Marine Management Organisation

# Sustainability Appraisal Scoping Report: East Marine Plan

## Final

## (MMO1419)

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# MMO1419: Sustainability Appraisal Scoping Report: East Marine Plan. *April 2025*

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Report prepared for:
Marine Management Organisation

Version History for removal at publication

| Version | Author | Note |
|---|---|---|
| 1 | FA/IT/LJ | Draft |
| 2 | IT/LJ | Amended for engagement |
| 3 | IT/LJ | Final report for engagement |
| 4 | IT | Minor editorial amends |
| 5 | IT/LJ | Post consultation amends |
| 6 | IT/LJ | Final post consultation report |
| 7 | LJ | Minor post consultation amends |
| 8 | IT | Final for publication |

Information about this publication and further copies are available from:

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When referencing this publication, please cite as:
MMO1419 (2025). East Marine Plan: Sustainability Appraisal Scoping Report. A report produced for the Marine Management Organisation, April 2025, 72pp

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# 1 Introduction

## 1.1 Background to the East Marine Plan

Through the Marine and Coastal Access Act 2009 (MCAA), the UK government introduced a number of measures to achieve its vision of '*clean, healthy, safe, productive and biologically diverse oceans and seas*'. One of these measures was the provision of a marine planning system. The marine planning system is underpinned by a set of marine spatial plans covering UK waters, together with the UK Marine Policy Statement (MPS).

Marine Plans, and their integration with the MPS, contribute to a plan-led regulatory system for marine activities. They provide greater coherence in policy and a forward looking, proactive and spatial planning approach to the management of the marine area, its resources, and the activities and interactions that take place within it. Each marine plan seeks to take account of social, economic and environmental factors that affect their relevant inshore and offshore marine plan areas and the communities that are dependent on, or have an interest in, the marine area.

Marine plans are prepared under the policy framework provided by the MPS, and together they underpin the marine planning system for England. The MPS builds on the shared UK wide high level marine objectives, and provides an overview of the relevant national policy, including the National Planning Policy Framework and associated National Policy Statements.

Public authorities need to take into account marine plans covering the offshore area when preparing plans, insofar as they have implications for onshore activities. In the Levelling up & Regeneration Act 2023 it states: "The prescribed public body must do everything that the plan-making authority reasonably requires of the body to assist the authority in relation to the preparation or revision of the relevant plan". The Levelling up & Regeneration Act 2023 states that a 'relevant plan' includes "(d) a marine plan under the MCAA for the English inshore region, the English offshore region or any part of either of those regions". The inshore and offshore east marine plan areas are demonstrated in Figure 1.

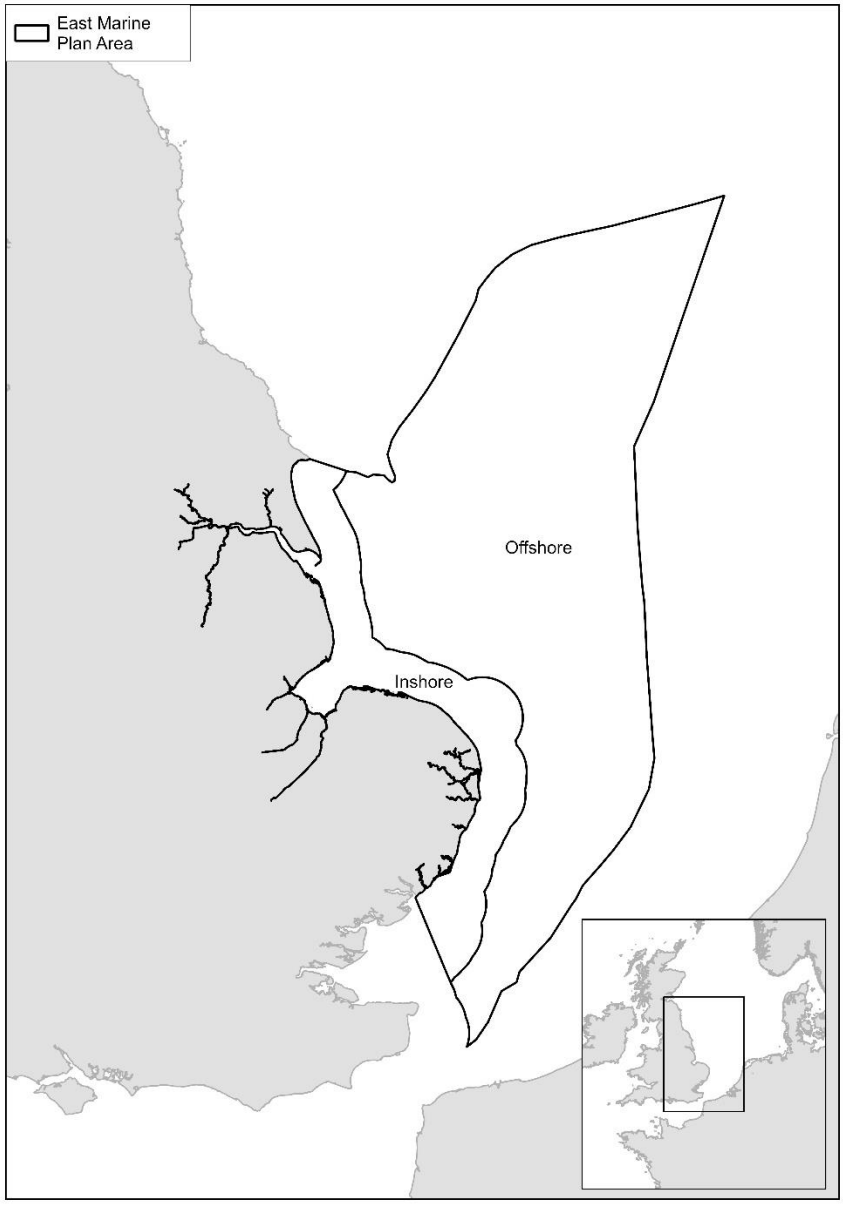


**Figure 1: The inshore and offshore east marine plan area**

The MCAA ensures that the Marine Management Organisation (MMO) must take all reasonable steps to secure that marine plans are compatible with the development plans in the land-use planning system. In addition, there is also a requirement when preparing a marine plan to have regard to any other plan prepared by a public or local authority in connection with the management or use of the sea or coast, or of marine or coastal resources in the area in, adjoining or adjacent to the marine plan area. The intent of these inclusions in the MCAA was to aid integration between planning on land with that in the marine area (and vice versa).

The existing East Inshore and Offshore Marine Plans were prepared by the MMO on behalf of the government and adopted in April 2014 by the Secretary of State for Environment, Food and Rural Affairs. The plans cover approximately 55,000 $km^2$ from Flamborough Head in Yorkshire to Felixstowe in Suffolk and extend from mean

high water spring (MHWS) limits, out to the UK's international maritime boundaries with Belgium, France and the Netherlands. Following their adoption, as a requirement of the MCAA Sections 54 and 62, these plans have been revisited, and progress reports have been published every 3 years to review progress made in meeting the aims of the East Inshore and Offshore Marine Plans and the MPS. Both the Three-year report on the East Marine Plans (2 April 2017 to 1 April 2020) (published in 2020) and the Three-year report on the East Marine Plans (2 April 2020 to 1 April 2023) (published in 2023) recognised increasing policy gaps and substantial legislative and policy changes since plan publication in 2014.

In 2023, the Sectary of State for Environment, Food and Rural Affairs agreed with the MMO's recommendation to replace the East Inshore and East Offshore Marine Plans. The adopted East Inshore and East Offshore Marine Plans will be replaced with a new 'East Marine Plan' which will be the first of a second generation of plans for English waters. The new document will be referred to as the 'East Marine Plan'.

This report concerns the east marine inshore and offshore marine plan areas only and these are collectively known as the east marine plan area.

## 1.2 Structure of the Scoping Report

The scoping report comprises the following sections and technical appendices:

- Section 1: Introduction and background
- Section 2: Overview of SA methodology incorporating the natural capital approach
- Section 3: Review of policies, plans and programmes and sustainability objectives
- Section 4: Baseline information
- Section 5: Interactions
- Section 6: Natural capital evidence base
- Section 7: SA framework
- Section 8: Next steps
- Appendix A: a fully searchable SA baseline database has been produced as part of the SA scoping process which includes information that can help to characterise the plan areas, identify impacts upon receptors, legislative and policy targets and objectives that should be met, issues that have been identified for each sub-topic, and also identifies known data gaps
- Appendix B: a series of report cards have been produced at the scoping stage which provide a more accessible way of interpreting the findings of the SA scoping process; expert judgement has been used to determine which elements of the baseline/issues have been included on the report cards.

## 1.3 Purpose of the Sustainability Appraisal (SA)

In 1987, the United Nations Brundtland Commission[1] noted how "*Economic growth always brings risk of environmental damage, as it puts increased pressure on environmental resources. But policy makers guided by the concept of sustainable*

[1] Chapter 1, paragraph 50

*development will necessarily work to assure that growing economies remain firmly attached to their ecological roots and that these roots are protected and nurtured so that they may support growth over the long term"*.

In response, sustainability appraisals (SAs) consider the economic, social and environmental impacts of a plan (the three dimensions of sustainable development). The aim in undertaking a SA is to identify likely significant effects so that plan makers can take steps to avoid and/or mitigate potential negative effects as well as identify opportunities to maximise a plan's contribution to sustainability.

The requirement for a SA in the marine planning process is outlined in the MCAA Schedule 5 (paragraph 7), which stipulates that all marine plans are subject to a SA and that it is undertaken in line with the procedures prescribed The Environmental Assessment of Plans and Programmes Regulations 2004 (commonly referred to as the Strategic Environmental Assessment (SEA) Regulations).

SAs differ from SEAs in that it gives greater consideration to socio-economic issues (although the SEA Regulations refers to a possible need to consider issues such as 'population' and 'human health' and to contribute to sustainable development) alongside the environment.

The requirement to undertake a SA reflects the fact that, although marine plans will be developed to reflect the principles of sustainable development, it is important that there is an independent check. The SA process ensures that sustainability issues are considered in a clear and transparent manner. In particular, the SA process ensures a structured and systematic consideration of sustainability issues through its focus on testing and comparing the merits of different plan alternatives as well as consultation with key stakeholders[2]. An integrated SEA and SA process refers to the fact that the Sustainability Appraisal adheres to the requirements of the SEA regulations but also fully reflects relevant social and economic issues.

The Dasgupta Report emphasised the importance of planning in sustainable development, and in using natural capital to inform planning: *One way in which we can manage this influence and activity, including for conservation and restoration, is through careful land-use and marine spatial planning to balance economic, social and environmental trade-offs. Spatial planning informed by natural capital offers huge opportunities to conserve and restore Nature, and to ensure that existing conservation and restoration is as effective as possible in an increasingly crowded world"*[3]*.*

The SA of the East Marine Plan applies a natural capital approach, which is the first time this approach has been taken to a SA of an English marine plan. Applying a natural capital approach to the SA aligns with the environmental principles introduced by the Environment Act 2021. The environmental principles are developed to ensure that nature and the environment are proactively designed into the policymaking process and include:

[2] Note that there is no formal guidance for key stakeholders in the SA of marine plans - the closest to this would be the National Planning Practice Guidance (NPPG) for terrestrial plans
[3] *Page 463*

- the integration principle - that environmental protection should be integrated into the making of policies
- the prevention principle - government policy should aim to prevent environmental harm
- the rectification at source principle - environmental damage should, as a priority, be addressed at its origin to avoid the need to remedy its effects later
- the polluter pays principle - where possible, the costs of pollution should be borne by those causing it, rather than the person who suffers the effects of the resulting environmental damage, or the wider community
- the precautionary principle - assists the decision-making process in the face of a lack of scientific certainty - the principle helps policy-makers deal with risks which may not be precisely calculable in advance

Taking a natural capital approach to the SA aligns with the integration principle of the environmental principles. A natural capital approach can provide a strategic basis for how the natural environment can be integrated with and deliver wider socio-economic outcomes. The natural capital framework "suggests additional options to meet policy goals and enables all options to be assessed more accurately for potential improvements or damage to the environment" (His Majesty's Treasury Green Book 2022). A natural capital approach can help organisations to assess needs, identify dependencies on natural assets and translate this into relevant information for decision making (Enabling a Natural Capital Approach (ENCA) guidance). It can also support public authorities to decide on what action to take as part of the duty to conserve and enhance biodiversity. Details of the natural capital approach can be found in Section 2.1.

## 1.4 Purpose of this report

This scoping report is the first formal output of the SA process. The scoping report provides baseline information on the environmental, social and economic characteristics of the east marine plan area, including the likely evolution of the baseline without the East Marine Plan. It also sets out the proposed methodology for taking a natural capital approach to SA. It sets the framework and approach for the SA process and explains how the SA will be undertaken during the following stages of appraisal.

## 1.5 Equality Impact Assessment

The Equality Act 2010 imposes a duty on public bodies that shape policy, deliver service and/or employ people. The Public Sector Equality Duty (PSED), which applies in England, Scotland and Wales, requires public authorities to have due regard to certain equality considerations when exercising their functions, like making decisions. PSED requires public bodies to:

- have due regard to the need to eliminate discrimination
- advance equality of opportunity
- foster good relations between different people when carrying out their activities

The Equality Act 2010 sets out a series of "protected characteristics" which help identify which groups of people (or individuals) may suffer discrimination:

- age
- disability
- gender reassignment
- marriage and civil partnership
- pregnancy and maternity
- race
- religion or belief
- sex
- sexual orientation

Equality impact assessment (EqIA) is a means of systematically identifying and assessing the likely effects arising from the design and implementation of a proposed plan, policy, or project for people sharing one or more protected characteristics. EqIA itself is not a legal requirement and formal guidance on the approach to an EqIA is not available. However, it is a recognised method commonly employed to demonstrate compliance with the Equality Act 2010.

EqIA identifies the likely effects on discriminatory practices, the potential to alter the opportunities of certain groups of people and/or effects on relationships between different groups of people which could arise as a result of the East Marine Plan.

The assessment identifies whether people with protected characteristics would be disproportionately or differentially affected by the East Marine Plan. Definitions of this are as follows:

> Disproportionate:
> there may be a disproportionate equality effect where people with a particular protected characteristic make up a greater proportion of those affected than in the wider population.
>
> Differential:
> there may be a differential equality effect where people with a protected characteristic are affected differently from the general population as a result of vulnerabilities or restrictions they face because of that protected characteristic.

PSED only applies to the protected characteristic of marriage and civil partnership in relation to employment discrimination. It is therefore considered unlikely that there would be effects from the East Marine Plan for people on the basis of marriage and civil partnership. Therefore, this characteristic will not be considered as part of the assessment.

Whilst socio-economic status is not a characteristic protected by the Equality Act 2010, it is best practice to consider this topic in an EqIA due to its close association with the protected characteristics. Socio-economic groups to be considered in the EqIA include those on low incomes, carers and those living in deprived areas.

EqIA has been integrated into the SA via inclusion of objectives relating to EqIA in the SA framework. Further information can be found in Section 7 of this report. Baseline information about communities is discussed in Section 4.7.

Through integrating EqIA objectives into the SA framework, the SA will assess the East Marine Plan options for potential impacts on the protected equality groups and identify opportunities within the power of the East Marine Plan for more positive outcomes for protected groups.

## 1.6 Habitats Regulations Assessment

As well as the SA, the marine plans are also subject to a habitats regulations assessment (HRA). The need for a HRA is set out within The Conservation of Habitats and Species Regulations 2017 and The Conservation of Offshore Marine Habitats and Species Regulations 2017, together referred to as the Habitats Regulations. Internationally important wildlife sites (also called the National Site Network in the UK) can be defined as actual or proposed/candidate special areas of conservation (SACs) or special protection areas (SPAs). It is also English and Welsh government policy for sites designated under the Convention on Wetlands of International Importance (Ramsar sites) to be treated as having equivalent status to SACs and SPAs.

The Habitats Regulations apply the precautionary principle to protected areas. Plans and projects can only be permitted having ascertained that there will be no adverse effect on the integrity of the site(s) in question. In the case of the Habitats Regulations, plans and projects may still be permitted if there are no alternatives to them and there are imperative reasons of overriding public interest (IROPI) as to why they should go ahead. In such cases, compensation would be necessary to ensure the overall integrity of the site network. In order to ascertain whether or not there is potential for site integrity to be affected, an HRA should be undertaken for the plan or project in question.

The term HRA refers to the assessment of the implication of a proposed plan on one or more National Site Network designated sites in view of the sites' conservation objectives. The marine plan HRA process will be carried out in the following stages:

- Pre-screening: identifying an initial list of potentially relevant National Site Network sites for consideration and setting out the HRA methods,
- Screening: identifying (ie 'screening in' to the next assessment stage) those National Site Network sites for which there is a 'likely significant effect' (LSE) from the marine plans (or where a LSE cannot be excluded) and those policies that identify specific areas where distinct development (or activities) will, or may, affect National Site Network or Ramsar sites but for which no previous HRA has been undertaken,
- Appropriate assessment information review (AAIR): assessing the marine plans' effects on the integrity of the 'screened in' National Site Network sites,
- Appropriate assessment (AA): preparing the formal assessments and HRA record on the basis of the AAIR findings

## 1.7 Marine Conservation Zone Assessment

A marine conservation zone (MCZ) assessment is also required to ensure that sites designated under the MCAA are not affecting (other than insignificantly) the protected features of an MCZ or any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependent. As yet, the MCZ assessment has only been applied at the marine licence decision making level within the MMO. However, for the East Marine Plan development the assessment will now be applied at the plan level and will be carried out in the following stages (subject to change dependent on stakeholder input as this process is untested for plan level MCZ assessment):

- Screening: identifying an initial list of potentially relevant MCZs for consideration and setting out the MCZ assessment methods

- Stage 1 assessment: assess policies against the features of the screened-in MCZs to determine if it is possible to conclude the plan will not affect (other than insignificantly) either (i) the protected features of an the MCZ; or (ii) any ecological or geomorphological processes on which the conservation of any protected features of an MCZ is (wholly or in part) dependant, either alone or in-combination with other plans. Where it is not possible to conclude that the impacts will not be insignificant, consider the extent of the potential impact of the plan on the conservation objectives for the sites, including any plan-level mitigation measures to lessen those impacts.

- Stage 2 assessment: if, after application of plan level mitigation, it is still not possible to conclude the plan will not affect (other than insignificantly) either (i) the protected features of an the MCZ; or (ii) any ecological or geomorphological processes on which the conservation of any protected features of an MCZ is (wholly or in part) dependant, a stage 2 assessment report must be prepared which provides justification for proceeding with the draft East Marine Plan by applying the following tests:
    - there is no other means of proceeding with the act which would create a substantially lower risk of hindering the achievement of those objectives,
    - the benefit to the public of proceeding with the act clearly outweighs the risk of damage to the environment that will be created by proceeding with it, and
    - the person seeking the authorisation will undertake, or make arrangements for the undertaking of, measures of equivalent environmental benefit to the damage which the act will or is likely to have in or on the MCZ.

The HRA and MCZ assessment will be presented in separate documents, but the findings will be reflected within the findings outputs of the full SA of the East Marine Plan.

# 2 Overview of SA methodology

## 2.1 The natural capital approach to SA

The potential for applying a natural capital approach to SA has already been explored in depth as part of research for the Marine Pioneer Programme (2017 - 2020) in North Devon, undertaken through the South-West Partnership for Environmental and Economic Prosperity. The methodology developed for the assessment of the East Marine Plan draws extensively on that approach, as well as further work undertaken as part of the marine Natural Capital and Ecosystem Assessment (mNCEA) programme in Sustainability Appraisal for Marine Plans: a natural capital methodology (MMO1315[4]). Key aspects of the methodology presented in MMO1315 will be adapted and applied for the East Marine Plan. This report has not yet been published, but will be amended where required, following its application in this SA.

As described in MMO1315, the central concept of natural capital is that "The natural capital system has three key components, as depicted in Figure 2 below:

- the assets (species and habitats)
- the ecosystem services (useful ecological products) that are provided by nature
- the goods and benefits that we receive from them, access to which requires human intervention through, for example, the availability of skills and infrastructure

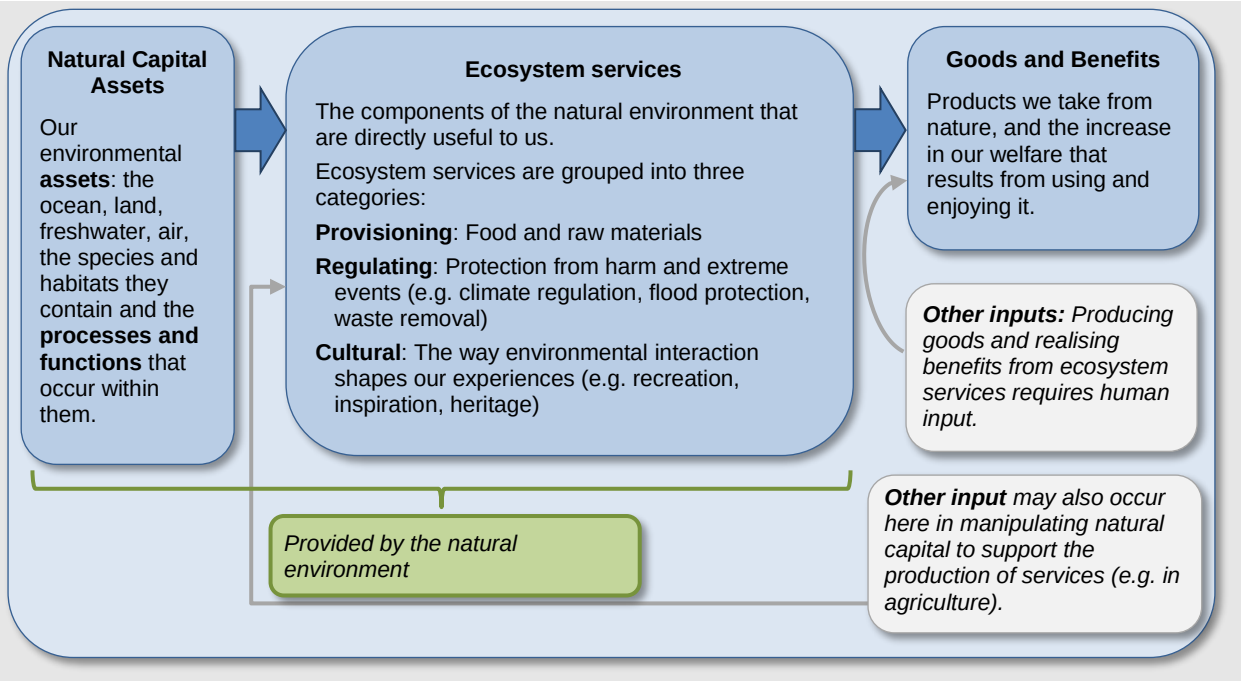


**Figure 2: Core elements of the natural capital system[5]**

[4] Unpublished at the time of this scoping report's publication.
[5] Adapted from Application of the natural capital approach to the marine environment to aid decision-making (Tara *et al.*, 2019) as part of Marine Natural Capital (ME5115)

In taking a natural capital approach, it is anticipated that a holistic assessment of the assets within the marine environment and services which these assets provide to individuals, society and the economy, will be achieved. Therefore, for the SA of the East Marine Plan, a natural capital approach will be embedded into the assessment, ensuring natural capital is considered throughout the plan making process.

The methodology for integrating a natural capital approach into SA proposed within MMO1315 has been used, along with discussions with the guidance authors, to develop the methodology of the SA of the East Marine Plan.

Natural capital has been considered in the development of the SA framework (see Section 6) and a natural capital evidence base will be developed prior to SA Stage B (assessment of the draft East Marine Plan and its alternatives). The natural capital evidence base will be used to determine the nature of potential effects when assessing the East Marine Plan. Further details can be found in Section 6.

Future work may consider a five capitals approach as outlined in A pilot for using the five capitals approach for marine plan development in the East of England (MMO1336) to further integrate the consideration of other capital types, however this is beyond the scope of this SA.

A SA for marine plans is required under MCAA Schedule 6 (paragraph 10). The MPS Section 2.4.4 provides further detail noting the need to consider "…*the potential social, economic and environmental benefits and adverse effects of the proposals…"* and connecting the SA to requirements of the SEA Regulations. Neither the MCAA, MPS nor the SEA Regulations outline in detail how the SA should be carried out, and no other formal guidance for SAs for marine plans exists. This allows for the approach to be adapted to incorporate a natural capital approach, whilst still meeting the SEA requirements. See Table 1 for how this will be achieved for this project.

**Table 1: SEA Regulation requirements and how these will be met**

| What the regulations require[6] | How this has or will be addressed within the SA |
|---|---|
| An outline of the contents, main objectives of the plan or programme | See Section 1.1 of this SA scoping report |
| An outline of the relationship with other relevant plans and programme | Section 3 of this SA scoping report |
| The relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme | Summarised in Section 4 (Baseline Information) of this report and supported by the report cards. Full details available within appendix A |
| The environmental characteristics of areas likely to be significantly affected | Summarised in Section 4 (Baseline Information) of this report and supported by the report cards. Full details available within appendix A |
| Any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Directives 79/409/EEC and 92/43/EEC[7] | Summarised in Section 4 (Baseline Information) of this report and supported by the report cards. Full details available within appendix A |
| The environmental protection objectives, established at international, community or national level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation | Summarised in Section 3 (review policies, plans, and programmes) of this report and supported by the report cards. Full details available within appendix A |
| The likely significant effects on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors. The identification of the above effects should consider secondary, cumulative, synergistic, short, medium and long-term permanent and temporary, positive and negative effects | This will be set out in the SA report |
| The measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan or programme | This will be set out in the SA report |
| An outline of the reasons for selecting the alternatives dealt with | This will be set out in the SA report |

[6] Based on Schedule 2 of SEA Regulations Directive - 2001/42 - EN - EUR-Lex (europa.eu): *Information for Environmental Projects*

[7] Now The Conservation of Habitats and Species Regulations 2017 and The Conservation of Offshore Marine Habitats and Species Regulations 2017

| What the regulations require[6] | How this has or will be addressed within the SA |
|---|---|
| A description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information | This will be set out in the SA report |
| A description of measures envisaged concerning monitoring | This will be set out in the SA report |
| A non-technical summary of the information provided under the above headings | This will be set out in the SA report |
| The report must include the information that may reasonably be required taking into account current knowledge and methods of assessment, the contents and level of detail in the plan or programme, its stage in the decision-making process and the extent to which certain matters are more appropriately assessed at different levels in that process to avoid duplication of the assessment | This will be set out in the SA report |
| Consultation: Authorities with environmental responsibility, when deciding on the scope and level of detail of the information which must be included in the environmental report | Engagement on this scoping report will be reported on within the SA report |
| Consultation: Authorities with environmental responsibility and the public, shall be given an early and effective opportunity within appropriate time frames to express their opinion on the draft plan or programme and the accompanying environmental report before the adoption of the plan or programme | Statutory consultees will be engaged with at several points throughout the SA and plan development process |
| Monitoring of the significant environmental effects of the plan's or programme's implementation | The SA adoption statement will set out a monitoring schedule |

## 2.2 Stakeholder engagement

### 2.2.1 Objectives of the stakeholder engagement process

Delivering deep and effective engagement is an essential part of the SA process and the East Marine Plan development. Building and managing relationships across all stakeholders throughout the SA will not only enhance the East Marine Plan and associated SA, but also make a strong contribution to the successful implementation of their outcomes and recommendations. Objectives of the SA stakeholder engagement process have been identified as set out below:

- bring together key stakeholders at a national and regional level who will participate in, and have an impact on the SA's operation and success
- help to build and cement essential relationships, particularly with statutory consultees
- facilitate open and meaningful engagement, which promotes collaboration and opportunities to exchange ideas, experience and information
- build stakeholder consensus around the SA, particularly given the novel methodology used in the natural capital approach
- present the SA (and East Marine Plan) in a positive progressive light.
- manage all aspects of the SA engagement process in a professional, enlightened manner
- document all necessary stakeholder feedback, ensuring key stakeholders are familiar with the process followed and the main conclusions of the SA upon publication

### 2.2.2 Sustainability Appraisal Advisory Group

A Sustainability Appraisal Advisory Group (SAAG) will be used throughout the project to engage on the SA process. This group includes statutory consultees and subject matter experts. This group will contribute specialist knowledge to concept development and represents different perspectives (eg industry, research institutes, local interest groups, government agencies and regional marine experts, etc) and will allow a broad range of data to feed into the SA.

A series of virtual engagement events with the SAAG will take place over the course of the SA. Two of these events will take place during Stage A (Scoping) and the subsequent events will happen during Stages C and D.

The first engagement event, which was completed to inform this scoping report, took place on Monday 29th January 2024 and addressed the following aims:

1. to identify the priority sustainability objectives within the east marine plan area,
2. to explore potential data gaps in the draft asset register,
3. to review the draft asset register and explore the development of this into a risk register.

Comments received during this event have assisted in the development of the objectives and baseline database which form part of the scoping outputs.

During the course of formal engagement on the scoping outputs (this scoping report and accompanying report cards), a second event will be held with the SAAG to discuss the outputs and gain feedback. Formal feedback received will then be considered as part of updates to the scoping outputs, assisting in the formation of the final scoping report.

### 2.2.3 Regional experts

A group of regional experts in natural capital have been invited to provide regional evidence towards the scoping report and review the outputs of the SA in forming part of the SAAG engagement.

### 2.2.4 Wider engagement

Following the completion of the assessment of the draft East Marine Plan, the draft East Marine Plan and accompanying draft SA report will be consulted on during the formal consultation period, during which the public will be invited to comment alongside members of the SAAG. This is expected to take place later in 2026.

## 2.3 Five main stages of the SA

Guidance provided in A practical guide to the Strategic Environmental Assessment Directive (ODPM, 2005) and Strategic environmental assessment and sustainability appraisal (MHCLG, 2014) on SA and implementation of the SEA Regulations outline five main stages:

- Stage A: Setting the context and objectives, establishing the baseline and
- deciding on the scope
- Stage B: Developing and refining alternatives and assessing effects
- Stage C: Preparing the environmental report
- Stage D: Consultation and decision-making
- Stage E: Monitoring implementation of the plan or programme

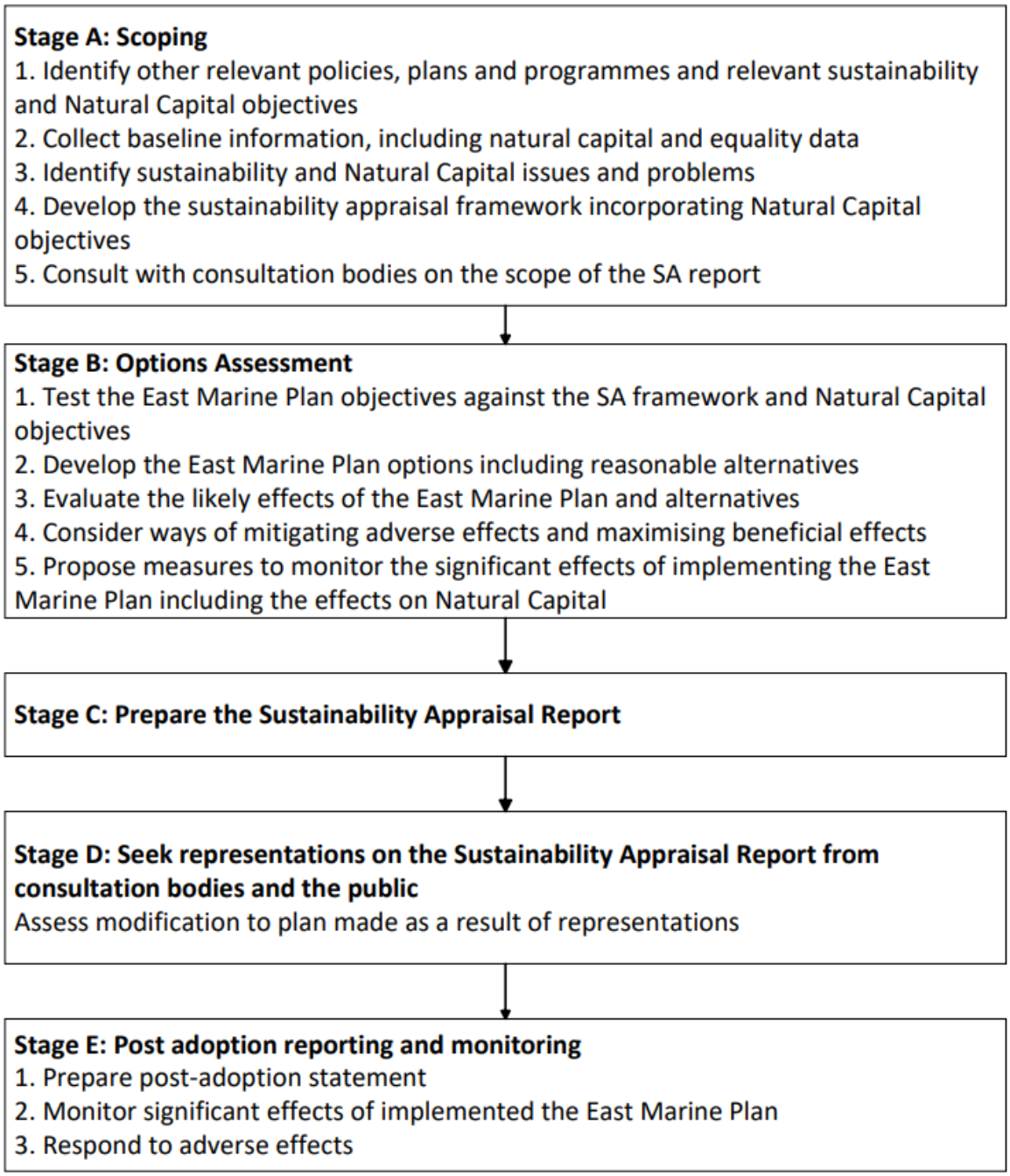


**Figure 3: The SA process, incorporating a natural capital approach**

### 2.3.1 Stage A: Scoping

This scoping report provides information about the proposed approach and provides baseline information about the existing conditions specific to the east marine plan area. A SA framework which the East Marine Plan and its' alternatives will be measured against in order to test their sustainability is also presented for comment.

Table 2 has been adapted from Table 3 of Sustainability Appraisal for Marine Plans: a natural capital methodology (MMO1315[8]), to show the key tasks and processes for Stage A (Scoping) of the East Marine Plan SA.

[8] Unpublished at the time of this scoping report's publication.

**Table 2: Method steps within stage A (Scoping) of the SA for the East Marine Plan**

| Sustainability appraisal requirement | Key elements of the method | Main output | Evidence and engagement required |
|---|---|---|---|
| **Step 1:** Identify other relevant policies, plans and programmes (PPP) and sustainability objectives | Identify and compile relevant information in the context of the wider socio-ecological system, UK's high level marine objectives, and national policy priorities (including any related targets), and regional level PPP. | A table of summary sustainability objectives categorised according to marine planning (sub)themes. See Table . | **Evidence**: Objectives and targets of all relevant policies, plans, programmes (using the MMO National Priorities database as a resource).<br><br>**Stakeholder Engagement**: SAAG Workshop 1 (Part 1) opportunity for regional experts to ensure key regional objectives are included. |
| **Step 2:** Collect baseline information | Collation of baseline data. | Fully searchable baseline database. | **Evidence:** Baseline database, containing available baseline data, key issues and data gaps.<br>**Stakeholder Engagement**: Database available for comment to SAAG membership. |
| **Step 3:** Identify sustainability issues and problems. | Determine the importance of assets (for biodiversity, the delivery of specific ecosystem services and national policy priorities) and assess the level of risk to asset status and continued delivery of services. | Asset risk status informed by an asset risk register.<br>Identification of potential sustainability issues and problems for wider topic areas. | **Evidence:** Initial risk register<br>**Stakeholder Engagement:** SAAG Workshop 1 (Part 2 – 60mins) with regional experts to sense-check and adjust for key regional issues. |
| **Step 4:** Develop sustainability appraisal framework. | Define the criteria against which the plan options will be evaluated, with, where appropriate, specific. | **Scoping Report Cards** scoping report. | **Stakeholder Engagement:** SAAG Workshop 2 – brief review of the scoping report to facilitate comment and feedback. |

| Sustainability appraisal requirement | Key elements of the method | Main output | Evidence and engagement required |
|---|---|---|---|
| | objectives, indicators and targets | | |
| **Step 5:** Collect evidence for assessment of the draft East Marine Plan and alternatives. | Identify assets, ecosystem services, goods and benefits. Select indicators for, and collate data on, quantity and quality, including trends and spatial elements, where available and appropriate. | An asset register showing (where possible) current status, trends and distribution/extent with regional application shown.<br><br>An ecosystem services inventory, showing potential in the region and known information on use/demand, value and regional importance.<br><br>An asset-service matrix showing which services are supplied by which assets. | **Evidence***:* Asset and ecosystem service classifications, information on status, trends, distributions, which assets supply which ecosystem services (asset-service matrix) and known use or demand for ecosystem services in the east marine plan area.<br><br>**Stakeholder Engagement*:*** SAAG Workshop 1 (part 1) with regional experts to sense-check and adjust for regional data.<br><br>SAAG Workshop 1 (part 2) confirmation of status and trends of assets and to bring in regional importance of assets and services. |

The SA framework integrates guidance provided within Sustainability Appraisal for Marine Plans: a natural capital methodology (MMO1315[9]) on the relationships between natural capital assets recognised to exist within the east marine plan areas and the environmental topic-based approach required by the SEA Regulations. The SA framework also integrates the relevant environmental protection objectives of plans and programmes listed within the SA database (see appendix A, SA Database). It has also been developed from the framework used to assess the South East, South West, North West and North East Marine Plans and from information suggested at a SAAG (see Section 2.2.2) workshop held on the 29th January, 2024.

Collection of baseline data is an important part of SA. The overall approach to the scoping report was to focus on collecting data and information that is crucial to the decision-making process, correlating and cross referencing this data with the natural capital assets that they represent, and then using this to effectively scope in (and out) those issues that are relevant to the East Marine Plan.

Please note that the word “issues” was used to denote potentially negative issues (challenges) and positive issues (opportunities) and refers to issues which are significant in helping to set the scope of the SA. This is consistent with SA best practice. The data that has been collated within the scoping report will be subsequently updated as the assessment progresses and will continue to be used to develop the evidence base to support both the options assessment and the draft plan assessment stages of the SA.

### 2.3.2 Stage B: Assessing the Options

The SEA Regulations require that the assessment identifies and evaluates reasonable ‘alternatives’ to what is proposed within the plan. Please note that this report uses the terms options and alternatives interchangeably.

Good practice is to consider reasonable, realistic and relevant alternatives which are sufficiently distinct to enable a meaningful comparison of their different environmental effects.

This stage will involve assessment of the alternative options against the SA framework, taking into account the evidence base provided within the SA database.

### 2.3.3 Stages C and D: Preparing the SA report and undertaking consultation

The SEA Regulations require that an assessment is carried out on the plan as it is developed and a statutory environmental report (a SA report under the English planning system) is produced and consulted on alongside each iteration of the plan. Therefore, a full draft SA report will accompany the draft East Marine Plan for consultation later in 2026, setting out the methodology, potential significant positive, negative or uncertain effects and proposed mitigation.

### 2.3.4 Stage E: Monitoring the effects of the plan

The SEA Regulations require that the significant environmental effects of plans and programmes be monitored. This intends to allow the early identification of unforeseen adverse effects so that appropriate remedial action can be taken.

[9] Unpublished at the time of this scoping report’s publication.

Therefore, monitoring undertaken for the East Marine Plan as part of the SA, and as part of the implementation and monitoring of the adopted East Marine Plan, should help to:

- monitor the potential significant effects of the final East Marine Plan
- track whether the East Marine Plan has had any unforeseen effects
- ensure that action can be taken to reduce/offset the significant negative effects of the plan

The requirements of the SEA Regulations focus on monitoring the significant and unforeseen effects of the East Marine Plan. Therefore, the SA monitoring framework should be focused only on monitoring those effects which are significantly negative or uncertain.

The East Marine Plan process will itself include a comprehensive monitoring programme which is focused on the achievement of the plan's objectives. This monitoring programme will enable the MMO to track the success of policies and also to monitor the baseline environmental, economic and social conditions of the east marine plan areas. The monitoring also contributes to the three-yearly reporting to parliament, which in turn provides a mechanism for reviewing and amending the plan or individual policies. The final monitoring programme for the SA will be included within the SA adoption statement. The MMO will publish their approach to monitoring the East Marine Plan separately, following adoption of the plan.

# 3 Review of policies, plans and programmes

To evaluate compliance, best practice and consistency with existing relevant PPP, relevant documents and core commitments potentially applicable to the East Marine Plan have been identified as part of this scoping report. This initial review has focused on identifying changes to the overarching legislative and policy framework which have occurred since the adoption of the original East Marine Plans in 2014. This review has also looked at sector relevant plans and policies particularly relating to energy, climate and renewables. Plans and policies from other key sectors and topics were also identified where considered relevant. This initial list will be updated, and the specific relevance of objectives and commitments will be further reviewed during preparation of the SA and following additional refinement to the emerging updated draft East Marine Plan.

Following the publication of the third monitoring report on the 2014 East Marine Plans in 2023, the MMO completed project East Marine Plan Spatial Assessment (MMO1274), a spatial assessment of the east marine plan area with the aim of understanding whether the geography of the east marine plan areas was suitable for supporting different sectors and to identify potential policy trade-offs. The study focused on eleven industry sectors within the east marine plan area:

- energy production (renewables – with a focus on offshore wind)
- energy production (oil and gas)
- carbon capture, usage and storage (CCUS)
- dredging and disposal
- aggregate extraction
- ports and shipping
- aquaculture
- tourism and recreation
- coastal change and flooding
- fisheries (MMO1274)
- environment (MMO1274)

As a result, the MMO has identified a series of national policy priorities which have been integrated in the policy review completed to inform this scoping report. The full policy review is included in appendix A and is summarised below.

Policy changes since 2014 have included, but were not limited to, the adoption of the North East, North West, South East, and South West Marine Plans by the Secretary of State for Environment, Food and Rural Affairs in June 2021. These more recent marine plans were developed using an evolved marine planning process and captured changes in legislation and national strategic objectives since the adoption of the plans.

More recently, the British Energy Security Strategy was published in April 2022. The strategy builds on the 10 point plan for a green industrial revolution (published 18 November 2020) and Net Zero Strategy: Build Back Greener (published 19 October

2021). Together, the strategies set out the government's long-term vision for energy development and security, as well as how it intends to meet its net zero targets. The legislative mechanism for realising the aims of the British Energy Security Strategy and Net Zero Strategy will be delivered through the Energy Act 2023 which received royal assent on 26 Oct 2023.The UK Government are currently in the process of creating a Strategic Spatial Energy Plan (SSEP). The SSEP will define the optimal location of generation and infrastructure required to meet forecast demand and our 2050 targets. This will allow us to provide industries with the certainty they need and enable the creation of a transmission network blueprint in the Centralised Strategic Network Plan (CSNP).

As part of Offshore Wind Leasing Round 4, The Crown Estate may proceed with the plan on the basis of a derogation (a process which enables plans or projects to progress if certain tests are met, while ensuring any environmental impacts are fully offset through environmental compensatory measures). This is due to the inability to rule out adverse effects on two of the protected sites forming part of 'the national site network' (Flamborough and Filey Coast SPA due to the potential impact on the kittiwake feature and the Dogger Bank SAC due to the likely impact on the sandbank feature of that site). The decision to invoke the IROPI test recognises that unacceptable impacts will result on existing marine protected areas (MPAs), necessitating strategic compensation to offset. However, this will reduce the environmental headroom in and around existing MPAs, resulting in potentially significant implications for other marine activities. It will be the marine plans and marine licensing regime that will need to manage these implications, given the derogation decision does not take into account indirect or consequential impacts on other marine activities. This is likely to represent a fundamental test of the marine planning system during the next 15 years - and this decision will also influence where activities take place during this period, most likely having to be concentrated into smaller areas of sea space.

Alongside offshore wind, oil, gas, and CCUS industries are expected to help meet the UK's energy demands and net zero targets. The role of these industries in driving North Sea energy transition is regulated by the North Sea Transmission Authority, which was vested in March 2022. The Levelling-up and Regeneration Act 2023 represents another legislative change and makes provisions for setting levelling-up missions. Together with other future planned changes to national policy, the Levelling-up and Regeneration Bill has implications for the integration of marine and terrestrial planning systems.

The Environmental Improvement Plan 2023 (EIP) outlines environmental ambitions for the English marine environment. Relevant targets included within the EIP include: ensuring that 70% of designated features in MPAs are in favourable condition by 2042 (with the remaining 30% being in recovering condition) and restoring 15% of priority habitats along the English coast by 2043, including meadow, marsh and reef in estuarine and coastal habitats.

Finally, the EU Marine Strategy Framework Directive (MSFD) has been incorporated into the UK Marine Strategy, part three of which constitutes the UK Programme of Measures. The UK Programme of Measures outlines the measures that contribute towards Good Environmental Status (GES) in UK seas.

Please see appendix A for the detailed list of relevant policies plans and programmes considered in the PPP review.

# 4 Baseline information

## 4.1 Overview

The following sections of this report summarises known baseline conditions within the east marine plan area for each of the SA topic areas explored. These topic areas are arranged into natural capital categories to mirror the natural capital approach, specifically:

- environmental assets i.e. biodiversity, cultural heritage, geology, landscape/seascape and water
- services, uses and benefits – including communities, health and wellbeing and economy
- risks and impacts – including climate and pollution

This summary of environmental conditions has then been used to characterise, inform and frame the environmental conditions within the east marine plan area within the context of the natural capital assets (Section 6: natural capital evidence base). Key baseline information and/or issues which have been identified within the east marine plan areas are detailed in the scoping report cards. Mapping of baseline information and/or issues is also provided within the scoping report cards.

# Environmental Assets

## 4.2 Biodiversity

Baseline information and/or issues which have been identified for this SA topic are detailed in the scoping report cards.

Biodiversity and natural conservation interests in the east marine plan area are complex and extensive. Much of the plan area is covered by MPA designations including SPAs providing protection to an assemblage of coastal and marine birds and SACs designated for the protection of a range of seabed habitats as well as the Southern North Sea SAC for the protection of harbour porpoise. MCZ designations are also present, including for the protection of specific benthic habitats such as Cromer Shoals Chalk Beds MCZ and a mosaic of seabed habitats are represented within the Holderness Inshore MCZ and Holderness Offshore MCZ (which span across the east marine plan area). The condition of a number of MPA's is declining however, a lot of sites are moving further away from their conservation objectives and some are now requiring strategic compensation measures in order for developments to proceed within them. Further information relating to designated sites is included within the scoping report cards.

The plan area supports important populations of seabirds and marine mammals, as well as providing valuable spawning and nursery habitats for fish species. Many of these species are of commercial importance to the area's extensive fishing industry. Further characterisation of species and populations of importance within the east marine plan area is included within the scoping report cards.

The UK MSFD part three: UK programme of measures outlines the measures that contribute towards GES in UK seas. The GES status of a number of biodiversity indicators in the east marine plan area is as follows, as according to the UK Marine Online Assessment Tool (2019):

- GES has not yet been achieved for sublittoral rock and biogenic habitats. The achievement of GES is uncertain for intertidal and soft sediment habitats
- the UK has achieved its aim of GES for grey seals in the Greater North Seas, however harbour seals in the Greater North Sea have not yet achieved GES
- the UK has not yet achieved its aim of GES for non-indigenous species. The ability to detect new non-indigenous species has improved but there has been no significant change in the number of new records of non-indigenous species made between 2003 and 2014
- the achievement of GES for underwater noise in the UK is also uncertain. Research and monitoring programmes established since 2012 have provided an improved understanding of the impacts of sound on marine ecosystems
- the UK has achieved its aim of GES for contaminants in seafood

### 4.2.1 Anticipated baseline evolution over plan duration

Within the timeframe of the East Marine Plan implementation, changes to the natural environment including those arising as a result of climate change may be anticipated. These may include (but will not be limited to) the following examples:

- rising sea temperatures causing changes to the plankton community, which underpins many aspects of the natural ecosystem within the marine plan area,
- broad scale changes to habitats and species as a result of rising sea temperatures,
- mismatch between predator and prey key lifecycle timings as a result of changes in marine physical environment including sea temperature,
- ocean acidification and other changes in the marine physical environment resulting in changes in habitat composition, condition or total loss, with resultant ecosystem changes in prey availability etc,
- effects of pollution from marine activities (aquaculture, shipping, oil and gas, marine construction) on benthic and intertidal habitats and species, including cumulative impacts from increasing levels of contaminants and risk of high-level mortality from oil spills,
- fishing activity affecting biological viability of fish stocks (eg 48% Atlantic fish stocks being fished above maximum sustainable yield and total allowable catch is being set on average 7% higher than International Council for the Exploration of the Sea advice),
- deteriorating intertidal sediment habitats due to cumulative effects associated with historical land claim, presence of coastal structures, non-native species and beach litter,
- nature based solutions, such as the restoration of salt marsh, sea grass, kelp, native oysters, and biogenic reef habitats, can contribute to carbon sequestration as they act as blue carbon sinks,
- underwater noise from human activities, including (but not limited to) shipping, dredging, and recreational boating may affect marine species in a variety of ways. Megafauna may be affected due to the masking of sounds used to communicate and find food; a reduction in foraging efficiency as a result of increased dive time to avoid vessels; physical injury; and impacts to reproductive capacity. Fish and shellfish may be affected due to changes to migration patterns, methods of communication, and reproductive capacity,
- sea level rise and coastal squeeze, as a consequence of climate change, is likely to lead to changes in the condition of intertidal habitats, as well as their loss. This will impact the extension and retraction of the ranges of different intertidal species, potentially leading to a loss of intertidal feeding sources for ornithology. This is also likely to reduce the ability of the habitat to sequester carbon, particularly as restored saltmarsh has a lower sequestration ability than natural saltmarsh,
- Marine Net Gain (MNG) is likely to come into legislation within the plan period. Consultation on what MNG could include revealed that stakeholder perceived the most important ecosystems services to be those related to fisheries, maintaining nursery habitats and climate regulation, and therefore MNG should be focused around these services. Consultation also revealed that

stakeholders would like fish, birds and marine mammal targets to be included within MNG

- as part of Offshore Wind Leasing Round 4, The Crown Estate may proceed with the plan on the basis of a derogation due to the inability to rule out adverse effects on two of the protected sites forming part of 'the national site network' (Flamborough and Filey Coast SPA due to the potential impact on the kittiwake feature and the Dogger Bank SAC due to the likely impact on the sandbank feature of that site). However, this will reduce the environmental headroom in and around existing MPAs, resulting in potentially significant implications for other marine activities. Strategic compensation measures will subsequently be required to offset any anticipated impacts.

## 4.3 Cultural Heritage

Heritage assets in the east marine plan area include both designated and non-designated assets ranging in significance to include assets of national and international importance. The east marine plan area also includes previously unknown but highly significant heritage assets. Baseline information and/or issues which have been identified for this SA topic are detailed in the scoping report cards.

### 4.3.1 Designated Heritage Assets

Within the east inshore marine plan area there are numerous designated heritage assets including scheduled monuments, listed buildings, registered parks and gardens (within estuaries and tidal rivers), conservation areas, and military protected wrecks (Exmoor, Vortigern, Umpire, The Xanthe, The Seagull and Amphion). Within the east offshore marine plan area there are no designated heritage assets.

### 4.3.2 Non-designated Heritage Assets

Whilst there are no designated heritage assets in the east offshore marine plan area, this does not indicate an absence of significant heritage assets, as non-designated heritage assets that are of equivalent significance to designated heritage assets may be present in the offshore area. For example, development over the Dogger Bank complex is revealing prehistoric land surface/final stage terrestrial evidence (peat) relating to late Devensian/early Holocene climatic change and inundation, which can be found within and exposed through contemporary seabed. As a result, post late glacial maximum heritage assets are being revealed.

For heritage assets within marine plan areas, marine plans could have an important role in supporting positive strategies on place-making, wellbeing, regeneration and marine tourism etc. Equally, marine plan policies that do not take into account heritage assets in the vicinity of marine plan areas could undermine or detract from such social and economic benefits. Marine planning represents an opportunity to manage the historic and natural environment together in a holistic and strategic manner across all plan areas, given the commonality of issues and impacts that may arise from natural or anthropogenic change.

### 4.3.3 Anticipated baseline evolution over plan duration

Within the timeframe of the East Marine Plan implementation, there are likely to be the following changes to the environment:

- erosion of shorelines and of intertidal surfaces will damage or destroy heritage assets of all forms, both designated and undesignated,
- erosion of shorelines and intertidal surfaces will potentially reveal hitherto previously unknown but highly significant heritage assets. This provides opportunities to foster public interest and participation in heritage assets,
- changes in sedimentation, especially the movement of bedforms, will result in heritage assets being uncovered and exposed to damage, whilst other heritage assets that are currently visible will become buried and inaccessible,
- increasing sea temperatures may prompt greater damage to submerged heritage assets as a result of biological and chemical changes in their environment,
- the marine historic environment is benefitting from improvements in policy provision, particularly with respect to the decisions and actions of public authorities and control through licensable activities – the continuation of this is dependent on continuing investment in regulatory and curatorial capabilities and data and information accessibility,
- streamlined marine licensing required by archaeological activities will facilitate investigation and awareness of the marine historic environment, especially amongst volunteer groups,
- greater recognition of the value of the marine historic environment in social and economic terms should result in increased benefits being achieved in coastal communities,
- restrictive licencing within the expanding network of MPAs could curtail archaeological investigations in these areas,
- there is likely to be increasing sensitivity to proposed developments within the marine plan areas that affect the setting of heritage assets on the coast.

## 4.4 Geology

The geology SA topic encompasses coastal features and processes, seabed substrates, and bathymetry. Baseline information and/or issues which have been identified for this SA topic are detailed in the scoping report cards.

### 4.4.1 Coastal Features and Processes

There is extensive coastal erosion around the UK, particularly in the East of England due to the presence of low-lying land that alternates with soft glacial rock cliffs. This is at least in part caused by the presence of ‘hard’ coastal defences such as seawalls, which is leading to ‘coastal squeeze’ and decrease of the intertidal area. Rising sea-levels and the increased frequency of extreme weather events, as a result of climate change, are also contributing to increased rates of coastal erosion.

### 4.4.2 Seabed Substrates and Bathymetry

Broadscale topographic and bed-form features within the east marine plan area include subtidal sediment banks, shelf mound/pinnacles and shelf troughs. Sediments include subtidal coarse sediment, subtidal mixed sediments, subtidal sand, peat and clay exposures, intertidal sand and muddy sand, and subtidal coarse sediment. The bedrock in the inshore east marine plan area is dominated by chalk and mudstone bedrock.

Development activities (eg aggregate extraction, fisheries, capital dredging, port expansion, cable and pipeline installation, renewable and other energy structures) have all had varying degrees of effect on the seabed and related habitats, including the alteration of sediment and physical processes, which have the potential to generate environmental issues.

### 4.4.3 Anticipated baseline evolution over plan duration

Within the timeframe of the East Marine Plan implementation, there are likely to be the following changes to the environment:

- geological timeframes are long and it is the dynamic coastal zones which are most likely to change over the plan period where natural processes resulting in erosion/deposition are influenced most strongly by human activity. With both steeping of intertidal profiles and rates of coastal erosion expected to increase in the future, coastal squeeze and associated habitat loss may well be accelerated by continued sea level rise. Local and regional factors, including coastal management strategies (and funding), will also be important considerations in future outcomes,
- there are five Shoreline Management Plans (SMPs) covering the east marine plan area: Flamborough Head to Gibraltar Point; Gibraltar Point to Hunstanton; Hunstanton to Kelling Hard; Kelling Hard to Lowestoft; and Lowestoft to Felixstowe. The majority of the preferred management options for coastal erosion from the SMPs within the east marine plan area are hold the line, particularly at Bridlington, Hornsea and Felixstowe, and managed realignment particularly along the Norfolk coastline (eg Cromer). Lowestoft incorporates a mixture of both management options. There are also large sections of no active intervention (NAI) at Hollesley Bay, and between Flamborough and Withernsea. The policy of NAI across many undeveloped sections of coastline will see the dynamic nature of the coast sustained, and likely accelerated due to climate change. Some natural, geological and archaeological assets may be lost to the sea (coastal squeeze), whilst new ones will be revealed,
- managed realignment is likely to increase in the future as a key management strategy and although this will result in increased local erosion rates, the enhanced erosion may benefit other sections of coast by reducing erosion or even causing accretion. Adaptation and realignment are emerging as the key coastal management concept to cope with coastal erosion, with novel approaches already being explored in some areas,
- there are clear links to economic activity, as increased activity in the coastal zone can potentially lead to changes to coastal and sediment processes in particular. The more notable activities in the east marine plan area include coastal developments (ports and hard coastal defences), growth (or otherwise) of our coastal communities and development of offshore renewable energy projects. Predicting such change is extremely difficult and macro-political and economic drivers become important in directing such activity,
- sea level projections to 2300 suggest that UK sea levels will continue to rise over the coming centuries under all representative concentration pathways

climate change scenarios. This will lead to increased steeping of intertidal profiles and coastal erosion across the coastline, leading to habitat loss,
- there will be increased levels of beach replenishment required along coastal frontages in the east marine plan area to protect sensitive environments, communities and key economic infrastructure,
- The National Flood and Coastal Erosion Risk Management Strategy 2020 highlights how risk management authorities should utilise nature-based solutions to improve resilience to flooding and coastal processes.

## 4.5 Landscape/Seascape

This SA topic considers the potential effects on the seascape and landscape within the east marine plan area. There are no SA sub-topics for seascape and landscape. Baseline information and/or issues which have been identified for this SA topic are detailed in the scoping report cards.

The visual impacts of developments on the landscape and/or seascape have the potential to influence views in different ways; affect the setting of heritage or cultural assets; and potentially reduce local revenue. Potential sensitive receptors include both residents and tourists of an area of coastline or at sea. The setting of these locations may be affected through development, and therein, the perception of these landscapes or seascapes may also be affected. Alteration of setting may impact designated landscapes, non-designated landscapes and cultural/heritage assets for which there are particular cultural associations.

The present seascape is influenced by a diverse array of fixed and transient activities, for example, shipping and aggregate extraction, among other activities. Some of these may have strong cultural associations, such as fishing.

All marine plan areas have overlapping designations that affect the coast and these include national parks (The Broads National Park), national landscapes (Suffolk Coast and Heaths and Norfolk Coast National Landscape; the Lincolnshire Wolds National Landscape are adjacent to the plan area) and heritage coasts (Suffolk Heritage Coast, North Norfolk Heritage Coast, Spurn Head Heritage Coast and Flamborough Headland Heritage Coast). 10 marine character areas have been identified within the east marine plan area.

### 4.5.1 Anticipated baseline evolution over plan duration

Within the timeframe of the East Marine Plan implementation, there are likely to be the following changes to the environment:

- climate change is likely to have an impact on coastal landscapes and this could particularly affect protected landscapes,
- the seascape and coastal landscape will continue to change on different timescales through shoreline changes such as inundation, erosion and development (eg energy, industrial and port developments), which could impact views and people's sense of place and historic associations.

SMPs will take a long term view on options for managing dynamic coastal systems which will influence perceptions of seascape.

## 4.6 Water

The water SA topic encompasses tides and currents, water temperature and salinity and marine litter. Water pollution is discussed in Section 4.10.2. Baseline information and/or issues which have been identified for this SA topic are detailed in the scoping report cards.

### 4.6.1 Tides and Currents

Many activities proposed within the east marine plan area could potentially have an impact on currents and the tidal regime, and climate change scenarios could exacerbate the impacts of tides and currents on coastal areas.

### 4.6.2 Water Temperature and Salinity

Changes in water temperature and salinity are predicted due to climate change. It is predicted that the seas in the east marine plan area will continue to rise in temperature. Warming in the east has been identified to be between approximately 0.3 and 0.5°C per decade, over the last 3 decades. There is considerable uncertainty regarding future salinity however. Most 21st century projections suggest UK shelf seas, and the adjacent Atlantic Ocean, will be less saline than present, driven by ocean circulation changes in response to climate change.

### 4.6.3 Marine Litter

Marine litter is found across all parts of marine, coastal and estuarine areas, including on the sea surface, in the water column, on the seabed and on beaches. Marine litter takes many forms, including (macro) litter, microplastics and nanoplastics.

Litter on UK beaches is a particular problem as its geographical location exacerbates the problem, in part due to the English Channel being one of the busiest shipping lanes in the world; proximity to the industrialised nations of northern Europe; and as a result of proximity to the Atlantic gulf stream. According to the 2023 Great British Beach Clean Survey, 167 items of litter were found per 100m of beach in England, which is an 1.2% increase from 2022. The most commonly found items where plastic pieces between 2.5 and 30cm.

### 4.6.4 Anticipated baseline evolution over plan duration

Within the timeframe of the East Marine Plan implementation, there are likely to be the following changes to the environment:

- all of the UK regions will continue to increase in temperature. In the surface waters, the temperature is predicted to increase by between 1.5 to 3.5°C
- even if all sources of plastic were to immediately stop, the number of microplastics would continue to increase due to fragmentation
- it is predicted that there will be a 3-fold increase in the amount of plastic in the sea between 2015 and 2025, with the full implications still unknown

# Services, uses and benefits

## 4.7 Communities, Health and Wellbeing

Baseline information and/or issues which have been identified for this SA topic are detailed in the scoping report cards.

### 4.7.1 Communities, Health and Wellbeing

Coastal areas provide physical health and wellbeing benefits to communities through coastal walking and outdoor swimming, as well as mental health and wellbeing benefits. Access to estuarine, coastal and marine areas, both physical (adequate footpaths and slipways) and interpretative (signage, information boards), in the east marine plan area can be spatially variable.

Coastal communities are particularly dependent on the marine environment as a means of employment or other income generation (eg through tourism). Fishing helps to shape the identity of many coastal communities, including through attracting tourism to fishing ports and local seafood. Communities dependent on fisheries and tourism are particularly vulnerable to change, largely due to increased competition between fisheries and other plan areas, as well as the seasonal nature of tourism. There is also a need to address socio-economic deprivation of coastal communities. Potential receptors which may be affected as a result of changes within the east marine plan area include:

- declining fishing and other traditionally skilled communities,
- low paid, low skill workers, unemployed and under-employed people in coastal communities,
- households affected by multiple forms of deprivation.

There are opportunities for employment through emerging sectors, such as maritime renewables and CCUS sectors, particularly in construction and maintenance within the east marine plan area.

Employment and skills levels can be connected to the wellbeing of communities in that higher levels of employment and educational achievement could correlate with people's health, such as the proportion of the population who describe their health as 'good' in census returns. Part of this effect could be related to the higher level of physical activity in more affluent groups. Effects on protected equality groups can relate to employment inequalities and patterns relating to gender and age groups.

### 4.7.2 Anticipated baseline evolution over plan duration

Within the timeframe of the East Marine Plan implementation, there are likely to be the following changes to the environment which may affect communities, health and wellbeing:

- climate change leading to coastal squeeze could have adverse effects on local communities, due to loss of housing and infrastructure,
- existing issues of isolation of coastal towns due to lack of infrastructure, transience, ageing populations and deprivation relating to income and

employment in coastal communities may continue in the future but efforts are being made to address these issues through the funding of projects via the Coastal Community Fund. With this investment, jobs numbers and the quality of jobs could improve.

## 4.8 Economy

The economy SA topic encompasses ports and shipping, fisheries and aquaculture, leisure/recreation and tourism, marine manufacturing, defence, aggregate extraction, energy generation and infrastructure development (renewables, carbon capture, usage and storage, nuclear and fossil fuels) and seabed assets (cables, outfalls and pipelines). Baseline information and/or issues which have been identified for this SA topic are detailed in the scoping report cards.

### 4.8.1 Ports and Shipping

Shipping is an essential and valuable economic activity for England, including significant ship movement around the English coastline in addition to ship movement into and out of English ports. The primary driver for ports, shipping, dredging and disposal is economic growth. Maritime UK, trade body for the maritime industry, reported that the sector directly contributed £17 billion to the economy in 2017. Ports continue to play an important part in local and regional economies through tourism, recreation and job creation. Ports are also key enablers for other activities, such as offshore renewable energy development, or the import of construction aggregates to support wider economic activity.

Maritime 2050 aims to establish 10 freeports as national hubs for global trade and investment across the UK, to promote regeneration, job creation and hotbeds for innovation. Two of these freeports have been developed completely or partially within the east marine plan area: Humber Freeport and Freeport East (Felixstowe and Harwich).

### 4.8.2 Fisheries and Aquaculture

Key drivers for the aquaculture sector include economic development, particularly for rural communities; food security to help meet the increasing global demand for seafood as wild capture fisheries plateau; market supply and demand, technological developments to enable the industry to move offshore to suitable sites where production can be increased and, for the shellfish sector and the availability and supply of spat/seed. The farming of seaweed as a food or fuel is a growing part of the fisheries and aquaculture sector.

The east marine plan area contains around 115 main seafood processing hubs, across the Humber and East Midlands. Shellfish production is an important part of the aquaculture sector, particularly blue mussels, and pacific oysters, but also scallops and native oysters. There are 15 registered shellfish production sites located in the east inshore marine plan area.

Sustainable fish stocks have the potential to maintain a prosperous and efficient fishing industry and provide social, cultural and economic benefits to often fragile coastal communities. Changes to fishing activity can subsequently lead to communities facing related social, economic and environmental impacts.

### 4.8.3 Leisure/Recreation and Tourism

Marine and coastal tourism and recreation is socially and economically important to England and the UK as a whole. Activities such as visiting the beach, walking, pleasure boating, sailing, recreational diving (including diving on wrecks), sea angling (including on wrecks), kayaking, and surfing, as well as exploration of underwater and coastal heritage assets, can generate a considerable amount of income for the economy. Marine and coastal tourism and recreation can be a mainstay for many coastal towns, supporting their quality of life, and providing health and wellbeing benefits, with many local businesses relying on the marine environment for their livelihoods. These activities will be enhanced by a well-managed and healthy marine environment, attractive and well-maintained beaches, seashore and clean bathing water.

### 4.8.4 Marine Manufacturing and Seabed Assets

The marine manufacturing sector encompasses marine systems, equipment, design, manufacturing, engineering and architecture. UK's marine manufacturing sector is recognised globally for its skills and expertise in building naval vessels and submarines, high-end leisure ships, marine equipment systems for international shipping and autonomous systems.

Electrical interconnection with other nations contributes to UK energy security, affordability and decarbonisation objectives. Future trends and developments in telecommunication cables are likely to be focused on extending the global reach of the submarine networks, investing in higher capacity circuits and increasing resilience by diversity and the operation of networks over a number of different cables.

### 4.8.5 Defence

The primary drivers for the defence sector are political. Prime Minister Keir Starmer has launched a Strategic Defence Review, which will report in the first half of 2025. This is in response to the urgency of threats facing the UK. The review will utilise views from experts including military personnel, industry and academics.

### 4.8.6 Aggregate Extraction

The UK has some of the best marine aggregate resources in the world. Marine sand and gravel make a crucial contribution to meeting the nation's demand for construction aggregate materials, essential for the development of our built environment. Marine aggregate also contributes to energy security and economic development through provision of fill for major coastal and inland infrastructure projects, for example ports, renewable energy and nuclear energy projects. There is likely to be a growing demand for offshore marine aggregate material to support large scale coast defence schemes, to protect communities and key infrastructure such as the Bacton Gas Terminal.

### 4.8.7 Energy Generation and Infrastructure Development

This sub-topic considers renewables, carbon capture usage and storage, nuclear, and fossil fuels. In 2023, renewables accounted for 43% of the UK's electricity generation, with offshore wind making up a significant proportion of this. The UK currently has 14,679 MW of operational offshore wind (equivalent to 2766 turbines). Operational offshore wind farms in the east marine plan area have a combined

capacity of almost 7000 MW. The plan area subsequently delivers over 50% of England's current offshore wind capacity at present. Further offshore wind farms are currently in/awaiting construction- including East Anglia TWO (900MW), East Anglia THREE (1200MW), East Anglia ONE North (800MW), Hornsea 3 (2.9GW) and Sofia (1400MW). Existing offshore wind farms, including Sheringham and Dudgeon, are also being extended. New and amended offshore wind farms will contribute further to the offshore wind capacity of the east marine plan area.

A renewable energy plant has recently been granted permission for development within the east marine plan area, on the coast of Lincolnshire. The plant will export 80MW of renewable energy to the National Grid, created from Advanced Thermal Conversion using energy from waste. The process will refuse derived fuel, which consists of pre-processed non-recyclable household waste. The plant will power 206,000 homes.

In 2023 nuclear accounted for 13% of the UK's electricity generation. Sizewell B nuclear power station is currently in operation in the east marine plan area. The development of Sizewell C nuclear power station is proposed, and if approved will create thousands of local jobs and contribute around £4 billion to the regional economy. The government is also currently in discussions with communities which could host a geological disposal facility, one of which is in the east marine plan area (Theddlethorpe).

The UK offshore area is also thought to be one of the most promising hub locations in Europe for permanent storage of carbon dioxide. The expectation is that storage in the UK will take place almost exclusively offshore, which in turn will require the necessary infrastructure (such as pipelines and offshore structures) to be installed to transport carbon dioxide from the mainland and inject it deep below the seabed. Twelve companies secured a total of 20 licences as part of the UK's first-ever carbon storage licensing round. The Wash has recently been approved for CCUS licenses. The East Coast Cluster has been named as one of the UK's first CCUS clusters. Potential projects for CCUS in the east marine plan area include the Humber and Yorkshire CCUS project and the Bacton Energy Hub.

In 2023, fossils fuels accounted for 33% of UK electricity, the lowest level since 1957. In 2022, fossil fuels accounted for 79.3% of the UK's total energy generation. 260 fixed platforms and 20 floating oil and gas platforms existed in UK waters in the same year. The majority of UK gas supply comes from the east marine plan area, making it critical for energy security. Future oil and gas licences will be critical to providing energy security options, including unlocking CCUS and hydrogen opportunities. This will be achieved by adopting a more flexible application process, meaning licenses could be offered near to currently licensed areas.

### 4.8.8 Anticipated baseline evolution over plan duration

Within the timeframe of the East Marine Plan implementation, there are likely to be the following changes to the environment which may affect the economy:

- shipping will continue to provide the only effective way to move the vast majority of freight in and out of the UK, and the provision of sufficient sea port capacity will remain an essential element in ensuring sustainable growth in

the UK economy. The government port forecasts show a continued strong growth in the ports sector. There are a number of recent developments in the east marine plan area which will see further development at certain ports, such as Felixstowe,

- wider changes to the nation's energy mix arising from decarbonisation are affecting the ports industry. Changes in energy commodity flows will surely continue, albeit in uncertain ways, but what can be sure is that the English maritime sector will have to remain vigilant and agile if it is to take advantage of the global move to decarbonisation,
- the number of English fishing vessels has been declining since the 1990s and levels of fishing effort have therefore fallen dramatically,
- in terms of aquaculture, trends in the industry are closely tied in with changes in wild fisheries, the availability of investment, and site availability. There is evidence that the aquaculture industry across Europe has stagnated, despite some areas of the UK experiencing growth in the sector. This has led to an increased reliance on fish products from outside the EU,
- under climate change scenarios, sea level rise, more frequent extreme storms and waves, sea temperature rise, and changes to fluvial inputs may affect ecotourism (access to sites in bad weather, decrease in some bird species populations); safety of recreational fisheries during bad weather; coastal tourism during bad weather; integrity of coastal tourism infrastructure; loss or degradation of beaches; and decrease in bathing water quality during storms and operation of combined sewer overflows (CSOs),
- under climate change scenarios, air and sea temperature rise may create benefits through increased ecotourism, increased recreational fishing, increased coastal tourism; and more extreme storms and waves, air and sea temperature rise and coastal flooding creating benefits through increased opportunities for some water sports such as sailing and surfing,
- the future of the manufacturing sector is very much dependent on government subsidies and the performance of the UK and the global economy and this is uncertain,
- the relative importance of dredging areas changes as reserves become depleted and new reserves are developed. There is likely to be an increased reliance on marine-sourced aggregates as traditional land-based sources become more constrained, and beach replenishment becomes more frequent,
- potential new sub-sea cabling to reinforce and better connect certain sections of the inshore grid is a key part of supporting the growth of renewable and low carbon generation,
- although the UK plans to reduce its reliance on fossil fuels, transition will take a significant time and gas will continue to play an important part in the UK fuel mix for years to come. The UK will remain heavily dependent on gas. Consequently, significant investment in new gas infrastructure will be required and unconventional fossil fuel technology will also start to contribute towards supply,
- English waters, and the UK as a whole, have some of the best wind resources in the world. Offshore wind will play an important and growing part in meeting renewable energy and carbon emission targets and improving energy security by 2030, and afterwards towards 2050. Following the development of new offshore wind farms- such as Dogger Bank and Hornsea 3, by 2026 the east

marine plan area could hold combined offshore wind capacity of over 12.6 GW,
- the UK target is to have CCUS deployed in two industrial clusters by the mid-2020s, and a further two clusters by 2030, with an ambition to capture and store 20-30MtCO2 per year by 2030. The east marine plan area has large potential for CCUS due to depleted gas fields,
- the technology to enable wave and tidal energy generation is at an earlier stage of development than offshore wind. However, it is anticipated that the amount of wave and tidal energy being generated will increase in the coming years.
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# Risks and Impacts

## 4.9 Climate

Baseline information summarised in this section covers data relating to greenhouse gas emissions and climate change resilience and adaptation within the east marine plan areas. Baseline information and/or issues which have been identified for this SA topic are detailed in the scoping report cards.

### 4.9.1 Greenhouse Gas Emissions

Emissions from ships are estimated to account for approximately 3% of global $CO_2$ emissions. UK shipping emissions are estimated between 0.8 to 5% of global shipping emissions. The contribution of greenhouse gas emissions to the atmosphere from the maritime industry is contributing towards climate change. Despite an expected increase in global trade, the International Maritime Organisation aims to reduce greenhouse gas emissions from international shipping, to net zero by 2050.

### 4.9.2 Climate change resilience and adaptation

The impacts of climate change are already being observed, and impacts are predicted to continue. The main focus for climate change resilience and adaptation is the inshore marine plan area and will address issues such as coastal inundation and flooding, impacts on communities such as loss of property, risks to wellbeing, improving the resilience of existing coastal defences and developments and loss of intertidal habitat. However, there are some issues which may affect the offshore marine plan areas, including ensuring offshore wind energy development (and any other offshore development) is supported (eg through the allocation of space within the marine plan areas), which will help to meet net zero targets and build resilience to the effects of climate change.

### 4.9.3 Anticipated baseline evolution over plan duration

Within the timeframe of the East Marine Plan implementation, there are likely to be the following changes to the environment:

- the realignment of some coastal infrastructure and housing may be expected. This is a national issue. Around 520,000 properties (including 370,000 homes) are at risk annually from coastal flooding and 8,900 properties at risk from coastal erosion (not taking into account coastal defences)

- future effects of climate change are also likely to include increased storm intensity, increased rainfall, increase in seawater temperature and acidity leading to ecological impacts. Rate of coastal erosion is likely to increase as sea levels rise
- climate change could lead to deeper water in near shore areas, which would in turn cause an increase in wave energy reaching the coast. Impacts of coastal erosion on buildings and infrastructure located along the coast are therefore likely to increase
- over the next 20 years, there will be a need to reduce greenhouse gas emissions in order to meet UK climate legislation. It is envisaged that further development of renewable energy generation including offshore wind farms and wave and tidal energy generation, could contribute to this reduction
- it is expected that there will be opportunities to increase, restore and protect coastal habitats that provide carbon sequestration capabilities such as saltmarsh and seagrass, which will be enhanced through actions such as filling data gaps which currently hinder the inclusion of saltmarsh and seagrass habitats into the UK Greenhouse Gas Emissions Inventory

## 4.10 Pollution

The pollution SA topic encompasses air pollution and water pollution. Baseline information and/or issues which have been identified for this SA topic are detailed in the scoping report cards. These include information of specific geographic relevance to the east marine plan area, but also where appropriate information which helps to characterise the broader characteristics of air and water pollution concentrations in a wider North Sea context.

### 4.10.1 Air Pollution

Shipping is a key contributor of a number of air pollutants to the environment, including sulphur dioxide, nitrous oxide and particulate matter 2.5 due to shipping lanes and engine operation. Air pollution could increase further due to increased shipping activity, port expansion and associated industry growth. The development of offshore oil and gas installations may also contribute to air pollution. As a result, there is increasing pressure upon the maritime sector to reduce its carbon and pollutant emissions. An Emission Control Area (ECA) was established in the North Sea (sulphur oxides), which covers the east marine plan area. To improve the air quality in the east marine plan area further, the government is hoping to extend the North Sea ECA beyond its current geographical limits or establish a new, geographically distinct ECA in UK waters[10]. Designated air quality management areas (AQMAs) are also in place in close proximity to the east marine plan area to help reduce air pollution; there are around 20 AQMAs in place within 10km of the East inshore marine plan. Connecting ships and other vessels to on shore electricity supply at ports and marinas can help reduce emissions through alleviating the need for on board energy generation.

### 4.10.2 Water Pollution

There is a risk of pollution effects in many coastal areas, especially where there have been historical discharges, emissions and losses from high population densities or

[10] Department for Transport (2024). Extending the emission control area to all UK waters.

heavy industry. Water pollution can also be the result of heavy rainfall; increased flood risk from heavy rainfall may lead to overflows from CSOs, in order to minimise the likelihood or severity of flooding. There are around 600 CSOs along the east marine plan area coastline. Large clusters exist around Norwich (121 CSOs) and Hull (96 CSOs). The frequency of heavy rainfall events may be exacerbated by climate change.

### 4.10.3 Anticipated baseline evolution over plan duration

Within the timeframe of the updated East Marine Plan implementation, there following potential changes to the environment may be reasonably anticipated:

- agreed amendments to International Convention for the Prevention of Pollution from Ships (MARPOL) will help improve air quality at ports. There have been substantial reductions in nitrogen oxides ($NO_x$) emissions recorded in recent decades across Europe. From 1990 to 2009 the $NO_x$ emissions in Europe decreased by 31%,
- the MCAA aims to achieve clean, healthy, safe, productive and biologically diverse oceans and seas. It seeks to provide better protection for the marine environment; sustainable use of marine resources; an integrated planning system for managing UK seas, coasts and estuaries; a robust legal framework for decision-making; streamlined regulation and enforcement; and access to the coast. This should subsequently improve the quality of UK waters,
- increased shipping activity, port expansion and associated industry growth could lead to increased sulphur oxides and nitrous oxides emissions at certain coastal locations, which in turn could contribute to the breach of national objectives for air quality,
- hazardous substances in the sea have shown a general decreasing trend, and it is likely these trends will continue overtime, with the continued implementation of ever more stringent regulatory controls. Exceptions are likely to be chemicals of a particularly persistent nature, such as persistent organic pollutants. Sediment contamination is also likely to remain a problem into the future and may present a risk to the water habitat where it becomes remobilised, for example in the North Sea as a result of oil and gas decommissioning operations or in dredging or extraction operations
- wetter winter weather is expected to result in a greater number of overflows from CSOs with potential for water quality issues, in particular eutrophication and microbiological blooms
- climate change resulting in more frequent extreme storms and waves may exacerbate problems caused by pollutants and contaminated sediment disposal sites in the marine environment
- population growth may put more demand on the sewage network and water companies to dispose of waste water
- urban creep may increase the impermeable nature of the catchment and thus promote the rapid response of watercourses to rainfall events

## 4.11 Data Gaps

The following sections highlight the key data gaps which are recorded within the SA database (appendix A).

### 4.11.1 Biodiversity

Key data gaps for biodiversity include:

- work is currently underway to develop a new spatially predictive fish habitat model. This is noted as a UK-wide data gap,
- the status of phytoplankton is currently unknown as there is no assessment threshold for status in place,
- there is currently no assessment methodology to evaluate the status of cephalopods (common cuttlefish) within UK MSFD part two: UK marine monitoring programmes,
- the effects of Artificial sky glow created by lighting from coastal settlements on coastal ecosystems, particularly on symbiotic corals are not fully understood. Further study through the ALICE project may help to address this data gap,
- assessment thresholds (such as the achievement or not of GES) for pelagic fish communities in the Greater North Sea have yet to be concluded,
- the migratory patterns of diadromous fish within the east marine plan areas are currently unknown,
- a call for evidence is currently underway to address data gaps surrounding the impacts of commercial fishing on harbour porpoise and marine birds in offshore MPAs,
- the impacts of avian flu on certain populations of seabirds are not yet known. This is noted as a UK-wide data gap,
- the extent of impacts on marine fauna from the ingestion of marine litter is currently unclear,
- need for more evidence of disturbance to seabirds from vessel activity in terms of severity and longevity of behavioural changes,
- seabird populations are disturbed and impacted by a variety of activities, including disturbance by recreational users, offshore windfarms, bait digging and fisheries bycatch. There are plans for the MMO to collaboratively progress and national marine wildlife disturbance reporting platform, which will also gather information on recreational activities in MPAs,
- emerging data from Natural England will help to address data gaps relating to the most likely causes of decline in seabirds in England. The resulting report will form the English Seabird Conservation and Recovery Pathway (ESCaRP),
- there is a need to fully understand the impacts to benthic habitats and biodiversity from infrastructure, particularly noting the cumulative levels that are now having to be considered due to the scale of ambition from battery energy storage systems,
- there is limited understanding of the MPA network and its condition, due to the limited MPA monitoring that is being undertaken at present.

### 4.11.2 Cultural

Key data gaps for cultural heritage include:

- there is currently no publicly accessible, comprehensive and authoritative dataset available for heritage assets in offshore marine plan areas or for shipwrecks or air wrecks subject to the Protection of Military Remains Act 1986. Some appear to be included in the MMO Explore Marine Plans ‘Historically Significant Shipwrecks’, ‘Military Protected Wrecks’ and ‘Protected Wreck Sites’ though the derivation is unclear,

- there is currently no publicly accessible, comprehensive and authoritative mapping of the potential presence of pre- or post- Late Glacial Maximum heritage assets in the east marine plan area ,
- there is also an absence of comprehensive data on the positive contribution of marine settings to the significance of coastal heritage assets,
- the National Marine Heritage Record, a dynamic dataset that will inform responses to marine planning and contribute to assessments of significance for heritage assets under consideration for statutory protection within the English inshore marine planning areas. Researchers might also consult it for thematic studies to inform conservation. It will relate to heritage assets that lie between Mean High Water and the 200 nautical mile sea limit, as well as the tidal extent (at MHWS tides) of rivers, estuaries and creeks,
- the role of the marine historic environment is rarely identified specifically in the official statistics presented in Taking Part and Heritage Counts, due to the small number of designated heritage assets. This prevents quantification of the baseline for this issue and impedes the identification of actions through which marine planning could augment the social and economic benefits of the marine historic environment,
- there is an absence of comprehensive data on the social and economic value of the east marine plan area historic environment and coastal heritage assets, especially where aspects of value are attributable to the character of marine plan areas.

### 4.11.3 Geology

Key data gaps for geology include:

- more information is needed on how sea-level rise will affect both sediment supply, and sediment transport on UK coasts, and the implications for coastal margin habitats,
- understanding the rates and distribution of coastal erosion and changes to beach dynamics in response to climate change and sea-level rise will be an area for new research and monitoring. The importance of the coastal zone in terms of coastal erosion and flooding, habitats and commercial uses, make this a key area for future work,
- there is little information on seabed composition from very shallow waters, where surveying is slow (‘the white ribbon’). However, the coastal zone is so important in relation to erosion, flooding, habitats, and commercial uses, that this is a key area for future work,
- coastal response to sea-level rise is strongly determined by site-specific factors and usually it is these factors that determine the coastal response, rather than a global change in sea level or a regional change in wave climate. Any predictions of general coastal response due to climate change are therefore rather meaningless and will have a low confidence. However, if a detailed study is conducted and long-term coastal change data are available, then local or regional predictions of coastal response to climate change can have medium confidence,
- more ornithology data is needed in relation to the extents of intertidal coarse sediment, intertidal mixed sediments, intertidal rock, and freshwater and coastal grazing marsh,

- new National Coastal Erosion Risk Maps (NCERM) data will be available before the end of the East Marine Plan planning process.

### 4.11.4 Seascape/Landscape

Key data gaps for seascape/landscape include:

- the concepts of seascape are not fully understood and there is uncertainty about how to consider impacts to seascape in a subnational policy context. The MMO are currently in the process of creating a new seascapes assessment for the east marine plan area, which will include a change assessment. This should provide a better understanding of seascapes, as well as provide a better indication of trends.

### 4.11.5 Water

Key data gaps for water include:

- the main risks to marine life include entanglement of, and ingestion by, marine species and transport of invasive non-native species, but there are currently no agreed assessment tools to quantify the impacts on marine life at the population level from the presence of marine litter,
- seabed litter has been surveyed at only a few sites and data are sparse, which limits the possibilities for an assessment of changes in quantities of litter over time or between regions,
- the government is investing £200,000 in research by the University of Plymouth to improve scientific understanding of how tiny particles of microplastics from car tyre friction on roads make their way into the sea through sewers. This Department for Environment Food and Rural Affairs funded research will close current gaps in the evidence; looking at how microplastics from a variety of sources end up in marine environment and what we can do to tackle this problem in the future,
- the government have commissioned research to better understand how plastic particles from a range of sources including synthetic materials enter waterways and the marine environment, and to analyse their impact,
- current impacts of ingestion on marine life and human health are unknown from marine litter,
- the impacts of desalination works have not yet been fully assessed for the marine environment,
- a number of the suggestions made were looking at potential future measures and not proposing new targets. There is ongoing work and investigation on developing appropriate measures to address most of these issues and these will be consolidated into the upcoming update to the UK MSFD part three programme of measures,
- the issue of fishing gear as a source of marine litter is not yet fully understood. Through The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR), the UK is co-leading a study to improve our understanding of the issue of fishing gear as a source of marine litter across the OSPAR area, including ropes and nets, as a source of marine litter. This study will specifically look at best practices for gear recycling and innovation,
- an indicator for micro litter is currently under development, in order to better understand the impacts,

- the transfer of contaminants from microplastics to the food chain is not sufficiently well established yet and needs further evidence.

### 4.11.6 Communities

Key data gaps for communities include:

- although data is available for employment in the fisheries, marine aggregates, offshore wind and tourism, most employment data is collected from a terrestrial perspective which can make it difficult to isolate marine influences on data metrics
- it should be noted that data and issues relating to coastal communities are difficult to map, particularly at the scale of the marine plans and this is a difficulty identified within the collation of data,
- the need for collaboration and information sharing across areas which face similar challenges, such as seaside towns and communities, remains essential. The government should consider how the valuable work of networks can be built into the planned integration of Local Enterprise Partnerships into local authorities. The government must consult the Local Government Association and interested parties to consider how information sharing and a collective voice can be created for this new integrated structure
- research is currently underway to determine the social impact of coastal management and flooding in the east marine plan area
- the Productive Seas Evidence Group is currently revising the employment numbers for the purposes of the UK Initial Assessment and GES, as the last update was in 2015.

### 4.11.7 Economy

Key data gaps for economy include:

- further research is needed to develop a better understanding of the potential impacts that newer renewable energy technologies might have on potentially sensitive environmental features. Extensive additional work is needed before the effect on flooding, biodiversity and sedimentation transport is fully understood,
- the MMO is undertaking a strategic review of dredge disposal sites around the coast of England to provide additional information to assist future decision making on marine licensing applications. This review will look at the current status of each site, sensitivities and forthcoming designations, and the process for identifying and using disposal sites,
- there is a lack of understanding of the significance of impacts of recreational activities on biodiversity (eg significance of bird disturbance at a population level). There is also a lack of recreational activity data in general – where activities occur, participation levels, activity intensity and frequency. Improving this both for management and marine planning would be useful,
- the potential impacts of decommissioning activities are not well understood, including the extent to which infrastructure can be reused and repurposed. Given the large number of fields that will be reaching the end of their usable life during the lifetimes of the plan this is an important consideration. The

investigation into the impacts of decommissioning is in progress by the North Sea Transition Authority,
- the wide scale introduction of hard structures into soft sediment environments could have cumulative impacts of this on the seabed and these potential impacts are not well understood. The mapping of impacts of cables and their mitigation is in progress by the National Grid,
- there is not a consolidated database on the aquaculture developments in the east marine plan area. This is because the majority of the aquaculture sector is made up of small-scale developments, so it is very difficult to map them all out.

### 4.11.8 Climate

Key data gaps for climate include:

- coastal responses to changes in sea level, extreme storms and waves are complex and localised. Understanding the responses is made more difficult due to reliance on largely conceptual coastal functions. This needs to be addressed through further research
- improved knowledge of how regional patterns in rainfall and winds will change over the next century is needed to understand potential changes to stratification in shelf seas
- waves at the coast are difficult to predict, particularly in models, due to limited knowledge of bathymetry and small-scale physical processes known to influence coastal wave characteristics
- although the processes relating to ocean acidification are relatively well understood, knowledge of impacts on marine species and their ability to adapt to increased acidity is limited
- a lack of long-term records from deep-sea habitats means that there is no baseline against which to assess climate change impacts

local responses to climate change will vary in relation to climate change factors (eg sea level rise and changes to wave heights and directions). There is only low confidence of any predictions at present.

### 4.11.9 Pollution

Key data gaps for pollution include:

- it would be useful to collect more information on sites in the national site network that are sensitive to air pollution. This will be undertaken as part of the HRA screening process. The use of Multi-Agency Geographic Information for the Countryside (MAGIC) and the site relevant critical loads section can be used to inform this process,
- air quality is not routinely monitored at offshore sites so it is difficult to predict the future trends of air quality within offshore plan areas,
- regional data relating to air quality in the east marine plan area is lacking,
- the MMO developed a method for use in the South Marine Plan for providing an assessment of water quality in an area using all available information. This method could be applied to other marine plans, thereby providing a consistent approach. They also reviewed and selected bioremediation techniques that

would be most suitable in areas. Again, these same techniques could be used in other plan areas as ways to improve water quality. Much of the background work has already been carried out,

- current spatial resolution of water quality monitoring is inadequate to assess impacts on all features in the national site network transitional and coastal waters,
- there is a need to also consider the value of sediment transport systems, and their impacts on pollution,
- pollutants, nutrients and the sources of are a reoccurring data gap issue for our protected sites. Water quality information is often limited in scope in terms of sample points and frequency of data collection making it difficult to assess the status of the habitat for any kind of condition assessment or analysis,
- more data is needed to confirm the current issues around water quality and the knock on impacts we are seeing in local wildlife, particularly birds and shellfish.

# 5 Interactions

## 5.1 Environmental Assets

Natural capital assets, ecosystem services and risks to these are intrinsically linked, thus the sub topics presented within the baseline are also heavily linked. This section sets out the potential interactions which may be experienced between topic areas.

### 5.1.1 Potential interactions with other SA topics - biodiversity

The biodiversity of the natural environment underpins the natural capital which supports the broadest range of functions within the east marine plan area. As a result, potential interactions which may occur between the biodiversity SA topic and other topics described in this SA for the East Marine Plan are extensive and may particularly concern climate change, fishing and fisheries, economy, ports and shipping, renewable energy and communities.

### 5.1.2 Potential interactions with other SA topics – cultural heritage

Potential interactions which may occur between the cultural heritage SA topic and other topics described in this SA for the East Marine Plan are:

- nature conservation measures (eg designation of MPAs for benthic and ornithology interest etc.) may have implications for access to heritage assets and/or the conduct of archaeological investigations,
- climate change is having a direct impact on heritage assets on shorelines and in intertidal areas and may be having indirect impacts on submerged material through biological, chemical and physical changes (geology / water quality),
- the marine historic environment is important as a source of economic and social benefits to coastal communities in relation to place-making, seascape, employment, health and wellbeing, regeneration, recreation and marine tourism,
- there is a close relationship between the presence of heritage assets and the character, value and appreciation of landscape/seascape.

### 5.1.3 Potential interactions with other SA topics – geology

Potential interactions which may occur between the coastal features and processes, and seabed substrates and bathymetry SA topics and other topics described in this SA for the East Marine Plan include:

- coastal and sedimentation processes can operate over large areas spanning UK administrative boundaries (England, Wales, Scotland, Northern Ireland) and UK borders (EU and non-EU countries), requiring the co-ordination between devolved administrations and wider governments. Specific large-scale issues relating to contamination of sediments and the overall functioning of habitats which rely on key sediments and substrates are being tackled through EU Directives such as OSPAR with implementation at member state level,
- potential geological storage sites for carbon capture and storage exist within the east marine plan area,
- coastal squeeze is expected to lead to increased intertidal habitat loss, particularly saltmarsh and mud flats, which are also bird feeding grounds,

- coastal erosion is expected to lead to increased loss of land and properties, as well as transport, energy and waste infrastructure. 1/10 historic coastal landfills could erode by 2050 if coastal defences are not maintained, leading to impacts on water pollution, human health, and marine species.

### 5.1.4 Potential interactions with other SA topics – landscape and seascape

Potential interactions may occur between this SA topic and most, if not all, of the other SA topics. The interrelationship between this topic and heritage, climate change, economy, geology, tourism and recreation and energy developments may be the most pertinent. More specifically, seascape and landscape are intrinsically linked to other issues including, but not limited to, archaeological sites, heritage sites and historic landscapes, the latter including prehistoric sites.

### 5.1.5 Potential interactions with other SA topics - water

Potential interactions which may occur between the water SA topic and other topics described in this SA for the East Marine Plan include:

- sea level risk and storminess will impact upon hydrological impacts and could exacerbate the impacts of tides and currents for risk to coastal areas,
- changes in water temperature and salinity are predicted due to climate change. This could negatively impact commercial fisheries as the range and distribution of many marine species will be affected, as well as aquaculture due to a rise in disease and infection, as well as nuisance species. Changes in water temperature may also increase the numbers of people involved in recreational fishing and visitors to coastal area, as well as allow more ships to use Arctic shipping routes with benefits to ports,
- plastics in the environment contain chemical additives which when ingested are introduced into the marine food web, including phthalates and parabens. These do not readily break down and can bio-magnify up the food chain. Plastics also attract chemicals in the marine environment, such as polychlorinated biphenyls, dichlorodiphenyldichloroethylene and nonylphenol. These can have chronic effects on marine organisms. The UK MSFD part three programme of measures outlines a GES target related to the reduction in the number of visible litter items (within specific categories/types) on coastlines, as well as a target of no significant adverse change in the function of different trophic levels in marine food webs as a result of human activities. This includes the consequences of marine litter (microplastics being ingested by marine animals and entering the food web),
- marine litter can act as a vector for non-indigenous species. The UK MSFD part three programme of measures outlines a GES target related to the reduction in the risk of (i) introduction and (ii) spread of non-indigenous species through improved management of high-risk pathways and vectors.

## 5.2 Services, uses and benefits

### 5.2.1 Potential interactions with other SA topics - communities

Potential interactions which may occur between the communities, health and wellbeing SA topic and other topics described in this SA for the East Marine Plan are:

- climate change could increase risks to the wellbeing of people living near the coast due to the impacts from flooding and coastal erosion,
- water quality, air quality and pollution could affect people's health at the coast, including both residents and visitors,
- there are strong links between leisure, recreation and tourism at the coast with the health and wellbeing of residents in these areas. Good health is most prevalent in areas close to the coast and this could be a result of individuals being able to partake in activities to reduce stress and increase physical exercise. However, research findings are uncertain, and it is suggested that a "healthy migrant effect" could exist, whereby healthy (and wealthy) individuals move to the coast, showing a higher ratio of good health to proximity to the coast. This effect should be noted in connection with recreation and leisure,
- there is a strong connection between how seascape character areas are identifiable, protecting and supporting access to heritage, as well as maintaining and enhancing biodiversity with recreation/leisure and health and wellbeing. Historic England has supported research examining individual and community wellbeing and Natural England survey results have found that respondents felt refreshed, relaxed and enjoyed their time in nature[11],
- levels of employment are closely linked to the economy, investment, national policy and market forces which dictate growing and waning industries.

### 5.2.2 Potential interactions with other SA topics - economy

Potential interactions which may occur between the ports and shipping SA topic and other topics described in this SA for the East Marine Plan include:

- dredging is an enabling activity which is essential to the functioning of ports and marinas and can have impacts on water and sediment pollution. Current safeguards have significantly improved the chemical status of the sediments around our coasts. This is due to reductions in the tonnage of contaminants which have been permitted to be disposed of at sea. The UK has achieved its aim of GES for contaminants in seafood. There is a high level of compliance with agreed safety levels,
- ports and shipping can have positive interactions with economic and social topics including job creation and benefits to local fishermen, as well as wider benefits to national, regional or local economies (including tourism and recreation). Despite continuing advances in efficiency, ports remain substantial employers in their own right and they generate and facilitate economic activity in trade-related sectors. In addition, they are essential to

[11] Natural England: Monitor of Engagement with the natural Environment Survey (2009-2012) https://publications.naturalengland.org.uk/file/4871615

support emerging industries such as renewable energy development and carbon capture and storage. Sea ports also play an important role in the tourism and leisure industries, supporting many different forms of economic and social activity, including passenger cruise liners, channel ferries, sea going yachts and dinghies,

- ports and shipping can have some negative interactions with other sustainability topics including the effects of dredging on water quality and biodiversity. Particular impacts might include: impacts to the local hydrodynamic and sedimentary regime including from increased pollution risk (oil spill) and disposal of spoil; increased collision risk or barrier to movement; loss of or disturbance to intertidal habitats; disturbance of historical contamination during capital works; impacts on migratory and juvenile fish; marine mammals, impacts on important bird populations, accidental introduction of invasive non-native species via shipping, and impacts on heritage assets. There may also be potential interactions with protected sites, existing or proposed,
- ports and shipping also have key interactions with other users of marine space including biodiversity for example, displacement of species can result from shipping and has potential consequences to SPAs and SACs, particularly with regards to mobile features,
- there is increased competition for sea space, as a consequence of marine activity being displaced and concentrated by the expansion and growth of offshore renewable energy. This may affect the sea space available for the safe navigation of ships,
- marine plan authorities and decision makers should take into account and seek to minimise any negative impacts on shipping activity, freedom of navigation and navigational safety and ensure that their decisions are in compliance with international maritime law,
- there are particular issues with regard to shipping and offshore renewable energy installations. Navigational safety around such installations is essential and the Government have issued various guidance notes on this issue. There are also issues with regard to keel clearance and tidal stream devices. There are a number of management measures in place to manage interactions between ports, shipping, dredging and other activities,
- interactions exist between ports and energy. Ports have a vital role in the import and export of energy supplies, including oil, liquefied natural gas and biomass, in the construction and servicing of offshore energy installations and in supporting terminals for oil and gas pipelines. Port handling needs for energy can be expected to change as the mix of our energy supplies changes and particularly as renewables play an increasingly important part as an energy source. Ensuring security of energy supplies through our ports will be an important consideration, and ports will need to be responsive both to changes in different types of energy supplies needed (and to the need for facilities to support the development and maintenance of offshore renewable sites) and to possible changes in the geographical pattern of demand for fuel, including with the development of power stations fuelled by biomass within port perimeters.

Potential interactions which may occur between the fisheries and aquaculture SA topic and other topics described in this SA for the East Marine Plan include:

- there are links between fisheries and biodiversity. The UK MSFD part three programme of measures outlines the measures that contribute towards GES in UK seas. GES requires populations of all commercial fish and shellfish stocks to be exploited within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock,
- achieving GES will also involve better managing and mitigating the impact of fisheries on the wider marine environment, such as wider biodiversity impacts. It is however recognised that fisheries management does not fall within the remit of marine planning,
- as well as over-exploitation of commercial fish stocks, fishing activities can have wider environmental impacts, including threats to vulnerable or rare species, including bycatch, and extensive damage or destruction to benthic habitats. Such impacts can often be associated with particular gear types and the intensity of fishing activity. GES has not yet been achieved for sublittoral rock and biogenic habitats. The achievement of GES is uncertain for intertidal and soft sediment habitats,
- fishing can impact on the historic environment. As above, the extent of damage can be dependent on gear types,
- there are links with communities as fishing helps to shape the identity of many coastal communities, including through attracting tourism to fishing ports and local seafood,
- fishing activity is sensitive to changes in other sea uses. Interactions between fishing activity and marine developments and their consequent impacts on fish stock and the environment are complex and need to be considered. Marine developments have the potential to prevent, displace or encourage fishing activities. There are potential social, economic and environmental impacts of displacement of fishing activity caused by other sea uses, particularly if from well-established fishing grounds,
- with regard to aquaculture, the impacts are diverse, reflecting the broad scope of the industry. The precise nature of impacts will vary depending on the nature of the activity and local conditions,
- shellfish and algal culture can improve local water quality through bioremediation, these activities require good quality water if sold for food and the industry recognises the importance of being neutral or positive regarding water quality. Negative water quality impacts are generally lower for shellfish production than finfish production (which is present in Scottish waters but not English waters) as shellfish do not require supplementary feed or antibiotics and are generally low-density cultures. However, it should be recognised that shellfish are considered keystone species and therefore they have the ability to affect the surrounding environment in both negative and positive ways. They influence primary and secondary productivity and can start a series of cascade effects on water column and sediment population and dynamics. Effects can include phytoplankton modification, reduced turbidity, increase ammonium and metals concentration, increased deposition, modification of topography and introduction of invasive non-native species. However, bivalves also have the potential to change topography and provide novel

habitats that would not normally occur and can provide for a diversity of species,
- there are potential conflicts between aquaculture and recreational boating and/or commercial fishing associated with competition for space,
- there are links with climate change and the potential effects of ocean acidification. The effects of ocean acidification will make it harder for commercial shellfish species to create their calcium carbonate shells. This could potentially result in a lower quality product being produced although the likely responses of different species to ocean acidification is unclear,
- the identification of climate change refugia provides the opportunity to manage the aquaculture sector, despite marine heatwaves and ocean acidification, and may support planning for the farming of shellfish, finfish and seaweed.

Potential interactions which may occur between the leisure/recreation and tourism SA topic and other topics described in this SA for the East Marine Plan include:

- leisure, recreation and tourism are dependent on a well-managed and healthy marine environment, attractive and well-maintained beaches, seashore and clean bathing water. There are clear links to water quality and the water database discusses bathing water quality,
- tourism can have negative environmental impacts, which may include the removal of marine fauna and flora, the physical or visual disturbance of wildlife, pollution from wastewater and litter and pressures from increased visitor numbers in environmentally sensitive areas,
- tourism can also provide environmental benefits through helping to enhance understanding and appreciation of the marine environment through activities such as ecotourism and nature watching,
- socioeconomic benefits of tourism, leisure and recreation include positive economic benefits through increased visitor numbers and improved access,
- outdoor recreation and enjoyment of the coast can provide benefits to physical and mental wellbeing,
- designations of MPAs can affect boating activity through potential restrictions on speed, anchoring, mooring and facility development,
- there are potential interactions between recreational stakeholders and other economic sectors and without adequate early consultation with recreational stakeholders, development of sectors such as wind, wave and tidal energy, and aquaculture can impact upon the recreational sector,
- unmarked fishing gear can cause a recreational hazard, as can buoys and lines in busy boating areas,
- cable installations can be an issue in terms of maintaining navigable depth on recreational boating routes where cables come close to the surface, and where obstructions are inevitable,
- seasonality of employment in the tourism sector is a long-term issue and links to deprivation in coastal communities and various social issues.

Potential interactions which may occur between the marine manufacturing and defence SA topic and other topics described in this SA for the East Marine Plan include:

- there are a variety of environmental benefits and risks associated with national defence and national security activities. These include activities affecting intertidal habitats and water quality, protecting areas of seabed from potentially damaging activities and concerns about noise and disturbance from maritime activities. Ministry of Defence (MoD) has well established systems to manage the risks arising from its activities,
- non-defence activities in the marine area have the potential to impact the MoD elsewhere. Some inshore coastal defences such as aerodromes, transmitter sites and explosive stores have safeguarding zones extending over the marine area to regulate development that may otherwise affect their operation,
- there are potential effects of future wind turbines on radar interference,
- military training can have negative effects on habitats and wildlife,
- with regard to manufacturing, heavy manufacturing which has a coastal or estuarine location can potentially have a number of impacts on the environment, including impacts on the water environment,
- coastal developments or developments which occur within the marine environment, usually the inshore marine plan area, can have adverse effects on transitional waters, coastal waters and marine waters,
- during the construction, operation and decommissioning phases of such marine or coastal developments, there can be increased demand for water, discharges to water and adverse ecological effects resulting from physical modifications to the water environment. Equally, inland developments may impact the marine environment through polluted water discharges which may have ecological consequences.

Potential interactions which may occur between the aggregate extraction and seabed assets SA topic and other topics described in this SA for the East Marine Plan include:

- marine aggregates contribute to energy security and economic development through provision of fill and essential construction material for major coastal and inland infrastructure projects, for example ports, renewable energy and nuclear energy projects,
- marine aggregates can present reduced impacts on local communities compared to the extraction of land-won aggregates, in particular with regard to the extraction process and transportation. Impacts on local communities are also reducing due to the exhaustion of land based resources,
- substantial volumes of marine aggregates are landed on wharves close to where they are needed, which is often outside of the marine plan area in which they are dredged. They are then locally distributed by rail, water (through barges) and road. Wider social and economic benefits include skilled, stable employment and the generation of income through the construction industry supply chain,
- potential adverse impacts of aggregate extraction include changes to the hydrodynamic regime that may alter coastal processes; loss of seabed habitat

and heritage assets; impacts on fisheries and secondary impacts to marine life and habitat associated with sediment plumes; disturbance of fish spawning, migration routes, nursery and overwintering areas,

- new sub-sea cabling and grid connections will be needed to reinforce and better connect certain sections of the inshore grid. This is a key part of supporting the growth of renewable and low carbon generation and providing energy security,
- currently, impacts from cable installations on the seabed are low, spatially minor and tend to occur due to the physical disturbance involved during installation. As demand for offshore renewable energy increases, impacts from cable installation on the seabed will increase due to issues over sea space. The main impact will be where cable protection (eg rock armour or concrete mattresses) is required, where cable burial is not feasible and potentially in the intertidal area where the cable lands. This could have large implications on biodiversity,
- impacts may also occur if the cable runs through any site designated as being of national or international nature or cultural heritage conservation importance, or other sensitive areas such as designated shell fisheries, spawning or nursery ground for economically important fish species. Other potential impacts could include disturbance to known or undiscovered archaeological sites, or marine mineral resource sites,
- cables are buried deep in the seabed where possible and installers and operators promote marine safety and protection. However, cable installations on the UK continental shelf and surrounding waters can be subject to damage. Although this can be through natural causes, human activity is the main cause of submarine cable faults due to damage caused by fishing trawlers and anchors. Given the increased activity in English waters, there is a risk that the number of incidents may increase,
- there are issues around the cumulative effects of submarine cabling with other sectors specifically in certain areas where multiple cables utilise the same grid connection/landfall location meaning several cables can be located in close proximity,
- there are likely to be potential interactions between areas licenced for aggregates and those offered (currently or in the future) through oil and gas licensing rounds and this may result in conflict,
- marine mineral extraction, which often targets prehistoric rivers under the North Sea, has a high likelihood of encountering and potentially impacting archaeological material.

Potential interactions which may occur between the energy SA topic and other topics described in this SA for the East Marine Plan include:

- there are a number of potential environmental risks and potential impacts associated with oil and gas extraction, the most notable being the risk of oil spill, noise from exploration (such as a seismic survey) and production, historical oil-based cuttings piles, and inputs of exploration and production chemicals. Oil discharges in produced water have fallen in English waters and the majority of oil spills are now of less than one tonne,
- dependent upon the location, manner of installation and size of the pipeline there are potential impacts from pipeline installation on habitats. However,

these are generally spatially minor with short-term noise and disturbance impacts,

- use of existing storage features and infrastructure is likely to result in negligible additional impacts although the production of salt caverns may result in significant local impacts and interference with other users of the area
- decommissioning at the end of life can cause impacts including ecological impacts and potential pollution impacts,
- derogation as part of the Offshore Wind Leasing Round 4 will reduce the environmental headroom in and around existing MPAs, resulting in potentially significant implications for other marine activities, such as offshore renewable development,
- renewable energy developments can potentially have adverse impacts on marine fish and mammals, primarily through construction noise, and may displace fishing activity and have direct or indirect impacts on other users of the sea, including mariners. The achievement of GES for underwater noise in the UK is currently uncertain,
- certain bird species may be displaced by offshore wind turbines, which also have the potential to form barriers to migration or present a collision risk for birds. The UK has achieved GES for non-breeding waterbirds, such as sanderling, in the Greater North Sea. Breeding seabirds, such as common guillemot, have not achieved GES,
- marine renewable energy deployments may pose potential risks to the environment if inappropriately sited. The level of risk and ecological significance is largely unknown since, particularly so for tidal stream and wave technologies, as marine renewables as a whole are at a relatively early stage of development,
- there is the potential for existing fields to be included within the boundaries of future protected areas with implications for both maintenance and decommissioning activities,
- renewable projects, depending on substructure type, can also cause habitat damage/loss. Studies of tidal range technologies, including barrages, have indicated that these structures can have adverse impacts on migratory fish and bird species and on the hydrodynamics of the estuarine environments and can impact on intertidal and subtidal habitats,
- decommissioning of renewable projects can also cause impacts but these impacts are less well understood because of the relative immaturity of some of the technologies,
- when considering sites for new nuclear infrastructure, important to consider effects on coastal processes. Particularly relevant along soft substrate Norfolk/Suffolk coast. Also consider environmental impacts of cooling water inflow/outfall. Inflow/outfall structures also quite large and their presence and environmental effects can exclude other marine activities and uses,
- consider join up of new nuclear infrastructure with other marine and terrestrial users and infrastructure, as well as socio-economic costs/opportunities (eg employment). There are challenges here and we should seek to site new developments as appropriately as possible,
- with regard to CCUS, leakage from a properly selected storage site is extremely unlikely. Once injected into a formation, a number of physical and chemical trapping mechanisms will retain carbon dioxide within the formation.

It is possible that leakage of carbon dioxide from the injection process could take place, for example through failure of infrastructure, such as pipelines and wellheads. This could have some localised impact on benthic marine communities and possibly cause minor localised seawater acidification. However, such impacts are unlikely to be widespread or long-term, taking into account the dilution and buffering capacity of oceans.

## 5.3 Risks and impacts

### 5.3.1 Potential interactions with other SA topics - climate

Potential interactions which may occur between the climate SA topic and other topics described in this SA for the East Marine Plan particularly concern biodiversity, ecosystem services, fishing and fisheries, economy, ports and shipping, renewable energy and communities:

- renewable energy offers the potential for mitigating greenhouse gas emissions from energy production. It could also provide opportunity for socioeconomic benefits including employment, energy security and export business,
- rising air and sea temperatures and associated sea level rise could have implications for the majority of marine ecology receptors identified within the biodiversity report cards. For instance, the loss of intertidal habitat through coastal squeeze and the effect on foraging bird species. The loss of intertidal habitat and impacts on benthic species is covered in the benthic and intertidal ecology SA topic,
- ocean acidification which is occurring through the uptake of carbon dioxide from the atmosphere is predicted to have negative impacts on calcifying organisms, including numerous plankton taxa, molluscs and echinoderms – the effects of this will resonate at higher trophic levels,
- ocean acidification could affect the behaviour and bioavailability of contaminants in the marine environment,
- climate change related storm surges, sea level rise and coastal erosion collectively have the potential to increase the complexity of chemical mixtures, which may impact on marine life and contaminate UK fisheries and seafood supplies,
- under climate change scenarios more frequent extreme storms and waves may affect safety of fishing vessels and negative impacts may be exacerbated by low oxygen conditions, and presence of pollutants and marine contaminants,
- under climate change scenarios sea level rise, more frequent extreme storms and waves, fluvial flooding and changes in ocean currents may affect flooding of port facilities and access roads, disruption to shipping (including passenger ferries) and safety of ships at sea, loss of cargo,
- under climate change scenarios sea temperature rise, ocean acidification, changes in fluvial flows (particularly in estuarine nursery grounds) and ocean currents may lead to a decrease in abundance, survival and growth of some exploitable fish species and an increase in abundance, survival and growth of non-native pest species,

- under climate change scenarios sea level rise, more frequent extreme storms and waves and fluvial flooding may affect safety of military operations at sea (and air),
- more frequent extreme storms and waves, fluvial flooding and changes in ocean currents may affect sea level rise and coastal flooding causing an increase in demand for aggregates for building and maintaining sea defences,
- climate change leading to coastal squeeze could have adverse effects on local communities, due to loss of housing and infrastructure,
- the redistribution of species as a result of climate change induced sea temperature increases, presents opportunities for aquaculture and fisheries and challenges around predator-prey interactions, competition and population level impacts,
- an increase in extreme weather events as a result of climate change has the potential to adversely affect infrastructure attached to the seabed, for example from increased scouring around wind turbine foundations.

### 5.3.2 Potential interactions with other SA topics - pollution

Potential interactions which may occur between the pollution SA topic and other topics described in this SA for the East Marine Plan include:

- there are potential interactions with air quality and several sectors of the economy, for example, tourism, aggregate extraction and defence but particularly ports development, shipping and industrial emissions. As detailed above, shipping is a significant contributor to sulphur dioxide (SO2) emissions which can contribute to poor air quality,
- there are potential interactions with water quality and biodiversity, particularly for birds and shellfish,
- increased air quality could lead to eutrophication of the marine environment and acid deposition effects,
- developments and other activities can have adverse effects on transitional waters, coastal waters and marine waters. This includes increased demand for water, discharges to water, adverse ecological effects resulting from physical modifications to the water environment and increased risk of spills and leaks and transmission of invasive non-native species. Movement of water offshore between catchments means that action in one catchment can have a profound impact on water quality in waters at some distance away along the coast. These interactions are important in managing catchment activities.

# 6 Natural capital evidence base

As part of the natural capital approach to this SA, it is key to ensure natural capital is considered within both the development of the evidence database and also the SA framework which will be the basis of the assessment phase of the draft East Marine Plan and its alternatives (see Section 7). This will help to ensure an evidence-based assessment is carried out, which incorporates natural capital throughout all stages of the SA.

The SA will need to consider the connections between the natural capital assets and ecosystem services in the assessment and report on these in the SA report. Table 3 demonstrates the linkages between the SA topics and sub-topics and related natural capital assets, ecosystem services and goods and benefits.

**Table 3: SA topic connections to natural capital assets and services**

| Overarching SA Topic | SA Sub-Topic | Assets | Ecosystem Services | Goods/Benefits |
|---|---|---|---|---|
| **Cultural heritage** | Heritage assets within and adjacent to marine plan areas | Designated (including scheduled monuments, conservation areas, registered parks and gardens), non-designated and previously unknown but highly significant heritage assets | Characteristics that are resonant in terms of culture or heritage and/or have symbolic, sacred or religious meaning, habitat creation and biodiversity enhancement | Recreation, leisure, inspiration, wellbeing, education, tourism |
| **Geology, substrates and coastal processes** | Coastal features and processes | Seabed, water bodies and geological features | Flood and erosion control, observational interactions, aesthetic experiences, materials, coastal stabilisation | Non-food products, recreation, inspiration, wellbeing from coastal protection |
| **Seascape and landscape** | Effects on seascape and landscape | Habitats, water bodies and geological features | Observational interactions and aesthetic experiences | Recreation, leisure, inspiration, wellbeing |

| Overarching SA Topic | SA Sub-Topic | Assets | Ecosystem Services | Goods/Benefits |
|---|---|---|---|---|
| **Water** | Tides and currents, Marine litter | Water bodies and currents | Clean water supply, tidal and wave energy potential, transport options | Water for drinking and irrigation, electricity, shipping, recreation and leisure |
| **Biodiversity, habitats, flora and fauna** | Ecosystem Recovery, Protected sites and species, Benthic and intertidal ecology, Fish and shellfish, Marine megafauna, Plankton, Ornithology, Invasive non-native species | Species, populations and habitats | Cultivated and wild food stocks, materials, filtration and bioremediation, flood and erosion control, observational and immersive interactions, aesthetic experiences, habitat creation and biodiversity enhancement | Fish/shellfish harvests, wildlife watching trips, wellbeing related to existence of wildlife |
| **Communities, health and wellbeing** | Effects on communities including protected equality groups | Species populations and habitats, water bodies | Disease and pest control; flood control, observational and immersive interactions, aesthetic experiences | Improved health/wellbeing from food, clean air and water, flood protection, interactions with nature |
| **Economy** | Ports and Shipping, Fisheries and aquaculture, Leisure and recreation, Tourism, Marine manufacturing and defence, Aggregate extraction, Energy generation | Species populations and habitats (including abiotic components of substrates), as well as water bodies and geological features | Clean water supply, wind, tidal and wave energy potential, transport options, cultivated and wild food stocks, non-food products, observational and immersive interactions, aesthetic experiences | Fish/shellfish harvests, non-food products, and tourism and recreation experiences (eg wildlife watching trips) |

| Overarching SA Topic | SA Sub-Topic | Assets | Ecosystem Services | Goods/Benefits |
|---|---|---|---|---|
| | and infrastructure development Seabed assets | | | |
| **Pollution** | Air pollution, Noise pollution, Pollution and water quality | Wind conditions, species populations and habitats | Dilution by the atmosphere, filtration and bioremediation by marine species | Clean air and associated health benefits |
| **Climate** | Greenhouse gas emissions, Climate change resilience and adaptation | Species populations and habitats, water bodies, geological features | Regulation of temperature, humidity and chemical composition of the atmosphere and oceans, flood and erosion control, carbon capture and storage | Stable climate, mitigation of impacts from climate change |

## 6.1 Asset register

An asset register is a central component of any natural capital approach. It summarises information about the extent/abundance and condition of assets within the area, using standardised asset groups that cover habitats, mobile species and heritage assets. It is designed to allow key status and trend information to be clearly displayed, which, in a sustainability appraisal, can help to identify where there may be sustainability risks and issues.

Table 4 below shows the preliminary asset register for the East Marine Plan area developed as part of the SA scoping phase, which represents a static snapshot based on the evidence collated for that wider scoping. The asset register may evolve over the course of the full SA and wider marine plan development process should additional evidence become available.

**Key to Table 4**
(1) Category headers

| Header letter | Category title | Explanation |
|---|---|---|
| **A** | Condition | The state of the asset, which may be described in general terms (e.g. abundance) or for a specific aspect (e.g. breeding success). Evidence obtained primarily from assessments of designated features, although wider evidence is also included, which uses common narrative terms (poor, |

| | | |
|---|---|---|
| | | good etc) rather than a systematic classification. |
| **B** | Trend | How the asset has changed over time. This may relate directly to the condition metric and share an evidence source or be derived from other data. |
| **C** | Target | Whether the state of the asset is in line with a defined target (typically the achievement of Good Environmental Status). |
| **D** | Conservation importance | Whether the asset is formally designated as a protected feature or is otherwise recognised in another systematic assessment (e.g. a Marine Character Assessment). |
| **E** | Data scale | The geographic scale from to which the evidence relates. This includes national and regional sea scale evidence as well as that from the plan area specifically. |
| **F** | Evidence source quality | Based on an internal quality assurance process that considers the evidence source in terms of production quality standards, methodology, timeliness, appropriateness, completeness, auditability, independent external review and accuracy. |

(2) Category headers

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| R | Unfavourable No Change or poor | Declining (may have some elements stable) | Not achieved | - | - | Low |
| A | Mixed | Unclear | Partially achieved | - | National | Moderate |
| $G_1$ | Some elements favourable, others not assessed | Stable | Largely achieved | Recognised | Regional sea | - |
| $G_2$ | Favourable or within safe threshold | Improving (may have some elements stable) | Achieved | Designated | Marine plan area | High |
| na | Not assessed | - | - | - | - | - |
| | No data | No data | No data | No data | No data | No data |

- indicates the classification is not used for that particular category

**Table 4: A preliminary asset register for the East Marine Plan area** (see above for the key to the colours and letters used)

| Group | Subgroup | Asset detail | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|
| **Natural assets** | | | | | | | | |
| Abiotic features | Geological features | Sea caves, Spurn Head and "the Binks", North Sea Glacial tunnel valleys | $G_1$ | | | $G_2$ | $G_2$ | $G_2$ |
| | | Glacial till cliffs and tidal embayments | | | | $G_1$ | $G_2$ | A |
| | | Other bedrock | | | | | $G_2$ | $G_2$ |
| | Oceanographic features | Bathymetry and circulation characteristics | | | | | $G_2$ | A |
| | | Coastal processes and estuarine influences | | | | $G_1$ | $G_2$ | A |
| Pelagic assets | Coastal water bodies | General | | | A | | A | A |
| | | Hydrographical conditions | | $G_1$ | $G_1$ | | A | $G_2$ |
| | | Bathing waters | | A | $G_1$ | | A | A |
| | | Other waters | $G_d$ | | $G_1$ | | A | $G_2$ |
| | Transitional water bodies | | | | A | | A | A |
| Landward habitats | Coastal margin | Saltmarsh | R | R | | $G_2$ | $G_2$ | R |
| | | Lagoons | A | $G_1$ | | $G_2$ | $G_2$ | $G_2$ |
| | | Cliffs, dunes, halophilous scrubs, Salicornia, vegetated stony banks and vegetated drift lines. | na | | | $G_2$ | $G_2$ | A |
| | | Vegetated shingle, marshes and grazing marsh | | | | $G_1$ | $G_2$ | A |
| Benthic assets | Intertidal habitats | Intertidal mudflats | A | R | | $G_2$ | $G_2$ | R |
| | | Intertidal sandflats | A | $G_1$ | | $G_2$ | $G_2$ | A |
| | | Intertidal sand and muddy sand | na | | | $G_2$ | $G_2$ | $G_2$ |
| | | Beaches and intertidal sandbanks | | | | $G_1$ | $G_2$ | A |
| | Subtidal habitats | High and moderate energy circalittoral rock, Peat and clay exposures | na | | | $G_2$ | $G_2$ | $G_2$ |
| | | Reefs (Sabellaria spinulosa) | | R | | $G_2$ | $G_2$ | $G_2$ |
| | | Reefs, Subtidal sandbanks | A | $G_2$ | | $G_2$ | $G_2$ | $G_2$ |

| Group | Subgroup | Asset detail | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|
| | Subtidal habitats (cont.) | Subtidal chalk, Subtidal coarse sand, Subtidal mixed sediments | R | $G_1$ | | $G_2$ | $G_2$ | $G_2$ |
| | | Subtidal mud, subtidal coarse sediment, subtidal sand | na | | | $G_2$ | $G_2$ | $G_2$ |
| | | Tidal sand ridge, Submerged lowland landscapes | | | | $G_1$ | $G_2$ | A |
| | Habitat complex | Estuaries | $G_1$ | | | $G_2$ | $G_2$ | $G_2$ |
| | | Large shallow inlets and bays | A | $G_1$ | | $G_2$ | $G_2$ | $G_2$ |
| Mobile species | Water birds | General | | R | | | A | A |
| | | Bar-tailed godwit, Dunlin and Goldeneye | na | R | | $G_2$ | $G_2$ | A |
| | | Sanderling | na | $G_2$ | $G_2$ | $G_2$ | $G_2$ | $G_2$ |
| | | Pink-footed goose, Knot and Redshank | $G_1$ | | | $G_2$ | $G_2$ | $G_2$ |
| | | Avocet, Bewick's swan, Bittern, Black-tailed godwit, Common scoter, Curlew, Dark-bellied Brent goose, Gadwall, Golden plover, Greater white-fronted goose, Grey plover, Hen harrier, Lapwing, Marsh harrier, Montagu's harrier, Nightjar, Oystercatcher, Pintail, Ruff, Shelduck, Shoveler, Teal, Turnstone, Wigeon, Seabird assemblage | na | | | $G_2$ | $G_2$ | $G_2$ |
| | | Barnacle goose, Common eider, Common shelduck, Eurasian spoonbill, Little egret, Red-necked phalarope, Ringed plover, Slavonian grebe, White fronted goose | | | | | A | A |
| | Marine birds | General | | R | R | | $G_1$ | $G_2$ |
| | | Benthic, Surface, Wading and Water column feeders | | | R | | $G_1$ | $G_2$ |
| | | Grazing feeders | | | $G_2$ | | $G_1$ | $G_2$ |
| | | Guillemot | | $G_2$ | $G_2$ | | $G_1$ | $G_2$ |
| | | Arctic tern, Northern gannet and Great skua | | $G_2$ | | | A | $G_2$ |
| | | Razorbill | na | $G_2$ | | $G_2$ | A | $G_2$ |
| | | Kittiwake | na | R | R | | $G_1$ | $G_2$ |

| Group | Subgroup | Asset detail | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|
| | Marine birds (cont.) | Herring gull, Roseate tern and Arctic skua | | R | | $G_2$ | $G_2$ | $G_2$ |
| | | Lesser black-backed gull, Little gull, Little tern, Common tern, Gannet, Red throated diver, Sandwich tern, general Seabird assemblage | na | | | $G_2$ | $G_2$ | A |
| | | Cory's shearwater, European storm petrel, Balearic shearwater, Black tern, Black throated diver, Great northern diver, Leach's storm petrel, and Mediterranean gull | | | | | A | A |
| | Fish | Coastal, demersal and pelagic | R | R | R | | $G_1$ | $G_2$ |
| | Cephalopods | Cuttlefish and squid | | $G_1$ | | | A | $G_2$ |
| | Cetaceans | General | | $G_1$ | A | | $G_1$ | A |
| | | Minke whale | | $G_1$ | $G_2$ | | $G_1$ | A |
| | | Harbour porpoise | na | $G_1$ | | $G_2$ | $G_2$ | $G_2$ |
| | | Small toothed cetaceans | | | R | | $G_1$ | $G_2$ |
| | Seals | Grey seal | na | $G_1$ | | $G_2$ | A | $G_2$ |
| | | Harbour seal | | $G_2$ | R | | $G_1$ | $G_2$ |
| | Aquatic mammals | Otter | na | | | $G_2$ | $G_2$ | $G_2$ |
| Sedentary species | Benthic invertebrates | Native oyster | | R | | | $G_2$ | A |
| | | Ocean quahog | na | | | $G_2$ | $G_2$ | $G_2$ |
| | Marine flora | Laminaria hyperbora (kelp) | | $G_2$ | | | $G_2$ | A |
| | | Saccharina latissima (sugar kelp) | | R | | | $G_2$ | A |
| | Plankton | | | R | R | | $G_1$ | A |
| **Heritage assets** | | | | | | | | |
| Archaeological features | | | | | | | $G_2$ | A |
| Coastal sites and structures | | | | | | $G_1$ | $G_2$ | A |
| Wrecks | | | | | | | $G_2$ | $G_2$ |

## 6.2 Ongoing natural capital assessments

The following evidence base documents will be developed prior to Stage B (Assessment of the draft East Marine Plan and its alternatives):

- baseline database – further development of the baseline database will be undertaken, specifically adding to and amending baseline data already present in response to consultation comments and the issues with supporting evidence process. In addition, work will be undertaken to examine methods for further identifying data relating to natural capital assets and ecosystem services,
- an asset risk register – published literature will be used to determine and weight the connections between marine activities, the pressures they exert and how assets interact with these pressures. This process will identify the assets likely to be most at risk regionally, and the main sources of those risks. This will build on work undertaken with the SAAG already and will draw on further evidence from sources in the baseline database and more widely. The available information on asset status and trends (as compiled in the asset register) and any further expert knowledge drawn in through the SAAG will also be used in this process of considering risk,
- an ecosystem services inventory – detailing the current services provided by the east marine plan areas, utilising information from the baseline database as far as possible,
- an asset-service matrix – demonstrating which assets are providing specific ecosystem services within the east marine plan areas.

This will form the complete natural capital evidence base, which will highlight the risks to assets and services in the east marine plan area. The assessment will then consider how the East Marine Plan could affect these risks, thus this will inform the assessment of the nature of potential effects. For example, if an asset known to be of limited extent and with irreplaceable features could potentially be affected, this will provide evidence to support the assessment of a potential significant negative effect.

# 7 SA framework

This chapter presents the proposed SA framework (Table ) containing SA objectives, arranged into key topic areas. The East Marine Plan and its alternatives will be tested against these objectives.

This framework and the structure have been developed taking a natural capital approach and take into consideration the key emerging messages from the review of local, regional and national PPP.

In order to enable an understanding of how each objective depends on or affects natural capital, the objectives have been identified as “use” or “outcome” objectives, where:

- ‘use’ reflects where exploitation of an asset/service is required to support the objective
- ‘outcome’ refers to objectives that seek to improve the status of the asset/service.

In some cases, both objective types may be relevant (ie identified as 'both' in Table ). For example, an objective to use nature-based solutions to manage flooding and coastal erosion will use the regulating services provided by assets, but also improve environmental outcomes (in terms of increasing the extent and/or quality of appropriate habitats). The categorisation of an objective as ‘use’ or ‘outcome’ focuses on the main motivation or most significant action.

There are multiple linkages and feedbacks between the themes and objectives shown in the SA framework. The SA framework will be used in the assessment of the East Marine Plan and its alternatives to identify potential significant effects of options and policies and to identify which ‘use’ objectives impact on particular assets, and how individual assets support the delivery of ‘outcome’/’use’ objectives. Figure 4 provides an illustrated example of linkages and feedbacks with further explanation provided following the figure.

**Table 5: Proposed SA Framework**

| Natural Capital Category | Overarching SA topic | Sub topic | Proposed Objective | Type of objective |
|---|---|---|---|---|
| Environmental Assets | Cultural heritage | Heritage assets within and adjacent to marine plan areas | Objective 1: The use of the marine environment recognises the protection, enhancement and management needs of marine cultural heritage (designated, non-designated and undiscovered), ensuring that access to and condition of heritage assets are maintained and improved where necessary, including increasing knowledge of the past | Outcome |
| | | | Objective 2: Ensure the historic environment within and adjacent to marine plan areas is a driver for economic growth, attracting local investment and tourism and sustaining enjoyable and successful coastal communities in which to live and work | Use |
| | Geology, substrates and coastal processes | Coastal features and processes | Objective 3: Manage impacts arising from coastal processes (such as erosion), development and flooding, whilst allowing natural processes (such as sediment and nutrient transport) to continue. Consider the secondary impacts resulting from management | Outcome |
| | Seascape and Landscape | Effects on seascape and landscape | Objective 4: Safeguard and enhance the beauty of our natural scenery, improving its environmental value while being sensitive to considerations of its heritage, and ensure appropriate assessments are undertaken for marine developments | Outcome |
| | Water | Tides and currents | Objective 5: Ensure permanent alteration of hydrographical conditions does not adversely affect marine ecosystems | Outcome |
| | | Marine litter | Objective 6: The amount of litter found on beaches, the number of items on the seabed and within the water column, and the amount of degradation products, is decreasing, and levels do not pose a significant risk to the environment and marine life | Outcome |

| Natural Capital Category | Overarching SA topic | Sub topic | Proposed Objective | Type of objective |
|---|---|---|---|---|
| | Biodiversity, habitats, flora and fauna | Ecosystem recovery | Objective 7: Allow space in the marine environment for ecosystem recovery, biodiversity and MNG via reducing pressures or restoration which includes links into work undertaken in neighbouring terrestrial areas | Outcome |
| | | | Objective 8: The health of the marine food web is not significantly adversely affected by human activities, as indicated by an appropriate balance between, and productivity of, representative feeding guilds, and size structure of fish communities | Outcome |
| | | Protected sites and species | Objective 9: Increase the scope, condition and protections of protected areas to create resilient ecosystems, which are able to recover from negative impacts and which meet GES objectives | Outcome |
| | | Benthic and intertidal ecology | Objective 10: Ensure all marine and coastal seafloor habitats occur across their native range, are productive and sufficiently extensive to support healthy, sustainable ecosystems, with the extent of physical disturbance and physical loss caused by human activities minimised (with loss of sensitive fragile or important habitats prevented), and where feasible reversed | Outcome |
| | | Fish and shellfish | Objective 11: Marine fish populations are healthy (with, for commercial species, mortality rates and spawning stock biomass appropriate for maximum sustainable yield), supported by habitat of sufficient quality, and not threatened by bycatch or decreasing due to other human activity | Outcome |
| | | Marine megafauna | Objective 12: Marine mammal populations are healthy, and not threatened by bycatch or entanglement, sustainable development, Nationally Significant Infrastructure Projects (NSIPs) or other human activity, including through the effects of noise or disturbance | Outcome |

| Natural Capital Category | Overarching SA topic | Sub topic | Proposed Objective | Type of objective |
|---|---|---|---|---|
| | | Plankton | Objective 13: The structure, function, composition and abundance of the plankton community is not adversely influenced by anthropogenic drivers | Outcome |
| | | Ornithology | Objective 14: Marine bird populations are healthy, and not threatened by ingestion of litter, bycatch, or other human activity | Outcome |
| | | Invasive non-native species | Objective 15: Reduction in the risk of (i) introduction and (ii) spread of non-indigenous species | Outcome |
| Services, uses and benefits | Communities, health and wellbeing | Effects on communities including protected equality groups | Objective 16: Retain existing and create new employment opportunities for all (including protected equality groups), particularly those linked to the green economy and higher value jobs | Use |
| | | | Objective 17: The use of the marine environment is benefiting society as a whole (including protected equality groups), society understands and values the ocean in relation to health, wellbeing and education for coastal communities, with increased levels of ocean literacy | Use |
| | Economy | Ports and shipping | Objective 18: Encourage sustainable port development, with ports as hubs for trade, investment and transport | Use |
| | | Fisheries and aquaculture | Objective 19: Ensure that food is produced sustainably and profitably | Use |
| | | | Objective 20: Develop suitably located sustainable aquaculture opportunities for seaweed, shellfish, and finfish | Use |
| | | | Objective 21: Ensure that all fish stocks are recovered to and maintained at levels that can produce their maximum sustainable yield, through a consideration of natural capital and tackle illegal, unregulated and unregistered fishing activity | Both |

| Natural Capital Category | Overarching SA topic | Sub topic | Proposed Objective | Type of objective |
|---|---|---|---|---|
| | | Leisure and recreation | Objective 22: There are high quality, accessible, natural spaces close to where people live and work; encourage more people to spend time in them, and recognise them; to benefit their health and wellbeing, and recognise where the sea plays a significant role in communities | Both |
| | | Tourism | Objective 23: Develop the visitor economy and places that people want to visit to ensure a diverse and thriving tourism industry | Use |
| | | Marine manufacturing and defence | Objective 24: Allow for the continuation of sustainable marine manufacturing and defence activities within the marine plan areas | Use |
| | | Aggregate extraction | Objective 25: Ensure a future for mineral extraction | Use |
| | | Energy generation and infrastructure development | Objective 26: Progress new nuclear development to help deliver low carbon energy and achieve net zero | Use |
| | | | Objective 27: Allow for planned new oil & gas licensing to improve energy security, mindful of net zero commitments and minimal impact | Use |
| | | | Objective 28: Develop renewable energy, including interconnector cables and other associated infrastructure which allows nature to thrive alongside | Use |
| | | Seabed assets | Objective 29: Optimise the use of existing cable routes and develop a coordinated network of interconnections and offshore wind farm network connections | Use |
| Risks and impacts | Pollution | Air pollution | Objective 30: Tackle all sources of air pollution, including reducing impacts from the maritime sector, to improve environmental and human health | Outcome |
| | | Noise pollution | Objective 31: Levels of anthropogenic continuous and impulsive sound sources do not exceed levels that adversely affect populations of marine animals (specifically harbour porpoise and ornithology) | Outcome |

| Natural Capital Category | Overarching SA topic | Sub topic | Proposed Objective | Type of objective |
|---|---|---|---|---|
| | | Pollution and water quality | Objective 32: Concentrations of contaminants (such as persistent organic pollutants) measured in water, sediment or marine biota comply with appropriate threshold values, biological and ecological effects are minimised and monitoring for affected seafood is rigorous | Outcome |
| | | | Objective 33: Improve water quality (including for recreation, drinking and biodiversity), including by minimising harmful bacteria and acute pollution and keeping chlorophyll, nutrients and oxygen at appropriate levels | Outcome |
| | Climate | Green House Gas emissions | Objective 34: Invest in carbon capture, usage and storage, particularly close to existing onshore hubs | Use |
| | | Climate change resilience and adaptation | Objective 35: Support low carbon hydrogen production, transportation, and storage capacity, including offshore | Use |
| | | | Objective 36: The marine environment plays a role in building climate resilience, adaptation and mitigating climate change, including through blue carbon habitats | Use |
| | | | Objective 37: Reduce harm from, and develop resilience to, flooding, storm surge and coastal change, including using nature-based solutions | Both |
| | | | Objective 38: Water-borne transport is preferred to road, and vessels are to maximise energy efficiency, including exploring zero-emission propulsion technologies | Use |
| | | | Objective 39: Ensure interruptions to water supplies are minimised during prolonged dry weather and drought | Use |

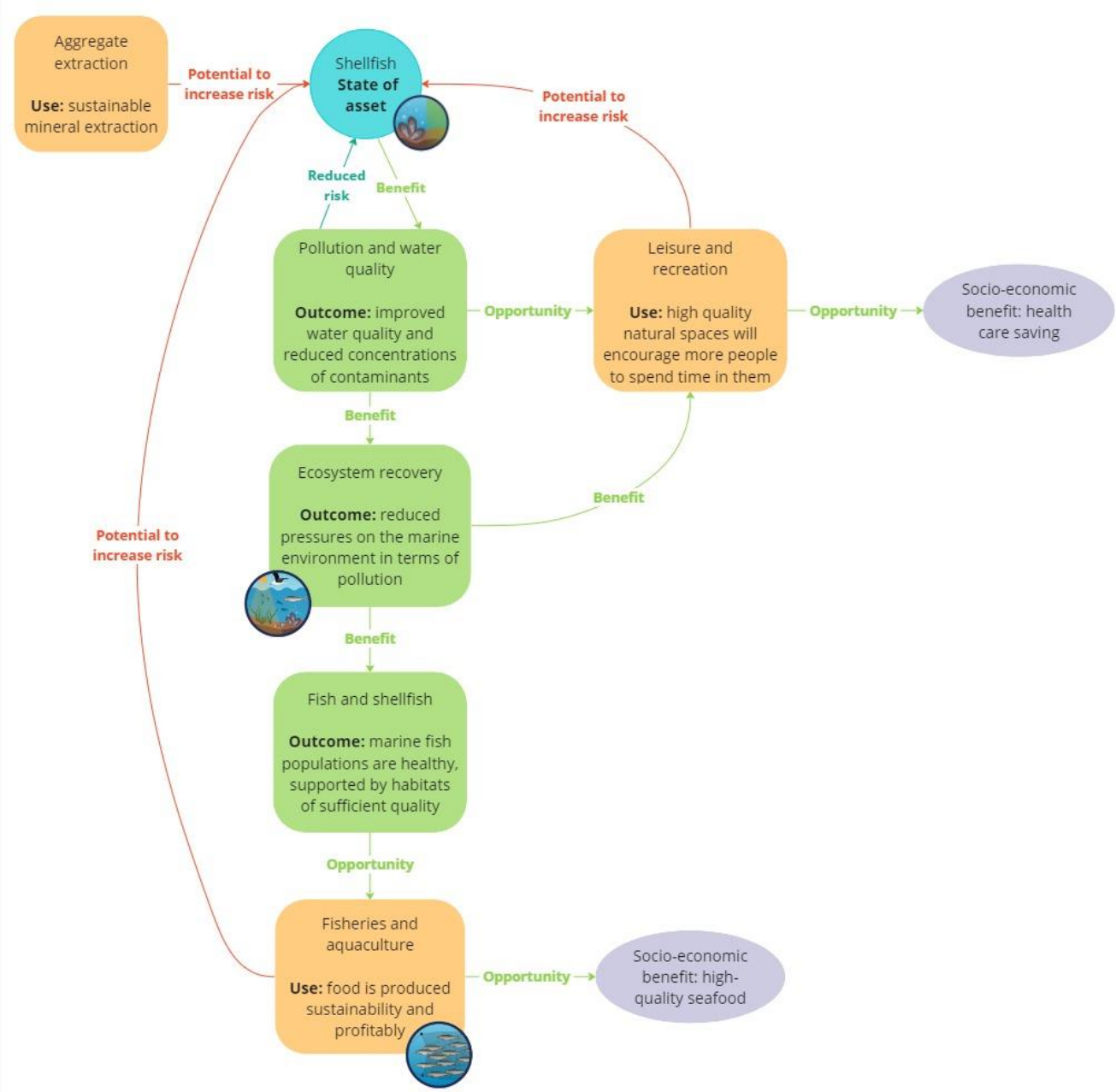


**Figure 4: Example of natural capital interactions with objectives**

Figure 4 illustrates the links between one natural capital asset (Shellfish) and some of the SA objectives from Table  that it can affect or be affected by.

Shellfish, such as mussels and clams, help to remove waste and toxins from the water, through the filtration that they undertake as they feed. This leads to improved water quality (benefitting Outcome Obj. 33), which itself feeds back to improve the status of the environment for Shellfish. Improved water quality also benefits the outcome around ecosystem recovery [Obj. 7] and this leads to improved outcomes also for the healthy marine fish and shellfish objective [Obj. 11].  Improved water quality and healthy shellfish and fish stocks, provide opportunities for economic activities such as extraction of commercial species [Obj. 21] and recreational activities [Obj. 22]. Use objectives can therefore benefit from assets where the status of assets means they have capacity to function and support the services they supply

(such as shellfish functioning contributing to waste treatment in this example). The red arrows indicate where unsustainable use can lead to increased risk for an asset. This then reduces its capacity to supply ecosystem services, leading to reduced outcomes for a range of objectives as shown, and therefore reducing their achievability.

# 8 Next Steps

This scoping report was consulted on for a period of 5 weeks with the SAAG membership between Monday 18th March and Tuesday 23rd April.
After this engagement period, comments received have been analysed and updates have been made to the SA baseline and framework where appropriate. An internal log of changes made in response to these comments has been maintained.
The report was made available to statutory consultees as well as the full SAAG membership. Statutory consultees included:

- the Environment Agency
- Natural England
- Historic England

In addition, the following list of organisations were identified to join the SAAG:

- The Crown Estate
- Department for Environment, Food and Rural Affairs (DEFRA)
- National Federation of Fishermen's Organisations
- Associated British Ports
- Royal Yachting Association (RYA)
- Visit England
- JNCC
- Whale and Dolphin Conservation
- North Sea Transition Authority
- British Marine Aggregate Producers Association
- Wildlife and Countryside Link

Regional:

- Norfolk County Council
- Great Yarmouth Borough Council
- Yorkshire Marine Nature Partnership
- North Eastern Inshore Fisheries and Conservation Authority
- North and East Yorkshire Ecological Data Centre
- North East Coastal Group
- The Wash & North Norfolk Marine Partnership

Work is now ongoing to update the natural capital evidence base, to include:

- an asset register
- an asset risk register
- an ecosystem services inventory
- an asset-service matrix

This evidence base, the baseline database and the agreed SA framework will then be used to support the next stage of the SA which is stage B options assessment.