Evidence uncovered.

A nature conservation body and government adviser highlighted significant data gaps around the abundance and distribution of marine birds at sea, and a lack of demographic data for many breeding seabird species which is hampering efforts to understand drivers of change and management options as a result. This includes modelling impacts of industries such as offshore wind. This was echoed by another nature conservation body and government adviser that commented on a significant evidence gap around monitoring and quantifying the numbers of collisions of seabirds with offshore windfarms across the UK.

Further gaps cited include bycatch monitoring, which was described as inadequate, the diet and energetics information for many species that then help better assess the sustainability of fisheries, the impact of non-native predators in mainland colonies of breeding seabirds, and the levels of licensed and illegal take of seabirds and whether this then has population-level effects. A government body respondent also drew on the potential impact of interactions of fisheries vessels with species such as seabirds as another area where gaps exist.

#### **5.1.2 Marine mammals**

Similarly to seabirds, a nature conservation body and government adviser warned that for most of the UK's marine mammal species, there is limited data to draw from to estimate abundance and distribution. Life history parameters are also impacted by a lack of data. It makes it harder for those monitoring mammals to understand these and then set reference values. They also drew on how large-scale surveys being conducted during the summer months are leading to seasonal information on marine mammals lacking too.

This respondent drew out a number of other areas, including how bycatch monitoring is inadequate, resulting in an underestimation of rates, impacting efficient management strategies. Though marine litter likely impacting ecosystem health and increasing the risk of entanglement or ingestion by marine mammals, the respondent warned evidence is too limited to properly assess this. They also remarked on how evidence needs to improve on the current and potential impacts of climate change on marine mammals. This is especially so for indirect impacts. Improving this would help improve adaptive management responses to continued environmental change. How cumulative noise levels lead to effects at population and ecosystem scales is another area in need of work, with more robust characterisation of sound sources required.

Elsewhere, a representative from academia warned there is a lack of species and biodiversity data for "all but a few" well-studied habitats nationally, while a public body in Northern Ireland cited the impact of large-scale development on priority species and habitats in Northern Ireland and greater insights into key sites and the usage of Northern Irish seas by mobile species including seabirds, elasmobranchs and less well studied fish populations as a gap.

### **5.1.3 Ecosystems/habitats**

As stated above, a representative from academia highlighted a lack of species and biodiversity data for “all but a few” well-studied habitats nationally. A public body in Northern Ireland, which commented on the need for more data to understand the impact of large-scale development on priority species and habitats in Northern Ireland, also highlighted knowledge gaps around the true condition of the MPA network, suggesting a sufficiency review is needed.

A nature conservation body and government adviser explained that data availability is lacking for benthic habitats, with a need in particular to improve monitoring programmes on habitats within and outside of MPAs. Improving monitoring programmes on habitats both in and outside of MPAs would help to fill data gaps, improving the accuracy, confidence and geographical range of results, ensuring any shortcomings can be addressed and quality criteria identified under relevant indicators can be met. This would include areas under different levels of pressures from a wider range of human activities. The same respondent also referred to a need for improved evidence on the impacts of climate change on benthic habitats.

A government body, meanwhile, highlighted how data on the hydromorphological condition of estuarine and coastal waters is not something collected as it stands as part of The Water Environment Regulations 2017. This, it noted, is a significant gap. While baseline data is available on coastal processes and geomorphology through Regional Coastal Monitoring Programmes and monitoring of intertidal areas by the Environment Agency, a consistent approach to analysing this data and applying it to assess water body condition was said to be lacking.

In the survey responses to this Call for Evidence, the issue of the spatial area of permanent rock protection consistently growing came up, with no long-term monitoring programmes in place to bring in data from a variety of benthic habitats and ages of rock protection that could then be used to understand more fully the temporal impact of this pressure.

## **5.2 Data gaps on fish and fisheries**

Another descriptor used to judge GES is D3, which requires populations of all commercially exploited fish and shellfish to be within safe biological limits. They should exhibit a population age and size distribution that is indicative of a healthy stock. Several respondents drew on data gaps around commercial fisheries and, indeed, recreational angling on fish stocks – something that was said not to be monitored - which, in turn, would have a knock-on effect in accurately measuring this.

### **5.2.1 Commercial fisheries**

A public body in Northern Ireland highlighted the issue of poor monitoring of bycatch rates with fisheries, as well as the interactions of vessels with species such as seabirds and the impact of unregulated fishing activities as areas where data gaps exist. Bycatch rates were also noted as a gap by a government adviser and nature conservation body, which further drew on how there are data-poor fisheries, non-quota species and inshore fisheries that need clarity on how they will be treated within FMPs, and that modelling of Maximum Sustainable Yield for any given species needs to be updated and refined.

A representative from academia noted key gaps exist around understanding the differential vulnerability – meaning how stressors and resources can impact people differently - of those working in the marine environment. This includes for those in fisheries, namely with regards to how well they can cope with change to the environment, the climate, and the socio-economic

and legislative landscape. It also concerns their sensitivity to the impact of change and capacity to adapt and exhibit resilience.

Another government adviser and nature conservation body highlighted data gaps around the diets and energetics information for many seabird species, which would help to better assess the sustainability of fisheries, the abundance, distribution and change in important forage fish populations, and the effects of climate change on ecosystems and how this then impacts forage fish populations.

### **5.2.2 Recreational angling**

One independent respondent, a government adviser, drew on the impacts of recreational angling and other recreational activities on fish stocks as an area where gaps exist. No further detail or evidence was supplied to support this.

## **5.3 Offshore energy data gaps**

Considering the UK's energy security and net zero ambitions, the introduction of energy infrastructure into the UK's waters is inevitable. Offshore wind in particular is viewed as a major part of meeting these goals and the pipeline appears strong – as of the summer, it was verging on almost 100GW, according to RenewableUK<sup>23</sup> – though there are areas where gaps in evidence and data currently remain. Considering one of the metrics for GES is that the introduction of energy, including underwater noise, should be at levels that do not adversely affect the marine environment, is clear that these gaps must be filled.

### **5.3.1 Offshore wind**

As previously stated, data and evidence gaps in a given area can cause gaps in other areas. For example, a government adviser spoke of how a lack of demographic data for many breeding seabird species has an impact on the ability to accurately model the impacts industry (such as offshore wind) can have on them. Seabirds and offshore wind were linked in the responses, with a government adviser and conservation body warning of a significant evidence in gap in terms of monitoring and quantifying the numbers of collisions of seabirds with offshore windfarms across the UK. It was noted how important closing this gap will be with a great collective benefit to be had from obtaining an evidence-based assessment of the actual UK-wide scale of collision mortality. It was even noted the technology does exist to automate it, but that this will need funding to be fully developed.

Responses to the Call spoke of major evidence gaps in both primary and grey literature on the impacts of various decommissioning options for offshore wind. It also drew on how most available literature reports on the short-term impacts of offshore wind, rather than looking into the longer-term outcomes. Another also highlighted the lack of evidence for decommissioning outcomes of offshore wind and for outcomes by species, pressure and ecosystem service.

The issue of expansion of offshore wind also came up throughout the Call feedback, with one respondent highlighting the planned increase in capacity and development of floating wind farms. Though it is not economically feasible to install fixed bottom turbines at depths above 50m<sup>24</sup>, floating offshore wind technology makes it possible to extract offshore wind energy at depths up to 700 metres and potentially beyond.. This respondent explained that current evidence will not

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<sup>23</sup> UK Offshore Wind pipeline nears 100GW as Global pipeline tops 1.23TW - [Renewable UK](#)

<sup>24</sup> [Market Needs, Opportunities and Barriers for the Floating Wind Industry – Diaz et al \(2022\)](#)

be adequate for the different habitats and communities that are set to be impacted by floating offshore wind farms. The response called for developing an evidence base for these types of installations to be a priority. More generally, another response highlighted the need for more research into the multi-scale and cumulative impacts of increasing offshore wind combined with other anthropogenic impacts and uses of UK marine space.

### **5.3.2 Offshore energy**

In the survey, one respondent commented on how the regulator for oil and gas – the North Sea Transition Authority – does not adequately undertake Marine Conservation Zone assessments or Habitats Regulations Assessments for programme applications. This is making it increasingly challenging to understand the ongoing and overall pressures that MPAs within UK waters are under.

## **5.4 Barriers to better data and evidence**

As indicated above, respondents did allude to why some of these data gaps exist – which we explore in depth below.

### **5.4.1 Funding**

One of the government advisers and conservation bodies highlighted how technology does exist to automate the numbers of collisions of seabirds with offshore windfarms, helping to fill a key gap, but funding is needed to release the potential benefits of this. On a broader scale, one written response remarked on the need for funded research to predict the multi-scale and cumulative impacts of increasing offshore wind in combined effects with other anthropogenic impacts and uses of UK marine space.

A government adviser and conservation body, drawing on the findings of a government committee, did note how monitoring of the marine environment can be costly. This means budgets for monitoring can be difficult to maintain. Furthermore, they remarked on there being insufficient budget for effective monitoring outside of MPAs. This makes it impossible to then compare the relative health of marine biodiversity inside and outside of MPAs.

### **5.4.2 Data access**

The lack of reliable, standardised ecological monitoring data over time was highlighted as a gap by an academic organisation. This makes it difficult to judge what changed, what the baseline was and how fast species and ecosystems recover from impact. Unless this is rectified, it will be impossible to define GES, they said, let alone measure it. A research institute in Northern Ireland, meanwhile, drew on a lack of coordinated monitoring and databasing as an issue – there is data there for pressures, but bringing it together ineffectively then makes it harder to access. That same body also highlighted how frequently short-term industry projects are not being capitalised on for their data.

### **5.4.3 Monitoring inadequacies**

Perhaps the biggest reason behind data gaps cited was down to issues with monitoring programmes. Multiple respondents described monitoring programmes for bycatch as being inadequate for fish and seabirds. This is then leading to underestimations in what bycatch rates actually are, which then makes it more challenging to develop management strategies as a result. A conservation body and government adviser also highlighted a need to improve monitoring programmes on habitats both within and outside of MPAs. They explained that doing so would allow data gaps, shortcomings and quality criteria that has been identified under relevant

indicators being met, leading to improvements in the accuracy, confidence and geographical range of the results of that monitoring.

A research body in Northern Ireland highlighted that current catchment studies are identifying that status and compliance monitoring is failing to identify the dynamic nature of aquatic inputs, leading to poorly resolved estimates of loads of these inputs. It continued that current monitoring of the marine system in the Belfast Lough – the focus of its research - only has one long-term monitoring station. This will likely fail to capture the full range of impacts. Having more long-term monitoring stations in terrestrial, freshwater and marine domains would help provide data that is continuous in time and more resolute, it said.

As explained in the funding section, budgets are also limiting monitoring programmes in terms of maintaining them and increasing their size and scope.

## **5.5 Actions for better data and evidence**

Building on these data and evidence gaps, as well as the reasons behind them, several respondents offered suggestions of actions needed to address these and improve availability and of data and evidence. This would bring better outcomes and, as a result, better monitoring of progress towards GES.

Three key themes emerged through the written responses covering suggested actions to better align the data collection and monitoring activities across different stakeholders, improve the delivery of existing and new monitoring programmes, and achieve better data availability, which are outlined below. Figure 12 provides a block diagram illustrating how often different actions to address gaps in data and improve monitoring regimes were suggested across independent written responses – with larger areas indicating a greater number of references.

It is worth noting some standalone remarks highlighted through the written responses. An academic organisation, for example, questioned whether GES can be achieved everywhere and, if this is attempted, asked if there a risk of not being able to achieve it anywhere because of spreading ourselves too thin. The organisation recommended that, instead, a better approach would be to focus on areas where there is the best probability of achieving GES.

It was also noted by that same organisation that more understanding of social, economic and political impacts of efforts to improve GES is needed.

It can be assumed that better funding is central to all themes. For example, a conservation body remarked on the nature of the marine environment and lack of long-term investment in data collection has led to the evidence base across all UK waters and beyond being rendered insufficient in terms of location, distribution and condition of species and habitats in particular. This is something that has to change to ensure the least sensitive areas for development of offshore wind can be identified. A step change in funding and investment for data collection, they said, would increase certainty for industry and marine planners and could then prove transformative to nature.

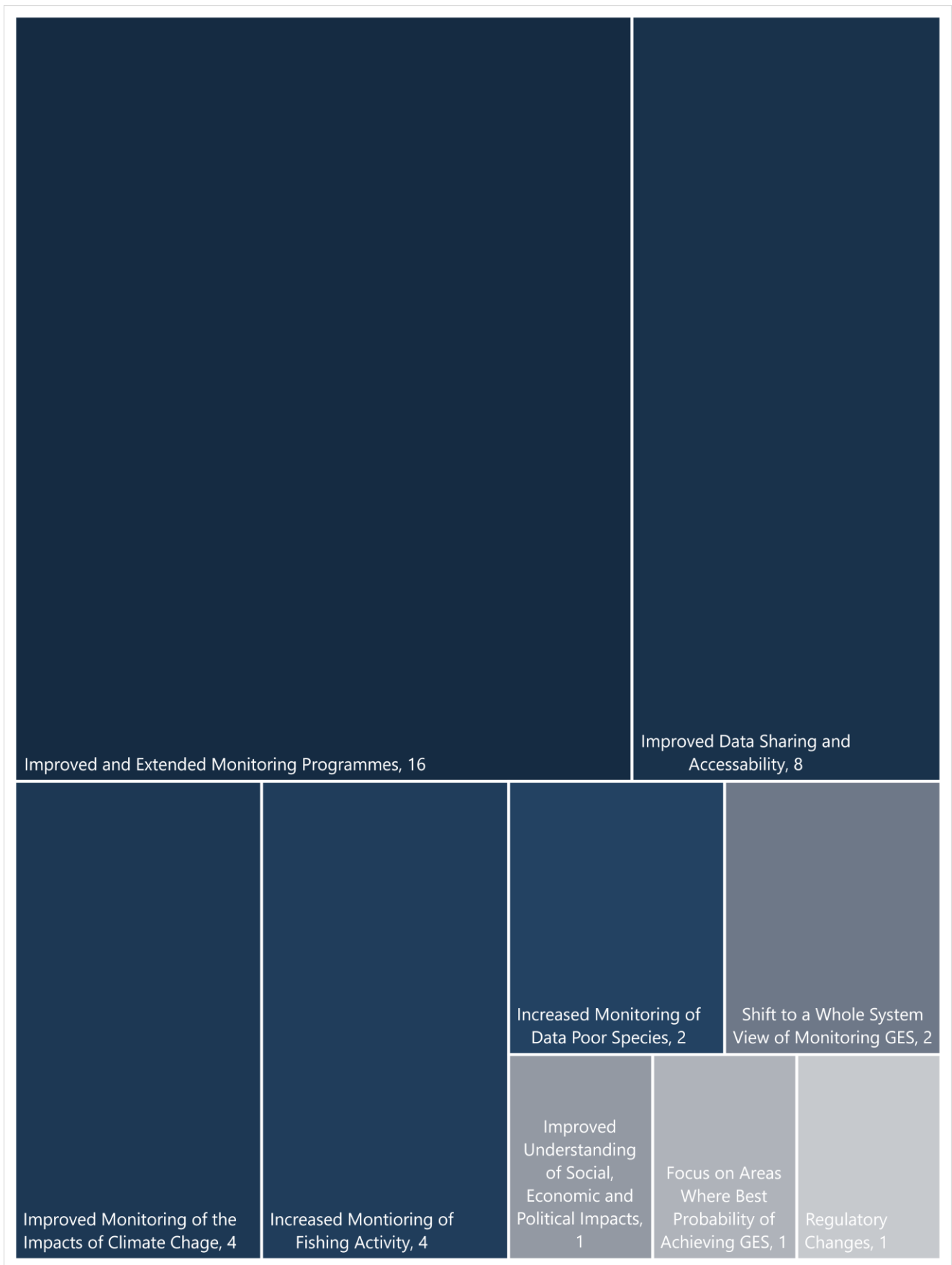


Figure 12 Block diagram indicating how frequently the range of actions to address data gaps were highlighted – category name and number of references made to this data action through the Call responses shown

### **5.5.1 Better Alignment on Monitoring Activities**

A lack of consistency between the four UK nations was among one of the barriers cited to achieving GES, with one respondent recommending that more should be done to align monitoring outcomes across government agencies, industry and academia. It also stressed continuity of funding is key to achieving greater alignment.

### **5.5.2 Improvements to Delivery of Current and Future Monitoring Programmes**

A government adviser and conservation body called for the development of new thresholds and methods to aid with monitoring and data collection. This includes developing indicator thresholds to assess indicators against GES targets, helping to expand existing methods to accommodate a wide range of human activities, as well as assessing products to support management decisions, developing assessment methods to further integrate assessment results and help evaluate the effects of human activities in relation to climate change, and developing indicators for habitats where there are currently gaps.

A research body in Northern Ireland drew on the need to ramp up the frequency of data collection of the outcomes for parameters such as nutrients and bacteria, suggesting this would help to validate monitoring models. A conservation body and government adviser, meanwhile, called for a continued commitment to increased frequency of SCANS (Small Cetaceans in European Atlantic waters and the North Sea) surveys, as this will help improve the ability to identify trends and assess status of abundance and distribution of cetaceans in the UK's waters, as well as calling for targeted monitoring of data-poor species, allowing for better assessment and management of the species. There were also calls to increase monitoring of fishing activity, especially of Scottish inshore fishing activity in parallel with implementing measures that can reduce the extent of physical seabed damage and bycatch caused by high-impact fishing.

An academic organisation discussed the need for reliable, standardised monitoring over time. This is something that must happen as without it, defining GES will be impossible, let alone measuring it. A government agency, meanwhile, noted the need for surveillance monitoring to provide information on long-term natural changes and long-term changes resulting from widespread anthropogenic activity.

### **5.5.3 Achieve Improved Data Availability and Accessibility**

An academic organisation highlighted open access to key data as a way to solve gaps, potentially through a government repository, which would allow for sharing across different agencies, the devolved nations and beyond. A government adviser and conservation body did note that the MEDIN – the Marine Environmental Data and Information Network – partnership, which brings together UK organisations committed to improving access to and stewardship of UK marine data, is driving improved standards to allow for data sharing and improved accessibility to data, but stressed more compliance from industry data holders would help see gaps filled in monitoring and data. It emphasised that “a lot more investment” from industry is required to pave the way for seamless data sharing.

A government body remarked that a lack of publicly available evidence from work carried out by the commercial sector is a lost opportunity. The respondent explained how there has been an emphasis on common monitoring protocols across the UK by regulators and developers, meaning there is a lot of information that could have been used by arms-length bodies, but is not currently open to them. They went as far to say it could even be more comprehensive at a local level than its own status assessments, which would provide greater confidence. It said it has been flagged as an opportunity for more than a decade now but received little funding.



A government body and conservation organisation, meanwhile, highlighted a need for improved use of existing datasets into data from dedicated surveys, explaining how this will improve understanding. It also suggested that continued support for different initiatives in standardising and collating data will help mobilise data for this purpose.

Survey respondents suggested industry should be required to survey and report on their activities for both during and post-operational impacts. Others called for enforceable conditions being attached to all new licenses from all regulators, both to require as-laid or as-installed data on infrastructure and operators, and requiring monitoring of habitat and species recovery presented both as useable data in a format that is agreed across industry and in comparison to the applicant's assumed impacts during the application process.

## 6 Supporting Evidence

Written responses to the Call provided, or otherwise made reference to, over 300 pieces of supporting evidence. This included highly credible peer reviewed sources such as published journal articles, well evidenced and researched scientific reviews and reports, policy and legislative documents, and website material or news articles discussing the achievement of GES in UK marine waters.

This supporting documentation was reviewed and assessed with support from the NVivo software where a sentiment analysis was undertaken based on terminology and language trends across all documents. Figure 13 presents the results of this sentiment analysis, indicating the majority of the content across these supporting documents tended to be balanced in tone – with the AI indicating predominantly moderate positive and negative content. “Moderately negative” instances in tone were recorded 12,842 times, followed by “moderately positive” (11,612), “very negative” (4,295) and “very positive” (3,211). This supports the conclusion that the referenced supporting evidence and documentation has focused on valid and credible research.

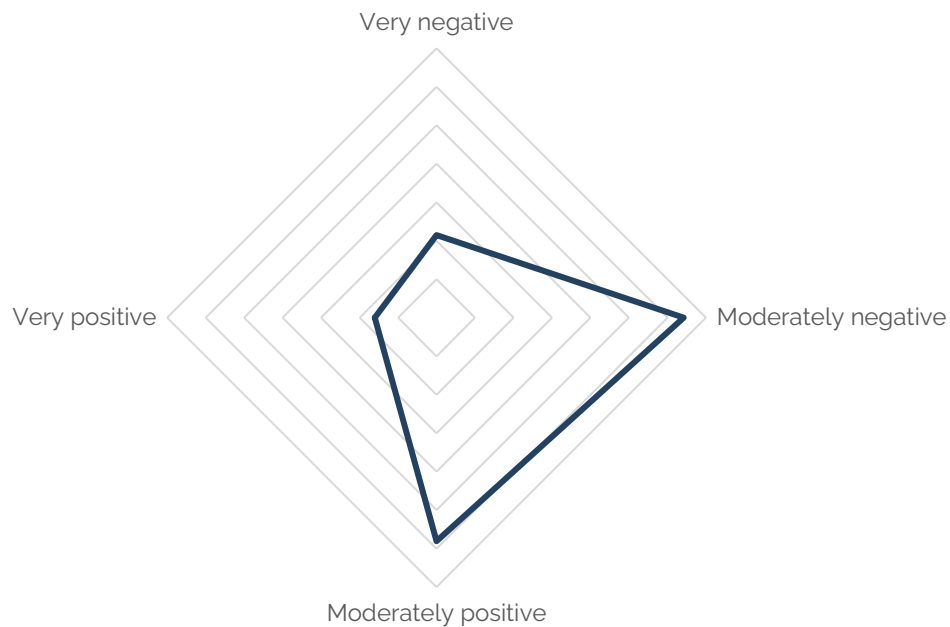


Figure 13 Radar chart presenting the sentiment analysis undertaken on the supporting information referenced through written responses to the Call

Referenced material identified to be most positive included reports or strategies setting out targets towards implementing a positive environmental or industrial change and roadmaps or action plans to achieve this. References that were more negative in tone included assessments of the state of different ecosystem components or, indeed, environmental pressures. In these cases, the use of more negative language and tone reflects the work remaining to achieve GES across all descriptors in the marine environment.

The remainder of this chapter presents key insights gathered through the wider assessment of the supporting evidence and documentation referenced through the Call, across the main drivers, pressures and impacts identified. This commentary elaborates on evidence provided on the key themes discussed most commonly throughout responses, as well as references highlighted across more than one response.

## 6.1 Evidencing Commercial Fishing Impacts and Data Gaps

On commercial fishing, "unsustainable fishing practices" was a common term across responses to the Call, with adverse impacts of fishing activity discussed around both fish stocks and damage to different marine habitats. This section explores research from OSPAR<sup>25</sup> – *a commission that brings together 15 governments, including the UK, and the EU to protect the marine environment of the North-East Atlantic taking its name from the Oslo (OS) Convention (1972) and the Paris (PAR) Convention (1974) identifying the sources of marine pollution* - the Food and Agriculture Organisation of the United Nations (FAO), and the UK government.

Research from OSPAR was cited across five responses, with 59 different examples of work highlighted. OSPAR's Quality Status Report<sup>26</sup>, was frequently referenced, which includes among its key messages the fact that limited progress has been made towards achieving biologically diverse seas, with many fish populations still not being in good status even where improvements in the situation for some species has been achieved.

OSPAR's Fish Thematic Assessment<sup>27</sup>, a sub-section of the 2023 Quality Status Report, mapped out how the finding that many marine fish species have not met GES was common to coastal, demersal and pelagic fish across the Greater North Sea, Celtic Seas, Bay of Biscay and Iberian Coast Regions, as well as for deep sea fish across the OSPAR Maritime Area.

OSPAR did find fisheries management regulations have been somewhat successful in bringing the harvesting of some fish stocks to sustainable levels. However, others are still overexploited – though which stocks were not explicitly specified. It also drew on how concerns remain when it comes to bycatch of sensitive or non-commercial species, the need to integrate concepts of ecosystem function into fisheries management regulation, and how management regimes can take account of the impact of fisheries on the pelagic habitat and food webs.

OSPAR's research supports the suggestions made across several responses to the Call, that bycatch is an issue, which was also discussed along with the issue of discards in the FAO's Third Assessment of Global Marine Fisheries Discards<sup>28</sup>. This was also one of the documents identified as most negative in tone – 362 references addressing this issue were identified to be either "very" or "moderately negative" via the AI analysis.

In this assessment, the FAO estimated annual discards from global marine capture fisheries were around 9.1 million tonnes between 2010 and 2014. Almost half (46%) of total annual discards were found to be from bottom trawls, including otter trawls, shrimp trawls, pair bottom trawls, twin otter trawls and beam trawls.

The FAO found methods to avoid, minimise and offset pre-catch fishing mortality are largely the same as those to mitigate capture fishing mortality and post-release mortality. The path to preventing discards and bycatch, thus reducing fish mortality, include small modifications to the gear used such as using pelagic longline circle rather than J-shaped hooks, reducing injury to captured organisms.

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<sup>25</sup> About – OSPAR - <https://www.ospar.org/about>

<sup>26</sup> Quality Status Report, OSPAR (2023) <https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/>

<sup>27</sup> Fish Thematic Assessment, OSPAR (2023) <https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/thematic-assessments/fish/>

<sup>28</sup> Third assessment of global marine fisheries discards, Food and Agriculture Organisation (2019) <https://www.fao.org/documents/card/en?details-ca2905en/>

The FAO further drew on how methods to reduce ghost fishing mortality can be preventative too. Ghost fishing<sup>29</sup> relates to any discarded, lost or abandoned fishing gear in the marine environment, that then continues to 'fish'. Methods to prevent this include gear marking, identifying the owner and discouraging abandonment of gear, or remedial measures such as using less durable and biodegradable gear. It then highlighted the various types of measures that are available to manage bycatch and reduce discards, such as those that involve modifications to fishing gear or fishing practices, or those that include restrictions on periods and areas within which specific types of gear are prohibited, bycatch limits, effort restrictions, minimum landing sizes and discard bans.

Summing up, the report made the point that discard practices are often determined by a wide range of factors and it is difficult to assess the effectiveness of any particular measure or action, with a range of policy options to reduce discards determined both by the biological characteristics of the fishery, as well as the social and economic environment.

Elsewhere, the government's 25-Year Environment Plan<sup>30</sup> (25 YEP) - one of the more positive documents, with 405 recordings deemed "moderately" or "very positive" - calls for an approach to fishing that puts the environment first. Among other things, the 25 YEP sets out an approach to secure clean, healthy, productive and biologically diverse seas and oceans, with pledges here including implementing a sustainable fisheries policy as the UK leaves the Common Fisheries Policy – the policy of the EU – with this plan having been released in 2018.

## 6.2 Evidencing Climate Change Impacts and Actions

Climate change is a significant pressure highlighted through the Call as having an impact on the marine environment. The below explores evidence referenced by respondents sourced from UK government, Climate Northern Ireland, and Ulster Wildlife.

The UK's 25YEP stresses the importance of tackling the effects of climate change which, it suggests, is perhaps the most serious long-term risk to the environment, leading to higher land and sea temperatures, rising sea levels, extreme weather patterns and ocean acidification.

Climate Northern Ireland's Climate Change Risk Assessment Evidence Report<sup>31</sup> was another supporting reference provided to evidence the risk of climate change to the marine environment. While the focus is on Northern Ireland in this report, many of the issues contained within are transferable to the wider UK. The assessment covered the risks and opportunities facing marine species, habitats and fisheries, including changing climatic conditions such as ocean acidification and higher water temperatures. It detailed a range of actions to address the impacts of climate change which supported suggestions made by respondents to the Call. Examples include further development and regulation of the MPA network associated with present biodiversity requirements and expected future shifts in distributions; efforts to reduce non-climatic pressures such as pollution and overfishing to help maximise potential for species and habitat resilience; further development of habitat restoration initiatives; a clearer assessment and implementation of sustainable fisheries yields in the context of present and future climate change; improved monitoring schemes to better assess progress on biodiversity and fisheries goals; further research

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<sup>29</sup> What is ghost fishing? National Oceanic and Atmospheric Administration <https://oceanservice.noaa.gov/facts/ghostfishing.html>

<sup>30</sup> A Green Future: Our 25 Year Plan to Improve the Environment, HM Government (2018) <https://assets.publishing.service.gov.uk/media/5ab3a67840f0b65bb584297e/25-year-environment-plan.pdf>

<sup>31</sup> CCRA Evidence Report for Northern Ireland, Climate Northern Ireland (2021) <https://www.ukclimaterisk.org/wp-content/uploads/2021/06/CCRA-Evidence-Report-Northern-Ireland-Summary-Final.pdf>

into the climate sensitivity and interactions of plankton to fisheries, seabirds and mammals; and further research on the sensitivity of UK aquaculture species to multiple climate change drivers.

Climate Northern Ireland also looked at opportunities, namely how further investigation linked to developing the role of MPA would maximise chances to enhance biodiversity value. The continued future conservation of MPAs, it explained, will be crucial in providing habitats where new species of high biodiversity value can become established and opportunities then realised. It cited "strong evidence" of how providing habitats in good condition aids in the movement of species. For fisheries, opportunity could arise through assessments linked to improved data on current and projected movements of key species, together with sustainable yield assessments.

Blue carbon habitats were a major area of focus for a feasibility study into blue carbon habitat restoration in Northern Ireland<sup>32</sup>, published by Ulster Wildlife. This work outlined how management of blue carbon habitats is becoming an increasingly crucial part of the response to the climate emergency. There are three elements to this that are key: habitat protection, restoration and creation. The biggest threats to blue carbon habitats were noted as physical disturbance, climate change, and land-use and land management changes. It warned that if in a poor state of health or unprotected from threats, then blue carbon habitats may release their stored carbon, becoming a future source of carbon emissions.

It went on to list priority areas for future work across several different themes, including "evidence" where there needs to be a baseline inventory for all blue carbon habitats for Northern Ireland and an investigation into the likely response of blue carbon habitats to climate change. It highlighted "policy and management" too, where efforts are needed to raise awareness of the potential for blue carbon to contribute to Nationally Determined Contributions to the UK's greenhouse gas inventory under the Paris Agreement, through engagement with policymakers and the Climate Change Committee. This should also involve developing a cross-cutting blue carbon strategy that would underpin action to protect, restore, recreate and monitor blue carbon habitats. Priority should be given to protecting and restoring existing habitats.

### 6.3 Evidencing Pressures of Invasive Species

Invasive species can have detrimental impacts on food webs and ecosystems. Climate Northern Ireland's assessment<sup>33</sup> warned of the risks of pests, pathogens and invasive species to marine habitats and species. Specifically, it highlighted how transport by ships – usually associated with international trade – is a significant risk factor when it comes to harmful species and microorganisms establishing themselves in the UK. Climate change is considered an additional risk factor; resulting in warming of seas, thus encouraging establishment and spread of pests, pathogens and invasive species at a magnitude that had not previously been experienced.

Once these pest and invasive species are established in the marine environment, the supporting evidence corroborated that it can be very difficult and costly to eradicate them. Land-based strategies, such as quarantining, culling and vaccinating would not be successful for marine pathogens, for example.

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<sup>32</sup> Blue Carbon Restoration in Northern Ireland – Feasibility Study, Strong et al. (2021)  
<https://www.ulsterwildlife.org/sites/default/files/2021-05/Blue%20Carbon%20Habitat%20Restoration%20in%20Northern%20Ireland%20-%20A%20Feasibility%20Study.pdf>

<sup>33</sup> CCRA Evidence Report for Northern Ireland, Climate Northern Ireland (2021)  
<https://www.ukclimaterisk.org/wp-content/uploads/2021/06/CCRA-Evidence-Report-Northern-Ireland-Summary-Final.pdf>

The assessment's recommendations therefore include collecting long-term data to better understand how marine pests, pathogens and invasive species are impacted by extreme events, climate variability and climate change; taking steps to improve horizon scanning and modelling capability for invasive species and pathogens – including through international collaboration; improving public awareness including through further use of citizen space; improving understanding of factors that can contribute to disease-resistant organisms; and improving understanding and contingency planning for emergent risks. This is especially needed when it comes to novel pathogens.

## 6.4 Evidencing Marine Litter and Other Marine Pollutants

Marine litter and pollutants were cited as a key pressure through the Call. This section explores evidence referenced by respondents sourced from the European Commission's Joint Research Centre, and OSPAR.

The Joint Research Centre released a report focused on the harm caused by marine litter<sup>34</sup>, it sought to provide an evidence base that can serve as a key supporting step to define harm and provide an evidence base for the various actions that then need to be implemented by decision makers. This described the different ways marine litter can impact organisms at different levels of biological organisations - the system scientists use to organise living objects from the smallest parts to the largest parts - and habitats. For example, through entanglement in, or ingestion of litter items by individuals which then leads to death or severe suffering, through chemical and microbial transfer as a vector for transport of biota, and by altering or modifying assemblages of different species.

The report also highlighted how marine litter is not only a threat to marine species and ecosystems, but also to human health, with significant implications for human welfare, including negatively impacting vital economic sectors including tourism, fisheries, aquaculture or energy supply, and bringing economic losses to individuals, enterprises and communities. It set out how risk assessment can be used to help to identify priority actions with a view to the complex sources, pathways and consequences of marine litter.

Research from OSPAR also explored the issue of marine litter and release of pollutants and contaminants into the marine environment<sup>35</sup>. OSPAR's research revealed 10 out of the 12 OSPAR sub-regions have a poor status for hazardous substances in marine animals, such as fish, mussels and oysters, even though concentrations of the most serious hazardous substances such as man-made Polychlorinated Biphenyls (PCBs), naturally occurring Polycyclic Aromatic Hydrocarbons (PAHs) and organochlorine insecticides have decreased substantially compared to the 1980s to 1990s. The reason for poor status for hazardous substances in marine animals was attributed to excessive concentrations of mercury and PCB118. It added that going by current trends, the indication is that only one of the sub-regions could improve substantially over the next 10 to 20 years.

Society was noted to have made considerable progress in reducing many hazardous substances from high levels in the early 1980s to more moderate levels over the last decade, though OSPAR said that its objective of cessation of discharges and emissions has proven considerably slower. This is down to the high chemical stability of hazardous chemicals and their re-release from

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<sup>34</sup> Harm caused by Marine Litter, Werner et. Al (2016)

<https://mcc.jrc.ec.europa.eu/documents/201709180716.pdf>

<sup>35</sup> Hazardous Substances Thematic Assessment, OSPAR (2023) <https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/thematic-assessments/hazardous-substances/>

marine sediment, with this then acting as storage for past contamination. This re-release was noted as being caused by both natural and anthropogenic processes, such as bottom trawling, anchoring, dredging and dumping operations. There was also noted to be continued discharge from sources that are located both within and outside the OSPAR area. PCBs are proving a "real threat to survival" for animals at high trophic levels, such as predatory whales, while emerging contaminants such as PFAs and chemicals in personal care products have been increasingly focused on in recent years.

OSPAR cited this as a "cocktail" of chemicals owed to the diversity of substances that marine organisms are being exposed to, with quite limited knowledge on the cumulative impact of this as it stands.

## 6.5 Evidencing Impacts of Offshore Energy Production

As the net zero transition gathers pace, offshore energy will continue to be a pressure. The below explores supporting evidence referenced from the OSPAR Quality Status Report (2023).

The impacts of offshore energy production are addressed by OSPAR in their thematic assessment of human activities<sup>36</sup>. In this assessment, OSPAR discussed how pressures can lead to changes in ecosystem state either singularly or collectively. Building on this, it created the DAPSIR framework – setting out how multiple drivers (D) lead to human activities (A), which then exert multiple pressures (P), leading to multiple changes in ecosystem state (S), which have impacts (I) on multiple ecosystem services, as well as the goods and benefits they provide to society, which in turn influence the drivers of change. Then there are management measures which can prevent, change or mitigate the effects of change from these cumulative pressures, which filter into the assessment framework as responses (R).

The OSPAR Quality Status Report explored how the negative impacts from oil and gas activities are continuing to decrease. However, with an expansion of renewable energy forecast in the OSPAR Maritime Area, there will be associated increases in construction activity and turbine operation, as well as shipping, power cable laying and maintenance activities, along with dredging and deposit operations needed to prepare the ground and install offshore wind infrastructure. These new activities will bring a range of increasing pressures, with OSPAR highlighting its suite of indicators that describe state change and those states that can be influenced by pressures from offshore wind development, such as impulsive noise and invasive species.

Furthermore, OSPAR explained how the outputs from these indicator assessments quantify such changes, which can then be considered alongside the trends in human activities and pressures through "cause and effect" analysis". OSPAR Contracting Parties are tasked with progressing development to manage risks to avoid, or at least minimise, "unacceptable environmental impact from offshore wind activities". Offshore wind development has both positive and negative impacts on a range of ecosystem services, with OSPAR stating the type and extent of impact has a consequence for the drivers. Consideration of the effectiveness of management measures was noted as a crucial element of the assessment of cumulative effects, identifying how impacts are prevented or mitigated.

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<sup>36</sup> Human Activities Thematic Assessment, OSPAR (2023) <https://oap.ospar.org/en/ospar-assessments/quality-status-reports/gsr-2023/thematic-assessments/human-activities/cumulative-effects/>

## 6.6 Evidencing Impacts on Biodiversity and Key Marine Species

A large volume of supporting evidence covering the broad area of biodiversity and species was provided through the Call responses. Notably, this topic area was cited in responses as one where significant data gaps exist. This section explores referenced evidence from the Special Committee on Seals, OSPAR and the State of Nature Partnership.

The Special Committee on Seals (SCOS)<sup>37</sup> was appointed by the Natural Environment Research Council to formulate advice to government on matters related to the management of UK seal populations. Supporting claims made by respondents to the Call for Evidence, this work has highlighted a lack of detailed information for grey seal demographic rates, namely regional information on fecundity and survival rates would help to improve the ability to provide advice on population status, though this would require considerable investment in resources. It also found knowledge of UK harbour seal demographic parameters is limited, meaning inferences around population dynamics are reliant largely on count data from moulting surveys.

This work went on to highlight inconsistencies in regulations for different parts of the UK for seal protection and, specifically, protection of seals at haul-out sites from deliberate harassment, noting there is no monitoring in place to determine the effectiveness of such designations of Scottish haul-out sites from deliberate harassment. Having this monitoring would help make assessments in future.

OSPAR's Marine Mammals Thematic Assessment<sup>38</sup> discussed how marine mammals have been and are subject to significant pressure from both natural impacts and human activity. This is leading to many populations and species falling short of indicators for good environmental status. It cites incidental bycatch as a pressure still occurring on a wide scale today, while noting others that are increasing, including noise and hazardous substances, habitat loss or degradation of habitat. It also notes that with marine mammals tending to have wide distributional ranges and some species being very rare, monitoring of them is challenging. This is resulting in a "concerningly poor" understanding of the distribution and population size of many marine mammal species. The environment is expected to change rapidly in the future. Climate change will likely cause future alterations in the structure of food webs, continuing exposure to pollutants and society's shifting of food and energy production from land to sea. Therefore, threats facing marine mammals are set to remain at a high level.

OSPAR noted limited evidence that measures implemented to protect and improve the condition of marine mammal populations have been effective, calling for more tailored measures, improvements to implementation of management measures, and capitalising on the amount of data gathered through regionally coordinated monitoring.

The State of Nature Partnership's State of Nature report<sup>39</sup> released in 2023 was also cited by respondents to evidence how the UK has experienced a significant loss in biodiversity. The report claims that the UK is now one of the most nature-depleted countries on earth. Referencing the marine environment specifically, it set out how the abundance of 13 species of seabird has fallen by an average of 24% since 1986, with the situation even worse in Scotland, where the abundance of 11 seabird species has fallen by an average of 49% since 1986. It states that these results pre-

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<sup>37</sup> Scientific Advice on Matters Related to the Management of Seal Populations, SCOS (2020)

<https://drive.google.com/file/d/14ds7vCO31PQVfQvkwTBx2FrxDAU0SgS-/view?pli=>

<sup>38</sup> Marine Mammals Thematic Assessment, OSPAR (2023) <https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/thematic-assessments/marine-mammals/>

<sup>39</sup> State of Nature, State of Nature Partnership (2023) [https://stateofnature.org.uk/wp-content/uploads/2023/09/TP25999-State-of-Nature-main-report\\_2023\\_FULL-DOC-v12.pdf](https://stateofnature.org.uk/wp-content/uploads/2023/09/TP25999-State-of-Nature-main-report_2023_FULL-DOC-v12.pdf)



date what would be the potentially major impact of the ongoing outbreak of Highly Pathogenic Avian Influenza.

The State of Nature report goes on to explain the varied picture for other marine life, with less known about changes in species' abundance and distribution in UK seas. Well-monitored species of demersal fish, which means those living on or near the seafloor – around 105 species – were found to show an average increase in abundance during the 1990s and early 2000s, but have since declined. Whales and dolphins were found to have shown little change in average abundance since the early 1990s. Grey seal abundance was found to increase after recovering from historical hunting pressure, while harbour seals in contrast are in decline in parts of the north-east of Scotland and south-east of England. They are, however, stable or increasing in other regions.

Abundance, distribution and extinction risk were highlighted as three metrics through which biodiversity change can be measured. The State of Nature Partnership recommended improving species status as one way to respond to the crisis, highlighting good evidence that conservation can be effective for individual species when it is possible to apply it to a large proportion of the population. It also explained that targeted conservation action has set some species on the path to recovery – such as the Large Blue butterfly, bats and Bitterns, provided as land-based examples. Nature-friendly farming, forestry and fisheries should all increase according to the State of Nature report, which noting that an increased proportion of sustainably harvested fish stocks appears to be having a positive impact. For example, the proportion of large fish in landings has increased since 2002 – an indication of population health.

OSPAR-cited research<sup>40</sup> found marine birds within the OSPAR maritime area are not in good status. It spoke of widespread declines in breeding productivity and population abundance across all OSPAR regions assessed, with additional deterioration observed for many species since 2010. Climate change was cited as a major cause behind marine bird declines, causing changes to their food supply, while anthropogenic activities exert additional pressures. This includes direct mortality, habitat loss, degradation and disturbance.

It warned that the decline of marine bird populations will have a negative impact on the ecosystem services they provide, leading to imbalances in the food web, causing negative impacts on various ecosystem and cultural services as well. It noted addressing the decline in marine birds has been identified as a priority for OSPAR in its North-East Atlantic Environment Strategy 2030<sup>41</sup>, and is something it will address through its forthcoming Regional Action Plan on Marine Birds, which is set to build on evidence provided in the Quality Status Report 2023 and recommend action to reduce and eliminate, where possible, the main pressures and activities that are impacting marine birds.

## **6.7 Evidencing Seafloor Integrity and Status of Benthic Habitats**

Another of the GES descriptors is that of seafloor integrity and benthic habitats. This section explores research from OSPAR, the Benyon Review into HPMAAs and the State of Nature Partnership, which are all evidence across responses to the Call.

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<sup>40</sup> Marine Birds Thematic Assessment, OSPAR (2023) <https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/thematic-assessments/marine-birds/>

<sup>41</sup> North-East Atlantic Environment Strategy 2030, OSPAR (2021) <https://www.ospar.org/convention/strategy>

OSPAR's Benthic Habitats Thematic Assessment<sup>42</sup> highlighted how many benthic habitats within its maritime area are under threat from pressures such as physical disturbance, modification of substrate or loss, which includes abrasion by bottom trawling, sediment extraction or man-made structures, and from chemical and biological impacts (such as nutrient enrichment or contaminants for the former, and the spread of invasive species or native species exploitation for the latter). The impact is not uniform, with the state of benthic habitats and level of threat varying across sub-regions.

It set out how in the face of climate change and ocean acidification, as well as the increasing production of food and energy, there is more than ever an urgent need to lower the pressures on benthic habitats. This is something that can be achieved through a combination of responses including effective area-based management, sustainable use and other regulation of human activities and innovations.

OSPAR stressed that it is difficult to assess the effectiveness of measures to improve the status of benthic habitats, owed to the multiple activities and pressures involved, while the effects of measures on the recovery of habitats may also take a long time to become evident. Though, with a lack of clear signs of improvement reported through its assessment, it suggested this shows current measures are inadequate or ineffective.

The Benyon Review into HPMA<sup>43</sup> made a comprehensive list of suggestions of what government needs to do going forwards, such as suggesting that HPMA should be defined as areas of the sea that allow the protection and recovery of marine ecosystems. This would prohibit extractive, destructive and depositional uses and allow only non-damaging levels of other activities. It calls for a whole site approach to HPMA to conserve all habitats and species within the site boundary, with this including mobile and migratory species that visit or pass through the site.

It suggests too that the government should plan the sustainable and equitable use of the marine environment. This would include ensuring that marine plans are sufficiently spatially prescriptive to address competing demands on space, as well as allowing for the need of nature to recover. The review also explains how government should consider blue carbon habitats and their ability to improve the climate resilience of the seas. Co-management principles should be adopted where possible to agree effective management in partnership with sea users.

The Benyon Review further recommends putting in place sufficient funding for the designation, management, monitoring and enforcement of HPMA. Government needs to make available sufficient resources that are proportionate to the scale of any designated HPMA, while then reconsidering existing marine governance over the longer-term to ensure current structures do not hinder the introduction of HPMA. The review explained how MPA management sits in a wider framework of marine management and governance, with a variety of government departments, arm's length bodies and international agreements involved, meaning governance arrangements can be complex. Simplifying them could be key to ensuring that the introduction of HPMA is not hindered.

The State of Nature Partnership<sup>30</sup>, meanwhile, noted that although 38% of UK waters are designated as protected areas, a comprehensive condition assessment and management measures are not yet fully implemented at most sites. The report noted that work is ongoing to designate MPAs and implement fisheries management within them, helping to contribute towards

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<sup>42</sup> Benthic Habitats Thematic Assessment, OSPAR (2023) <https://oap.ospar.org/en/ospar-assessments/quality-status-reports/gsr-2023/thematic-assessments/benthic-habitats/>

<sup>43</sup> Benyon Review Into Highly Protected Marine Areas, Benyon et al. (2022) <https://assets.publishing.service.gov.uk/media/5eda52cbe90e071b78731f0d/hpma-review-final-report.pdf>

the 2030 international target of 30% of land and sea being under effectively managed protected areas or other areas well-managed for nature – something all four UK governments have committed to.

## 6.8 Evidencing the Value of a Whole System Approach

The importance of taking a 'whole system' approach to addressing improvements in the status of the UK marine environment was highlighted by respondents to the Call, as well as in discussions through the workshops that followed (discussed further in chapter 7 of this report). In support of this suggestion, the Marine Management Organisation's Pioneer Programme Interactive Document<sup>44</sup> describes how the government's focus on nature improvement and restoration calls for a more holistic system-based approach at scale, reversing the degradation that is stifling the environment's ability to provide vital health and wellbeing for people and nature.

The Marine Pioneer Programme itself was devised to provide a space to explore and innovate as a collective, bringing together steering groups to develop shared and aspirational goals, objectives, projects and outputs. It tested ways to deliver the ambition of the government's 25-YEP, while making suggestions for applying a natural capital approach, integrating planning and delivery, using innovative finance, managing fisheries, managing MPAs, empowering communities and applying a net gain principle

## 6.9 Summary

While this analysis of the supporting evidence is far from exhaustive, it does cover many of the issues highlighted through the responses to the Call.

A recommended next step would be to review the supporting evidence in further detail, which would help to better understand what is driving the pressures cited by respondents, as well as the potential actions that could be implemented to minimise impacts and ultimately help to achieve Good Environmental Status.

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<sup>44</sup> Marine Pioneer Programme (2017-2020): Testing Delivery of the 25 Year Environment Plan, MMO (2020)  
<https://zenodo.org/records/4564011>

## 7 Workshop Delivery

As introduced through the introduction and methodology chapters, the research team facilitated a two-part interactive workshop series to gather further insights on the issues raised within the Call.

Two interactive virtual workshops were hosted, the first with the objective to test and validate the feedback from the Call, ensuring the perspectives of a diverse range of stakeholders were reflected. The second was held as a follow-up session to gather more detailed insights, particularly around the actions needed to deliver GES and the data and monitoring gas and challenges across the most commonly raised marine drivers and pressures.

This chapter summarises the key discussions and feedback received through the workshop sessions in each of the focus areas for this Call for Evidence. This summary highlights where feedback through the workshop corroborated and strengthened feedback received through the written responses to the Call.

### 7.1 Drivers and Pressures acting on the UK Marine Environment

In the first workshop, we asked attendees which three drivers or pressures on the marine environment they believe are the most important in affecting the UK's ability to achieve GES. The answers with the highest number of votes are outlined in Table 5. The attendees selection of climate change, commercial fishing activity and marine pollution corroborated the assessment of the written responses to the Call, reflecting similar priority areas.

Table 5 Indicating workshop attendees feedback when asked to enter their own opinion on the three most important stressors on the marine environment.

| Driver / Pressure Area      | Number of Votes |
|-----------------------------|-----------------|
| Climate Change              | 26              |
| Fisheries Activity          | 24              |
| Marine Pollutants           | 16              |
| Offshore Energy Development | 9               |
| Invasive Species            | 8               |

Some additional pressures suggested by attendees were: dredging, nutrient runoff associated with food production, a lack of joined up regulation and enforcement, and marine litter (particularly that which comes from cruise ships). These suggestions are in line with the more common themes that were drawn out from the responses to the Call.

Some additional ideas did arise from the workshop discussions that did not feature prominently in the Call responses; these included:

- Spatial squeeze associated with the competing ambitions of various marine industries, such as offshore energy, fisheries, and MPA management.
- A lack of a clear definition of GES resulting in an unclear strategy to achieve relevant descriptors.
- Production of new compounds – from plastics to polylactides (PLAs) – outpacing our ability to monitor their disposal.
- A suggested driver was the prioritisation of short-term economic growth over social or ecological sustainability.

### 7.1.1 Prioritisation of drivers, pressures, and impacts

In the first workshop, we asked the question: *How do you think drivers, pressures, and impacts should be prioritised?* Answers arrived in 3 broad themes:

The suggestion that drivers and pressures be prioritised by **scale of impact**, taking into account both intensity and frequency of the impact. One attendee suggested scale of impact is more important than timescale of impact i.e., target the most immediate pressures first, with long-term issues being a lower priority. Regarding drivers, someone suggested that those resulting in the highest volume of pressures and impacts should be prioritised.

Some answers focused on the **GES indicators**. Several attendees suggested that those actions should be prioritised which deliver benefits across multiple GES indicators – a greater number of GES descriptors benefiting from a given action should confer a greater priority for that action. The implication here is that a whole system approach would have more positive impact on marine health than focusing on individual stresses. Another answer proposed prioritising GES descriptors which are furthest from being achieved, giving some attention to the more neglected elements of marine health.

The final suggestion was to prioritise those actions that take a more **ecosystem-based approach** by focusing on drivers that harm elements of marine health like habitat, population density, and biodiversity – one example given was focusing on fisheries activities that damage the seabed. Several answers highlighted that these efforts would enhance marine resilience to other stressors, such as invasive species and climate related stressors.

Outside of these themes, a few other suggestions included greater evaluation of activities where profit-making companies are involved - requiring intervention at government level – and focusing on key drivers that underpin climate change like population growth, and consumption.

In the second workshop, use of an interactive voting system gave attendees the option to prioritise the four most frequently cited pressures on the marine environment (from the Call responses and workshop 1 feedback). The resulting ranking is provided in Figure 14 below. In order of highest priority to lowest, the four impacts were ranked: Climate change, commercial fishing, offshore energy development, pollutants/contaminants.

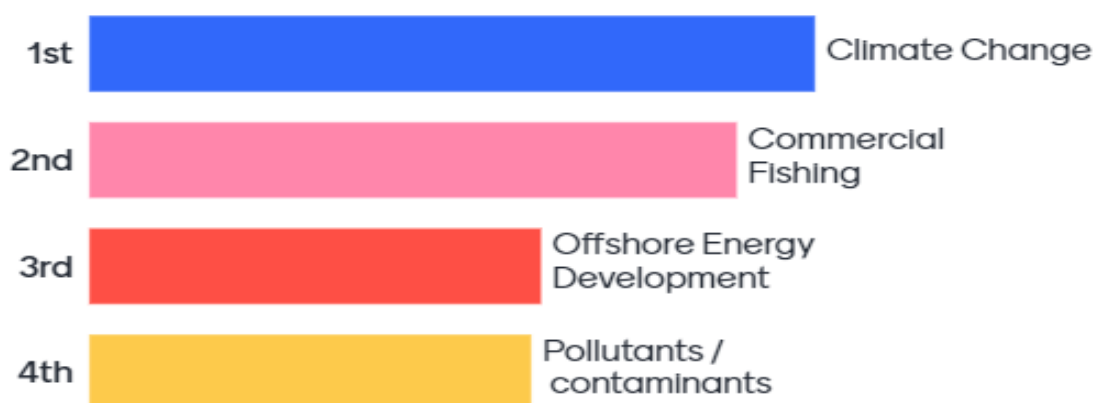


Figure 14 The results of a voting on the prioritisation of the 4 most commonly cited pressures on the marine environment undertaken during workshop 2.

The floor was then opened for discussion as to why attendees had ranked the pressures in the order they had. Several attendees explained that, in addition to the level of impact of each pressure area, consideration in the ranking exercise was given to the ability to impact and reduce that particular pressure. For this reason, Commercial Fishing was considered a high priority for several attendees. Various stakeholders also ranked Commercial Fishing highly due to the large impact of the sector on biodiversity and benthic habitat health, as well as the availability of actionable measures to reduce these impacts.

Some discussion was held on the lower prioritisation of offshore renewable development, reflecting the sector's importance in achieving net zero ambitions. Also noted were the opportunities for co-location of offshore wind with various other marine sectors – particularly aquaculture.

## **7.2 Actions Needed to achieve Good Environmental Status**

Through the workshops, time was allotted to discuss in detail any actions that participants thought should be taken as a priority to achieve GES in UK waters. In the first sessions, attendees were divided into three breakout groups to discuss this topic in more depth before reporting back to the whole group. Through discussions, five key areas of activity were highlighted by attendees with key feedback described below.

### **7.2.1 Commercial Fishing Actions**

Much discussion was had about the fishing of nephrops, and in particular the variable impact of techniques such as trawl and creel fishing. Trawl fishing is considered high impact in terms of damage to the seabed with creel fishing causing significantly less harm. One attendee cited studies that show greater efficacy of creel fishing in terms of performance per tonne of nephrops caught, and suggested a transition to this low impact method of fishing could have economic benefits whilst also reducing bycatch. However, it was also noted that creel fishing may not be viable on the same scale as trawling because the number of pots required is too significant.

Several participants mentioned the need for better regulation of MPAs to prevent damaging fishing techniques within them. It was hypothesised that current Maximum Sustainable Yield (MSY) may not be concurrent with GES descriptors, and that MSY and Total Allowable Catch (TAC) should be amended to be in line with relevant guidance and advice.

### **7.2.2 Offshore Energy Development Actions**

Various suggestions were made about the impact of offshore wind on marine health, noting in particular the harm to benthic habitats. The notion that we need to plan for nature in the design and deployment of offshore energy infrastructure was a sentiment shared by many participants. This included suggestions to adapt leasing processes to prevent development within MPAs.

An industry representative attending raised the potential for co-location of wind farms and aquaculture as an alternative source of income for fisheries that have been displaced by offshore infrastructure. However, this suggestion was countered by a fisheries representative who noted that enormous effort is required to diversify catch, and that without the necessary training, support, and equipment, displaced fishermen will end up without a livelihood.

### **7.2.3 Actions to Minimise Pollution/Release of Contaminants'**

Marine litter was discussed as a high priority issue with calls for bans and levies on single-use plastics. Extended Producer Responsibility legislation was also suggested as a way of reducing the volume of plastic entering our water ways via a top-down approach. An NGO representative cited a study which showed the efficacy and cost-effectiveness of voluntary action in removing large quantities of litter that has washed up. To incentivise this voluntary action via legislation that provides for modest payments to facilitate such clean-ups may prove fruitful.

Some concern was raised about marine litter associated with fisheries activity. As with single-use plastics, a suggestion of up-front levy payments for sales of fishing nets with cost recovery on return of end-of-life nets was proposed as a solution for minimising this. Additionally, suggestions arose for recovery and return strategies to be incentivised within the fishing industry to reduce impact of lost fishing gear. However, a representative from the fishing industry added the caveat that the fisheries industry is not a big contributor to marine litter, and fisheries see very little loss of fishing gear due to its high value.

A final source of pollution raised was sewage discharge from Combined Sewage Overflows (CSOs). Public awareness around this issue is high which puts pressure on sewage and water companies but without tighter regulations, discharge into waterways will continue to occur.

#### **7.2.4 Actions to Address Climate Change**

On the discussion of climate change, the interconnectedness of the climate and nature crises was highlighted again, as was the need for continued action towards net zero targets. Without taking steps to tackle this overarching issue, GES will not be able to be achieved due to pressure on biodiversity and marine habitats as a result of temperature increases and ocean acidification, amongst other stressors. To this end, a priority short-term action suggested was protection of blue carbon habitats like seagrass and saltmarshes which will have spillover benefits for biodiversity to the surrounding area and also help net zero ambitions in terms of carbon sequestration.

Additional comments included the importance of education to tackle the lack of public awareness about climate change and greater innovation around sails and wind kites for cargo vessels, to limit the use of heavy crude oil which is particularly polluting.

#### **7.2.5 Need for Improved Marine Spatial Planning**

Some more general comments from the group suggested a focus on better Marine Spatial Planning (MSP) would be required to achieve GES, in particular the necessity to involve all sectors within MSP. It was suggested that fisheries have been neglected from such consideration in the past and greater engagement with this industry would help to prevent domination of the space by other sectors that are licensed in particular ways, such as offshore wind.

Regarding MSP, several attendees highlighted the need to maintain an ecosystem-based approach over a feature-based approach, and that whilst it's important to achieve the 30% protection target by 2030 set under the Global Biodiversity Framework (GBF), it's equally important not to forget about the remaining 70%.

### **7.3 Data Gaps and Monitoring of Marine Health**

The workshops also facilitated discussion on the topic of data gaps that are hindering our ability to achieve GES in UK marine waters. A large number of participants vocalised the need for the government to take action quickly and not use a lack of evidence to stall implementation of environmental measures.

More efficient use of existing data was a key theme discussed through the workshop, with the need for better data sharing and mobilisation being echoed by several attendees. One representative from a research institute provided some insight from the perspective of a monitoring agency, noting that it is hard to get data into the British Oceanographic Data Centre (BODC) at times because of the resource available within the BODC. Following on from this, one attendee noted that a central government data sharing platform for environmental indicators across the marine space has been recommended by the National Infrastructure Commission. One

attendee stated that DEFRA had agreed to publish a plan regarding the creation of this by 2025, highlighting the positive impact this could have.

Comments arose about the implementation of monitoring programmes and what we seek to find. We should not be monitoring for the sake of monitoring but to test the efficacy of intervention - the example was given of monitoring fisheries activity to see if fish stocks are recovering in protected areas or areas of alternative fishing practices. This raised another point that data gathering is often clustered around MPAs because that is where monitoring is required to meet targets etc. This has knock-on implications for the applicability of certain data which may not be representative of the wider marine ecosystem; wider reaching monitoring programmes would go some way to solving this problem. It was also noted that in many instances, monitoring programmes are not used to prevent problems from arising, but to measure various indicators after a problem has been caused.

### **7.3.1 Commercial Fishing**

As for data gaps within the fisheries sector, a key one identified through discussion was the catch made by vessels under 12 meters. Data is not collected about when or where they are fishing if they turn off their Automatic Identification Systems (AIS), which has led to concerns about breaches of quotas. Mandatory Inshore Vessel Monitoring Systems (i-VMS) were suggested as a solution to fill this data gap and ensure compliance. A representative from the fishing industry did note however, that all fishermen in their region of the UK are subjected to Remote Electronic Monitoring (REM) and clean catch apps.

The issue of bycatch monitoring was raised as a concern due to its impact on a large number of endangered and threatened marine species. Data regarding bycatch is only collected from a small number of trials and is not representative of actual bycatch rates so it was suggested that much more thorough monitoring be implemented. The granularity of fishing data on the whole was questioned by several participants, who shared the belief that data collection needs to occur at a much higher resolution.

### **7.3.2 Offshore Energy Production**

Lack of data surrounding the impact of offshore wind deployment on marine health was noted as a concern particularly by representatives from research institutions. Often monitoring will occur during and immediately after the installation of offshore wind infrastructure but will then cease shortly after and it is not clear with whom the responsibility lies for continued monitoring. Additionally, the data collected in the run up to an application going through government consenting processes is rarely made available. If we are not fully aware of the impact of turbines on marine species and the interactions between these species, then effective actions to limit any potential harm cannot be implemented. An NGO representative explained that, if monitoring isn't in the conditions of a development consent order or licence, then it's rarely done. Planning of monitoring programmes tends to happen after consent is granted, meaning sometimes there aren't sufficient funds available to implement the programmes.

### **7.3.3 Pollution/contaminants**

Regarding marine litter, one SNCB in Scotland commented monitoring of marine pollution / contamination, particularly of marine litter is undertaken at a very low spatial and temporal scale, particularly for seafloor litter. It was suggested that there is a need for a standardised methodology for monitoring, particularly around microplastics. Furthermore, indicators for marine litter show what is present, but do not provide information about the sources of this marine litter, which is where it would be pertinent to focus efforts. Collecting more brand information based on the marine litter collected would apply more pressure to big companies to implement EPR and introduce measures like Deposit and Return Schemes (DRS).



## 8 Conclusions & Suggested Next Actions

This report has detailed the comprehensive assessment of the OEP's Call for Evidence exploring drivers, pressures and data gaps affecting the achievement of GES in UK marine waters, and actions which need to be taken to move towards achievement of GES in the future.

The stakeholder feedback and evidence provided supports the hypothesis that more work is needed if GES is to be achieved within the UK's marine waters, with human activities and climate change – notably warming sea temperatures – proving especially detrimental to the condition of the marine environment.

Biological diversity (**D1**) was identified as one of the more data-poor areas. Respondents cited limitations in the available data on the abundance and distribution of marine birds and marine mammals which is particularly problematic, given the descriptor itself states that "distribution and abundance of species should be in line with prevailing physiographic, geographic and climatic conditions". Without this data, respondents highlighted measurement and monitoring of performance against this descriptor is challenging. Issues were identified around bycatch monitoring for seabirds and mammals, making it harder to determine the impact of fishing activities in this area. Evidence gaps were also described for different habitats, lacking for "all but a few", once more making it harder to monitor this area given "the quality and occurrence of habitats" forms part of the description as well.

Invasive species (**D2**) are a stressor on the marine environment, with respondents highlighting it as a significant driver of biodiversity loss at affected sites, and an area that can prove extremely difficult and costly to control and eradicate once these species and the ecological effects they bring are established. Examples of their impacts on seabird populations and the wider environment were discussed. Discussion on this topic was more limited among respondents compared to others, however.

Commercial fishing was highlighted as being a substantial pressure on UK marine health through the Call for Evidence with "unsustainable fishing practices" a common concept discussed. The UK Marine Strategy states that populations of all commercially exploited fish and shellfish should be within safe biological limits (**D3**), exhibiting a population age and size distribution indicative of a healthy stock. Given the concerns expressed by contributors to this Call for Evidence, it could not be said that this indicator has been achieved. Commercial fishing was also considered by contributors to be an area of marine pressure which is currently data poor, with bycatch monitoring described as inadequate, and gaps in the available data noted around interactions between fishing vessels with different species including seabirds and marine mammals, and on the impact of unregulated fishing activities.

Marine foodwebs (**D4**) can be impacted by bycatch and entanglement from the fishing industry, while data gaps for certain species as discussed for D1 can have an influence on how much we know about foodwebs too. Human-induced eutrophication (**D5**) can come from agricultural fertilisers, sewage, industrial waste products, the livestock industry, with it highlighted by respondents that up to 80% of marine pollution is coming from land and then reaching the sea through inland waterways. Nutrient pollution from terrestrial run-off was identified as a big issue, including diffuse contaminants from agricultural run-off.

Respondents did not focus considerable attention on the achievement or otherwise of the GES indicator concerning sea-floor integrity (**D6**), however it was noted that this is impacted by particular types of fishing gear and is also an area considered data poor. Data availability is lacking

for benthic habitats, while data monitoring programmes need to improve for habitats both within and outside of MPAs. Data is lacking too for **D7**, which focuses on the ramifications of permanent alterations in hydrographical conditions, with it noted that data on the hydromorphological condition of estuarine and coastal waters is not currently monitored as part of The Water Environment Regulations (2017). This was described as a significant evidence gap.

The issues discussed for D5 are also relevant for **D8**, which relates to concentrations of contaminants not being at levels that give rise to pollution effects. Wastewater and nutrient pollution from terrestrial run-off is inhibiting the ability to see GES achieved for D8, while chemical pollutants, especially those from household chemicals and trade waste were highlighted as a factor under this descriptor. Little reference was made to **D9**, though work is undoubtedly needed on marine litter (**D10**).

Chemical contaminants associated with microplastics were noted as acting as a carrier for pollutants, forming "toxic pulls" for marine wildlife. A lot of this pollution is sourced from fisheries and marine traffic, though a disproportionate amount of it comes from terrestrial sources. The urbanisation of coastal zones is proving an exacerbating factor behind these sources of pollution.

**D11**, relating to ensuring the introduction of energy, including underwater noise, is not at levels that adversely affect the marine environment, formed a big part of responses, with the expansion of offshore wind noted as being problematic and resulting in an "ocean squeeze". Limitations around the UK's planning system were given as a reason for this, with poorly planned deployment leading to increasing pressure on the marine environment. This was also identified as one of the more data-poor areas, including for monitoring of seabird collisions with offshore wind turbines, decommissioning options and outcomes for offshore wind, as well as for outcomes by species, pressure and ecosystem service, and long-term outcomes of offshore wind, given how much research to date looks at short-term impacts. The expansion of offshore wind too, including the multi-scale and cumulative impacts of this, as well as other anthropogenic impacts and uses of UK marine space, was further noted as an area where greater evidence is needed, as was the emergence of floating offshore wind, especially for the habitats and communities set to be impacted. It was said that an evidence base needs to be developed for these types of installations as a priority. Looking at offshore energy more broadly, concerns were expressed around loss of habitats and disturbances to spawning or feeding grounds, which leads to fish breeding at lower rates and doing so within waters that are less suitable. Reference was made too to how the oil and gas regulator is not adequately undertaking Marine Conservation Zone assessments or Habitats Regulation assessments for programme applications, which makes it challenging to understand the ongoing and overall pressures MPAs in the UK are under.

As discussed, respondents corroborated findings from the updated Marine Strategy Part One, published in 2019, which indicated areas where GES has not yet been achieved. For example, abundance and distribution of species, as well as bycatch mortality, were all cited as key metrics in that assessment for cetaceans, seals, seabirds and fish, and all noted as key data gaps through this Call for Evidence. There are also perhaps indications that for some areas things have got worse, such as eutrophication and contaminants, given respondents concerns had around pollution from land-based sources – both of these descriptors were said to have achieved GES as of the 2019 assessment.

The findings of this assessment alone are of course insufficient to fully evaluate the extent of improvements that still need to be made to achieve GES. The UK Marine Strategy Part One is expected to be updated through 2024, which will update the 2019 assessment of progress. In addition to this feedback on GES indicators, further conclusions can be drawn from the Call for Evidence assessment as elaborated below.

What is clear from responses is the complexity of the marine environment, especially the interconnectedness of the different marine stressors. Human activities of all kinds can have wide reaching impacts and implications on marine health, with cumulative impacts potentially accelerating or accentuating these pressures. Likewise, actions and initiatives designed to minimise impact are often developed and implemented for one impact or industry in isolation. This could represent significant missed opportunities for collaboration and coordinated activity, or may lead to unintended consequences elsewhere. The feedback from stakeholders strongly encourages a holistic approach to measuring and addressing the marine stressors discussed. Strategic consideration and planning should be pursued considering impacts and implications of both policy and industry initiatives across terrestrial, coastal and marine environments.

This holistic approach should consider climate change as well, with it clear through written responses to the Call and subsequent workshops that GES cannot be considered in isolation to climate change. It is an overarching pressure on the marine environment, bringing about changes directly and also through driving other pressures. For example, rising sea temperatures caused by climate change are leading to changes in distribution of species and substantial alterations to the way ecosystems function as a result, while extreme weather events pose risks to species and habitats. There are data gaps too, notably around how climate change is impacting different species and habitats, while the differential vulnerability of people working in the marine environment was put forward as an area where greater understanding is needed. This relates to how they can cope with change, such as exposure to the changing climate and environment, as well as the socioeconomic and legislative landscape, their sensitivity to change and their capacity to then adapt or show resilience.

Furthermore, as put forward through workshop discussions, offshore renewable energy production itself – a clear pressure on the marine environment – is a strategy to secure reliable and low carbon energy to minimise climate change, while commercial fishing efforts are aiming to provide sustainable food sources that do not deplete natural resources and maintain healthy oceans as effective carbon sinks. Actions in future to address GES must, therefore, be considered alongside climate change mitigation and adaptation.

A whole host of actions were suggested by respondents, with a common thread being the importance of the role for the UK government, as well as governments across the devolved administrations, in driving forward initiatives to support the achievement of GES. This includes new and improved policy and regulations, especially those related to marine spatial planning, particularly with regards to the rollout of offshore wind, as well as enhanced enforcement of existing regulation of activities and industries that impact the marine environment. Some specific suggestions included strict regulation on levels of marine noise, the location and monitoring of impacts of offshore energy developments, and commercial fishing activity. Responses promoted an effective planning policy that is able to integrate terrestrial planning with marine plans and incentivise the use of nature-based solutions wherever possible. This would reform the marine planning system to better complement the Marine Strategy and Marine Policy Statement and ensure better alignment of outcomes across the four UK nations, facilitating greater consistency and a better chance of achieving GES.

Respondents also recognised the important role that other actors have to play in bringing about positive change, both in industry and the general public. Reference was made to there being something of a disconnect between people and the marine environment. Raising awareness on different issues such as pollution, for example, could prove key in helping to provide better environmental outcomes for the UK's seas.

Availability of data that captures the status of the marine environment and the species within is essential to understanding where efforts need to be placed to make improvements not only to reach GES, but also to understand and review the effectiveness of initiatives that are being undertaken to minimise environmental impacts. Consistent feedback, as seen above, was received throughout on the importance of improved monitoring and data collection in relation to many indicators. With this evidence in place, resources can be better used, environmental impact and degradation minimised, and Good Environmental Status more likely achieved across a greater range of the indicators.

Based upon these conclusions, this report suggests the following next actions for the OEP in relation to supporting continued improvement of UK marine health:

- The OEP's role to hold government bodies to account continues to be important. Opergy's observation – there could be an important role for OEP in coordinating and articulating the findings and outputs of other actors / forums, including from government departments, public bodies / SNCBs and NGO's looking at different and specific areas of marine health. This role could see OEP bringing together the efforts and evidence to share a consistent picture with the central UK government as well as and devolved governments.
- A mapping exercise may be useful to map and articulate the roles and responsibilities of the wider government departments and SNCBs to support alignment of and communication to government across the devolved administrations. Incorporate comments on devolved administrations – each devolved administration has a different structure of regulatory departments and SNCBs with a responsibility in relation to marine and terrestrial environmental health which would be valuable to understand going forward.
- An important suggested action is to develop close relationships with complementary organisations to initiate joint work to gather evidence or develop suggested actions in relation to improvements to marine health. A particular example is the potential complementary working relationship with the Climate Change Committee.
- Proactive action from the OEP following the results of this Call for Evidence. Opergy suggest OEP publish the feedback received through responses to the Call and continue their engagement with the UK government to highlight key issues where focus should be placed in approaching the review and update of the UK Marine Strategy.
- As mentioned, further work is needed to establish a clear picture of the achievement or otherwise of GES in all indicator areas. However, a clear suggestion of this work is for the OEP and their partners to focus attention on GES indicators which are performing poorly in relation to meeting their targets. Consideration of a holistic system-based approach should be considered throughout.
- In relation to coordinating functions, OEP could support wider efforts to achieve greater alignment on data sharing – what data should be collected and shared with whom. Various data platforms may be available, but OEP could play a role in monitoring whether these are updated and utilised.
- Finally, the Call for Evidence received engagement from a wide range of stakeholders who are keen to continue to work alongside the OEP to drive action towards achieving GES in UK marine waters. The OEP should build on this engagement and momentum and continue to engage with those interested stakeholders to build further evidence and structure future activity in relation to the future improvement of the marine environment.

## 9 Glossary

AI: Artificial Intelligence

CSO: Combined Sewage Overflow

DRS: Deposit and Return Schemes

EEA: European Environment Agency

EIA: Environmental Impact Assessment

EPR: Extended Producer Responsibility

FMP: Fisheries Management Plan

GBF: Global Biodiversity Framework

GES: Good Environmental Status

IPBES: Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

MSFD: The European Marine Strategy Framework Directive

MPA: Marine Protected Area

MSP: Marine Spatial Planning

MSY: Maximum Sustainable Yield

OEP: Office for Environmental Protection

REM: Remote Electronic Monitoring

SAC: Special Area of Conservation

SCANS Surveys: Small Cetaceans in European Atlantic waters and the North Sea

TAC: Total Allowable Catch

WER: Water Environment Regulations

