



Department for
Business, Energy
& Industrial Strategy

UK Offshore Energy Strategic Environmental Assessment

Future Leasing/Licensing for Offshore
Renewable Energy, Offshore Oil & Gas and
Gas Storage and Associated Infrastructure

Scoping for Environmental Report



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Any enquiries regarding this publication should be sent to us at:
enquiries@beis.gov.uk

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1 General information

1.1 Why we are consulting

This Offshore Energy Strategic Environmental Assessment (OESEA4) Scoping Document has been prepared as part of the Department for Business, Energy and Industrial Strategy's (BEIS) Offshore Energy SEA programme. This SEA process aims to help inform offshore energy licensing and leasing decisions by considering the environmental implications of a proposed plan/programme and the potential activities which could result from its implementation.

A key purpose of scoping is to identify issues of concern at an early stage so that they can be considered in the SEA. The purpose of this scoping report is to set out sufficient information to enable the Consultation Bodies and other interested parties to form a view and give feedback on the scope and level of detail of the information to be included in the SEA Environmental Report.

The scoping document contains four parts (1) outlining the draft plan/programme and its legislative and policy context, (2) its context within a wide array of international, regional, national and local initiatives (including other plans and programmes), (3) an overview of the environmental baseline and how it will be described in the Environmental Report and (4) the approach to assessment and consultation. Consultation questions follow each section.

All feedback from the scoping consultation will be reviewed and, where appropriate, addressed in the OSEA4 Environmental Report. A compilation of the scoping feedback and a response to these will be published at the end of the scoping stage on the [OESEA pages of gov.uk](#).

1.2 Consultation details

Issued: 29/03/2021

Respond by: 5pm on 07/05/2021

Enquiries to:

Offshore Energy SEA4 Scoping
AB1 Building
Crimon Place
Aberdeen
AB10 1BJ

Tel: 01224 254015

Email: oesea@beis.gov.uk

Consultation reference: OESEA4 Scoping

Audiences:

Those consultation bodies defined under regulation 12(5) of *The Environmental Assessment of Plans and Programmes Regulations 2004* (as amended), as listed in Section 7.1.5 of this report, and additionally, the Joint Nature Conservation Committee, the Marine Management Organisation, Marine Scotland, and all other interested stakeholders and the public.

Territorial extent:

The territorial and offshore waters England, Wales, Scotland and Northern Ireland, but excluding the territorial and offshore waters of Scotland and Northern Ireland for the leasing of offshore renewable energy, and the territorial waters of Scotland for the storage of carbon dioxide.

1.3 How to respond

Please send responses either electronically or in writing to the following:-

By Email to: oesea@beis.gov.uk

Write to:

Offshore Energy SEA4 Scoping
AB1 Building
Crimon Place
Aberdeen
AB10 1BJ

When responding, please state whether you are responding as an individual or representing the views of an organisation.

Your response will be most useful if it is framed in direct response to the questions posed, though further comments and evidence are also welcome.

1.4 Confidentiality and data protection

Information you provide in response to this consultation, including personal information, may be disclosed in accordance with UK legislation (the *Freedom of Information Act 2000*, the *Data Protection Act 2018* and the *Environmental Information Regulations 2004*).

If you want the information that you provide to be treated as confidential please tell us, but be aware that we cannot guarantee confidentiality in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not be regarded by us as a confidentiality request.

We will process your personal data in accordance with all applicable data protection laws. See our [privacy policy](#).

We will summarise all responses and publish a summary on the OESEA pages of [GOV.UK](#). The summary will include a list of names or organisations that responded, but not people's personal names, addresses or other contact details.

1.5 Quality assurance

This consultation has been carried out in accordance with the government's [consultation principles](#).

If you have any complaints about the way this consultation has been conducted, please email: beis.bru@beis.gov.uk.

2 Consultation questions

The consultation questions for this scoping exercise are listed below, and are also given at key stages throughout the document:

1. **Consultees are invited to highlight additional initiatives which they consider are relevant to the draft plan/programme.**
2. **Consultees are invited to draw attention to and provide (where relevant/possible) additional information and data sets which they consider of potential relevance to this SEA.**
3. **Do you agree with the choice of Regional Seas used to help describe the environmental baseline?**
4. **Are there any additional environmental problems you consider to be relevant to the SEA?**
5. **Are there any additional influences, and supporting data sources, on the likely evolution of the environmental baseline?**
6. **Are there any additional alternatives that you feel the SEA should reflect?**
7. **Are there any objectives that you feel should be included or removed?**
8. **Are the indicators for each objective suitable? If not please suggest alternatives.**
9. **Do you have any comments on the sources of potentially significant effect for each of the activities covered by the draft plan/programme, including whether they should be scoped in or out of assessment in the Environmental Report?**
10. **Are there any additional information sources or existing monitoring arrangements which could be used to inform monitoring of the offshore energy draft plan/programme?**
11. **Do you have any comments on the proposed approach to consultation?**

3 Introduction, Purpose and Scope

3.1 Introduction

This UK Offshore Energy Strategic Environmental Assessment (OESEA4) Scoping Document has been prepared as part of the Department for Business Energy and Industrial Strategy's (BEIS) Offshore Energy SEA programme. The SEA process aims to help inform licensing and leasing decisions by considering the environmental implications of proposed plans/programmes and the potential activities which could result from their implementation.

Previous SEAs undertaken as part of this programme included UK OESEA in January 2009, UK OESEA2 in February 2011 and UK OESEA3 in July 2016, which built on a series of previous regional scale SEAs undertaken since 1999. OESEA considered the environmental implications of a draft plan/programme to enable: further seaward rounds of oil and gas licensing, including gas storage in UK waters; and further rounds of offshore wind farm leasing in the UK Renewable Energy Zone (now Exclusive Economic Zone)¹ and the territorial waters of England and Wales to a depth of 60m. During 2010, an exercise to update and extend the scope of the OESEA Environmental Report was undertaken, and OESEA2 was issued for consultation covering further licensing/leasing for offshore energy including oil and gas, gas storage including carbon capture and storage (CCS) and marine renewables (wind, wave and tidal technologies). OESEA3 covered the same plan/programme elements of OESEA2.

The indicative time horizon (i.e. period of currency) given for OESEA3 was 5 years from publication. During this period, as with previous SEAs, BEIS has maintained an active SEA research programme; identifying information gaps (some of which were outlined in the last set of SEA Recommendations), commissioning new research where appropriate, and promoting its wider dissemination through a series of research seminars². This has also involved continued engagement with the SEA Steering Group and review of the information base for the SEA, including the environmental baseline, other relevant plans and programmes, and policy and regulation.

BEIS are conducting a new SEA (OESEA4) leading to the production of a new Environmental Report with a view to publication in 2021.

This SEA is being conducted in accordance with the *Environmental Assessment of Plans and Programmes Regulations 2004* (as amended) (the SEA Regulations), which apply to any relevant plan or programme which relates either solely to the whole or any part of England³, or to England and any other part of the United Kingdom.

A required part of SEA is consultation with the consultation bodies and public, together with such EU Member States as may be potentially significantly affected.

¹ this part of the plan/programme did not include the territorial waters of Scotland and Northern Ireland.

² <https://www.gov.uk/guidance/offshore-energy-strategic-environmental-assessment-sea-an-overview-of-the-sea-process#offshore-energy-sea-research-programme>

³ Including the territorial waters of the United Kingdom that are not part of Northern Ireland, Scotland or Wales, and waters in any area for the time being designated under Section 1(7) of the *Continental Shelf Act 1964*.

3.2 Purpose

A key purpose of scoping is to identify issues of concern at an early stage so that they can be considered in appropriate detail in the SEA. Scoping also aids in the identification of information sources and data gaps that may require to be filled by studies or surveys to underpin the assessment. The purpose of this scoping report is to set out sufficient information on OESEA4 to enable the Consultation Bodies/Authorities and other interested parties to form a view and give feedback on the scope and level of detail of the information which will be included in the SEA Environmental Report.

The scoping process aims to:

- Promote stakeholder awareness of the SEA initiative
- Ensure access to relevant environmental information
- Identify opportunities for potential collaboration and the avoidance of duplication of effort
- Identify information gaps so these could be evaluated and filled if necessary
- Identify stakeholder issues and concerns which should be considered in the SEA

The scoping document contains four main parts (1) outlining the nature of the draft plan/programme and its legislative and policy context, (2) its context within a wide array of international, national and local initiatives (including other plans and programmes), (3) an overview of the environmental baseline and how it will be described in the Environmental Report and (4) the approach to assessment and consultation. Consultation questions follow each section, and these are summarised at the end of the document. Maps are interspersed throughout the document.

3.3 The Draft Plan/Programme and Scope of the SEA

The BEIS draft plan/programme under consideration is broad ranging and variously covers the range of energy related activities in the UK marine environment. The geographical limits of areas mentioned below are graphically represented in Figure 3.1-Figure 3.3. The elements of the draft plan/programme are:

Renewable Energy:

Offshore Wind – to enable further offshore wind farm leasing in the relevant parts of the UK Exclusive Economic Zone and the territorial waters of England and Wales, to contribute to the UK target of up to 40GW of offshore wind generation capacity deployed by 2030 (including 1GW of floating offshore wind). The technologies covered will include fixed and tethered turbines. Tethered turbines will only be considered in waters up to 250m. The Scottish Renewable Energy Zone and the territorial waters of Scotland and Northern Ireland are not included in this part of the plan/programme.

Wave – future leasing in the relevant parts of the UK Exclusive Economic Zone⁴ and the territorial waters of England and Wales. The Scottish Renewable Energy Zone⁵ and Northern

⁴ *The Exclusive Economic Zone Order 2013*

⁵ *The Renewable Energy Zone (Designation of Area) (Scottish Ministers) Order 2005*

Irish waters within the 12 nautical mile territorial sea limit are not included. In view of the relatively early stage of technological development, a target generation capacity is not set in the draft plan/programme.

Tidal Stream – future leasing in the relevant parts of the UK Exclusive Economic Zone and the territorial and internal waters of England and Wales. The Scottish Renewable Energy Zone and Northern Irish waters within the 12 nautical mile territorial sea limit are not included. In view of the relatively early stage of technological development, a target generation capacity is not set in the draft plan/programme. Similarly, a minimum average tidal current velocity threshold is not proposed.

Tidal Range – future leasing in the internal and territorial waters of England and Wales. It is considered unlikely that there will be tidal range developments outside of territorial waters.

Oil & Gas:

Exploration and production – further Seaward Rounds of oil and gas licensing of the UK territorial sea and UK Continental Shelf (UKCS), subject to the outcome of the Climate Compatibility Checkpoint assessments to be made in advance of each future licensing round.

Hydrocarbon gas importation and storage – further licensing/leasing for unloading and underground storage of hydrocarbon gas in UK waters (territorial waters and the relevant parts of the UK Exclusive Economic Zone), including hydrocarbon gas storage in other geological formations/structures including constructed salt caverns, and the offshore unloading of hydrocarbon gas.

Carbon Dioxide:

Carbon dioxide (CO₂) transportation and storage – further licensing/leasing for underground storage of carbon dioxide gas in UK waters (the UK Exclusive Economic Zone and relevant territorial waters, excluding the territorial waters of Scotland⁶). The UK target is to have Carbon Capture, Usage and Storage (CCUS) deployed in two industrial clusters by the mid-2020s, and a further two clusters by 2030, with an ambition to capture and store 10MtCO₂ per year by 2030. OESEA4 would include CO₂ storage in geological formations/structures including depleted reservoirs (and for enhanced oil recovery), saline aquifers and constructed salt caverns.

Hydrogen:

The offshore production and transport of hydrogen. This includes any offshore aspect of “power to gas” which uses excess renewable electricity and electrolyzers to produce hydrogen (green hydrogen) and the offshore carbon dioxide transport and storage aspects of onshore Steam Methane Reforming (SMR) (blue hydrogen). The plan would also consider the potential transport of hydrogen produced offshore via pipeline or ship. The UK target of 5GW (equating to 42TWh) of low-carbon hydrogen production capacity by 2030 has been set, with the hope that 1GW capacity could be delivered by 2025.

⁶ *The Storage of Carbon Dioxide (Licensing etc.) (Scotland) Regulations 2011, The Storage of Carbon Dioxide (Amendment of the Energy Act 2008 etc.) Regulations 2011*

Figure 3.1: The UKCS, UK EEZ, Scottish Renewable Energy Zone, Territorial waters and Median Lines

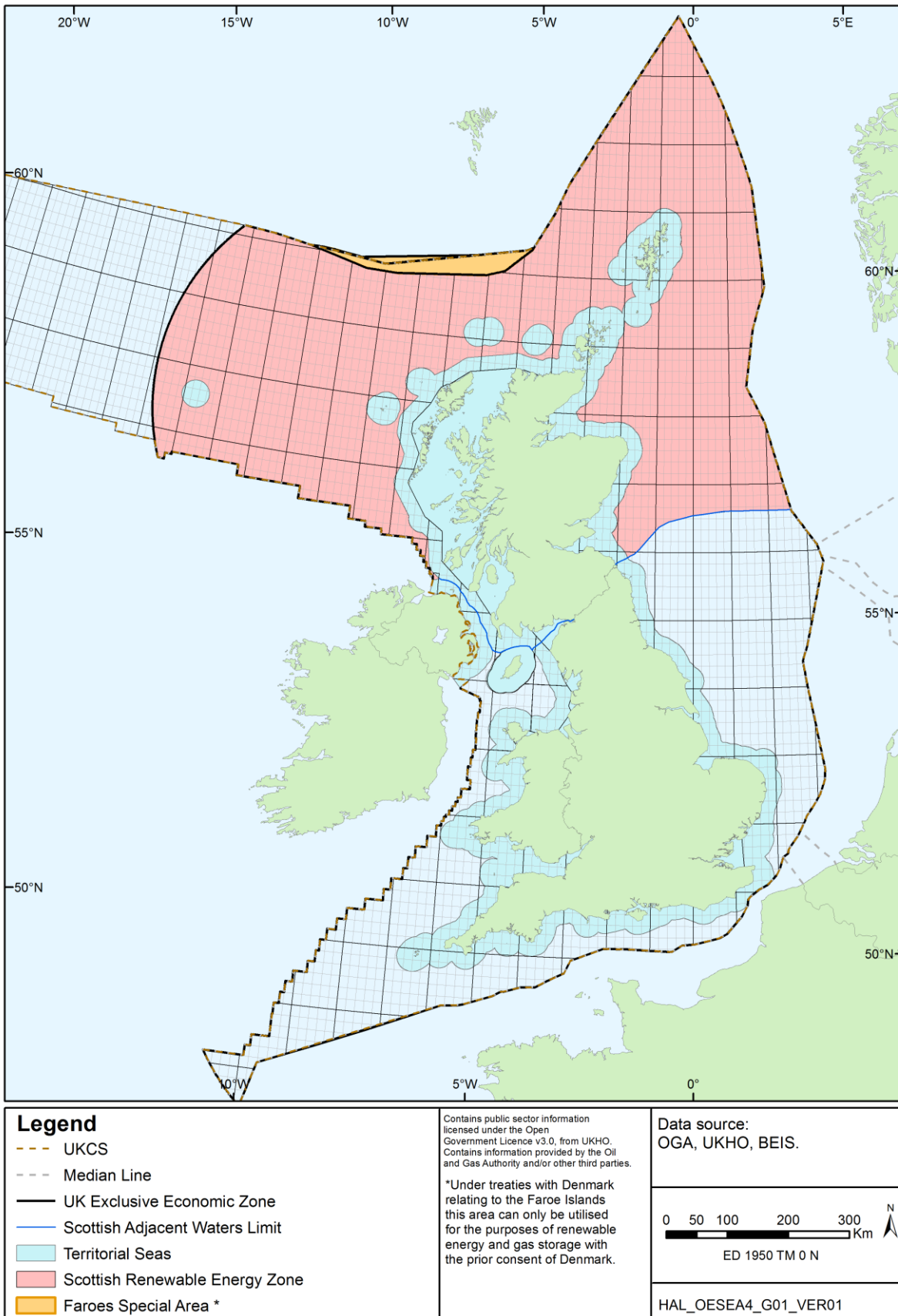


Figure 3.2: Geographical coverage of the SEA (Offshore Renewables)

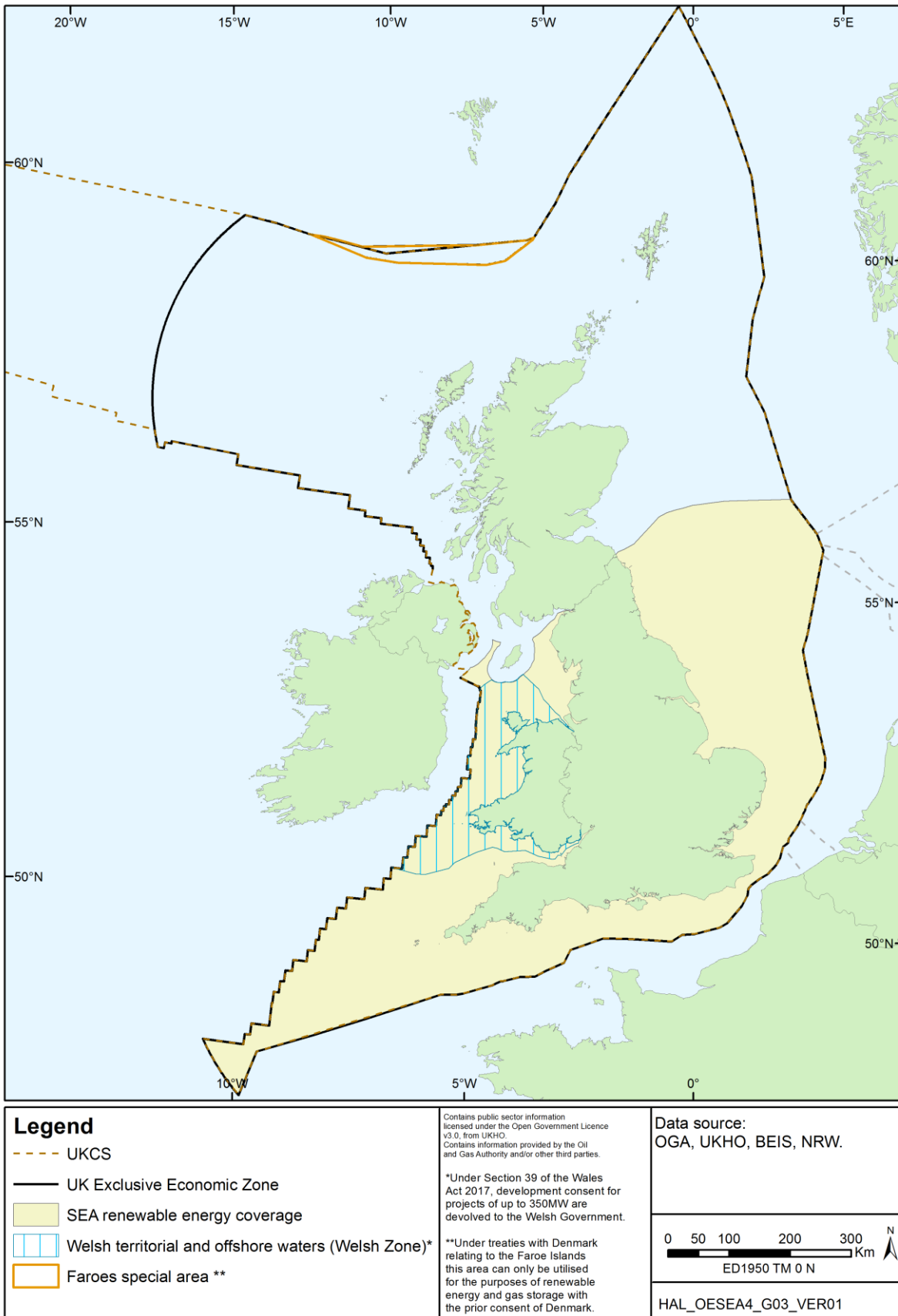
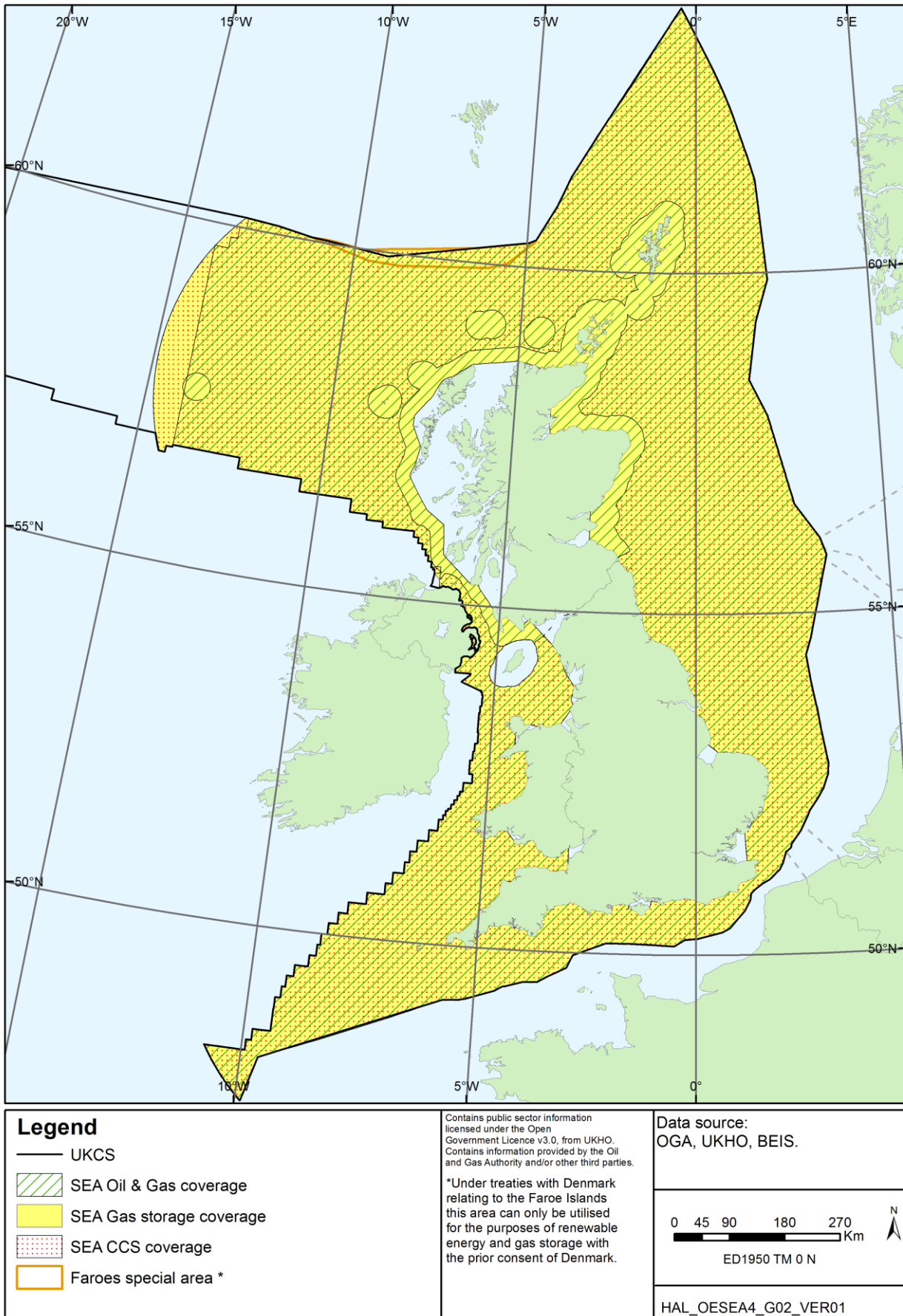


Figure 3.3: Geographical Coverage of the SEA (Oil and Gas, Gas Storage, CCS)



For this SEA it is anticipated that renewable energy devices will not be deployed in water depths of more than 250m. No depth constraints are envisaged for hydrocarbon exploration and production, or hydrocarbon and other gas storage activities.

Although the geographic remit of OESEA4 does not cover the entirety of the UKCS for certain activities, BEIS maintain links with the relevant devolved administrations, including in the consultation exercises for this and previous SEAs.

Several of the technologies covered in the draft plan/programme remain to be deployed at a commercial scale, and may undergo rapid development and change during the currency of the SEA, for instance, in order to assist in achieving medium to long-term targets in relation to the UK's commitment to achieve net zero emissions by 2050. The offshore energy SEA programme is a continuous process, and following the post consultation period, BEIS will keep the policy context, baseline, information on technologies, effects, or plan/programme status under review.

3.4 Policy context

3.4.1 Net Zero

The UK Government has committed to achieving net zero greenhouse gas (GHG) emissions by 2050 relative to a 1990 baseline, with the target made legally binding through the *Climate Change Act 2008 (2050 Target Amendment) Order 2019*. While the foundations are in place to meet net zero, according to the Climate Change Committee the ability for the UK to achieve this target will require additional policy (CCC 2020a). The CCC (2019) recognise that the potential to reach this target is not evenly distributed across the UK, and recommends that Wales achieve a 95% reduction by 2050, and Scotland a 100% reduction by 2045. The SEA will consider the contribution of the plan/programme towards the UK's new interim 2030 target (reduction in greenhouse gas emissions by 68% against a 1990 baseline⁷) and to the overall net zero target.

3.4.2 The Energy White Paper: Powering our Net Zero Future

The 2020 Energy White Paper, *Powering our Net Zero Future*⁸, was published in December 2020 and sets out the contribution that the energy sector could make to delivering emissions reductions consistent with the net zero by 2050 target, and the role that the Government and related regulatory bodies will take to assist relevant sectors to achieve this. The White Paper does not make any recommendation or prediction on the energy mix needed to deliver net zero (outside of the support to 2030 for certain technologies such as offshore wind). It is expected that the market will deliver the lowest cost route to net zero, and a number of modelling exercises illustrate how this might be achieved (also refer to CCC 2020).

The aspects of the White paper most relevant to the draft plan/programme are summarised below.

⁷ <https://www.gov.uk/government/news/uk-sets-ambitious-new-climate-target-ahead-of-un-summit> and <https://www.gov.uk/government/publications/the-uks-nationally-determined-contribution-communication-to-the-unfccc>

⁸ <https://www.gov.uk/government/publications/energy-white-paper-powering-our-net-zero-future>

Offshore renewables

In keeping with earlier announcements by UK Government is the delivery of up to 40GW of offshore wind by 2030, supported through further Contract for Difference (CfD) auctions. The fourth round of CfD is due in late 2021 and aims to procure up to 12GW of renewable generation capacity. This will cover a range of renewables including onshore wind, solar photovoltaics, other established technologies, and offshore wind. A call for evidence⁹ was announced in August 2020 covering the scope for innovation in marine energy (including tidal stream, tidal lagoons and barrages, floating offshore wind, and wave energy), building on a related consultation on changes to the CfD scheme¹⁰. In response to the call for evidence, 1GW of floating wind will be supported by 2030, and the UK Government will work with The Crown Estate and Crown Estate Scotland to address leasing issues, protecting the marine environment, and ensuring the UK captures the economic benefits of deploying the technology. The role of wave and tidal technologies will be considered following further evaluation.

A Ministerial Delivery Group will be established to bring together relevant Government departments to oversee the expansion of renewables, including tackling barriers to further offshore wind deployment, including radar interference, impacts on the marine environment, and appropriate network infrastructure. It will also focus on reducing consenting delays and ensuring that planning guidelines and environmental regulations are fit for purpose. Existing cross-government mechanisms will be used, such as the Offshore Wind Enabling Actions programme, a £4.3 million initiative run jointly by Defra and BEIS, and funded by HM Treasury.

The Offshore Wind Sector Deal will be used to ensure that domestic deployment creates jobs and raises skills levels across the country, and to support overseas trade and investment opportunities for UK-based companies. Developers who are awarded a CfD will be required to honour their supply chain plans. To support this, £160 million will be provided to support the development of major portside infrastructure hubs. This investment, and the 40GW target, will support the industry's target to achieve 60 per cent UK content by 2030.

Offshore wind farms have, to date, been connected to the onshore grid via individual project-specific export cabling. The Offshore Transmission Network Review was launched in July 2020 in recognition that the current regime has encouraged such connections, and the impact this can have on coastal communities. The review will consider such impacts and how the wider UK would benefit from a more strategic approach, seek the appropriate balance between environmental, social and economic costs, and the potential of hybrid, multi-purpose interconnectors. Those with projects already in development will be encouraged, where early opportunities for coordination exist, to consider becoming pathfinder projects that will help inform the design of the enduring regime.

CCUS

The deployment of CCUS projects in the energy sector will play a key role in the decarbonisation of the electricity system, and support will be provided for the construction of at least one power plant using CCUS, to be operational by 2030, and a business model will be introduced based on the existing CfD framework, adapted so that price signals incentivise power CCUS. It is considered that the current 300MW minimum threshold for carbon capture

⁹ <https://www.gov.uk/government/consultations/potential-of-marine-energy-projects-in-great-britain-call-for-evidence>

¹⁰ <https://www.gov.uk/government/consultations/contracts-for-difference-cfd-proposed-amendments-to-the-scheme-2020>

readiness creates a market distortion by disincentivising the deployment of larger gas plants which tend to be more efficient, and a consultation will take place early in 2021 on the removal of the 300MW threshold.

In addition to energy, CCUS is key to decarbonising industry, and centres where related industries have congregated and can benefit from utilising shared energy infrastructure, such as CCUS and hydrogen production and distribution. £1 billion will be invested up to 2025 to facilitate the deployment of CCUS in two industrial clusters by the mid-2020s, and a further two clusters by 2030, supporting the ambition to capture 10MtCO₂ per year by the end of the decade. CCUS is not yet a viable investment for the majority of industrial sectors, and a business model is therefore being designed and implemented to provide revenue support, and to improve confidence for investing in carbon capture solutions – a new commercial framework should be finalised by 2022.

The UK will continue to rely on natural gas for some years, during the work to largely eliminate carbon emissions from the energy system, including those from gas. A consultation starting in 2021 is to be undertaken to update the Gas Act 1986 to ensure gas supplies are decarbonised while continuing to provide the right price signals to market participants. This will reduce emissions and help build the networks needed to accommodate hydrogen (see below) and CCUS. This will include a review of gas quality standards to enable the widest range of gasses to be used to decarbonise energy.

Hydrogen

A Hydrogen Strategy will be published in early 2021. Around 95% of global hydrogen production is fossil-fuel based, and a switch to clean hydrogen is required together with a major increase in production capacity. Current production is ~27TWh/year, and the CCC suggest a ten-fold increase by 2050 may be required, with the option to go further depending on the scale of hydrogen use in heat, transport and power. A variety of production technologies will be required, but will likely include methane reformation with CCUS, biomass gasification with CCUS and, electrolytic hydrogen using renewable or nuclear generated electricity. A target of 5GW (equating to 42TWh) of low-carbon hydrogen production capacity by 2030 is the aim, with the hope that 1GW capacity could be delivered by 2025, on route to the 2030 goal.

Oil & Gas

Much of the crude oil from the North Sea basin is exported¹¹, with the UK making extensive use of strong trading links to meet domestic refinery demand. Domestic production met 46% of the UK gas supply in 2019, with the vast majority of this from North Sea offshore production, with a smaller proportion from the onshore oil and gas sector. Demand for oil and gas is expected to continue for several decades.

The sector is already coming under significant pressure from investors and the public to respond to the net zero challenge, and Government support will be in the context of delivering the net zero target. There is potential for the sector to play an important part in the energy transition and retain vital skills across key regional hubs around the country, supporting CCUS and hydrogen. Working with the regulators, greenhouse gas emissions from all offshore oil and gas operations will be driven down to make the UK continental shelf a net zero basin by 2050: the oil and gas sector will need to reduce its emissions from offshore production and

¹¹ <https://www.gov.uk/government/statistics/petroleum-chapter-3-digest-of-united-kingdom-energy-statistics-dukes>

operations to 0.5MtCO_{2e} by 2050, from 19MtCO_{2e} today, and methane will be a special focus. The UK will commit to the World Bank's 'Zero Routine Flaring by 2030' initiative¹² and will work with regulators towards eliminating routine flaring as soon as possible in advance of this date. The Oil & Gas Authority (OGA) will take a more robust stance to push for reductions in flaring and venting through its consents, field development process and project stewardship role. Regulatory and policy barriers to the use of clean electricity, such as offshore wind, to power offshore oil and gas facilities will be tackled to assist the reduction in upstream emissions, and the sector will also be challenged to address embodied emissions from the consumption of their products, or from supply chain activities.

The UK Government will work with the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) and OGA in the delivery of a net zero basin without imposing significant regulatory barriers. OPRED will increase its focus on the reduction of greenhouse gas emissions from offshore oil and gas operations and will put in place a regulatory framework to support emerging decarbonisation technologies. The Oil and Gas Authority's Maximising Economic Recovery (MER) Strategy has been refreshed and renamed the OGA Strategy¹³. The Strategy's central obligation, and supporting obligations are consistent with the delivery of the Government's net zero target.

The OGA is clear that Net Zero is compatible with MER and part of a proper and wide consideration of what Maximising Economic Recovery means. The Energy White Paper refers to the government's review of the UK's offshore oil and gas licensing regime. This review has recently concluded that licensing for oil and gas should continue but with the introduction of a Climate Compatibility Checkpoint in advance of each future licensing round¹⁴. These assessments will be based on a range of information including the UK's energy demand and sources of supply and will provide advice on how proceeding with future licensing would impact on the UK's climate and energy goals. The Energy White Paper indicates that a North Sea Transition Deal will be agreed with the industry during the first half of 2021, and will be focused on the economic opportunities of net zero and providing support for the people and communities most affected by the move away from oil and gas production. The North Sea Transition Deal was released on 24 March 2021 and includes the following commitments:

- the sector setting early targets to reduce emissions by 10% by 2025 and 25% by 2027, with emissions cut by 50% by 2030
- joint government and oil and gas sector investment of up to £16 billion by 2030 to reduce carbon emissions, including up to £3 billion to replace fossil fuel-based power supplies on oil and gas platforms with renewable energy, up to £3 billion on Carbon Capture, Usage and Storage, and up to £10 billion for hydrogen production
- by 2030, the sector will voluntarily commit to ensuring that 50% of its offshore decommissioning and new energy technology projects will be provided by local businesses
- support to the coordination of local growth and job opportunities with other sectors, such as Carbon Capture, Usage and Storage and offshore wind

¹² The UK endorsed the World Bank's 'Zero Routine Flaring by 2030' on 17 December 2020

¹³ <https://www.ogauthority.co.uk/news-publications/publications/2020/the-oga-strategy/>

¹⁴ <https://www.gov.uk/government/news/north-sea-deal-to-protect-jobs-in-green-energy-transition>

As part of decommissioning within the sector, the potential to use existing infrastructure in CCUS transport and storage will be considered. A review of the potential re-use of oil and gas assets for CCUS¹⁵ identified those with greatest potential, and UK Government will work with industry and regulators to provide clarity on the regulations for re-purposing assets and to develop technical guidance on how this can be done safely and securely.

Other areas of relevance to the draft plan/programme

The White Paper indicates that a review of the existing energy National Policy Statements (NPS) will be undertaken, with the aim of designating the updated NPSs by the end of 2021. The review will ensure the NPSs reflect the policies of the Energy White Paper, and that they will provide the framework required to deliver the infrastructure needed for net zero. It is noted that this review and update will not prevent the use of the existing NPSs to make decisions under the Planning Act 2008, in the period before the new NPSs are formally designated by Parliament.

A UK Emissions Trading Scheme (ETS) will be established to replace the UK's participation in the EU ETS and will be a market-based cap and trade measure¹⁶. A consultation will take place, in due course, following the introduction of the UK ETS on how to align the cap with an appropriate net zero trajectory, such that the system will significantly contribute to the 2050 target.

3.4.3 Clean Growth Strategy

The Clean Growth Strategy (October 2017) identifies UK progress to date in reducing emissions while maintaining economic growth. It sets out, at a high level, how the UK will meet its domestic emissions reduction targets, at the lowest cost to taxpayers, and maximising the social and economic benefits of the transition (for example skills, jobs and air quality). A number of the policies and proposals in the strategy are relevant to the SEA, including: to improve renewables route to market and biennial CfD auctions using up to £557 million as part of the "sector deal" for offshore wind¹⁷; which could lead to an extra 10GW of new capacity to be built in the 2020s; to demonstrate international leadership in CCUS; and to work with industry through a new CCUS Council to meet the ambition of having the option to deploy CCUS at scale (required beyond 2030 to decarbonise industry). The fifth carbon budget covers emissions of 1,725 MtCO₂eq. for the period 2028 to 2032¹⁸; the strategy will be updated in response to progress reports by the Climate Change Committee (CCC) before setting the sixth carbon budget in 2021. A review of the strategy by the CCC (2018) recognised the strong commitment of the UK Government to achieve decarbonisation, and the framing of the low-carbon economy in terms of its economic contribution, but identified that policies needed to be firmed up, and that gaps remain to attain the fourth and fifth carbon budgets¹⁹. This is recognised in the latest energy and emissions projections (BEIS 2019), in which it is indicated

¹⁵ <https://www.gov.uk/government/consultations/carbon-capture-usage-and-storage-ccus-projects-re-use-of-oil-and-gas-assets>

¹⁶ The UK ETS was introduced on 1st January 2021 <https://www.gov.uk/government/publications/participating-in-the-uk-ets>

¹⁷ <https://www.gov.uk/government/publications/offshore-wind-sector-deal>

¹⁸ equivalent to an average 57% reduction on 1990 emissions, see *The Carbon Budget Order 2016*.

¹⁹ Also see BEIS (2019) Updated energy and emissions projections 2018.

that policies and proposals from the Clean Growth Strategy will be developed more fully and included in future projections²⁰.

The Strategy also recognises the need for CCUS and commits to deploying the technology at scale in the 2030s subject to cost reduction. Further details on this commitment were contained in the 2018 UK Carbon Capture Usage and Storage Deployment Pathway, and a December 2020 update on business models for Carbon Capture, Usage and Storage²¹. Additionally, BEIS launched the Offshore Transmission Network Review in July 2020²², which has the objective of ensuring that electricity generated by offshore wind farms is delivered in an appropriate way, for example by a more coordinated approach to transmission rather than those deployed to date which largely rely on individual point-to-point connections between a wind farm and landfall.

3.4.4 The Industrial Strategy

Following the Clean Growth Strategy, the Industrial Strategy was published in November 2017²³. The strategy identifies four “grand challenges”, with the most relevant to the OESEA programme being to “maximise the advantages for UK industry from the global shift to clean growth”. The strategy emphasises the economic advantages of “clean growth”, including in the energy sector, and that the Government would increase support for innovation to reduce the costs of related technologies (recognising the cost reductions already achieved in offshore wind), with the long-term goal to make low carbon technologies cost less than higher carbon alternatives. The recent CfD auctions have demonstrated that the cost of renewables, in particular offshore wind, has fallen considerably (e.g. to £39.65/MWh for Dogger Bank A & B)²⁴. The power sector has supported much of the UK’s reduction in GHGs, which along with the UK Government ambition for 40GW²⁵ capacity of offshore wind by 2030, are in line with the scale of action required to achieve the net zero target (CCC 2020).

3.4.5 Oil and Gas Authority Strategy

Despite the focus of the above strategies on a move to low carbon energy sources, the Industrial Strategy also recognises that the oil and gas sector continues to be highly productive, and also has a role in maintaining the UK’s security of supply during the transition to a low carbon economy. Pursuant to Section 9G of the *Petroleum Act 1998*, an updated OGA Strategy was laid before Parliament on 16 December 2020 and came into force on 11 February 2021. The OGA Strategy (building on the earlier Maximising Economic Recovery (MER) UK Strategy) takes account of the UK Government’s Net Zero commitment, with alterations made to the central obligation, and supporting obligations, which commit “relevant persons”²⁶ to, “take appropriate steps to assist the Secretary of State in meeting the net zero target, including by reducing as far as reasonable in the circumstances greenhouse gas

²⁰ Also note the Environmental Audit Committee report on green finance:

<https://www.parliament.uk/business/committees/committees-a-z/commons-select/environmental-audit-committee/news-parliament-2017/green-finance-report-published-17-19/>

²¹ <https://www.gov.uk/government/publications/carbon-capture-usage-and-storage-ccus-business-models>

²² <https://www.gov.uk/government/publications/offshore-transmission-network-review>

²³ <https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future>

²⁴ <https://www.gov.uk/government/publications/contracts-for-difference-cfd-allocation-round-3-results/contracts-for-difference-cfd-allocation-round-3-results>

²⁵ <https://www.gov.uk/government/publications/queens-speech-december-2019-background-briefing-notes>, <https://www.gov.uk/government/news/new-plans-to-make-uk-world-leader-in-green-energy>

²⁶ Defined under Section 9A (1)(b) of the *Petroleum Act 1998* (as amended), i.e. the holder of a petroleum licence; an operator under a petroleum licence; the owner of upstream petroleum infrastructure, persons planning and carrying out the commissioning of upstream petroleum infrastructure, or owners of relevant offshore installations

emissions from sources such as flaring and venting and power generation, and supporting carbon capture and storage projects.” Downstream of offshore activities, gas production has been recognised as a potential contributor to a hydrogen economy (i.e. through methane reforming) and the wider net zero target when combined with carbon capture and storage²⁷.

3.4.6 25 Year Environment Plan

The 25 Year Environment Plan, published January 2018²⁸, is described as a “sister document” to the Clean Growth Strategy. The plan sets out a number of 25-year goals relating to air, water, flora and fauna, risks from natural disaster, sustainability and the enhancement of cultural aspects of the environment. Six policy areas are identified: using and managing land sustainably, recovering nature and enhancing the beauty of landscapes, connecting people with the environment to improve health and wellbeing, increasing resource efficiency and reducing pollution and waste, securing clean, productive and biologically diverse seas and oceans, and protecting and improving the global environment. The Natural Capital Committee (NCC), established in 2011, provides advice to Government on the sustainable use of natural capital (i.e. that from which ecosystem services flow), and provided advice on the 25 Year Environment Plan whereby the natural capital approach is signalled as the framework within the plan should be set²⁹, though it recognises the challenges of implementing the approach (e.g. a lack of knowledge in many areas), which is further acknowledged in the Plan.

A number of the policy areas in the 25-year environment plan are relevant to the plan/programme. These include: publishing a new strategy for nature, building on the current Biodiversity 2020 strategy which will be relevant to both the marine and terrestrial environment; the development of a Nature Recovery Network which will provide an additional 500,000 hectares of habitat to better link existing protected sites; reducing litter and littering including of the marine environment; the publishing of a chemicals strategy³⁰ building on existing approaches; the implementation of a sustainable fisheries policy as the UK leaves the Common Fisheries Policy (CFP) based on the principles of maximum sustainable yield (see the Fisheries White Paper, Sustainable Fisheries for a Future Generation, and the *Fisheries Act 2020*; achieve good environmental status of our seas, while allowing marine industry to thrive aided by the creation of a marine online assessment tool (MOAT) to look at pressures affecting the marine environment and the completion of marine planning; the completion of a network of well-managed Marine Protected Areas (MPAs).

The progress of the plan is being measured through the Outcome Indicator Framework (OIF) which is intended to describe progress of the ten goals of Plan through a set of metrics³¹ (also see the NCC (2020) interim response to the Government on the 25 Year Environment Plan Progress Report and their commentary on the OIF). *The Environment Bill* includes provisions to create an independent statutory body (the Office for Environmental Protection, OEP) which would have the principal objective of contributing to environmental protection and the improvement of the natural environment, including oversight of the implementation of

²⁷ For example, see: <https://www.gov.uk/government/news/pm-commits-350-million-to-fuel-green-recovery> and <https://www.ogauthority.co.uk/news-publications/news/2020/offshore-energy-integration-can-deliver-30-of-uk-s-net-zero-target/>

²⁸ <https://www.gov.uk/government/publications/25-year-environment-plan>

²⁹ The NCC have developed a “How to do it” guide, <https://www.gov.uk/government/groups/natural-capital-committee>

³⁰ Recognising the implications for the European Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) of the UK leaving the EU.

³¹ <https://www.gov.uk/government/publications/25-year-environment-plan-progress-reports>

environmental law³². The Bill was published pursuant to an obligation in Section 16 of the *European Union (Withdrawal) Act 2018* which includes a high-level indication of the “environmental principles” which the draft Bill must include, with more definition provided in Defra (2018). A consultation commenced in March 2021 on the draft policy statement on environmental principles, which is proposed to be a statutory requirement of The Bill³³.

3.4.7 **The UK’s withdrawal from the EU**

Following the UK’s exit from the European Union, the UK Government has confirmed that it is firmly committed to maintaining high environment and climate standards.

Sections 2-7 of the *European Union (Withdrawal) Act 2018*, confirm that the body of EU law transposed into UK legislation at the time that the UK exits the EU will be retained, such that it will continue to have effect in domestic law on or after exit day. The SEA will consider the implications of any relevant legislative and related policy changes which take place during its preparation that are associated with the UK’s exit from the EU.

3.4.8 **Industrial Decarbonisation Strategy**

The UK’s Industrial Decarbonisation Strategy³⁴ was published in March 2021 and aims to show how the UK can have a successful industrial sector, aligned with the net zero target, and without pushing emissions and business abroad. The strategy covers a range of established industry sectors and emerging industries such as low carbon hydrogen and carbon capture, usage and storage. It provides an indicative roadmap to net zero for UK industry and outlines how government will act to support this.

3.4.9 **Marine Spatial Planning**

Marine planning in the UK has been taking place across different timescales, with all plans targeting completion by 2021 (UK marine plan areas are shown in Figure 3.4). The first marine plans to be adopted in the UK were the East Inshore and Offshore Marine Plans in 2014 and the Scottish National Marine Plan in 2015, followed by the South Inshore and Offshore Marine Plans in 2018 and the Welsh National Marine Plan (WNMP) in 2019. The Marine Management Organisation (MMO) and Department of Agriculture, Environment and Rural Affairs (DAERA) continue to develop the remaining plans for areas of English waters and the waters of Northern Ireland respectively. In England, consultation on the remaining marine plans took place in January to April 2020, and a consultation summary has been published³⁵. The plans will be modified in light of this feedback prior to their submission to the Secretary of State for Environment, Food and Rural Affairs for adoption. The consultation on the Marine Plan for Northern Ireland took place in 2018, but a final plan is yet to be adopted.

The remaining plans, like those already adopted, are consistent with the Marine Policy Statement, and have taken a similar approach, presentation (comprising a vision, objectives and general and sectoral policies) and in the approach to policy wording. Marine plans in the UK have, to date, been written at a strategic level which largely consolidates and clarifies existing legal and policy arrangements, albeit with a regional focus, and in most instances do

³² <https://www.gov.uk/government/news/dame-glenys-stacey-appointed-as-chair-of-the-office-for-environmental-protection>

³³ <https://www.gov.uk/government/consultations/environmental-principles-draft-policy-statement>

³⁴ <https://www.gov.uk/government/publications/industrial-decarbonisation-strategy>

³⁵ <https://www.gov.uk/government/publications/draft-north-east-north-west-south-east-and-south-west-marine-plans-consultation-summary-2020>

not attempt to be spatially explicit, for example by indicating defined zones for development or where development would be precluded. The plans rather identify potential resource and constraint (including through mapping), with policies that seek to balance environment, economic and social considerations in decision making and consent application. This includes the promotion of certain activities such as offshore wind, or the safeguarding of strategic resources. As these are the first iteration of marine plans, subsequent revisions may be expected to be more explicit. Additionally, the activities of the planning authorities go beyond the documentation of the plans and have included commissioning work to improve the evidence base for marine planning and to support consenting³⁶.

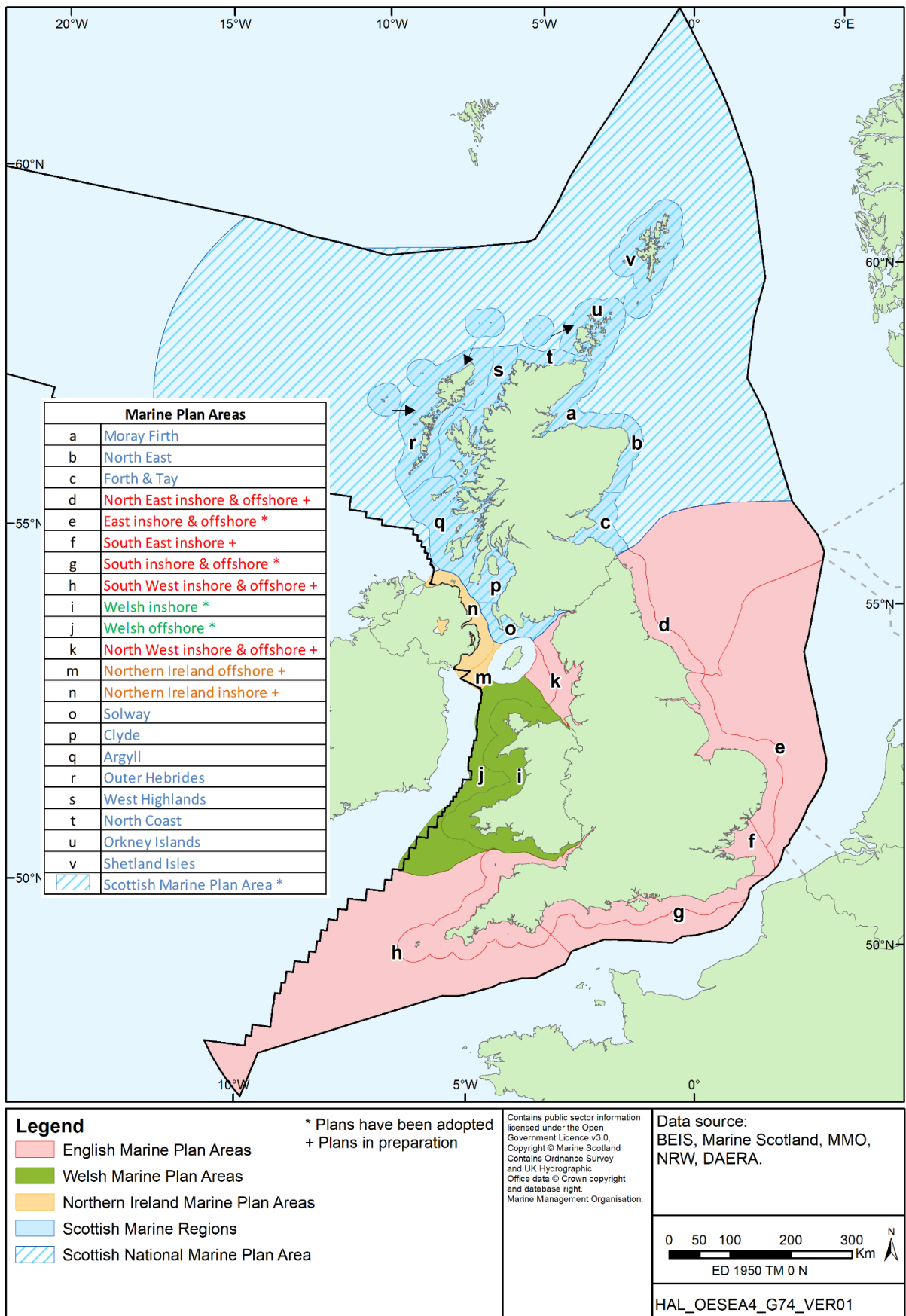
The adopted and draft plans all contain policies of relevance to the draft plan/programme and OESEA4, covering both offshore hydrocarbons, renewable energy and carbon dioxide storage. The East Marine Plans provide both strict safeguarding of areas of existing oil and gas production, and also new development proposals. For offshore wind, existing leases or agreements for lease are provided a level of safeguarding, and policy promotes future development in Round 3 areas (which are now no longer valid). Tidal stream and CCS have specific policies that seek to prevent the uses of key resources by other activities that would preclude future development in these areas. The South Plans contain similar policies for oil and gas and tidal stream, though lacks equivalent offshore wind or CCS policies.

The WNMP plan identifies and maps the key resource and/or strategic resource areas for different offshore renewables, including wave, tidal stream, tidal range and wind, and provides accompanying supporting policies and links to safeguarding policies. These policies promote the de-risking of low carbon energy sources and support developing strategic resource areas in order to safeguard relevant resources. Policies of relevance to offshore oil and gas in the WNMP recognise the continued role such resources will have during the transition to low carbon energy sources and the obligations set out in the OGA Strategy, and support the development of CCS technologies, but are also explicit that Welsh Government policy is to avoid continued extraction of fossil fuels in intertidal areas and estuaries and coastal inlet waters that fall within the Welsh onshore licence area.

The draft Marine Plan for Northern Ireland contains a single energy policy supporting all energy proposals (i.e. renewables and oil and gas) which improve the security and diversity of energy supply, provided that they do not unacceptably impact other activities or the offshore environment generally, and that restoration/decommissioning measures have, where necessary, been agreed. The draft plan does not include a specific CCUS or gas storage policy.

³⁶ <https://www.gov.uk/government/publications/evidence-and-the-marine-management-organisation-mmo>

Figure 3.4: Geographical Coverage of the SEA in relation to Marine Spatial Planning Boundaries



3.5 Context to Licensing and Leasing

Decision making in relation to licensing/leasing and also subsequent activities which could take place as a result of the adoption of the draft plan/programme, is split between a number of legislative and planning policy remits and related decision makers. The following summarises the current licensing and leasing arrangements for offshore energy in UK waters, and for the purposes of this SEA, only those aspects applicable to the geographical coverage of each aspect of the plan (see Figure 3.1, Figure 3.2 and Figure 3.3) are relevant.

3.5.1 Offshore Renewables: Wind

Under the *Crown Estate Act 1961*, The Crown Estate is entrusted to manage assets on behalf of the Crown including most of the UK seabed out to 12nm, over half of the foreshore, as well as certain sovereign rights in respect of areas beyond the territorial sea. Such sovereign rights are vested in the Crown by the virtue of the designation of the EEZ, formerly covered by the Renewable Energy Zone (REZ) under the *Energy Act 2004*, which covered an area from 12nm (nautical miles) out to 200nm (now the UK EEZ and the Scottish Renewable Energy Zone) in which rights under Part V of the UN Convention on the Law of the Sea may be exercised to exploit water or wind energy.

A lease from The Crown Estate is required for the placement of structures or cables on the seabed, this includes offshore wind farms and their ancillary cables and other marine facilities. The Crown Estate grants rights in the form of an Agreement for Lease or Option Agreement. An Agreement for Lease generally grants a developer an option over an area of seabed. Exercise of the option by the developer will be conditional on it satisfying certain conditions. If the conditions are satisfied and the developer exercises the option, The Crown Estate will be obliged to grant a Lease of the seabed to the developer. The conditions to be satisfied before the developer may exercise the option will include the obtaining by the developer of all statutory consents for the proposed development. If the developer is unable to satisfy all the conditions within a certain time provided for in the Agreement for Lease, the option will lapse. During the option period the developer will be permitted to undertake surveys and deploy anemometry equipment etc. However, the developer is not permitted to commence construction of its development until and unless a Lease is granted. Potential offshore wind farm developers also require statutory consents from a number of Government departments before development can take place.

Under the *Planning Act 2008*, the Planning Inspectorate (PINS) assumed responsibility for consent applications for offshore electricity generating stations with a capacity of more than 100MW (or 350MW in Wales³⁷). Such applications to PINS will be under the Planning Act (which replaces the provisions of the Electricity Act 1989) for these developments. While PINS deals with the acceptance and examination of the application and provides a recommendation on whether consent should be granted, the ultimate decision maker in these cases is the Secretary of State.

The *Marine and Coastal Access Act 2009* (as amended) provided for the creation of the Marine Management Organisation (MMO). The MMO took over the processing of offshore renewable energy generating station applications under section 36 of the *Electricity Act 1989* (i.e. those

³⁷ Section 39 of the *Wales Act 2017*. Note that applications for developments of national significance in Wales are made to the Planning Inspectorate Wales, with the planning procedure being similar to that for projects in England.

not considered to be nationally significant, with a capacity of more than 1MW but less than 100MW) in English territorial and offshore waters (i.e. that part of the UK EEZ relevant to this plan/programme). A single Marine Licence is required for activities formerly covered by the *Coast Protection Act 1949* and the *Food and Environment Protection Act 1985* (FEPA).

It should be noted that while the Secretary of State is responsible for consenting offshore wind farm projects of more than 100MW (England) or 350MW (Wales), the leasing of areas for offshore wind is the responsibility of The Crown Estate. The draft plan/programme to be assessed in OESEA4 includes future leasing for offshore wind, but is not geographically constrained by any area in relevant English or Welsh waters that The Crown Estate propose to include in any leasing round (for example, the proposed projects for Round 4). Therefore, OESEA4 is a connected but separate process to offshore wind leasing. The work undertaken by The Crown Estate to identify the Round 4 bidding areas will, however, be considered as inputs to the SEA.

3.5.2 Offshore Renewables: Wave and Tidal

The leasing and consenting processes for wave and tidal stream renewable energy generating developments are as described above for offshore wind, though tidal range developments consenting requirements may differ from those of offshore wind to reflect the likelihood of their being land-connected and being more akin to large terrestrial infrastructure development. The Crown Estate has not, to date, carried out any wave or tidal stream energy leasing rounds for English and Welsh waters but has offered leases for test devices or small arrays. The vast majority of wave and tidal demonstration to date has taken place in Scottish waters which are not in the remit of this SEA. No leases for tidal range proposals have yet been granted.

3.5.3 Offshore Oil and Gas Exploration and Production

The exclusive rights to search and bore for and get petroleum in Great Britain, the territorial sea adjacent to the United Kingdom and on the UKCS are vested in the Crown and the *Petroleum Act 1998* (as amended) gives the Oil & Gas Authority (OGA)³⁸ the power to grant licences to explore for and exploit these resources. The main type of offshore Licence is the Seaward Production Licence. Offshore licensing for oil and gas exploration and production commenced in 1964 and has progressed through a series of Seaward Licensing Rounds. A Seaward Production Licence may cover the whole or part of a specified Block or a group of Blocks. A Licence grants exclusive rights to the holders “to search and bore for, and get, petroleum” in the area covered by the Licence but does not constitute any form of approval for activities to take place in the Blocks, nor does it confer any exemption from other legal or regulatory requirements.

Offshore licensing takes place under an “Innovate” licence, with amendments to Model Clauses for offshore licensing made to implement this under the *Petroleum and Offshore Gas Storage and Unloading Licensing (Amendment) Regulations 2017*. The Innovate licence is made up of three terms covering exploration (Initial Term), appraisal and field development planning (Second Term), and development and production (Third Term). The lengths of the first two terms are flexible but have a maximum duration of 9 and 6 years respectively. The

³⁸ Note that while certain licensing and related regulatory functions were passed to the OGA (a government company wholly owned by the Secretary of State for BEIS) on 1 October 2016, environmental regulatory functions are retained by BEIS, and are administered by the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED).

Third Term is granted for 18 years but may be extended if production continues beyond this period. The Innovate licence has three Phases in its the Initial Term, covering:

- Phase A: geotechnical studies and geophysical data reprocessing (note that the acquisition of new seismic could take place in this phase for the purpose of defining a 3D survey as part of Phase B, but normally this phase will not involve activities in the field)
- Phase B: acquisition of new seismic data and other geophysical data
- Phase C: exploration and appraisal drilling

Applicants may propose the Phase combination in their submission to the OGA. Phase A and Phase B are optional and may not be appropriate in certain circumstances, but every application must propose a Phase C, except where the applicant does not think any exploration is needed (e.g. in the development of an existing discovery or field re-development) and proposes to go straight to development (i.e. 'straight to Second Term'). The duration of the Initial Term and the Phases within it are agreed between the OGA and the applicant. Applicants may choose to spend up to four years on a single Phase in the Initial Term but cannot take more than nine years to progress to the Second Term. Failure to complete the work agreed in a Phase, or to commit to the next Phase means the licence ceases, unless the term has been extended by the OGA.

Applicants for licences are required to provide the OGA with a number of submissions in support of their applications, including submissions to enable the Competent Authority³⁹ to assess their safety and environmental competence and capability. Seaward licensing rounds are progressed by the OGA with approximately one round taking place each year.

The power cables from shore or the integration of offshore wind turbines and oil and gas installations are likely to be features of new developments and modifications to existing developments in the coming years as means to reduce upstream emissions from oil and gas production (see Sections 3.4.2 and 3.4.5. There is an established consenting route for wind turbines exclusively used for the production of energy for use by oil and gas platforms, which would be a "supplementary unit", defined in regulation 2(1) of the *Offshore Installations and Pipeline Works (Management and Administration) Regulations 1995* (as amended) as, "...a fixed or floating structure, other than a vessel, for providing energy, information or substances to an offshore installation".

3.5.4 Offshore Natural Gas Transportation and Storage

The *Energy Act 2008* (as amended) made provision for the designation of Gas Importation and Storage Zones (now encapsulated and superseded by the Exclusive Economic Zone) and creates a licensing framework for the unloading and storage of combustible gas offshore. The Act prohibits the carrying out of the activities below except in accordance with an Energy Act licence:

- use of a controlled place for the unloading of gas to an installation or pipeline

³⁹ BEIS and the Health and Safety Executive (HSE)

- use of a controlled place for the storage of gas
- conversion of any natural feature in a controlled place for the purpose of storing gas
- recovery of gas stored in a controlled place
- exploration of a controlled place with a view to gas storage
- establishment or maintenance in a controlled place of an installation for the purposes of the above activities

A “controlled place” is a place in, under or over waters within the UK territorial sea, or within any area extending beyond the territorial sea within the Exclusive Economic Area. Carrying on such an activity without a licence, and in certain cases the breach of the conditions of a licence is a criminal offence, and the Licensing Authority for gas storage licensing is the OGA. Operators will also need to obtain a grant of the appropriate rights (a lease) from The Crown Estate.

The *Energy Act 2008* also makes provision with respect to the interaction between activities regulated under the *Petroleum Act 1998* and gas storage activities (e.g. that operations to recover gas from a formation are not regarded to be the result of boring for and getting petroleum within the meaning of the Petroleum Act). Analogous to offshore oil and gas licensing, the environmental management capacity and track record of applicants is considered by BEIS, through written submissions and interviews, before licences are awarded by the OGA.

3.5.5 Offshore Carbon Dioxide Transport and Storage

The *Energy Act 2008* (as amended) provides for a similar licensing regime governing the offshore storage of carbon dioxide and makes it an offence to carry out storage activities without a licence. The regime applies to storage in the offshore area comprising both the UK territorial sea (excluding Scotland), and any area extending beyond the territorial sea within the Exclusive Economic Zone (EEZ). Licenses specifically cover:

- Storage of carbon dioxide with a view to its permanent disposal
- Conversion of a natural feature (for example, a saline aquifer) for such storage
- Exploration for a carbon dioxide storage site
- Establishment or maintenance of an installation for any of those purposes

The licensing authority is the OGA except in the case of the territorial sea adjacent to Scotland for which Scottish Ministers are the licensing authority. In keeping with other offshore licensing arrangements for oil and gas, and gas storage, BEIS retain environmental regulatory functions for carbon dioxide transport and storage projects in relevant UK waters. The *Energy Act 2008* also indicates that the use of the seabed or areas under the seabed for these activities would also require a Crown Estate lease. The licensing arrangements for carbon dioxide storage for the area indicated above is contained within the *Storage of Carbon Dioxide (Licensing etc.) Regulations 2010* (as amended) for England and Wales, and the *Storage of Carbon Dioxide (Licensing etc.) (Scotland) Regulations 2011* (as amended).

3.5.6 Offshore Pipelines

The activities listed above may require a subsea pipeline for the purpose of exporting oil and gas, and for the transfer of gas or carbon dioxide to underground storage. In order to place and use/modify a pipeline on the continental shelf a Pipeline Works Authorisation (PWA) or PWA variation is required (as per Part III of the *Petroleum Act 1998*) for both gas, carbon dioxide transport and offshore petroleum production activities, the consent for which is granted by the OGA. Where a pipeline falls within territorial waters (i.e. within 12nm of the coast) a lease will also be required for that section of the pipeline from The Crown Estate, or in Crown Estate Scotland. Any works which precede the installation of any pipeline (e.g. deposits of rock prior to a PWA being in place), are covered by marine licences under the *Marine and Coastal Access Act 2009*. Any onshore part of a pipeline (that landward of mean low spring tides) is subject to the terrestrial planning regime, including the Planning Act 2008, where appropriate, and is not a subject of this SEA.

3.6 Likely nature and scale of draft plan/programme related activity

Though activities for the whole UKCS (for reserved matters) will be considered in the Environmental Report, the potential for areas to be leased/licensed for plan level activities to take place in any given area is spatially controlled to some extent by prospectivity, whether it be the conditions in which hydrocarbons have accumulated over geological time, the presence of geological structures capable of trapping gas or carbon dioxide in the long term, or the location of the best wind, tidal or wave energy resource. The following sections outline the prospective conditions for each of the plan elements, which are followed by a series of maps illustrating prospectivity against existing or proposed projects which are part of former licensing/leasing of these activities.

It is likely that in the coming years there will be a greater level of energy integration both offshore and onshore, such that oil and gas production, renewable energy generation, electricity transmission and carbon dioxide storage cannot be considered in isolation. For example, offshore natural gas from the UKCS may be used with carbon capture and storage in an offshore storage site to generate hydrogen as a low carbon energy carrier. This integration will be required in order to meet the 2050 net zero commitment.

3.6.1 Offshore Wind

In UK waters, offshore wind is the most developed renewable energy technology. Rounds 1 and 2 of offshore wind leasing were held in 2000 and 2003 respectively, with Round 3, held in 2009, being significantly larger in terms of the areas offered for leasing. Exclusivity agreements were signed for nine of the Round 3 areas, resulting in planning applications for 17 individual wind farm projects, the majority of which (15) have now been consented. The total offshore wind generation capacity of all currently operational (see Figure 3.5), in construction or consented wind farms in England and Wales is some 16.8GW, with a further 6GW in planning⁴⁰. When considering the UK as a whole, the capacity of those operational and consented projects is 23.3GW.

⁴⁰ Correct at June 2020: <https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract>

Further offshore leasing in the immediate term is likely to be delivered through a number of extensions to existing wind farms, seven of which were taken forward following the outcome of a plan level Habitats Regulations Assessment (HRA)⁴¹. These extensions amount to a further potential 2.85GW of capacity. The Crown Estate also is progressing Round 4⁴² wind leasing, which along with The Scottish Government's sectoral plan for offshore wind⁴³ (and related leasing via Crown Estate Scotland (ScotWind)⁴⁴) have the potential to deliver some 8GW and 10GW of additional capacity respectively. Six potential projects with a combined capacity of 7.98GW were announced by The Crown Estate in February 2021 following a competitive tendering process. These projects will be subject to Habitats Regulations Assessment prior to any Agreements for Lease being granted. It is expected that this will be concluded in spring 2022. The combination of the above capacities indicates sufficient potential to reach the 2030 target of 40GW of installed capacity, subject to project approval.

The CCC (2020b) have suggested the need for 95GW of offshore wind to be installed to meet the UK's net zero commitment by 2050 under their Balanced Net Zero Pathway (also see National Grid 2020). The 2050 figure noted by CCC (2020b) would require a further ~45.8GW of capacity to that already producing, in-planning and that envisaged to potentially be delivered as part of the most recent leasing rounds (Figure 3.6). In view of the typical operational life of an offshore wind farm (~20-25 years), a significant proportion of the current operational and consented capacity will also need to be delivered again by 2050, for example by repowering.

Away from the shelter of the coast, the total wind resource over a given year is relatively uniform across very large areas (Figure 3.7), although clearly the occurrence and strength of wind is dependent on a number of meteorological factors. At any point in time, while some areas of the UK may be calm, the wind is likely to be blowing elsewhere. Water depth, distance from areas of high electricity demand, and the availability of connection points to the onshore transmission grid are significant factors in the preferred location of offshore wind developments.

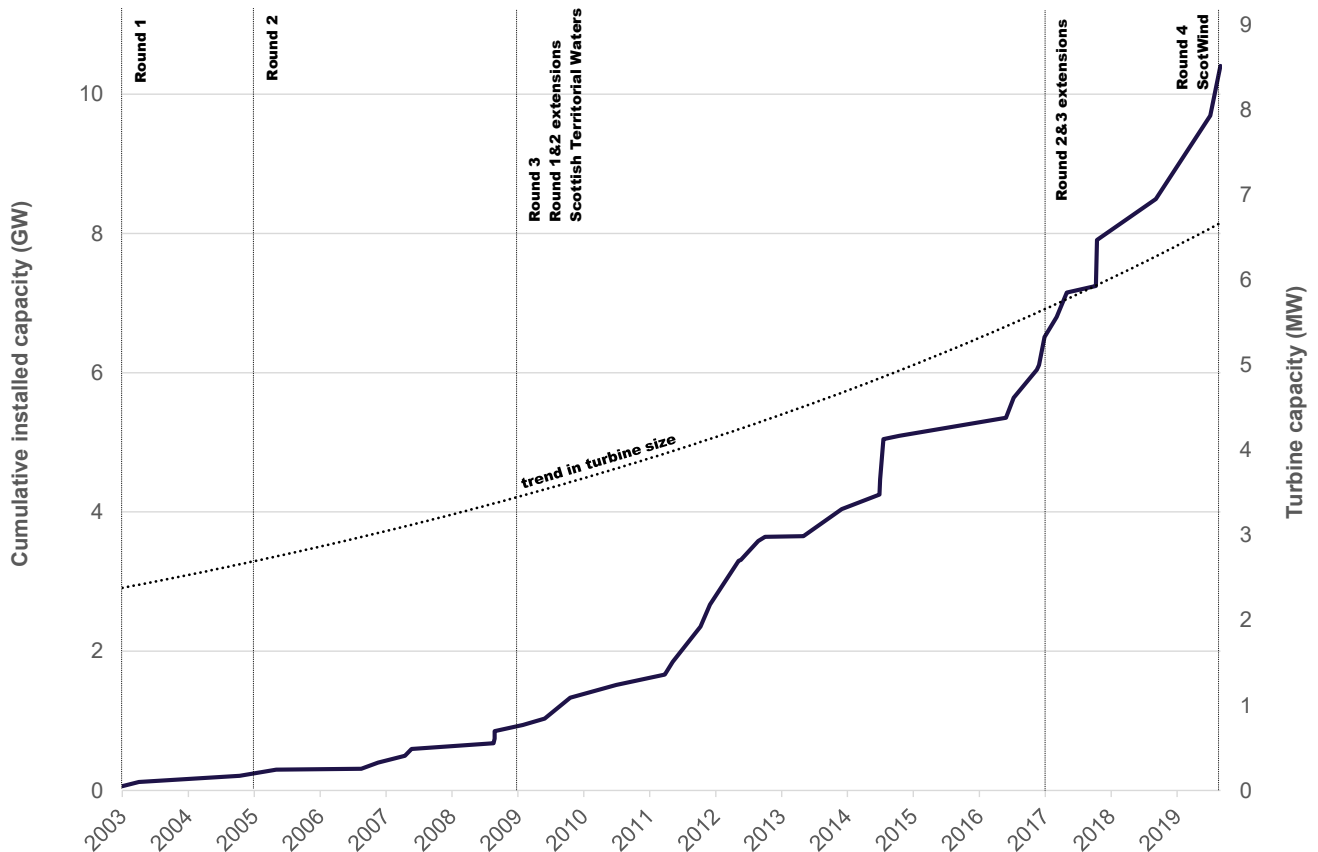
⁴¹ <https://www.thecrownestate.co.uk/en-gb/media-and-insights/news/2019-28-gw-of-offshore-wind-extension-projects-to-progress-following-completion-of-plan-level-habitats-regulations-assessment/>

⁴² <https://www.thecrownestate.co.uk/en-gb/what-we-do/on-the-seabed/offshore-wind-leasing-round-4/>

⁴³ <https://www.gov.scot/publications/draft-sectoral-marine-plan-offshore-wind-energy/>

⁴⁴ <https://www.crownstatescotland.com/what-we-do/marine/asset/offshore-wind/section/scotwind-leasing>

Figure 3.5: Trend in cumulative operational UK offshore wind installed capacity, 2003-2020



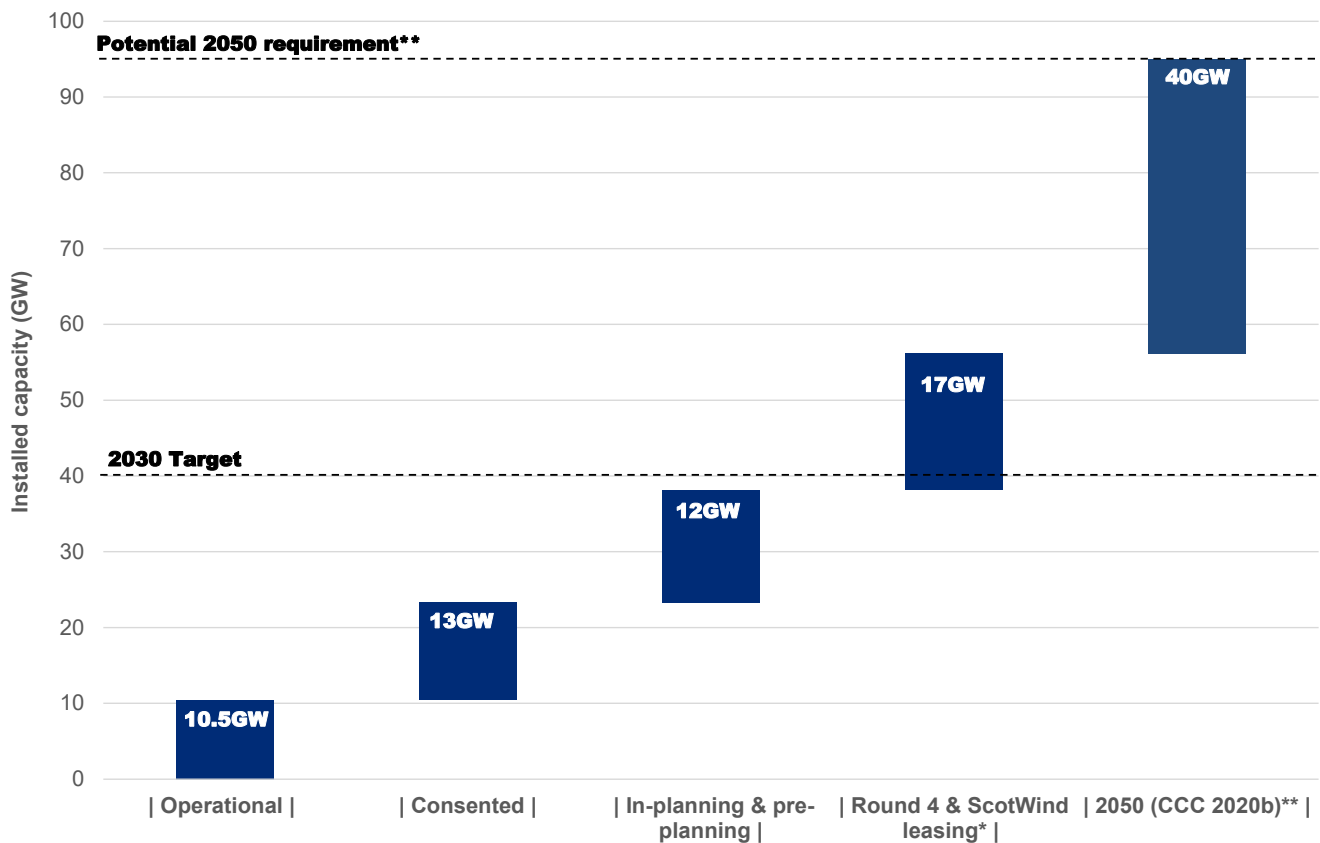
Source: BEIS renewable energy planning database. Note: data correct at September 2020. Excludes Blyth which was decommissioned in 2019.

Round 4 of offshore wind leasing was focussed on fixed foundations in water depths of up to 60m, however, leases for commercial scale developments could be issued in deeper areas for floating wind technologies within the timescale of the SEA. Therefore, for the purposes of this SEA, it is anticipated that wind turbines could be deployed in water depths of up to 250m in relevant UK waters (Figure 3.9). On 24 March 2021 The Crown Estate announced⁴⁵ that a new leasing opportunity for early commercial-scale floating wind projects in the Celtic Sea would be forthcoming. The leasing process will focus on projects of circa 300MW in scale, and would contribute to the Government’s ambition for 1GW of floating wind generation by 2030.

At present, operational offshore wind farms in the UK are using turbines with capacities of approximately 3.6MW to 8MW. The largest capacity turbines currently commercially available are the 14MW GE Renewables Haliade-X and the 14MW Siemens Gamesa, the scale of which are expected to be deployed at Round 3 locations yet to be constructed (e.g. Dogger Bank A and B, and Sofia). There is an expectation that turbines of 12-16MW will be deployed in the 2020s, and that those of 20-24MW may be available by 2040 (Everoze 2020). Increasing the size of turbines reduces the number of turbines required to achieve the same array capacity and tends to improve their load factor.

⁴⁵ <https://www.thecrownestate.co.uk/en-gb/media-and-insights/news/the-crown-estate-to-create-new-floating-wind-leasing-opportunity-in-the-celtic-sea/>

Figure 3.6: Current, planned and potential offshore wind installed capacity



Notes: Includes capacity for all UK waters. *Assumes that the capacity anticipated from ScotWind leasing and the Round 4 proposed project capacity are fully realised, **The CCC (2020b) figure of 95GW is based on their “balanced pathway” scenario to reach net zero emissions for the UK by 2050. The scenario makes a number of assumptions about the mix of the low carbon technologies that will be required to meet the net zero commitment in the energy sector and wider economy and is used here to reflect the potential scale of deployment required beyond 2030. National Grid (2020) project installed offshore wind capacities of between 81.9GW and 87.1GW for two of their Future Energy Scenarios 2020 (“consumer transformation” and “system transformation”) as part of an energy mix that would meet the net zero target by 2050. This diagram does not consider potential decommissioning or repowering of arrays and offshore transmission assets that may be needed to meet these installed capacities.

The main stages of offshore wind development are:

- Site prospecting/selection: including collection of site-specific resource and constraint data, and seabed information by geophysical and geotechnical survey.
- Development: includes selection and construction of foundations (which could be pile driven, gravity base, floating tethered) possibly scour protection, device installation, cable laying including shoreline and other cable/pipeline crossings and armouring, installation of gathering stations/substations and connection to the onshore national electricity transmission system.
- Generation operations, including maintenance.
- Decommissioning, including removal of facilities, for reuse, recycling or disposal.

Scenarios for the likely scale of the future offshore wind deployment for OESEA4 will be generated through consultation with industry and The Crown Estate, and a number of other sources for the purposes of assessment.

3.6.2 **Other Renewables**

Exploitation of wave and tidal stream energy is not yet commercial in UK waters, although several test and demonstrator projects have been deployed or are in development. It is likely that over the coming years as devices reach commercial scale and their viability is demonstrated, larger scale deployment of wave and tidal stream energy generation devices will commence.

The wave resource is broadly concentrated on the Atlantic facing coastline of the UK (Figure 3.10 and Figure 3.11), notably the Western Isles of Scotland and the South West peninsula and SW Wales. The tidal stream resource is more geographically constrained, being localised around headlands and through straits between land masses.

In English and Welsh waters, lease areas for wave and tidal demonstration have been issued almost exclusively on the west coast, off Anglesey (the West Anglesey Demonstration Zone), the Llyn Peninsula (Bardsey Sound), Pembrokeshire (South Pembrokeshire wave demonstration zone), and Cornwall (Wave Hub), the only exceptions being the Perpetuus Tidal Energy Centre off the Isle of Wight, and Torr Head (Northern Ireland). A number of areas in Scottish territorial waters have also been leased for wave and tidal stream development (Figure 3.10 and Figure 3.11).

3.6.3 **Oil & Gas**

For commercial hydrocarbon resources to occur, a number of factors and features have to coincide, including:

- The presence of source rocks, with an appreciable organic matter content
- Adequate depth of burial to allow the conversion of the organic matter to oil or gas through the action of temperature and pressure
- The presence of rocks with sufficient porosity to allow the accumulation of oil or gas
- Cap or seal rocks to prevent the oil or gas from escaping from the reservoir rocks
- Migration pathways to permit oil and gas formed in the source rocks to move to reservoir formations

Such conditions typically occur in sedimentary basins and not areas of igneous rock unless these overlay sedimentary rocks as in parts of the Faroe-Shetland Channel. Offshore areas of the UK have been offered for oil and gas licensing in a series of rounds since 1964, with the most recent 32nd Round held in 2020. Areas with hydrocarbon prospectivity have been extensively explored over this period and many fields brought into production, mainly in the North and Irish Seas, resulting in an extensive infrastructure which can be utilised by new developments, see Figure 3.7. The southern North Sea and Irish Sea are largely gas provinces, with the central and northern North Sea, and West of Shetland areas being oil provinces.

The main stages of oil and gas activity are:

1. Exploration and appraisal: following successful licensing this involves initial exploratory drilling with well evaluation and testing typically using mobile drilling rigs, possibly preceded by seismic survey (note that purchase and reprocessing of existing seismic data is often used). Based on previous experience, typically less than half the wells drilled reveal hydrocarbons, and of that half less than half again will yield an amount significant enough to warrant development.
2. Development: includes production facility installation which may be fixed or floating, and generally the installation of pipeline(s), which for major developments could come ashore but are more often “tied back” to existing export infrastructure, and the drilling of producer and injector wells.
3. Production and export operations: involves routine supply, return of wastes to shore, power generation, chemical use, flaring, produced water management/reinjection and reservoir monitoring and maintenance.
4. Decommissioning: including cleaning and removal of facilities, for reuse, recycling or disposal.

The number of exploration and development wells drilled on the UKCS shows a general decline over time, aligned with a decline in domestic gas and oil production and an increased proportion of hydrocarbon imports. Recent UKCS oil and gas licensing Rounds (31st and 32nd) have maintained significant interest in exploration in both mature hydrocarbon areas and in less explored areas such as the Mid-North Sea High. There is a consensus view that the great majority of large fields in shelf depth waters (<200m) have been found, and deeper water areas are either not prospective or are increasingly well explored and understood. However, the possibility of future major commercial finds cannot be discounted entirely. It is considered likely that the scale of future licensing Rounds will be analogous to that of recent Rounds; consultation with the OGA, industry and a number of other sources will inform the scale of activity used in the assessment for OESEA4, as well as the likely implications of the Climate Compatibility Checkpoint assessments which will be made in advance of each future licensing round (see Section 3.4.2). The speed and scale of decommissioning planning has increased considerably in recent years, and there is an expectation that activities involving the removal of offshore assets will increase over the coming decade.

As noted in Section 3.4.5, the current OGA Strategy, and its legislative underpinnings, commit offshore operators to take steps towards reducing their upstream emissions consistent with the UK commitment to achieving net zero greenhouse gas emissions by 2050. Upstream emissions are dominated by the combustion of diesel and gas, and flaring (14.14MtCO₂ in 2017, equivalent to ~3.75% of UK CO₂ emissions for the same year) which are used to meet offshore installation power demands and safety requirements. OGA (2020) note a number of decarbonisation options associated with the integration of energy systems which largely rely on the electrification of offshore installations, for example, from integration with offshore wind farms. OGA (2018) indicate the potential for a combination of this and the above integration of wind and hydrocarbon producing facilities, with bi-directional cables allowing for export and import. The technical feasibility of supporting power generation on platforms using offshore wind has already been demonstrated (e.g. at Beatrice in the Moray Firth), and the cost

reduction of offshore wind combined with developments in floating wind turbines may now make them more attractive for deeper-water locations⁴⁶.

The downstream emissions from oil and gas production are a result of the variety of end uses which include both energy and non-energy related activities. The reduction and abatement of all such emissions is dealt with through a range of other national policies and legislation, including the 2050 net zero GHG emissions target under the *Climate Change Act 2008*, and are beyond the scope of this SEA. However, the new plan/programme itself has an important role in contributing to the 2050 net zero target. This includes, for example, the integration of the UK's natural gas resources with hydrogen (H₂) gas production onshore (blue hydrogen) as a low carbon energy carrier, when associated with offshore carbon dioxide transport and storage.

3.6.4 Hydrocarbon Gas Storage and Unloading

The inclusion in the current draft plan/programme of gas storage is part of the strategy to increase the UK's storage capacity and maintain resilience of gas supply in cold weather periods of high demand or interruptions to imported supplies. Hydrocarbon gas storage has the potential to take place in depleted and other hydrocarbon reservoirs and other geological structures (e.g. saline aquifers), and can be expected to take place in the same areas as existing oil and gas production, or in areas of extensive halite (rock salt) deposits. Salt caverns, unlike hydrocarbon reservoirs or aquifers, are created in thick halite formations through solution mining, where some of the salt is made soluble and discharged allowing space for the storage of hydrocarbon gas. There are extensive halite deposits in the southern North Sea and eastern Irish Sea, and the most prospective area for halites with gas storage potential (Smith *et al.* 2005) is the Triassic Preesall formation in the East Irish Sea Basin, for which there have been previous development proposals both onshore and offshore.

Smith *et al.* (2005) note that "...based solely on geological criteria, large parts of the offshore Wessex Basin, Peel Basin, Solway Firth Basin, Cardigan Bay Basin and Forth Approaches Basin could also support such facilities. However, these areas currently have no infrastructure, and some have very few wells within the salt depositional area. Without knowing the economic viability of the various elements of the facility, the future competition with onshore facilities, and the total import of gas by this method, it is difficult to assess whether facilities could also be developed in such areas remote from existing infrastructure." Most other deposits in the UKCS are too thin or buried at too great a depth to be viable, though some salt diapirs that rise to shallow depths may be prospective in the central and southern North Sea.

3.6.5 Carbon Dioxide Transport and Storage

The aspects of CCUS of relevance to this plan/programme are any offshore storage site and related surface/subsurface infrastructure including connecting offshore pipelines. The capture and onshore transportation of carbon dioxide are not covered by this SEA.

Prospective areas on the UKCS suitable for storage of carbon dioxide primarily include depleted offshore oil and gas reservoirs and saline aquifers. Constructed salt caverns also have the potential to store gas. A theoretical P50⁴⁷ storage capacity of 78Gt has been

⁴⁶ <https://www.equinor.com/en/what-we-do/hywind-tampen.html> (accessed 19th October 2020)

⁴⁷ P50 is a statistical confidence level for an estimate, where 50% of estimates (in this case of storage capacity) exceed the P50 estimate (and conversely 50% of estimates are less than the P50 value). It can be considered a good middle estimate

estimated collectively for UKCS hydrocarbon fields and saline aquifers (Bentham *et al.* 2014), which is equivalent to over 200 years of UK carbon dioxide emissions at 2019 levels.

Hydrocarbon reservoirs have geological characteristics suited to trapping carbon dioxide over long timescales (e.g. a suitable porosity/permeability and impervious cap rock), and the injection of CO₂ into hydrocarbon reservoirs can also be used for enhanced hydrocarbon recovery. In the longer term these reservoirs can be used exclusively for CCS. Due to the maturity of most of the UKCS hydrocarbon basins, the availability of sites for enhanced hydrocarbon recovery or dedicated CO₂ storage is likely to increase in the coming years and has the potential to exploit existing infrastructure. In fulfilment of an action under the CCUS Deployment Pathway (see above), the UK Government and the OGA undertook an initial review of offshore assets which have the potential to be reused, and also suggested legislative changes to allow for changes in the decommissioning liability arrangements for operators so that there is not a disincentive to transfer these assets for re-use⁴⁸. The Government response to the consultation, published in August 2020, gave a range of future actions including ones related to further re-use assessment of offshore oil and gas assets, making data available, updated policy proposals and regulatory review. Further support for CCUS has been provided by UK Government, for example, through the CCUS Innovation Programme⁴⁹, the Industrial Decarbonisation Deployment and Roadmap administered by UKRI, and funding to support the transition from natural gas to hydrogen⁵⁰. Based on the targets given in the 2020 Energy White Paper (two industrial CCUS clusters by the mid-2020s, and a further two clusters by 2030, with an ambition to capture and store 10MtCO₂ per year by 2030) several facilities could become operational during the timescale of OESEA4, with a mixture of asset re-use and new facility installation.

Information on over 500 potentially prospective storage structures is available through the CO₂Stored database, which makes available some of the information on the UK Storage Appraisal Project commissioned by the Energy Technologies Institute, and which is now being updated by The Crown Estate and the British Geological Survey (Bentham *et al.* 2014).

Saline aquifers provide the largest potential storage capacity on the UKCS, with the highest proportion of this capacity being in the central North Sea. Potential storage areas include the Triassic Bunter Sandstone and Ormskirk Sandstone of the southern North Sea and East Irish Sea Basins respectively, the Captain Sandstone of the Moray Firth, and numerous overlapping formations of the central and northern North Seas having a similar distributed to that area where hydrocarbon production has taken place to date. Saline aquifers can have similar characteristics to hydrocarbon reservoirs (i.e. suitably porous/permeable medium with geological constraints on migration) and may also be suited to CO₂ storage. The capacity of saline aquifers is not yet well established for the UKCS, but they have a theoretically large volume – for instance the most prospective southern North Sea formation, the Bunter Sandstone, is estimated to have a capacity of between 2.2Gt and 14.25Gt CO₂ (Holloway *et al.* 2006, Smith *et al.* 2010, Heinemann *et al.* 2012), and more generally, saline aquifers provide the majority of the potential storage capacity on the UKCS (60Gt excluding chalk aquifers, Bentham *et al.* 2014).

⁴⁸ <https://www.gov.uk/government/consultations/carbon-capture-usage-and-storage-ccus-projects-re-use-of-oil-and-gas-assets>

⁴⁹ <https://www.gov.uk/government/publications/call-for-ccus-innovation>

⁵⁰ <https://www.gov.uk/government/news/pm-commits-350-million-to-fuel-green-recovery>

3.6.6 **Hydrogen: power-to-gas and offshore hydrogen transport and storage**

Hydrogen is an energy carrier which could contribute to carbon dioxide emissions reductions by being generated, for example, using renewables via electrolysis of water (“green hydrogen”), or natural gas by Steam Methane Reforming (SMR) combined with CCS to remove and store the carbon dioxide generated as a by-product of the process (“blue hydrogen”).

Power-to-gas involves the use of excess electricity produced by renewables, which would otherwise be curtailed, to generate hydrogen. Hydrogen may be produced onshore (as is done at a small scale on Orkney as part of two EMEC projects⁵¹), or possibly offshore, and could be used for storage (e.g. in fuel cells) to produce electricity at another time, or else be transported by pipeline (e.g. making use of offshore oil and gas pipeline infrastructure where feasible⁵²), or possibly by vessel.

The small-scale Acorn CCS project based in North East Scotland is considering the feasibility of storing carbon dioxide from the St Fergus gas terminal, including (in a later phase) from hydrogen production, in a North Sea geological store. At a larger scale, The Zero Carbon Humber (ZCH) Partnership⁵³ plans to create a zero carbon industrial cluster using blue hydrogen combined with CCS linked to a southern North Sea geological storage site.

In addition to the storage of carbon dioxide in geological formations, there is the potential to store hydrogen⁵⁴ for later use, including in geological formations (see: Stone *et al.* 2009, Henkel *et al.* 2013, 2014, Bauer *et al.* 2017). Unlike natural gas and carbon dioxide, there is no consenting route for projects transporting hydrogen by offshore pipeline, or its storage in geological formations, either under the *Energy Act 2008* (as amended), or related Regulations such as the *Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020*. Similarly, the consenting route for hydrogen generation offshore requires definition.

⁵¹ Building Innovative Green Hydrogen systems in an Isolated Territory: a pilot for Europe (BIG HIT): <https://www.fch.europa.eu/project/building-innovative-green-hydrogen-systems-isolated-territory-pilot-europe> and Surf ‘n’ Turf: <http://www.surfturf.org.uk/>

⁵² As noted OGA (2020) UKCS Energy Integration, final report.

⁵³ <https://www.nationalgrid.com/zero-carbon-humber-partnership-submits-ps75-million-bid-advance-uks-first-net-zero-industrial>

⁵⁴ For example as investigated by the H2STORE project

Figure 3.7: Current offshore oil and gas fields, infrastructure, onshore terminals, and licensed Blocks

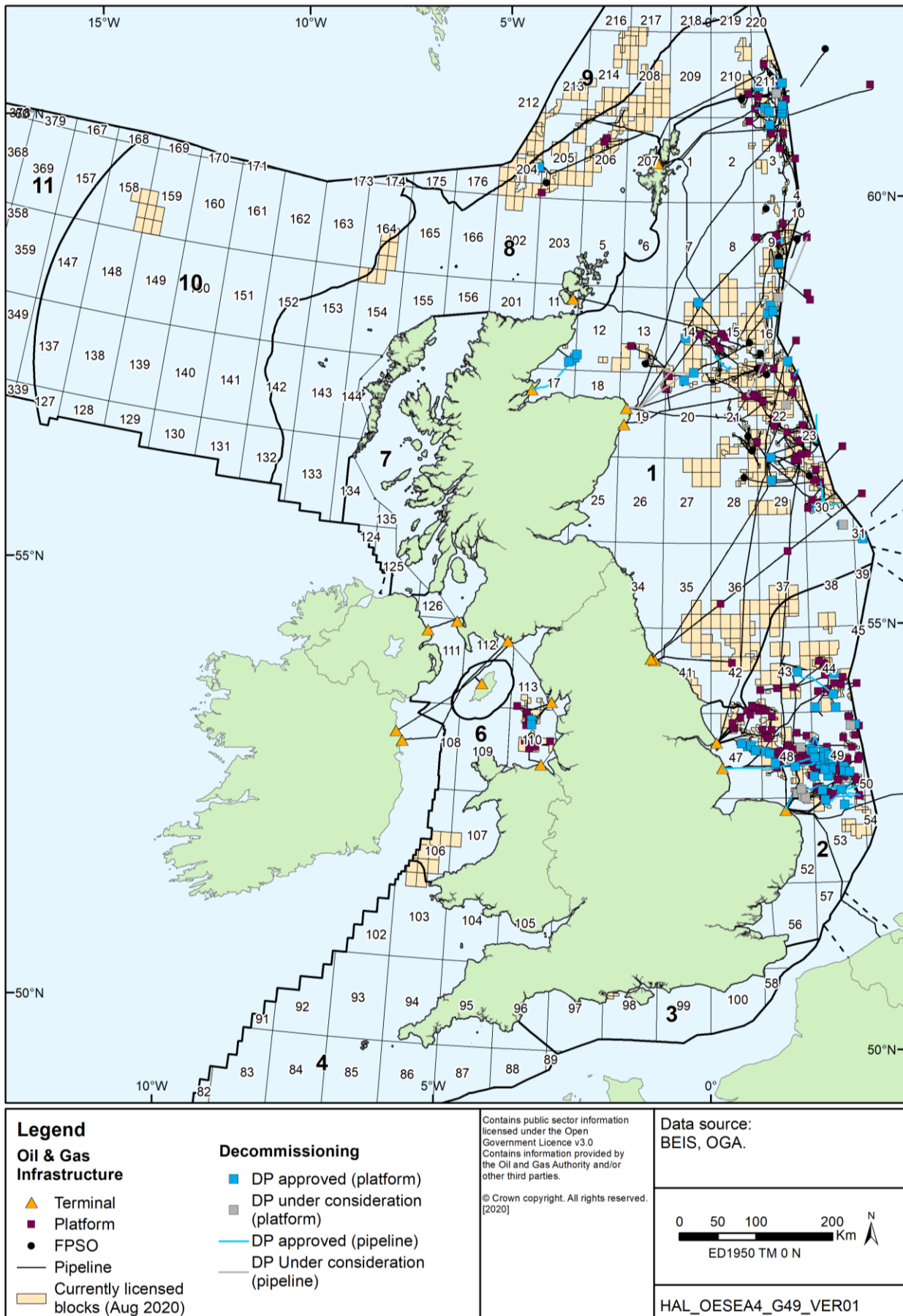


Figure 3.8: Average annual wind speed, current wind farm status and lease bidding areas (correct at February 2021)

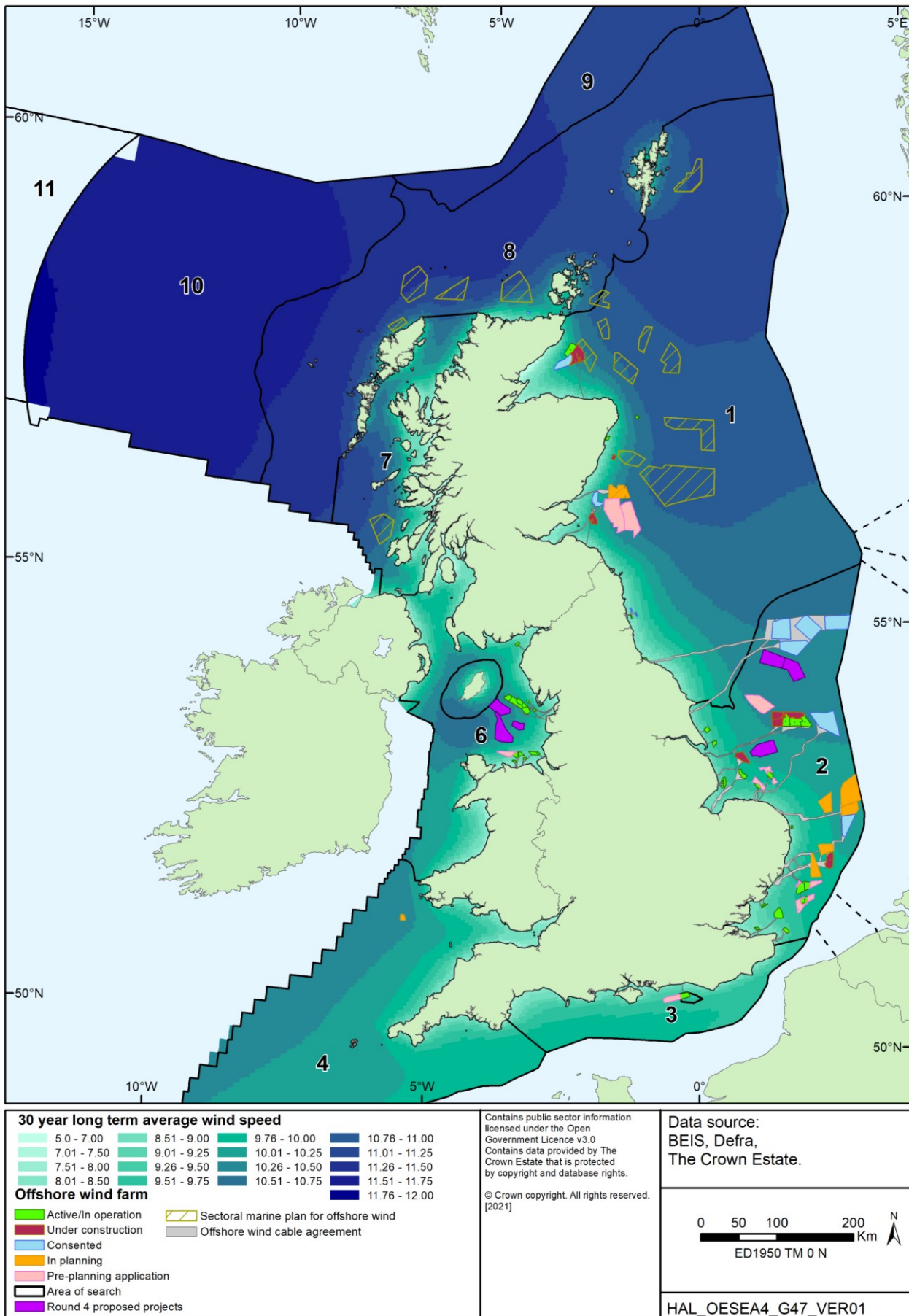


Figure 3.9: Primary offshore wind resource areas considered in OESEA4

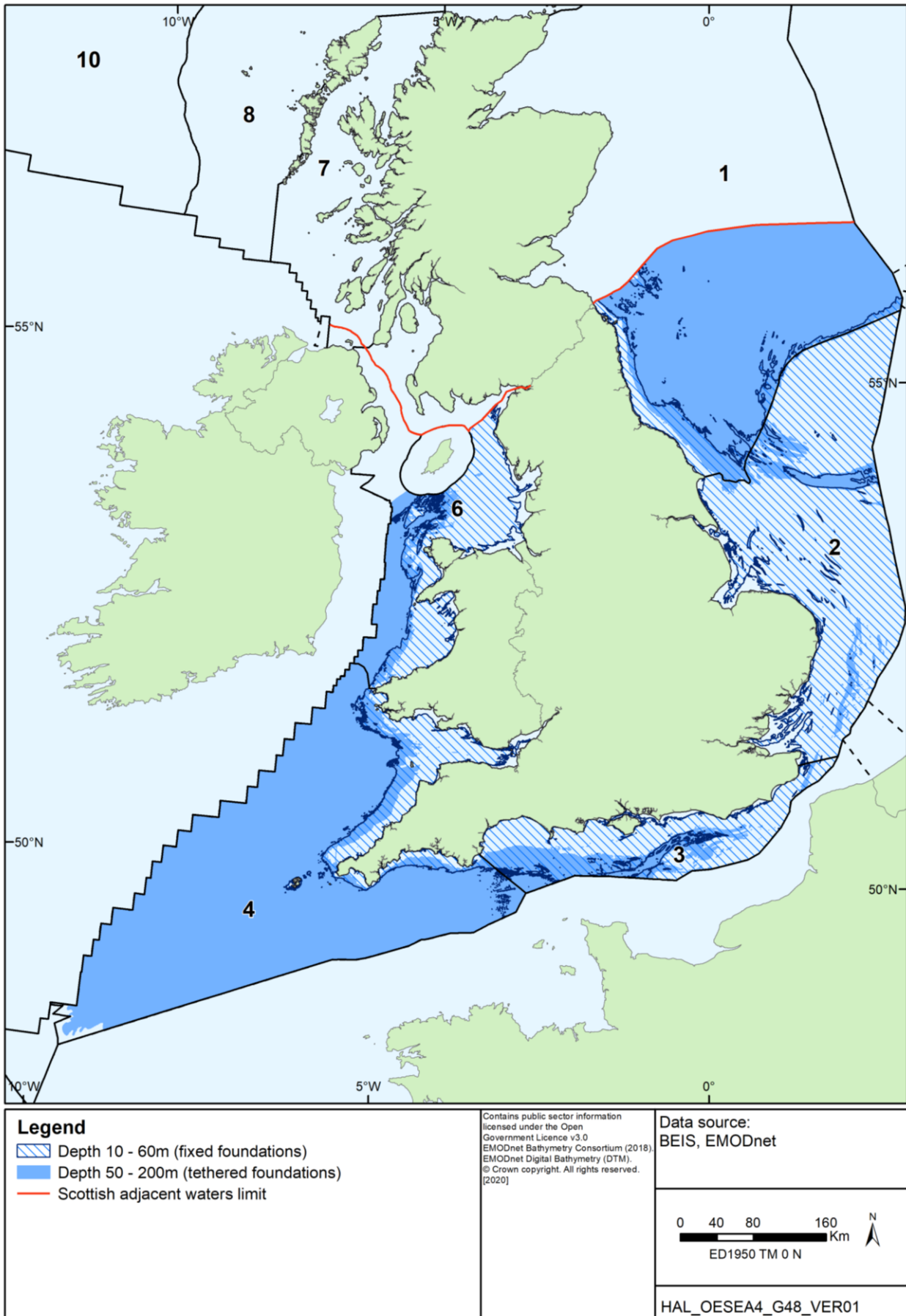


Figure 3.10: Annual mean wave power, current wave leasing areas and status, and potential resource areas

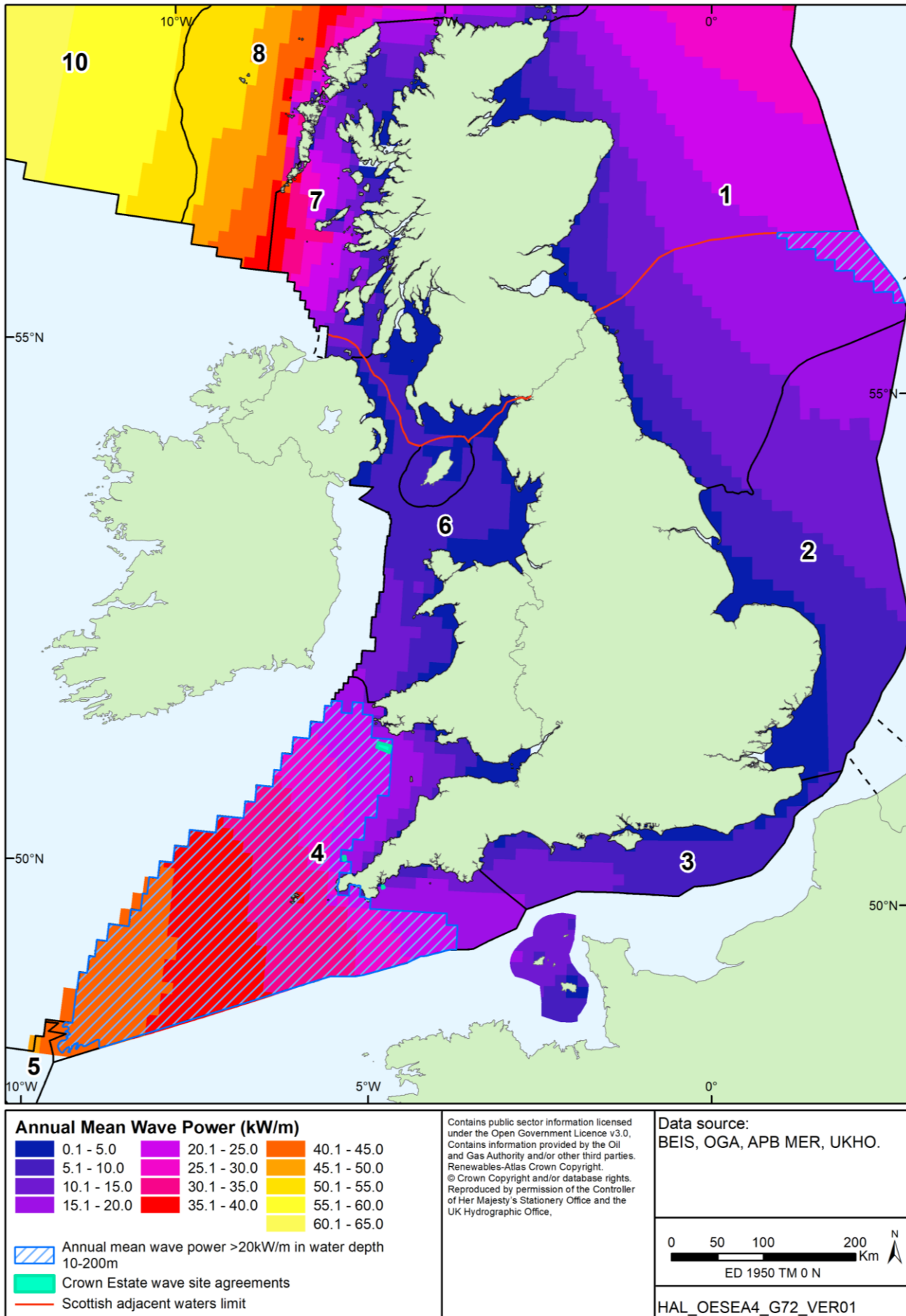


Figure 3.11: Annual mean tidal power, current tidal stream leasing areas and status, and potential resource areas

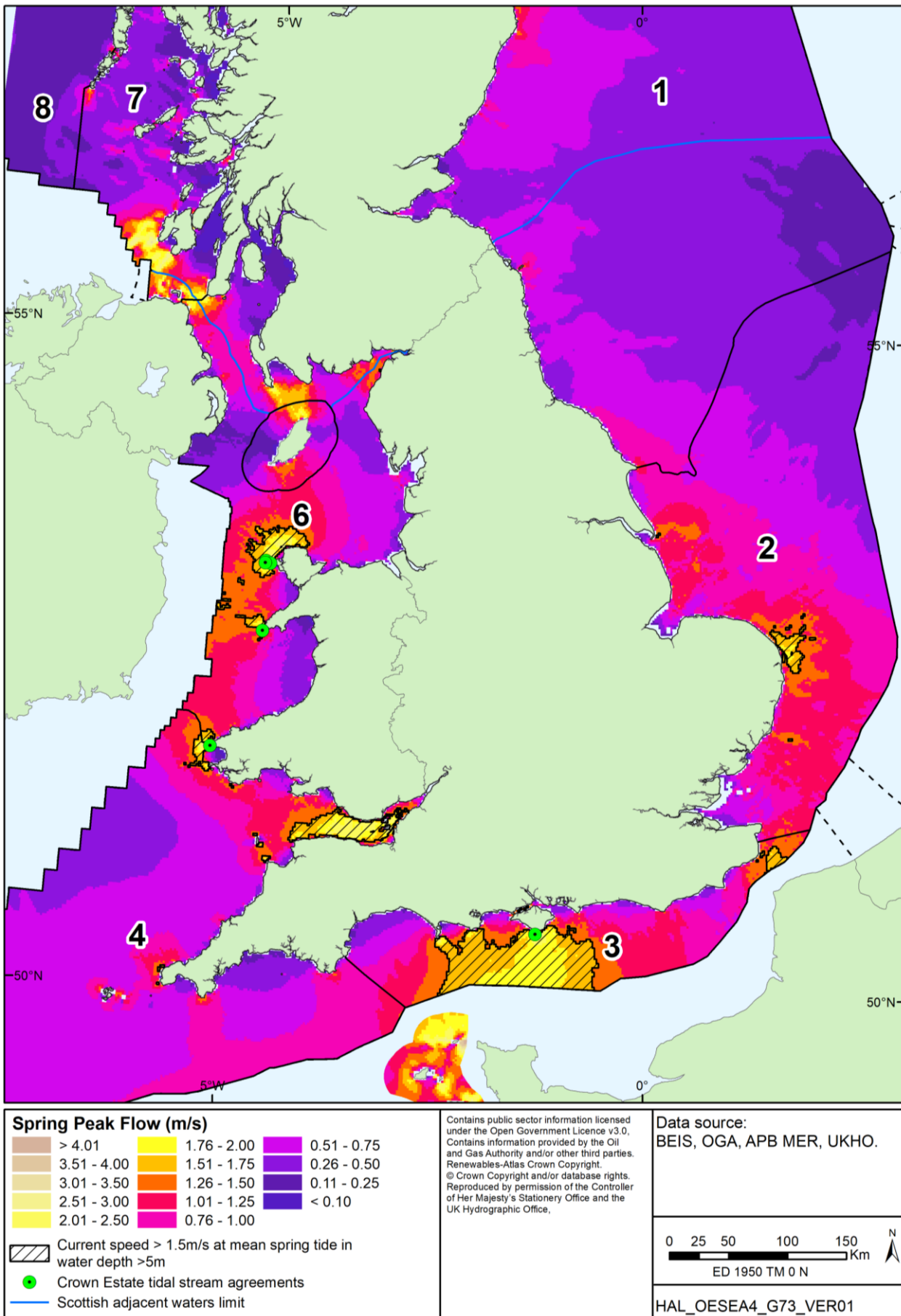
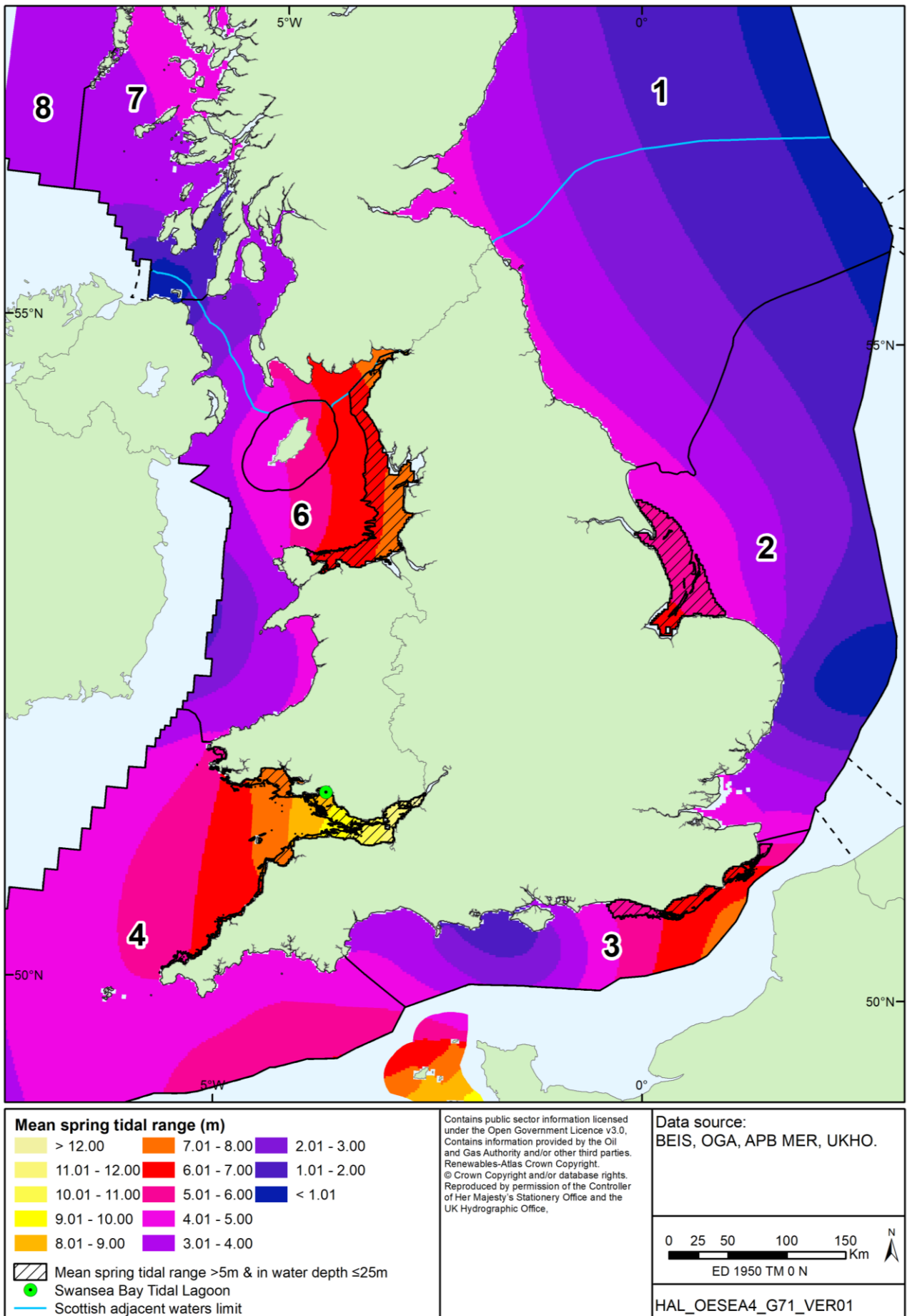


Figure 3.12: Mean spring tidal range and potential resource areas



4 Other Relevant Plans and Programmes

Schedule 1 and 2 of the *Environmental Assessment of Plans and Programmes Regulations 2004* (as amended), variously require that within a SEA Environmental Report consideration is given to:

“an outline of the contents and main objectives of the plan or programme, and of its relationship with other relevant plans and programmes” and that consideration is given to the degree to which the “plan or programme influences other plans and programmes including those in a hierarchy”

and;

“the environmental protection objectives, established at international, Community or National State 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”.

The following sections outline the main relevant initiatives (including plans and programmes, and environmental protection measures) and statutory measures established at international, UK and UK constituent country level, which are relevant to this plan/programme for those topics listed below. The initiatives are arranged by SEA topic area⁵⁵. Where legislation is listed, these are the most pertinent acts/bills/regulations etc. and are not a definitive list. Legislation transposed from EU Directives, amongst other sources of EU-derived law, will form part of the body of UK “retained EU law” created under the *EU (Withdrawal) Act 2018*, which came into effect on 1st January 2021. Any reference to all or part of a European Directive in the following section is only made to provide context to retained EU law.

The outputs of a number of initiatives provide baseline information in terms of the status of certain areas within the SEA topics and their trajectory (e.g. monitoring and reporting outcomes). The SEA will account for the implications of the other plans and programmes set out below on the draft plan/programme.

Consultation Question

1. Consultees are invited to highlight additional initiatives which they consider are relevant to the draft plan/programme.

⁵⁵ As given in Schedule 2(6) of *The Environmental Assessment of Plans and Programmes Regulations 2004*

4.1 Biodiversity, habitats, flora and fauna

Biodiversity, Habitats, Flora & Fauna	
International	<p>Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973)</p> <p>Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat (1971, 1982)</p> <p>Agreement on the Conservation of African-Eurasian Migratory Waterbirds (1999)</p> <p>United Nations Convention on Biodiversity (the Rio Convention, 1992)</p> <p>Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention, 1979)</p> <p>The International Council for the Exploration of the Sea (ICES) Code of Practice for the Introduction and Transfer of Marine Organisms</p> <p>Strategic Plan for Biodiversity 2011-2020 (UNEP/CBD/COP/DEC/X/2) and the Aichi Biodiversity Targets (UNEP/CBD/COP/10/9) - note Parties are working towards a post-2020 global biodiversity framework, under which the Aichi targets may be reviewed and revised</p> <p>International Convention for the control of ships ballast water and sediments (adopted 2004, entered into force September 2017)</p> <p>United Nations Sustainable Development Goals</p>
Regional	<p>Convention for the Protection of the Marine Environment of the North East Atlantic (the OSPAR Convention, 1992)</p> <p>OSPAR Recommendation 2003/3 on a Network of Marine Protected Areas, and OSPAR Recommendation 2010/2 amending Recommendation 2003/3 on a network of Marine Protected Areas</p> <p>OSPAR Agreement 2005-6 on the Agreement on Background Concentrations for Contaminants in Seawater, Biota and Sediment</p> <p>OSPAR List of Threatened and/or Declining Species and Habitats.</p> <p>Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention, 1979)</p> <p>Agreement on the Conservation of Small Cetaceans of the Baltic North East Atlantic, Irish and North Seas (1994)</p> <p>Convention for the Conservation of Salmon in the North Atlantic Ocean (1983)</p> <p>Council of Europe Strategy on Invasive Alien Species (2003)</p> <p>OSPAR Quality Status Reports 2000 and 2010, and intermediate assessment (2017)</p> <p>OSPAR Recommendation 2016/3 on furthering the protection and conservation of the Atlantic salmon (<i>Salmo salar</i>) in Regions I, II, III and IV of the OSPAR maritime area</p> <p>OSPAR Recommendation 2016/02 on furthering the protection and conservation of intertidal mudflats in Regions I, II, III and IV of the OSPAR maritime area</p> <p>OSPAR Recommendation 2016/01 on the reduction of marine litter through the implementation of fishing for litter initiatives</p>
UK	<p><i>National Parks and Access to the Countryside Act 1949</i></p> <p><i>The Wildlife and Countryside Act 1981</i></p> <p><i>Natural Environment and Rural Communities Act 2006</i></p> <p><i>The Conservation of Offshore Marine Habitats and Species Regulations 2017</i></p> <p><i>The Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001</i></p> <p><i>Marine and Coastal Access Act 2009</i></p> <p><i>The Marine Strategy Regulations 2010</i></p> <p><i>Environment Bill 2019-21</i></p> <p>Our Seas - a shared resource. High Level Marine Objectives (2009)</p> <p>Charting Progress 2 - An Assessment of the State of UK Seas (2010)</p> <p>Marine Policy Statement (2011)</p> <p>UK National Ecosystem Assessment (2011) and follow on (2014)</p> <p>Marine Strategy Part 1: UK Initial Assessment and Good Environmental Status (2012) and update (2019)</p> <p>Marine Strategy Part 2: UK Marine Monitoring Programmes (2014) and update (consultation, 2020)</p> <p>Marine Strategy Part 3: UK Programme of Measures (2015)</p> <p>The Great Britain Invasive Non-native Species Strategy (2015)</p> <p>NERC Marine Environmental Mapping Programme (MAREMAP)</p>

UK	<p>A Green Future: Our 25 Year Plan to Improve the Environment (2018) Marine Science Co-ordination Committee (MSCC) (established 2008) and related working groups The Natural Capital Committee (established 2011) Climate Change Committee (established 2008)</p>
	<p><i>Countryside and Rights of Way Act 2000 - England and Wales</i> <i>The Eels (England and Wales) Regulations 2009</i> <i>The Conservation of Habitats and Species Regulations 2017 - England and Wales</i> National Policy Statements for Energy (2011): - England and Wales Overarching National Policy Statement for Energy (EN-1) National Policy Statement for Renewable Energy Infrastructure (EN-3) National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) The National Planning Policy Framework (2019) - England East (2014) and South (2018) Inshore and Offshore Marine Plans - England Remaining Inshore and Offshore Marine Plans in English waters (North East, South East, South West, North West) (ongoing) - England Biodiversity 2020: A strategy for England's wildlife and ecosystem services (2011) and progress update (2013)</p> <p><i>Environment (Wales) Act 2016</i> (including Section 7: Biodiversity lists and duty to take steps to maintain and enhance biodiversity) The Natural Resources Policy Statement (2017) - Wales The Nature Recovery Plan for Wales (2015) Technical Advice Note 5: Nature Conservation and Planning 2009 - Wales Environment Strategy for Wales (2006) and annual progress reporting (2012) State of Wales' Natural Resources report (2016) The Natural Resources Policy Statement (2017) - Wales Planning Policy Wales, Edition 10 (2018) Welsh National Marine Plan (2019)</p> <p><i>The Conservation (Natural Habitats, &c.) Regulations 1994</i> (as amended) - Scotland <i>Nature Conservation (Scotland) Act 2004</i> <i>The Freshwater Fish Conservation (Prohibition on Fishing for Eels) (Scotland) Regulations 2008</i> <i>The Environmental Liability (Scotland) Regulations 2009</i> <i>Marine (Scotland) Act 2010</i> Scottish Planning Policy (2014) and the National Planning Framework for Scotland 3 (2014) Scotland's National Marine Plan (2015) Scottish Biodiversity Strategy (2004) and report to the Scottish Parliament on progress (2017)</p> <p><i>Nature Conservation and Amenity Lands (Northern Ireland) Order 1985</i> <i>Wildlife (Northern Ireland) Order 1985</i> <i>Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995</i> <i>The Environmental Liability (Prevention and Remediation) Regulations (Northern Ireland) 2009 Marine Act (Northern Ireland) 2013</i> Planning Policy Statement 2: Natural Heritage (2013) - Northern Ireland Strategic Planning Policy Statement For Northern Ireland (2015) Biodiversity Strategy for Northern Ireland to 2020 (2015) Strategy for Marine Protected Areas in the Northern Ireland inshore region (2014) The Marine Plan for Northern Ireland (consultation, 2018)</p>
Local.	

4.1.1 Key objectives and targets

Part 2 of the *Conservation of Habitats and Species Regulations 2017* (as amended) provides for the creation of a coherent ecological network of sites made up of Special Areas of Conservation (SACs), which are classified to conserve those species listed in Annex I of the Habitats Directive (92/43/EEC) and habitats listed in Annex II of the Directive; and those sites

designated as Special Protection Areas (SPAs) for bird species under Annex I (rare or vulnerable) and II (migratory) of the Wild Birds Directive 2009/147/EC.

The *Conservation of Species and Habitats Regulations 2017* (as amended) consolidates the *Conservation (Natural Habitats, &c.) Regulations 1994* in England and Wales, and also implements certain aspects of the *Marine and Coastal Access Act 2009*, principally the transfer of certain licensing functions from Natural England to the Marine Management Organisation (MMO), and the recognition of Marine Enforcement Officers to be able to use powers under the *Marine and Coastal Access Act 2009* and to enforce offences under the Habitats Regulations, within England, Wales and Scotland (for reserved matters) and their respective territorial seas. The devolved administrations of Scotland and Northern Ireland implement the *Habitats Directive* through the *Conservation (Natural Habitats, &c.) Regulations 1994* (as amended) in Scotland, and the *Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995* (as amended) in Northern Ireland. The Wild Birds Directive is also implemented through the above Regulations, and also through the *Wildlife & Countryside Act 1981* (as amended), the *Wildlife (Northern Ireland) Order 1985* and the *Nature Conservation and Amenity Lands (Northern Ireland) Order 1985* (as amended). The *Conservation of Offshore Marine Habitats and Species Regulations 2017* (as amended) apply the provisions of the Habitats Directive and the Birds Directive beyond territorial waters (beyond 12nm). The *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended) cover Habitats Regulations Assessment requirements of activities authorised under the *Petroleum Act 1998*, Part 1 of the *Energy Act 2008* (Gas Importation and Storage), or any Petroleum Act or Energy Act licence (e.g. oil and gas exploration and production, carbon dioxide appraisal and storage and gas storage, offshore pipelines).

Under the *Conservation of Species and Habitats Regulations 2017* (as amended), regulation 37 (or 28 and 33 for the Northern Ireland and Scottish Regulations respectively) requires that the conservation bodies (e.g. Natural England, Joint Nature Conservation Committee (JNCC), Natural Resources Wales (NRW), SNH, Northern Ireland Environment Agency (NIEA)) produce advice on the conservation objectives for marine sites and activities likely to cause deterioration/disturbance to qualifying site habitats and/or species. Such advice has been previously produced by each body, and conservation advice packages are currently being reviewed or produced for a range of MPAs by Natural England under both regulation 37 (SACs and SPAs) and the *Marine and Coastal Access Act 2009* (for Marine Conservation Zones, see below).

The *Wildlife and Countryside Act 1981* (as amended) is one of the principal pieces of legislation relating to nature conservation in Great Britain. Although protection under the Act generally includes adjacent territorial waters (12nm), for certain species protection is limited to 6nm from coastal baselines⁵⁶ due to the interaction with the Common Fisheries Policy⁵⁷ and for the designation of Marine Nature Reserves out to 3nm. The Act is supplemented by various other pieces of legislation including the *Countryside and Rights of Way Act 2000* (in England and Wales) and the *Nature Conservation (Scotland) Act 2004* (in Scotland). In Northern Ireland, the main legislation is contained in the *Wildlife (Northern Ireland) Order 1985* (as amended) and the *Environment (Northern Ireland) Order 2002*. This legislation provides for the protection of species and the designation of nationally important sites known as Sites of Special Scientific Interest (SSSI) in England, Wales and Scotland and as Areas of Special

⁵⁶ *The Territorial Sea (Baseline) Order 2014*

⁵⁷ Note the approach to the management of fisheries in UK waters may change within the timescale of OESEA4, following the UK's exit from the EU on 1st January 2021.

Scientific Interest (ASSI) in Northern Ireland. SSSI sites have until present extended only to Mean Low Water (e.g. intertidal areas), though the *Marine and Coastal Access Act 2009* (see below for further details) has allowed for all new SSSIs to extend below this line should features extend into the intertidal area.

The *Environmental Damage (Prevention and Remediation) Regulations 2015* (as amended) (separate regulations apply in the devolved administrations) applies to environmental damage caused to inter alia species and habitats protected through SACs and SPAs.

The *Environment (Wales) Act 2016* covers a range of environmental issues including, most relevant to this SEA: sustainable management of natural resources, climate change, fisheries for shellfish and marine licensing, and flood and coastal erosion and land drainage. A number of reporting duties are placed on NRW including the preparation of a State of Natural Resources Report (SNRR) and Area Statements, which are to set out an assessment of natural resources and how well they are being managed, and the priorities, risks and opportunities for managing natural resources sustainably and what action they will take. The Welsh Government will produce a National Natural Resources Policy (NNRP) that sets out the priorities and opportunities for managing our natural resources sustainably, taking account of the SNRR and the extant Natural Resources Policy Statement.

The *Marine Strategy Regulations 2010* establishes a framework for measures to achieve or maintain good environmental status (GES) in the marine environment by the year 2020. The Regulations transposed the requirements of the Marine Strategy Framework Directive (MSFD, 2008/56/EC). Annex I of the MSFD contains eleven qualitative descriptors for determining GES. While they are relevant to a range of SEA topic areas, these are reproduced below as they are variously referred to in later sections:

1. Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions.
2. Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems.
3. Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock.
4. All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity.
5. Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters.
6. Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.

7. Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.
8. Concentrations of contaminants are at levels not giving rise to pollution effects.
9. Contaminants in fish and other seafood for human consumption do not exceed levels established by legislation or other relevant standards.
10. Properties and quantities of marine litter do not cause harm to the coastal and marine environment.
11. Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.

As part of the implementation of the Marine Strategy Regulations, the UK Government released Marine Strategy Part 1: UK Initial Assessment and Good Environmental Status (2012), which was updated in 2018. The Marine Strategy Part 2, first published in 2014, and updated in March 2021⁵⁸ provides a description of the UK's marine monitoring programmes to support the targets and indicators set out for each of the eleven MSFD descriptors, and the UK's proposed programme of measures to maintain or achieve GES was published in December 2015.

Included in measures to achieve GES is the establishment of a cohesive network of Marine Protected Areas (MPAs) which is intended to build on the areas already protected in the UK by the Habitats Regulations. Sites established under the *Marine and Coastal Access Act 2009*, and Acts of the devolved administrations, will aid the completion of such a network of MPAs, which is also a requirement of other commitments regarding MPAs under international conventions such as the Convention on Biological Diversity. These sites which may be designated both within territorial and offshore waters are known as Marine Conservation Zones (MCZs) in England, Wales and Northern Ireland, and Marine Protected Areas (MPAs) in Scotland, administered at the local level in each UK constituent country.

The MCZ project in England and Wales was initially delivered through four regional projects administered by Natural England and the JNCC, covering the South-West (Finding Sanctuary), Irish Sea (Irish Sea Conservation Zones), North Sea (Net Gain) and Eastern Channel (Balanced Seas). The sites were selected based on representative habitat and species features (termed Features of Conservation Importance, FOCI), subject to consultation with a range of relevant stakeholders, and to several rounds of consideration by the Science Advisory Panel (SAP) prior to recommended sites being submitted in 2011. The result was the identification of 127 recommended MCZs and Reference Areas (sites within which strict environmental protection measures essentially made them hard constraints on certain marine activities). Formal advice was then given to Government in July 2012 by JNCC and Natural England, with 27 sites being designated in 2013 following consultation. Some sites were not designated in this first tranche due to a lack of robust evidence to support the presence or nature of certain FOCI, or their potential impact on activities such as renewable energy cable landfall. Subsequently, an additional 23 sites were designated in January 2016 followed by a further 43 sites and 12 additional features in 2019. A review into Highly Protected Marine Areas (HMPAs) was undertaken between 2019 and 2020 led by former Environment and

⁵⁸ <https://www.gov.uk/government/publications/marine-strategy-part-two-uk-marine-monitoring-programmes>

Fisheries Minister Richard Benyon (the Benyon Review⁵⁹) which made recommendations including that HMPAs should be introduced in conjunction with existing MPAs, setting objectives to allow full recovery of such sites and where extractive, destructive and depositional uses are prohibited.

Scottish territorial and offshore waters, and the territorial waters of Wales and Northern Ireland, are subject to their own programmes of MCZ/MPA identification and designation. In Wales, the Welsh Assembly Government (WAG) is running the Wales MCZ Project, which is advised by a Steering Group and a Technical Advisory Group. The former consists of WAG, NRW, the Welsh Local Government Association and other relevant bodies in Wales, with the latter having a broader array of advisers including the JNCC and Centre for Environment, Fisheries and Aquaculture Science (Cefas). The Welsh Assembly Government intends to use the new MCZ powers to supplement the existing network of marine protected areas (e.g. offshore SACs) with a limited number of highly protected sites. A consultation on 10 proposed sites was undertaken in 2012, however none of the proposed sites have yet been put forward for designation. In UK offshore waters adjacent to Scotland, MPAs are being identified through a Scottish Marine Protected Area Project under the *Marine and Coastal Access Act 2009*, with those in Scottish Territorial Waters through the *Marine (Scotland) Act 2010*. The Scottish MPA project identified proposals for 33 MPAs and 4 MPA search locations yet to be fully assessed which were consulted on in 2013. 30 of the sites were designated in 2014 under Marine Protected Area Orders, and the Fair Isle Demonstration & Research MPA was designated in 2016.

The Department of Environment (Northern Ireland) published, A draft Strategy for Marine Protected Areas in the Northern Ireland Inshore Region, for consultation in May 2013. The strategy outlines the approach in Northern Ireland to the creation of MCZs in their territorial waters, which will be designated under the *Marine Act (Northern Ireland) 2013*. Strangford Lough was the first MCZ in Northern Ireland, replacing its former designation as a Marine Nature Reserve under the *Nature Conservation and Amenity Lands (Northern Ireland) Order 1985*. Four additional MCZs were designated in Northern Irish waters in 2016.

The High Level Marine Objectives agreed by the UK Government and Devolved Administrations set out an approach to the sustainable use of UK seas, including the recognition that healthy marine habitats and ecosystems, species and biodiversity should be maintained and where appropriate recovered. These objectives underpin the Marine Policy Statement (MPS), and the next stage of marine planning is presently underway, with number of regional (East and South Inshore and East Offshore) marine plans having been adopted, with those remaining plans in England targeting completion by 2021. National marine plans in Scotland (2015) and Wales (2019) similarly interpret the MPS at a devolved government level, with further regional planning taking place in Scotland.

A number of potential impacts on the natural environment from energy developments relevant to OESEA4 are identified in the MPS. More widely and in relation to all marine activities, high level environmental considerations are provided by reaffirming the conservation responsibilities of the UK Government which are to be taken account of in the preparation of Marine Plans. This includes the commitment to establishing a UK network of MPAs incorporating MCZ designations under the *Marine and Coastal Access Act 2009* (see above) and existing and future marine sites including SACs and SPAs.

⁵⁹ <https://www.gov.uk/government/publications/highly-protected-marine-areas-hpmas-review-2019>

Northern Ireland are presently developing their own National marine plan under the *Marine and Coastal Access Act 2009* for offshore waters, with inshore marine planning to be covered by the *Marine Act (Northern Ireland) 2013*. The plan was consulted on in 2018 but is yet to be adopted.

The UK Biodiversity Action Plan (UKBAP) provided a national strategy for the conservation of biological diversity and the sustainable use of biological resources as required under Article 6 of the Rio Convention. A number of species (1,150) and habitats (65) were identified as being priorities for conservation action in the UK, and these include a number of marine components, for instance 28 BAP habitats are marine. Though the plans for these species and habitats have no statutory status, they are given some legal basis in the *Countryside and Rights of Way Act 2000* and the *Natural Environment and Rural Communities Act 2006* (e.g. list of species of principal importance designated under Sections 41 and 42 of the Act). UKBAP was succeeded by the UK Post-2010 Biodiversity Framework in 2012, produced by JNCC and Defra on behalf of the UK and devolved administrations, and covering the period 2011-2020. The Framework was the Government's response to the Convention on Biological Diversity's Strategic Plan for Biodiversity 2011-2020 and its five strategic goals and 20 "Aichi Targets", and the EU Biodiversity Strategy.

National Policy Statements published in 2011 (and currently under review) were aimed at providing a policy steer for Nationally Significant Infrastructure Projects (NSIPs) as detailed in the *Planning Act 2008*. Those which are of close relevance to OESEA4 are:

- Overarching National Policy Statement for Energy (EN-1)
- National Policy Statement for Renewable Energy Infrastructure (EN-3)
- National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4)

Each National Policy Statement was subject to an Appraisal of Sustainability (AoS) incorporating Strategic Environmental Assessment and Habitats Regulations Assessment (HRA). The Overarching National Policy Statement for Energy (EN-1) contains policy in relation to, amongst other considerations, generic biodiversity impacts; whereas the energy specific policy statements contain more detailed considerations, although still at a high policy level. Each National Policy Statement contains considerations relevant to potential impacts on the natural environment, including that within the remit of the plan/programme, such as birds, marine mammals, fish and intertidal habitats. Decisions made by the relevant authority with regards to NSIPs must also be taken with regard to the MPS and any relevant Marine Plan.

In addition to threats posed from marine development and climate change, the marine environment has recently been subject to a number of introduced species which have led to a series of localised changes in community composition. A number of national and international initiatives exist aiming to recommend and introduce safeguards to limit the transport of invasive species, including the International Convention for the Control and Management of Ships' Ballast Water and Sediments and the Great Britain Invasive Non-native Species Strategy.

4.2 Geology, substrates & coastal processes

Geology, Substrates & Coastal Processes	
International	<p>The Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (the London Convention) and 1996 Protocol Thereto (amendment on the storage of CO₂ in geological formations came into force 10 February 2007). GEBCO Seabed 2030 (launched 2017)</p>
Regional	<p>OSPAR Recommendation 2003/3 on a Network of Marine Protected Areas OSPAR Agreement 2005-6 on the Agreement on Background Concentrations for Contaminants in Seawater, Biota and Sediment OSPAR Recommendation 2006/5 on a management regime for offshore cuttings piles OSPAR Decision 2007/2 on the Storage of Carbon Dioxide Streams in Geological Formations OSPAR Recommendation 2016/02 on furthering the protection and conservation of intertidal mudflats in Regions I, II, III and IV of the OSPAR maritime area OSPAR Intermediate Assessment 2017</p>
UK	<p><i>The Wildlife and Countryside Act 1981</i> <i>Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended)</i> <i>Marine and Coastal Access Act 2009</i> <i>The Marine Strategy Regulations 2010</i> <i>The Storage of Carbon Dioxide (Licensing etc.) Regulations 2010</i> <i>The Energy Act 2008 (Consequential Modifications) (Offshore Environmental Protection) Order 2010</i> <i>The Energy Act 2011</i> The UK Marine Policy Statement (2011) Geological Conservation Review (GCR) Local Geological Sites, including Regionally important Geological and Geomorphological Sites (RIGS) Defra Consultation on Coastal Change Policy (2009), Coastal Change Pathfinder and Review (2012) National Coastal Erosion Risk Mapping Project (ongoing) CCS Roadmap: Supporting deployment of Carbon Capture and Storage in the UK (2012) - also see Next Steps in CCS: Policy Scoping Document (2015) - England and Wales The MCA Civil Hydrography Programme NERC Marine Environmental Mapping Programme (MAREMAP) Marine Strategy Part 1: UK Assessment and Good Environmental Status (updated 2019) Marine Strategy Part 2: UK Marine Monitoring Programmes (2020) - consultation Marine Strategy Part 3: UK Programme of Measures (2015) River Basin Management Plans for respective administrations, including those which are cross-border Flood Risk Management Plans in respective administrations The Conservation of Habitats and Species Regulations 2017 The Conservation of Offshore Marine Habitats and Species Regulations 2017 The Clean Growth Strategy (2017), relating to a new approach to CCUS Carbon Capture Usage and Storage Deployment Pathway (2018)</p>

Coast Protection Act 1949 (as amended) - England and Wales
Countryside and Rights of Way Act 2000 - England and Wales
 National Policy Statements for Energy (2011): - England and Wales
 Overarching National Policy Statement for Energy (EN-1)
 National Policy Statement for Renewable Energy Infrastructure (EN-3)
 National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4)
 East (2014) and South (2018) Inshore and Offshore Marine Plans - England
 Three-year report on the East Marine Plans (2 April 2017 to 1 April 2020)
 A Strategy for Promoting an Integrated Approach to the Management of Coastal Areas in England
 Making space for water: Taking forward a new Government strategy for flood and coastal erosion risk management in England (2008)
 National flood and coastal erosion risk management strategy for England (2020)
 Shoreline Management Plans - England and Wales
 Marine Aggregate Levy Sustainability Fund (MALSF) Regional Environmental Characterisations including : South Coast, Thames, East Coast and the Humber areas.
The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
 A Green Future: Our 25 Year Plan to Improve the Environment (2018)
 National Planning Policy Framework (2019)
 Good practice guidance: extraction by dredging of aggregates from England's seabed (2017)

Technical Advice Note 5: Nature Conservation and Planning (2009) - Wales
 Technical Advice Note 14: Coastal Planning (1998) - Wales
 Technical Advice Note 15: Development and Flood Risk (2004) - Wales
 Marine Conservation Zone Project Wales (ongoing)
 National Strategy for Flood and Coastal Erosion Risk Management in Wales (2019 - consultation)
 State of Wales' Natural Resources report (2020)
 The Natural Resources Policy Statement (2017) - Wales
 Planning Policy Wales, Edition 10 (2018)
 Welsh National Marine Plan (2019)

Marine (Scotland) Act 2010
The Conservation (Natural Habitats, &c.) Regulations 1994 - Scotland
Water Environment and Water Services (Scotland) Act 2003
Flood Risk Management (Scotland) Act 2009
The Storage of Carbon Dioxide (Licensing etc.) (Scotland) Regulations 2011
 The Scottish Coastal Forum and Local Coastal Partnerships (established 1996)
 Scottish Planning Policy (2014) and the National Planning Framework for Scotland 3 (2014), and consultation draft on the National Planning Framework for Scotland 4 (due 2020)
 Scotland's National Marine Plan (2015)
 National Marine Plan Review 2018: Three Year Report on the implementation of Scotland's National Marine Plan (encompassing inshore and offshore waters) (2018)
 The Scottish MPA Project (ongoing)
 Dynamic Coast: Scotland's Coastal Change Assessment (2017)

Marine (Northern Ireland) Act 2013
 Earth Science Conservation Review (Northern Ireland)
 An Integrated Coastal Zone Management Strategy for Northern Ireland 2006-2026 (2006)
 Marine Conservation Zone project
 Planning Policy Statement 15: Planning and Flood Risk (2014) - Northern Ireland
Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017
 The Marine Plan for Northern Ireland (consultation, 2018)

4.2.1 **Key objectives and targets**

The Geological Conservation Review (GCR), launched in 1977, identifies the most important (nationally and internationally) terrestrial geological sites in Britain. GCR sites are chosen such that they satisfy the legal requirements of SSSI designations for geology and physiography, and therefore they often geographically coincide with notified Earth Science-SSSIs (e.g. in Scotland 77% of sites are designated in such a way) or those which are awaiting notification. The *Marine and Coastal Access Act 2009* also amends the *Wildlife and Countryside Act 1981* in such a way that SSSI notifications can be made in England and Wales below the Mean Low Water Mark (MLWM) under certain statutory conditions, set out in the Act (e.g. the flora, fauna or features leading to the notification of the SSSI are also present in the subtidal area to which SSSI protection is to extend). The Act also provides powers to remove SSSI notifications where they coincide with new MCZs in England and Wales. Locally important sites are recognised through the Regionally Important Geological and Geomorphological Sites (RIGS) programme, though only SSSI features have any form of statutory protection.

In the marine environment, many geological features are gaining protection through designations for which they are a qualifying habitat feature (e.g. SACs designated under the *Conservation of Habitats and Species Regulations 2017* (as amended), or *Conservation of Offshore Marine Habitats and Species Regulations 2017* (as amended)). The *Marine and Coastal Access Act 2009*, the *Marine (Scotland) Act 2010* and the *Marine Act (Northern Ireland) 2013* provide a means for the conservation of specific “features of geological and geomorphological interest” through the designation of MCZs or MPAs. The number of sites subject to consultation by the relevant conservation bodies have been summarised above in relation to Biodiversity, Habitats, Flora and Fauna. The location of these sites and features for which they are to be designated are mapped and discussed in the Environmental Report.

At the coast, natural denudation processes are leading to shoreline retreat and increased flood risk in many cases, which may be accentuated by projected climate and associated environmental change, which is projected to include increased storminess and sea-level rise (see Climate & Meteorology, below), and is recognised in national climate change adaptation programmes. Integrated Coastal Zone Management and appropriate planning policy aims to help manage and mitigate the problems associated with inter alia coastal erosion and flood risk. The *Flood and Water Management Act 2010* (England and Wales), the *Flood Risk Management (Scotland) Act 2009* and the *Water Environment (Floods Directive) Regulations (Northern Ireland) 2009* make provisions for the creation of flood risk (and in the case of England and Wales, coastal erosion) management strategies/plans. In addition to these, terrestrial and marine planning policy for England (including in relation to NSIPs) and the devolved administrations provides policy and guidance for developers and authorities on how to manage development at the coast, incorporating aspects relating to climate change (such as increased sea-levels) and the prohibition of unnecessary or inappropriate development in areas subject to erosion and coastal flooding (e.g. the creation of Coastal Change Management Areas). Shoreline Management Plans (In England and Wales) are already taking a longer-term view by identifying sustainable management approaches of relevance for up to the next 100 years. Each SMP provides policy recommendations for coastal areas which may advise Holding the Line (HTL), through the maintenance of present defences or where monitoring and assessment provide evidence that new defences would be beneficial; No Active Intervention (NAI), where defences are not maintained and Managed Realignment (MR) or Retreat (R), where defences are removed and/or moved inland to allow for natural coastal denudation. Policies are provided in each SMP over three ‘epochs’, 2009-2025, 2025-2055 and 2055-2105.

The *Water Environment (Water Framework Directive) (England and Wales) Regulations 2017* (and those equivalent Regulations of the devolved administrations) seek to achieve good ecological and chemical status for coastal and estuarine water bodies. River Basin Management Plans (RBMPs) completed under the relevant Regulations will be used in combination with other plans including SMPs to achieve a fully integrated approach to coastal management. RBMPs identify relevant morphological and hydrodynamic issues and the measures to manage such issues. Similarly, the *Marine Strategy Regulations 2010* (as amended) seek to achieve good environmental status in the marine environment, which incorporates geomorphological conditions. These objectives, aligned with the published and forthcoming Marine Plans, should provide a holistic consideration of the geological aspects of the marine and terrestrial environment across the intertidal and coastal areas of the UK.

Internationally, the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (the London Convention) and 1996 protocol provide environmental law for the permanent storage of carbon dioxide in geological formations. The amendments to the 1996 protocol, which entered into force on 10th February 2007, state that, “carbon dioxide streams may only be considered for dumping, if: disposal is into a sub-seabed geological formation; they consist overwhelmingly of carbon dioxide (they may contain incidental associated substances derived from the source material and the capture and sequestration processes used); and no wastes or other matter are added for the purpose of disposing of them.” OSPAR Decision 2007/02 on the Storage of Carbon Dioxide Streams in Geological Formations, states that all contracting parties should not allow storage of carbon dioxide in geological formations without authorisation or regulation from their competent authorities. The decision also indicates what any permit or approval should, at least, contain.

The *Energy Act 2008* (as amended) provides a legislative basis permitting carbon storage on the UKCS, implemented by the Secretary of State or Scottish Ministers in their Territorial Waters via the *Storage of Carbon Dioxide (Licensing etc.) Regulations 2010* and the *Storage of Carbon Dioxide (Licensing etc.) (Scotland) Regulations 2011*. Suitable formations may consist of saline aquifers, halite deposits or depleted hydrocarbon reservoirs. The *Energy Act 2011* makes a number of amendments to the *Energy Act 2008* with regards to the conversion of installations and pipelines for CCS demonstration along with a number of other provisions, including details relating to compulsory acquisition for CCS pipelines over land.

4.3 Landscape/seascape

Landscape/Seascape	
International	<p>World Heritage Convention 1972 Council of Europe: European Landscape Convention 2000</p>
UK	<p><i>Marine and Coastal Access Act 2009</i> (as amended) UK Marine Policy Statement (2011) An approach to seascape character assessment (2012)</p>
Local	<p><i>National Parks and Access to the Countryside Act 1949</i> - England and Wales <i>Environment Act 1995</i> - England and Wales <i>Countryside and Rights of Way Act 2000</i> - England and Wales National Policy Statements for Energy (2011): - England and Wales Overarching National Policy Statement for Energy (EN-1) National Policy Statement for Renewable Energy Infrastructure (EN-3) National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) East (2014) and South (2018) Inshore and Offshore Marine Plans - England Seascape Character Assessments associated with Marine Plans The National Character Areas of England England Coast Path: improving public access to the coast (ongoing) English Heritage Historic Landscape and Seascape Characterisations Historic England's Heritage 2020, and Corporate Plan (2018-2021) Historic Environment Good Practice Advice in Planning Note 3: The Setting of Heritage Assets, 2nd Edition (2017) A Green Future: Our 25 Year Plan to Improve the Environment (2018) National Planning Policy Framework (2019)</p> <p>Local Seascape Character Assessment (Pembrokeshire Seascape Character Assessment, Landscape and seascapes of Eryri (Snowdonia), Anglesey seascape character assessment) - Wales (2013-onwards) LANDMAP Wales Cadw/ICOMOS Register of Landscapes of Outstanding Historic Interest or Special Historic Interest National Landscape Character Areas - Wales (2015) National Seascape Assessment for Wales (2015) State of Wales' Natural Resources report (2016) Technical Advice Note 12: Design (Wales) (2016) Planning Policy Wales, Edition 10 (2018) Welsh National Marine Plan (2019)</p>

Local	<i>Planning etc. (Scotland) Act 2006</i>
	<i>Marine (Scotland) Act 2010</i>
	<i>The Town and Country Planning (National Scenic Areas) (Scotland) Designation Directions 2010</i>
	<i>SNH's Landscape policy framework (under review)</i>
	<i>People, Place and Landscape: A position statement from NatureScot and Historic Environment Scotland, and Action Plan (2019)</i>
	<i>Scottish Planning Policy (2014) and the National Planning Framework for Scotland 3 (2014)</i>
	<i>Scotland's National Marine Plan (2015)</i>
	<i>Landscape and the Historic Environment – A Common Statement (2016)</i>
	<i>The Nature Conservation and Amenity Lands (Northern Ireland) Order 1985</i>
	<i>Marine (Northern Ireland) Act 2013</i>
	<i>The Marine Plan for Northern Ireland (consultation, 2018)</i>
	<i>Strategic Planning Policy Statement for Northern Ireland (2015)</i>
	<i>Landscape Character Areas of Northern Ireland (2006)</i>
	<i>Planning Policy Statement 18: Renewable Energy and Wind Energy Development in Northern Ireland's Landscapes (2009), and supplementary guidance on Wind Energy (2010)</i>
	<i>Northern Ireland's Landscape Charter (2014)</i>
<i>Northern Ireland Regional Seascape Character Assessment (2014)</i>	

4.3.1 Key objectives and targets

At the highest level, the European Landscape Convention (ELC) seeks to “promote landscape protection, management and planning, and to organise European co-operation on landscape issues.” (Ch. 1 Art. 2), and encompasses “the entire territory of the Parties and covers natural, rural, urban and peri-urban areas. It includes land, inland water and marine areas. It concerns landscapes that might be considered outstanding as well as everyday or degraded landscapes” (Ch. 1 Art. 1), and therefore considers that all landscapes are important, not just the outstanding but also the everyday landscapes where most people live, work and spend much of their time. The perception of landscape and seascape can go beyond that which is purely visual, and be valued in different ways (e.g. as source of economic gain, or by providing a sense of identity or wellbeing), recognised in the ELC definition of landscape, “An area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors.”

The ELC requires, “landscape to be integrated into regional and town planning policies and in cultural, environmental, agricultural, social and economic policies, as well as any other policies with possible direct or indirect impacts on landscape (Article 5 (d)). The ELC has been acknowledged in policy including the MPS which states that all coastal landscapes should be considered when developing marine plans, not just those which are protected through designations. Consistent with the MPS, the first of England’s marine plans and Scotland’s National Marine Plan both recognise that planners and developers generally take landscape and seascape into account, and as part of the process for English plans, seascape studies are being undertaken, informed by guidance commissioned as part of the first set of English marine plans. Similarly, a seascape project has been undertaken for Welsh waters⁶⁰ and has identified 29 character areas. This complements a number of local studies (the Pembrokeshire Seascape Character Assessment, Landscape and seascapes of Eryri (Snowdonia) and Anglesey seascape character assessment).

⁶⁰ <https://naturalresources.wales/evidence-and-data/maps/marine-character-areas/?lang=en>

The MPS arising from the *Marine and Coastal Access Act 2009* was issued in March 2011. The MPS states that all coastal landscapes should be considered in the preparation of Marine Plans, not just those which are protected through designations, which is broadly complementary to the tenets of the European Landscape Convention (e.g. see policy SOC3 in the East inshore and Offshore Marine Plans, and those SCP-1 policies in the remaining plans adopted in England, SOC_07: Seascapes and Seascape in the Welsh and draft Northern Irish plans respectively). The East Inshore and Offshore marine planning process involved the commissioning of a methodological pilot study for seascape assessment, which was developed by Natural England and formalised in, *An approach to Seascape Character Assessment*, which underpinned a series of seascape characterisations developed for the marine plan areas. More recently, the MMO has published guidance on how to assess seascape sensitivity (MMO 2019).

In addition to direct considerations of landscape, the MPS and the *Marine and Coastal Access Act 2009* provide a legal and policy framework for the construction of a new national coastal trail in England and amenity land associated with this route which the public is free to use. The scheme for the implementation of this part of the Act in England and its methodology was drafted by Natural England and approved in 2010. Work is in progress on a number of stretches of coastal path, and Natural England hopes to have all stretches approved and work underway towards completion of these by the end of 2021⁶¹. The *Marine (Scotland) Act 2010* makes no similar provisions though both Scotland and Wales are planning their own equivalent trails. The Welsh route opened in 2012, with improvements and additional routes planned in the coming years. These coastal and national trails may not have a significant impact on seascape, but it is possible that they will encourage more people to visit the coast for recreation and hence enhance the number of receptors subject to views which could be altered by elements of the plan.

Planning policies, for instance The National Planning Policy Framework and the Energy National Policy Statements (e.g. EN-1 and EN-3), exact the highest degree of protection to "most valued" sites (i.e. statutory designated areas such as Areas of Outstanding Natural Beauty (AONBs)), but do not propose that development should be precluded within them where project design would not conflict with the interests and features for which the sites are designated. More generally, they state that all developments should be well designed and in keeping with the scale and character (modern and historic) of the local area. Linked to this topic is that of the historic environment (e.g. listed buildings, UNESCO world heritage sites, scheduled monuments), where their setting is considered to be relevant to their designation or appreciation⁶².

Where developments fall within the visual range of receptors (i.e. resident and transient people) on the coast, or are intervisible from other viewing locations at sea, for instance from recreational or commercial vessels, their character, form, aspect, spatial extent and type of movement all influence how the seascape is experienced. In view of the use of turbines of greater size and in greater number, studies and guidance documents have been produced on

⁶¹ <https://www.gov.uk/government/collections/england-coast-path-improving-public-access-to-the-coast>

⁶² See: <https://historicengland.org.uk/images-books/publications/gpa3-setting-of-heritage-assets/>, also, "essential setting" and "significant views" are identified in Wales in relation to registered Historic Parks and Gardens.

the assessment of seascapes in relation to offshore wind farms whose findings may be more widely applicable to other marine energy devices which have surface infrastructure⁶³.

4.4 Water Environment

Water Environment	
International	<p>IMO International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78)</p> <p>International Convention on Oil Pollution Preparedness, Response and Co-operation (1990)</p> <p>Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (1972, as amended) 1996 protocol - revision to convention (2006) and amendments to 1996 protocol</p> <p>International Convention for the control of ships ballast water and sediments (adopted 2004, entered into force September 2017)</p>
Regional	<p>Convention for the Protection of the Marine Environment of the North East Atlantic (the OSPAR Convention 1992)</p> <p>OSPAR Decision 2000/3 on the use of organic-phase drilling fluids (OPF) and the discharge of OPF-contaminated cuttings</p> <p>OSPAR Decision 2000/2 on a harmonised mandatory control system for the use and reduction of the discharge of offshore chemicals (as amended by decision 2005/1)</p> <p>OSPAR Recommendation 2001/1 for the Management of Produced Water from Offshore Installations as amended by Recommendations 2006/4, 2011/8 and, 2020/02</p> <p>OSPAR Recommendation 2003/1 on the Strategy for the Joint Assessment and Monitoring Programme</p> <p>OSPAR Recommendation 2005/2 on Environmental Goals for the Discharge by the Offshore Industry of Chemicals that are, or Contain Added Substances, Listed in the OSPAR 2004 List of Chemicals for Priority Action</p> <p>OSPAR Recommendation 2006/3 on Environmental Goals for the Discharge by the Offshore Industry of Chemicals that are, or which Contain Substances Identified as Candidates for Substitution (as amended by Recommendation 2019/02)</p> <p>OSPAR Decision 2007/1 to Prohibit the Storage of Carbon Dioxide Streams in the Water Column or on the Sea-bed</p> <p>OSPAR Decision 2007/2 on the Storage of Carbon Dioxide Streams in Geological Formations</p> <p>OSPAR Recommendation 2012/5 for a risk-based approach to the Management of Produced Water Discharges from Offshore Installations as amended by Recommendation 2020/03</p> <p>OSPAR Recommendation 2010/3 on a Harmonised Offshore Chemical Notification Format (HOCNF), as amended by Recommendation 2014/17 and Recommendation 2019/3. Consolidated text</p> <p>OSPAR North-East Atlantic Environment Strategy</p> <p>OSPAR Co-ordinated Environmental Monitoring Programme (ongoing)</p> <p>OSPAR Quality Status Reports (QSRs) of the North Atlantic and its sub-regions (2000 & 2010)</p> <p>OSPAR Recommendation 2017/1 on a harmonised pre-screening scheme for offshore chemicals as amended by Recommendation 2019/4</p> <p>OSPAR Intermediate Assessment 2017</p> <p>MoU between the IMO and OSPAR on the promotion of the London Convention and London Protocol</p>

⁶³ For example, see White *et al.* (2019) Seascape and visual sensitivity to offshore wind farms in Wales: Strategic assessment and guidance, and White Consultants (2020) Review and Update of Seascape and Visual Buffer study for Offshore Wind farms.

UK

Water Resources Act 1991 (as amended)
The Offshore Chemicals Regulations 2002 (as amended)
UK Marine and Coastal Access Act 2009
The Marine Strategy Regulations 2010
Environment Bill 2019-21
 Marine Policy Statement (2011)
 Charting Progress 2 (2010)
 River Basin Management Plans for respective administrations, including those which are cross-border
 Our Seas – a shared resource. High level marine objectives (2009)
 Marine Strategy Part 1: Updated Assessment and Good Environmental Status (2019)
 Marine Strategy Part 2: UK Marine Monitoring Programmes (2014), and consultation on proposed measures (2020)
 Marine Strategy Part 3: UK Programme of Measures (2015)
 UK Climate Change Risk Assessment (2017)
 National contingency plan for marine pollution from shipping and offshore installations (2017)
 A new Chemicals Strategy (as noted in the 25 Year Environment Plan)
 UK REACH (2020) - maintains the EU REACH's aims and principles

Local

The Flood Risk Regulations 2009 - England and Wales
Flood and Water Management Act 2010 - England and Wales
The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
Environmental Damage (Prevention and Remediation) Regulations 2015 - England
 Flooding in England: A National Assessment of Flood Risk (2009)
 National flood and coastal erosion risk management strategy for England (2011)
 National Policy Statements for Energy (2011): - England and Wales
 Overarching National Policy Statement for Energy (EN-1)
 National Policy Statement for Renewable Energy Infrastructure (EN-3)
 National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4)
 National Policy Statement for Ports (2012) - England
 East Inshore and Offshore Marine Plans (2014) and South Inshore and Offshore Marine Plans (2018) - England
 Marine Pollution Contingency Plan (2020) - England and Wales
 A Green Future: Our 25 Year Plan to Improve the Environment (2018)
 Shoreline Management Plans - England and Wales

The Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009
 Technical Advice Note 15: Development and Flood Risk (2004, updated advice maps 2015 and consultation 2019) - Wales
 Technical Advice Note 15 guidance on climate change allowances for planning purposes (2016) and technical evaluation of the advice note (2017)
 National Strategy for Flood and Coastal Erosion Risk Management (2011, and consultation 2019) - Wales
 Welsh National Marine Plan (2020)
 Planning Policy Wales, Edition 10 (2018)
 State of Wales' Natural Resources report (2016)
 The Natural Resources Policy Statement (2017) - Wales

Water Environment and Water Services (Scotland) Act 2003
Water Environment (Controlled Activities) (Scotland) Regulations 2011
Flood Risk Management (Scotland) Act 2009
The Environmental Liability (Scotland) Regulations 2009
Marine (Scotland) Act 2010
 Flood Risk Management Strategies - Scotland (2015)
 Delivering sustainable flood risk management: guidance (2019)
 Scottish Planning Policy (2014) and the National Planning Framework for Scotland 3 (2014)
 Scotland's National Marine Plan (2015)
 Dynamic Coast: Scotland's Coastal Change Assessment (2017)

The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009
The Environmental Liability (Prevention and Remediation) Regulations (Northern Ireland) 2009
Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017
Marine Act (Northern Ireland) 2013
An Integrated Coastal Zone Strategy for Northern Ireland 2006-2026 (2006)
PPS 15 Planning and Flood Risk (2014) - Northern Ireland
The Marine Plan for Northern Ireland (consultation, 2018)

4.4.1 Key objectives and targets

The International Convention for the Prevention of Pollution from Ships (MARPOL) addresses pollution from ships and in part from offshore installations arising from oil, noxious liquids carried in bulk, harmful substances in packaged form, sewage and garbage (Annexes I-V) and in subsequent amendments. MARPOL covers pollution events arising from both operational and accidental causes.

At a regional level, the OSPAR Convention for the protection of the marine environment of the North East Atlantic has the aim of preventing pollution and to protect the marine environment from detrimental effects of human activity. The OSPAR Convention defines pollution as the introduction by man, directly or indirectly, of substances or energy into the maritime area which results, or is likely to result, in hazards to human health, harm to living resources and marine ecosystems, damage to amenities or interference with other legitimate uses of the sea. The convention requires the parties (which includes the UK) to adopt the precautionary principle and the polluter pays principle to meet their obligations. In 1998 Annex V was adopted, specifically aimed at biodiversity and ecosystem protection. OSPAR has several long-term strategies under the heading of its North-East Atlantic Environment Strategy (currently under review), aimed at improving the marine environment with regard to certain topics. Of those relevant to the water environment, these include:

- Eutrophication Strategy – sets the objective to combat eutrophication in the OSPAR maritime area, in order to achieve and maintain by 2020, that all parts of the OSPAR maritime area have the status of “non-problem area”.
- Hazardous Substances Strategy – sets the objective of preventing pollution of the maritime area by continuously reducing discharges, emissions and losses of hazardous substances, with the ultimate aim of achieving concentrations in the marine environment near background values for naturally occurring substances and close to zero for man-made synthetic substances, with the target of the cessation of discharges, emissions and losses of hazardous substances by the year 2020.
- Offshore Oil and Gas Strategy – to prevent and eliminate pollution from offshore sources and to protect the OSPAR maritime area against the adverse effects of offshore activities so as to safeguard human health and conserve the marine ecosystems, and where practicable restore affected areas.

The culmination of a number of information gathering and assessment initiatives are presented in the OSPAR Quality Status Reports (QSR) (2001, 2010), which were updated in the Intermediate Assessment (2017) with the next QSR planned for 2023. The assessment reports provide significant information on the current state of the UK and neighbouring seas, and the activities which affect them. Key aspects of the QSR cover biodiversity, eutrophication, hazardous substances, offshore oil and gas industry and radioactive

substances. At a national level, Charting Progress 2, a Defra initiative published in July 2010, provided an updated assessment of the state of UK seas since Charting Progress was first published in 2005. Supporting technical reports on healthy and biologically diverse seas, ocean processes, clean and safe seas, and productive seas provide relevant information on the UK's water environment baseline and issues affecting the water environment, and provided the basis of Marine Strategy Part 1: UK Initial Assessment and Good Environmental Status (2012). This was updated in 2019 as part of the UK's Updated Assessment and Good Environmental Status⁶⁴.

A number of European level directives have been implemented nationally which aim to protect the terrestrial and marine environments, and these include the Urban Wastewater Treatment Directive, the Nitrates Directive, the Water Framework Directive (WFD) and Marine Strategy Framework Directive (MSFD). These have been transposed in the UK through a number of Regulations including: The *Urban Waste Water Treatment (England and Wales) Regulations 1994*, the *Nitrate Pollution Prevention Regulations 2015*, the *Water Environment (Water Framework Directive) (England and Wales) Regulations 2017* (and those of other devolved administrations) and the *Marine Strategy Regulations 2010*.

The *Water Environment (Water Framework Directive) (England and Wales) Regulations 2017* implement the intention to achieve good ecological and chemical status/potential for a range of terrestrial, transitional (i.e. estuarine) and coastal waters out to 1nm (or 3nm under the Scottish Regulations) and is in the second cycle of planning to 2021. As much marine pollution is generated from terrestrial activities, the control of certain substances entering coastal waters from riverine sources and other direct discharges is important in the control of marine pollution. The Nitrate Pollution Prevention Regulations and Urban Waste Water Treatment Regulations seek to protect the environment from the adverse effects of nitrogen from agricultural sources and sewage discharges respectively in this regard. The most hazardous other chemicals are covered under the Environmental Quality Standards Directive, also known as the priority substances directive, which are considered in the UK through the implementation of the WFD.

In a similar approach to the WFD, the MSFD seeks to achieve "good environmental status" in Europe's seas by 2020. The *Marine Strategy Regulations 2010* require the development of the five elements of the marine strategy: (1) the assessment of marine waters; (2) the determination of the characteristics of good environmental status for those waters; (3) the establishment of environmental targets and indicators; (4) the establishment of a monitoring programme; (5) the publication of a programme of measures. Qualitative descriptors for determining good environmental status are listed in Annex I of the MSFD, and those of relevance to the water environment include:

- Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters.
- Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.
- Concentrations of contaminants are at levels not giving rise to pollution effects.

⁶⁴ <https://www.gov.uk/government/publications/marine-strategy-part-one-uk-updated-assessment-and-good-environmental-status>

- Properties and quantities of marine litter do not cause harm to the coastal and marine environment.
- Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.

UK “retained EU law” includes Regulations implementing Directive 2004/35/EC on environmental liability (and amendments through 2006/21/EC, 2009/31/EC and 2013/30/EU) with regard to the prevention and remedying of environmental damage (primarily transposed through the *Environmental Damage (Prevention and Remediation) Regulations 2015* – separate Regulations apply in the devolved administrations) is applicable to inter alia the aquatic environment covered by the WFD. The Directive, based on the polluter pays principle, establishes a framework to prevent and remedy environmental damage at a reasonable cost to society. The Directive applies strict liability to those operators of inherently hazardous activities listed in Annex III of the Directive which includes those subject to Integrated Pollution Prevention and Control (IPPC), and fault based liability for other activities. The implementing Regulations, as noted above, also implement amendments to the Environmental Liability Directive resulting from Directive 2013/30/EU (the offshore safety Directive), which is more broadly implemented through the *Offshore Installations (Offshore Safety Directive) (Safety Case etc.) Regulations 2015*.

The Marine Policy Statement (MPS) underpins UK marine spatial planning which is being implemented under the *Marine and Coastal Access Act 2009*. The first regional marine plans for English waters were adopted in 2014 (East Inshore and Offshore) and 2018 (South Inshore and Offshore). National marine plans of the devolved administrations have either been adopted (Scotland, 2015 and Wales, 2019) or are in preparation (Northern Ireland). These plan policies, though regionally specific, are to be consistent with national scale policy included in the MPS. With regards to water environment, the MPS indicates that marine plan authorities (e.g. the MMO, Scottish Ministers, Welsh Ministers) must contribute to or align with delivery of the policies and objectives of relevant River Basin Management Plans (RBMP) and the MSFD.

Climate change is likely to have a pervasive effect on all aspects of the coastal and marine environment including flooding, coastal erosion, water quality and resources. Output from the UK Climate Impacts Programme (UKCIP) reflects both past conditions derived from historical record and projections of future climate change across a range of terrestrial and marine variables, allowing for a measure of the uncertainty in future climate projections. The latest output (UKCIP18) has significantly enhanced its consideration of marine parameters from previous assessments, including of future sea-level rise, storm surge and wave climate, which complement the ongoing work of the MCCIP in summarising current understanding and potential future changes to the marine environment.

International efforts are progressing towards the publication of the IPCC Sixth Assessment Report (AR6), which is due for publication in 2021-2022, however, a recent update from this programme has been provided in the, Special Report on the Ocean and Cryosphere in a Changing Climate (2019).

4.5 Air Quality

Air Quality	
International	<p>Marine Pollution Convention, MARPOL 73/78 (the International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978)</p> <p>Geneva Convention on Long Range Transboundary Air Pollution (1979)</p> <p>Vienna Convention for the protection of the ozone layer (1985)</p> <p>Montreal Protocol on substances that deplete the ozone layer (1987) and subsequent updates and adjustments, including the Kigali Amendment (2019)</p> <p>Stockholm Convention on Persistent Organic Pollutants (2001)</p> <p>UNEP Global Mercury Partnership and Minamata Convention on Mercury (2017)</p> <p>Consolidated text of the amended Protocol (the Gothenburg Protocol) to Abate Acidification, Eutrophication and Ground-level Ozone (2012)</p> <p>Initial IMO strategy on the reduction of GHG emissions from ships (2018)</p>
Regional	<p>The Convention for the Protection of the Marine Environment of the North East Atlantic (OSPAR) 1998</p>
UK	<p><i>Clean Air Act 1993</i></p> <p><i>Environment Act 1995</i></p> <p><i>Pollution Prevention and Control Act 1999</i></p> <p><i>The Offshore Combustion Installations (Pollution Prevention and Control) Regulations 2013 (as amended)</i></p> <p><i>The Merchant Shipping (Prevention of air pollution from ships) Regulations 2008</i></p> <p><i>The Fluorinated Greenhouse Gas Regulations 2015</i></p> <p><i>Greenhouse Gas Emissions Trading Scheme Regulations 2012 (as amended, and in particular)</i></p> <p><i>The National Emission Ceilings Regulations 2018</i></p> <p><i>The Greenhouse Gas Emissions Trading Scheme Order 2020</i></p> <p><i>Environment Bill 2019-21</i></p>
Local	<p><i>Air Quality (England) Regulations 2000</i></p> <p><i>Air Quality Standards Regulations 2010 - England</i></p> <p><i>Pollution Prevention and Control (Designation of Directives) (England and Wales) Order 2013</i></p> <p><i>Clean Air Strategy - England (2019)</i></p> <p><i>UK National Air Pollution Control Programme (2019)</i></p> <p><i>Air quality plan for nitrogen dioxide (NO₂) (2019)</i></p> <p><i>The Environmental Damage (Prevention and Remediation) (England) Regulations 2015</i></p> <p><i>The Environmental Permitting (England and Wales) Regulations 2016</i></p> <p><i>A Green Future: Our 25 Year Plan to Improve the Environment (2018)</i></p> <p><i>The Air Quality Standards (Wales) Regulations 2010</i></p> <p><i>The Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009</i></p> <p><i>Well-being of Future Generations (Wales) Act 2015</i></p> <p><i>State of Wales' Natural Resources report (2016)</i></p> <p><i>Draft Clean Air Plan for Wales (2019)</i></p> <p><i>Air Quality (Scotland) Regulations 2000</i></p> <p><i>The Air Quality Standards (Scotland) Regulations 2010</i></p> <p><i>The Environmental Liability (Scotland) Regulations 2009</i></p> <p><i>Pollution Prevention and Control (Designation of Industrial Emissions Directive) (Scotland) Order 2011</i></p> <p><i>Cleaner air for Scotland: the road to a healthier future (2015) and its independent review (2019)</i></p> <p><i>The Air Quality Standards Regulations (Northern Ireland) 2010</i></p> <p><i>Environment (Northern Ireland) Order 2002</i></p>

4.5.1 **Key objectives and targets**

MARPOL addresses the prevention of marine pollution from ships and in part from offshore installations. It includes six annexes covering pollution by oil, noxious liquids carried in bulk, harmful substances in packaged form, sewage, garbage and air pollution. Less specific to marine activities, the Convention on Long-Range Transboundary Air Pollution 1979 considers transboundary pollutants including persistent organic pollutants, heavy metals, sulphur, VOCs and nitrogen oxides.

The UK Government's Clean Air Strategy (2019) outlines how the UK and devolved administrations are to tackle issues related to air quality across including those relevant to human health, the environment, clean growth, transport, household and farming emissions. Actions include a new long-term target for the reduction of exposure to PM2.5, a new target for nitrogen deposition, future policies to target air pollution and climate change in the areas of electricity, heat and industry, to work to reduce emissions from non-exhaust particulates and public transport, to prohibit the use of the most polluting fuels for use in the home, targeting the reduction of ammonia emissions from farming and tighter controls on medium industrial combustion plant. The strategy is set in the context of the Environment Bill and a number of other recent UK Government strategies and plans. Of most direct relevance are the air quality plan for nitrogen dioxide (NO₂), and the draft UK National Air Pollution Control Programme (2019), but also include the Industrial Strategy (2017), the Clean Growth Strategy (2017) and the 25 Year Environment Plan (2018), Aviation 2050 (2018) and Maritime 2050 (2019), all of which in part address emissions to air of pollutants and greenhouse gases. Being set in the context of these other plans recognises the benefits of integrating air quality and climate change policies, for example, as previously recognised by Defra and the devolved administrations in, Air Pollution: Action in a Changing Climate (2010).

The devolved administrations of Scotland and Wales have their own plans set out in the Cleaner air for Scotland Strategy (2015) and the draft Clean Air Plan for Wales (2019).

4.6 Climate and meteorology

Climate & Meteorology	
International	<p>The United Nations Framework Convention on Climate Change Kyoto Protocol to the UN Framework Convention on Climate Change The Copenhagen Accord (2009) Intergovernmental Panel on Climate Change Fifth Assessment Report (2013-2014) The Paris Agreement (2015) Initial IMO strategy on the reduction of GHG emissions from ships (2018) IPCC Sixth Assessment Reporting Cycle (report to be finalised 2022)</p>
UK	<p><i>Climate Change Act 2008 (as amended)</i> <i>The Energy Act 2008 (as amended)</i> <i>The Energy Act 2013</i> <i>The Climate Change Act 2008 (2020 Target, Credit Limit and Definitions) Order 2009</i> <i>The Climate Change Act 2008 (Credit Limit) Order 2016</i> <i>The Climate Change Act 2008 (2050 Target Amendment) Order 2019</i> <i>The Carbon Budget Order 2011 and 2016</i> <i>Greenhouse Gas Emissions Trading Scheme Regulations 2012</i> <i>The Emissions Performance Standard Regulations 2015</i> Marine Policy Statement (2011) UK Climate Impacts Programme (UKCIP) (update 2018, UKCP18) Marine Climate Change Impacts Partnership (MCCIP), including annual report cards The National adaptation programme (2018) UK Climate Change Risk Assessment (2017) - see national summaries for devolved administrations Clean Growth Strategy (2017) Industrial Strategy: building a Britain fit for the future (2017) The Future of UK Carbon Pricing (consultation, 2019) Energy White Paper: Powering our Net Zero Future (2020)</p>
Local	<p>East Inshore and Offshore Marine Plans (2014) and South Inshore and Offshore Marine Plans (2018) - England Clean Air Strategy - England (2019) A Green Future: Our 25 Year Plan to Improve the Environment (2018)</p> <p><i>Well-being of Future Generations (Wales) Act 2015</i> <i>Environment (Wales) Act 2016</i> <i>The Climate Change (Net Welsh Emissions Account Credit Limit) (Wales) Regulations 2018</i> Environment Strategy for Wales (2006 - under review) Energy Wales: a low carbon delivery plan (2019) State of Wales' Natural Resources report (2016) Climate Change Strategy for Wales (2010) and Adaptation Delivery Plan (2010) Welsh National Marine Plan (2019)</p> <p><i>The Climate Change (Scotland) Act 2009</i> <i>Climate Change (Emissions Reduction Targets) (Scotland) Act 2019</i> <i>The Climate Change (Annual Targets) (Scotland) Order 2010</i> <i>The Climate Change (Annual Targets) (Scotland) Order 2011</i> <i>The Climate Change (Annual Targets) (Scotland) Order 2016</i> <i>The Climate Change (Limit on Carbon Units) (Scotland) Order 2011</i> <i>The Climate Change (Limit on Use of Carbon Units) (Scotland) Order 2016</i> Climate Ready Scotland: climate change adaptation programme 2019-2024 (2019) Climate Change Plan: third report on proposals and policies 2018-2032 (2018) The future of energy in Scotland: Scottish energy strategy (2017) Securing a Green Recovery on a Path to Net Zero: Climate Change Plan 2018-2032 - update (2020) Offshore wind policy statement (2020) Scotland's National Marine Plan (2015)</p>

The Northern Ireland Climate Change Adaptation Programme (2019)
Proposals for taking forward NI climate change legislation - discussion paper (2016)
The Marine Plan for Northern Ireland (consultation, 2018)

4.6.1 Key objectives and targets

The United Nations Framework Convention on Climate Change (UNFCCC) entered into force in 1994, a precursor to the Kyoto Protocol which set legally binding targets for the reduction of greenhouse gases which are associated with anthropogenically induced climate change. The Kyoto Protocol was succeeded by the Paris Agreement which was adopted by parties to the UNFCCC in December 2015 and came into force in 2016. The agreement aims to hold the increase in global average temperatures well below 2°C above pre-industrial levels, and to pursue efforts to limit this to 1.5°C (Article 2). A high-level overview of the main provisions of the Agreement are set out below:

- An aim to reach global peaking of greenhouse gas emissions as soon as possible, to undertake rapid reductions thereafter in accordance with best available science, and to achieve a balance between emissions and removals by sinks in the second half of this century.
- To communicate and maintain successive nationally determined contributions which reflect its highest possible ambition. A nationally determined contribution shall be communicated every 5 years, with the first considered on a common timeframe, and also report on these
- The lead should be taken by developed countries by undertaking economy-wide absolute emission reduction targets, with developing country should continuing to enhance their mitigation efforts, moving in time to economy-wide emission reduction or limitation.
- All Parties should strive to formulate and communicate long-term low greenhouse gas emission development strategies in line with their common but differentiated responsibilities and capabilities.
- Parties should take action to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases as referred to in Article 4, paragraph 1(d), of the Convention, including forests⁶⁵.
- Establish the global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal referred to in Article 2.

⁶⁵ sinks and reservoirs of all greenhouse gases not controlled by the Montreal Protocol, including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems.

- Recognize that adaptation is a global challenge, that the need for adaptation is significant and that greater levels of mitigation can reduce the need for additional adaptation efforts.
- Strengthen cooperation on enhancing action on adaptation, and engage in adaptation planning processes and the implementation of actions, including the development or enhancement of relevant plans, policies and/or contributions.
- Recognize the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change, including extreme weather events and slow onset events, and the role of sustainable development in reducing the risk of loss and damage, with the meeting of the Parties to the Paris Agreement being through the Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts.
- Developed country Parties shall provide financial resources to assist developing country Parties with respect to both mitigation and adaptation in continuation of their existing obligations under the Convention.
- Parties share a long-term vision on the importance of fully realizing technology development and transfer in order to improve resilience to climate change and to reduce greenhouse gas emissions, served under the Technology Mechanism of the Convention
- Capacity-building under this Agreement should enhance the capacity and ability of developing country Parties, in particular countries with the least capacity, and those that are particularly vulnerable to the adverse effects of climate change.
- Parties shall cooperate in taking measures, as appropriate, to enhance climate change education, training, public awareness, public participation and public access to information.
- Establish an enhanced transparency framework for action and support, with built-in flexibility which takes into account Parties' different capacities and builds upon collective experience.
- A "global stocktake" will periodically review the implementation of the Agreement to assess the collective progress towards achieving its purpose, the first taking place in 2023 and every 5 years thereafter.

The *Climate Change Act 2008* makes provisions for the reduction of carbon dioxide equivalent emissions (i.e. includes other notable greenhouse gases including CH₄ and N₂O) through a number of measures, including the setting of a "carbon budget". The UK Government is committed to the reduction of greenhouse gas emissions to "net zero" on 1990 levels by 2050, with interim targets of 34% by 2020, 50% by 2025, and 57% by 2032. The Act aims to meet this target through a range of measures, but principally through the establishment and work of the Committee on Climate Change (CCC, now the Climate Change Committee), a system of carbon budgeting and trading, activities that reduce or remove greenhouse gases from the atmosphere and promotion through financial incentive, the production of less waste and more recycling. Subsequent Climate Change Act Orders outline carbon budgets for defined time periods, with the most recent (fifth) carbon budget (*The Carbon Budget Order 2016*),

containing a target of 57% reduction in emissions on 1990 levels by 2032. Similarly, in Scotland the *Climate Change (Scotland) Act 2009* sets an interim 56% reduction target for greenhouse gases by 2020, increasing to net zero by 2045 on 1990 levels⁶⁶. Scottish ministers have set annual targets through secondary legislation, presently covering the period from 2010-2027.

In response to the IPCC Special Report on Global Warming of 1.5°C, amongst other evidence, the CCC provided advice to Government setting out that in order to meet its obligations under the Paris Agreement, that the UK should pursue a “net zero” target for greenhouse emissions by 2050. This commitment was split between UK constituent countries on the basis of their individual circumstances, with Scotland set to achieve net zero by 2045, Wales set to achieve a 95% reduction by 2050, and England, net zero by 2050. While the carbon budgets for subsequent periods are yet to be set, the *Climate Change Act 2008 (2050 Target Amendment) Order 2019* commits the UK to achieving the net zero target on 1990 levels by 2050 and the UK’s Nationally Determined Contribution under the Paris Agreement commits the UK to reducing economy-wide greenhouse gas emissions by at least 68% by 2030, compared to 1990 levels⁶⁷.

The most recent annual statutory report to Parliament by the CCC (2020) on progress towards meeting the carbon budgets set to date, has indicated that despite meeting the first and second carbon budgets, and likelihood to meet the third, when considering the pace of the underlying emissions reductions, the UK is not on target to meet subsequent budgets. Additionally, in view of the legislative changes committing the UK to net zero emissions by 2050, the UK will need to outperform the fifth carbon budget, and the CCC (2020b) recommended that as a rule, outperformance of carbon budgets is not carried forward to subsequent budget periods. Of note to date is the deep decarbonisation of the power sector which has significantly contributed to the reduction in the UK’s carbon emissions across the last two carbon budget periods, however, further policy is now required (e.g. in relation to the delivery of CCS) in order to continue this trend, and to extend the progress made in the power sector to all emitting sectors of the economy. The CCC (2020a) noted that progress in 2019/2020 did not reflect the scale of the net zero challenge, and that policy to address this would be required, and should be integral to the COVID-19 recovery.

A number of initiatives have stemmed from these reduction targets and other provisions of the Climate Change Act, for instance the establishment of a National Adaptation Programme based on the Climate Change Risk Assessment, which forms part of Defra’s Adapting to Climate Change in England programme.

The Energy White Paper: Powering our Net Zero Future, sets out the contribution that the energy sector will make to the net zero target, which includes commitments to support up to 40GW of offshore wind including 1GW of floating wind by 2030, a doubling of the capacity in the 2021 CfD auction and investment in portside infrastructure, and the creation of a UK emissions trading scheme. The White Paper also refers to the need to decarbonise upstream oil and gas production, the elimination of routine operational flaring by 2030 under the World Bank’s ‘Zero Routine Flaring by 2030’ initiative, the revised MER-UK Strategy (see Section 3.4.5) and a review which is being undertaken into the future of oil and gas licensing.

⁶⁶ As amended by the *Climate Change (Emissions Reduction Targets) (Scotland) Act 2019*

⁶⁷ <https://www.gov.uk/government/publications/the-uks-nationally-determined-contribution-communication-to-the-unfccc>

Scotland's Energy Strategy Update is due to be published in 2021⁶⁸, and will set out the role electricity will play in decarbonising the energy sector. Scotland's Offshore Wind Policy Statement⁶⁹ indicated that as much as 11GW of offshore wind capacity was possible in Scottish waters by 2030.

In Scotland, the 2020 Routemap for Renewable Energy reflects the Scottish Government's target to produce 100% of electricity from renewables by 2020. An indication of progress towards decarbonising the energy industry in Wales, and what the Welsh Government intends to do during its current term to aid a low carbon transition is provided in Energy Wales: A Low Carbon Transition (2012). In the UK, the deployment of renewable energy has been incentivised through the Renewables Obligation since 2002 (see the Renewables Obligation Order 2009, as amended), whereby renewable electricity generators sell their Renewables Obligation Certificates (ROCs) to suppliers which guarantees a premium above wholesale market prices. Suppliers then present their ROCs to Ofgem to show their compliance (i.e. whether they have met their annual obligation), and pay a penalty if they fail to do so. The value of each ROC is decided between the generator and supplier. Under the UK Government's Electricity Market Reform there will be a transition from the Renewables Obligation to "Contracts for Difference" (CfDs), which will be the new support mechanism for renewables, new nuclear and CCS from 2014. The related policy and processes involved in this transition was set out in a consultation which closed in September 2013, also see The Renewables Obligation Closure Order 2014 (as amended). CfDs will be offered to operators at a fixed price, with the operator paying back any difference between the value of the CfD and wholesale electricity prices for electricity, effectively capping the cost of electricity to the consumer from these sources. Progress towards the promotion and use of energy from renewable sources under Article 22 of the Renewable Energy Directive for the UK was most recently provided in January 2016, which indicated that the interim target of 5.4% for the period 2013-14 was met at 6.3% (7% in 2014).

Shipping emissions are becoming a greater concern both in relation to the environmental and health implications they pose, but also their contribution to climate change. The Marine Environment Protection Committee of the International Maritime Organization (IMO) agreed amendments to the Annex VI regulations of MARPOL to further reduce harmful emissions from ships, comprising a progressive reduction in sulphur oxide (SO_x) emissions. Progressive reductions in nitrogen oxide (NO_x) emissions were also agreed, with the most stringent controls being placed on those engines installed on ships constructed on or after 1st January 2016. From 1st January 2015, ships operating in the North Sea and English Channel will need to use fuel not exceeding 0.1% sulphur, and 0.5% sulphur from 1st January 2020 outside of these areas.

Shipping is presently the source of approximately 2.2% (~800Mt) of global carbon dioxide emissions (Third IMO GHG Study 2014). Though these were excluded from reduction targets in the Kyoto Protocol, the IMO is progressing measures to reduce them, and the Initial IMO Strategy on reduction of GHG emissions from ships was adopted in April 2018. The strategy identifies that the following is needed to reduce emissions from shipping; that the carbon intensity of ships decline through implementation of further phases of the energy efficiency design index (EEDI) for new ships, that the carbon intensity of international shipping declines by at least 40% by 2030, pursuing efforts towards 70% by 2050, relative to 2008, and that

⁶⁸ See: Securing a Green Recovery on a Path to Net Zero: Climate Change Plan 2018–2032 – update: <https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/>

⁶⁹ <https://www.gov.scot/publications/offshore-wind-policy-statement/>

greenhouse gas emissions from international shipping peak and decline as soon as possible by at least 50% by 2050 whilst pursuing efforts towards phasing them out completely consistent with the Paris Agreement goals.

Similarly, at the national level, international shipping (and aviation) emissions are not specified within the 2050 Climate Change Act target, nor any related carbon budget order, but accounted for 7.9MtCO₂ of UK shipping emissions in 2017, with domestic shipping emissions, which are included in carbon budgets, being 5.9MtCO₂ in 2017. The CCC's advice to Government is that it should aim for net zero in the sector by 2050, which will likely require some form of greenhouse gas removal, amongst other means of reducing emissions such as alternative fuels. Following the publication of Maritime 2050 (2019), the Clean Maritime Plan sets out in more detail how the UK Government plans to transition the industry towards net zero by 2050.

At an international level, the IPCC provide information and evidence for climate change, its impacts, and how mitigation and adaptation might help alleviate its worst effects. The IPCC published their latest Assessment Report (AR5) in 2013-2014, and the sixth assessment report is scheduled for publication in 2021. In the UK, UKCP18 provides medium- to long-term projections (to 2100) for climate change specific to the UK and UK marine area. The MCCIP has close ties with the UKCP programme, and these programmes help to provide climate change evidence and advice which may be used to inform policy and decision-makers.

4.7 Population and human health

Population & Human Health	
International	<p>World Summit on Sustainable Development, Johannesburg, 2002 Aarhus Convention (Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters) (1998) Espoo Convention on Environmental impact Assessment in a Transboundary Context (1991) Commission on Social Determinants of Health (2008), 'Closing the gap in a generation: health equity through action on the social determinants of health and the Rio Political Declaration on Social Determinants of Health (2011) UN's Sustainable Development Goals (2015)</p>
Regional	<p>Children's Environment and Health Action Plan for Europe 2004</p>
UK	<p><i>Sustainable Communities Act 2007</i> <i>The Localism Act 2011</i> <i>The Health and Safety at Work etc Act 1974 (Application outside Great Britain) Order 2013</i> <i>The Offshore Installations (Offshore Safety Directive) (Safety Case etc.) Regulations 2015</i> <i>The Offshore Petroleum Licensing (Offshore Safety Directive) Regulations 2015</i> Marine Policy Statement (2011) Our Seas – a shared resource. High level marine objectives (2009)</p>
Local	<p><i>Health and Social Care Act 2012 (as amended) - England</i> National Planning Policy Framework (2019) - England East (2014) and South (2018) Inshore and Offshore Marine Plans - England Clean Air Strategy - England (2019) A Green Future: Our 25 Year Plan to Improve the Environment (2018)</p> <p><i>National Health Service (Wales) Act 2006 (as amended)</i> <i>Social Services and Well-being (Wales) Act 2014</i> <i>Well-being of Future Generations (Wales) Act 2015</i> <i>Planning (Wales) Act 2015</i> <i>The Environment (Wales) Act 2016</i> <i>The Wales Act 2017</i> Technical Advice Note 16: Sport, Recreation and Open Space (2009) - Wales Prosperity for All: the national strategy (2017) National Development Framework (2019) - Wales</p> <p><i>Public Health etc. (Scotland) Act 2008 (as amended)</i> <i>Public Services Reform (Scotland) Act 2010</i> Scotland and the sustainable development goals: a national review to drive action (2020) Scotland's Economic Action Plan 2019-20 (2019) Scottish Planning Policy (2014) and the National Planning Framework for Scotland 3 (2014) Scotland's National Marine Plan (2015)</p> <p>Health and Social Care (Reform) Act (Northern Ireland) 2009 (as amended) PPS 8: Open Space, Sport and Outdoor Recreation (2004) - Northern Ireland Making Life Better: Strategic Framework for Public Health 2013-2023 (2015) - Northern Ireland</p>

4.7.1 **Key objectives and targets**

At the UK and UK constituent country level, health is considered in the context of sustainable development and initiatives attempt to address health inequalities, for instance the gap in infant mortality across social groups, and the difference in life expectancy in disadvantaged areas compared with those that are more prosperous. Health is a cross-cutting issue, such that the condition of the water environment (Section 4.4), air quality (Section 4.5) and the potential worst effects of climate change (Section 4.6), all have direct or indirect health implications for which numerous initiatives have been implemented. Additionally, initiatives relating to the economic factors covered in Section 4.8 are also relevant, as are the wellbeing benefits associated with the natural environment (Section 4.1), landscape/seascape (Section 4.3) and cultural heritage (Section 4.9).

At the national and regional planning policy level, human health is a sectoral consideration in the MPS, for instance in relation to fisheries, aquaculture and safe operation of offshore facilities, and the improvement of health and social well-being is an objective of the English Marine Plans adopted to date, with specific policies in support of proposals which provide such benefits. This is similarly acknowledged in the Welsh National Marine Plan and Scotland's National Marine Plan.

4.8 Other users of the sea (material assets)

Other Users & Material Assets	
International	<p>Convention on International Civil Aviation (Chicago Convention) 1944 The London Convention (1972) Marine Pollution Convention, MARPOL 73/78 (the International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978) United Nations Convention on the Law of the Sea (1982) Basel Convention of the control of transboundary movements of hazardous waste and their disposal (1992) FAO Code of Conduct for Responsible Fisheries (1995) UN Fish Stocks Agreement (2001) Nairobi International Convention on the Removal of Wrecks (2007) The Hong Kong Convention for the Safe and Environmentally Sound Recycling of Ships (2009) Joint Roadmap to accelerate Maritime/Marine Spatial Planning processes worldwide (DG MARE and UNESCO) (2017)</p>
Regional	<p>Convention on the Future Multilateral Cooperation in North-East Atlantic Fisheries (NEAFC) (1980) Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) (1992) OSPAR Decision 98/3 on the disposal of disused offshore installations (1998) OSPAR Recommendation 2016/01 on the reduction of marine litter through the implementation of fishing for litter initiatives OSPAR Recommendation 2010/3 on a Harmonised Offshore Chemical Notification Format (HOCNF) (amended 2014 and 2019) OSPAR Recommendation 2017/1 on a harmonised pre-screening scheme for offshore chemicals (amended 2019)</p>
UK	<p><i>The Merchant Shipping Act 1995</i> <i>Merchant Shipping and Maritime Security Act 1997</i> <i>Sea Fisheries (Shellfish) Act 1967</i> <i>Sea Fish (Conservation) Act 1967</i> <i>Fisheries Act 1981</i> <i>Fisheries Act 2020</i> <i>Petroleum Act 1998</i> <i>Energy Act 2008</i> <i>Energy Act 2016</i> <i>Marine and Coastal Access Act 2009</i> <i>The Energy Act 2008 (Consequential Modifications) (Offshore Environmental Protection) Order 2010</i> <i>Wreck Removal Convention Act 2011</i> <i>The Exclusive Economic Zone Order 2013</i> <i>The Territorial Sea (Baselines) Order 2014</i> <i>The Offshore Installations (Offshore Safety Directive) (Safety Case etc.) Regulations 2015</i> <i>The Offshore Petroleum Licensing (Offshore Safety Directive) Regulations 2015</i> <i>Harbours Act 1964</i> The Renewables Obligation (introduced 2002, closed to new capacity 2017) Contracts for Difference (2014 to present) The future relationship between The United Kingdom and The European Union (2018), the Withdrawal Agreement and Political Declaration (2019) Fisheries white paper: sustainable fisheries for future generations (2018) UK Ship Recycling Strategy (2007) Our Seas - A Shared Resource. High Level Marine Objectives (2009)</p>

UK

The Industrial Strategy - Building a Britain fit for the future (2017)
 The Clean Growth Strategy (2018)
 CCUS Action Plan (2018)
 The Wood Review on maximising economic recovery from the UKCS (2013) and related Government response
 The Oil & Gas Authority Strategy (2016, updated 2020)
 Seaward Oil and Gas Licensing Rounds
 Oil and Gas Authority Decommissioning Strategy and Decommissioning Delivery Programme (2016)
 The Aviation Plan (2008, updated 2015), and also relevant CAA policy
 Concordat on Fisheries Management in the UK (2012)

Local

Waste (England and Wales) Regulations 2011 (as amended)
The Scallop Fishing (England) Order 2012
 Inshore Fisheries and Conservation Authorities bylaws
 National Policy Statements for Energy (2011): England and Wales
 Overarching National Policy Statement for Energy (EN-1)
 National Policy Statement for Renewable Energy Infrastructure (EN-3)
 National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4)
 National Policy Statement for Ports (2012) - England and Wales
 The National Planning Policy Framework (2019) - England
 Waste prevention programme for England (2013)
 East (2014) and South (2018) Inshore and Offshore Marine Plans - England

Inshore Fishing (Scotland) Act 1984
Sea Fisheries (Shellfish) Act 1967
The Marine (Scotland) Act 2010
The Aquaculture & Fisheries (Scotland) Act 2013
Scottish Marine Regions Order 2015
 Aquaculture growth to 2030 (2016)
 Strategic Framework for Inshore Fisheries in Scotland (2005) and Inshore Fisheries Groups
 National Transport Strategy (2020) - Scotland
 Scottish Government: The Carbon Capture and Storage Roadmap (2010)
 Blue Seas - Green Energy: A Sectoral Marine Plan for Offshore Wind Energy in Scottish Territorial Waters (2011)
 Scottish Energy Strategy: The Future of Energy in Scotland (2017)
 Scotland's Sectoral Marine Plans for Offshore Wind, Wave and Tidal Energy in Scottish Waters
 Scotland's Marine Tourism Strategy (2020)
 Scotland's National Marine Plan (2015)
 Shetland Marine Plan (2015)
 Pilot Pentland Firth and Orkney Waters Marine Spatial Plan (2017)

Wales Act 2017
 Technical Advice Note 8: Renewable Energy (Wales) - does not cover offshore elements of a development, but makes mention of any associated infrastructure that takes place on land (2005)
 Welcome to Wales: priorities for the visitor economy 2020-2025 (2020)
 Technical Advice Note 13: Tourism (1997) - Wales
 National Development Framework Wales (2020)
 The Wales Transport Strategy (2008, and consultation, 2020)
 Towards Zero Waste: our waste strategy (2019)
 Welsh National Marine Plan (2019)

Marine Act (Northern Ireland) 2013
The Sea Fishing (Licenses and Notices) Regulations (Northern Ireland) 2014
 Industrial Strategy for Northern Ireland (consultation, 2017)
 Offshore Renewable Energy Strategic Action Plan 2012-2020 and Offshore Wind and Marine
 Renewables Energy SEA Environmental Report (2012) - Northern Ireland
 Sustainable Energy Action Plan 2012-2015 and beyond (2012) - Northern Ireland
 Energy Wales: A Low Carbon Transition (2012) and Delivery Plan (2014)
 Energy Strategy - Call for Evidence (2019-20)
 Delivering Resource Efficiency: the revised Northern Ireland Waste Management Strategy (2013)
 Marine Plan for Northern Ireland (consultation, 2018)

4.8.1 Key objectives and targets

The *Marine and Coastal Access Act 2009* (MCAA) is intended to simplify and strengthen strategic management of the marine environment by enabling economic, social and environmental impacts and objectives to be considered simultaneously. A key objective of the Act is to implement a nationwide system of marine planning that will clarify marine objectives and priorities for the future, and direct decision-makers and users towards more efficient, sustainable use and protection of marine resources. The Marine Policy Statement (MPS) made under the Act was jointly adopted in March 2011 by the UK Government, Scottish Government, Welsh Government and the Northern Ireland Executive, and applies to all UK waters. The MPS provides an overarching framework within which regional marine plans have, or are presently, being drafted. The Act established the Marine Management Organisation (MMO) with responsibility for marine plan making covering English territorial and offshore waters on behalf of the UK Government. There are 11 marine plan areas within English inshore and English offshore regions and marine plans have been prepared for four of these with the remaining plans due to be adopted in 2021. In Scotland, Wales and Northern Ireland, plan making is being taken forward by the devolved administrations. The Scottish National Marine Plan was adopted in March 2015 and subsequent regional planning has been proposed for a further 11 inshore areas (with Shetland and Pentland Firth & Orkney Waters plans adopted or ongoing respectively). The Welsh National Marine Plan was adopted in 2019, and the Marine Plan for Northern Ireland is still in preparation.

The marine licensing regime for a number of activities (generally excluding oil & gas, and gas storage) underwent changes resulting from the MCAA. In considering the need for coordination with regard to marine spatial planning, the responsibilities of the devolved administrations also need to be accounted for. The territorial and offshore waters of Scotland, territorial waters of Wales and Northern Ireland are variously the remit of Scottish, Welsh and Northern Irish Ministers respectively. NRW and MMO are the responsible authorities for issuing marine licences for a range of activities in Welsh and English waters respectively. Section 36 consent for marine renewable arrays of <100MW passed from BEIS to MMO under the MCAA, and those for electricity generating stations at or below 350MW in Wales and Welsh Zone, passed to Welsh Ministers under the *Wales Act 2017*. With regards to Nationally Significant Infrastructure Projects (NSIPs), now defined as renewable arrays of >100MW in English waters, and >350MW in Welsh waters, the MMO and NRW are variously the licensing authorities for those provisions under Part 4 of the Marine and Coastal Access Act, while the decision maker with regards to the grant of a Development Consent Order is the Secretary of State. NRW and the MMO have a number of other roles in the consideration of NSIPs relevant to them, including as a statutory consultee, interested party. The Planning Inspectorate (PINS) is the examining authority for NSIPs, and provides advice to the Secretary of State to inform his decision. Advice is still provided by PINS for developments in Wales of less than 350MW,

however, this advice is provided to Welsh Ministers rather than the Secretary of State. On granting a Development Consent Order, the MMO/NRW is then responsible for enforcement⁷⁰, post-consent monitoring, and varying, suspending or revoking any marine licence⁷¹, though the Secretary of State/Welsh Ministers ultimately retain responsibility for the review of consents, for example, under the Habitats Regulations.

In addition to the regulatory regime which provides the framework for consenting, planning policy is variously covered by the MPS, NPSs for energy (note that the NPSs are due to be reviewed in 2021), regional marine plans, and a range of terrestrial policy including the NPPF and Planning Policy Wales. In Scotland, Marine Scotland is the relevant authority with marine planning and policy responsibilities, and in Northern Ireland, the NIEA is the licensing and enforcement authority (as part of the Department of Agriculture, Environment and Rural Affairs) for devolved matters.

A significant fraction of renewable energy generation in the next 10 years will come from offshore wind, and potentially other marine renewables, as they are increasingly deployed and become more technically and economically feasible. These will help deliver part of the government targets to reduce carbon dioxide equivalent emissions, as recognised in the Clean Growth Strategy (2017), Industrial Strategy (2017) and the Energy White Paper (2020). Devolved Governments have also released a number of documents outlining their commitment to transitioning to low carbon energy production, such as the Welsh Government's, Energy Wales: a Low Carbon Delivery Plan (2019), Scotland's, The Future of Energy in Scotland: Scottish Energy Strategy (2017) and related Sectoral Marine Plan for Offshore Wind, and the Northern Ireland Renewable Energy Strategic Action Plan (2015).

Within the UK, sources of carbon dioxide are clustered around a relatively few centres of significant industrial activity; Thames Estuary, Humberside, Merseyside, the Firth of Forth and Teesside and Tyneside, and it is recognised that Carbon Capture Usage and Storage (CCUS) is likely to be needed to decarbonise heavy industry in these areas. The CCUS Deployment Pathway: An Action Plan, sets out the UK Government's approach to the delivery of CCUS, with cost elements being considered by the CCUS Cost Challenge Taskforce⁷². Support for CCUS has been provided by UK Government, for example, through the CCUS Innovation Programme⁷³, the Industrial Decarbonisation Deployment and Roadmap administered by UKRI, and funding to support the transition from natural gas to hydrogen⁷⁴. Based on the targets given in the 2020 Energy White Paper (two industrial CCUS clusters by the mid-2020s, and a further two clusters by 2030, with an ambition to capture and store 10MtCO₂ per year by 2030) several facilities could become operational during the timescale of OESEA4, with a mixture of asset re-use and new facility installation.

While reliance on fossil fuel sources will continue during the decarbonisation of energy supply industry (including through CCUS), the UK is now a net importer of both oil and gas. Since 2000, UK domestic gas supply has declined with net imports commencing in 2004, and similarly, UK oil production has been in decline since a peak in 1999, with net imports of oil commencing in 2005. In 2019, imports met approximately 48% of the UK's oil and gas

⁷⁰ Note that enforcement functions under Part 4 of the *Marine and Coastal Access Act* were not delegated to NRW and remain with Welsh Ministers, see: <http://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2013/04/Advice-note-11-Annex-A-CCW.pdf>

⁷¹ <https://www.gov.uk/government/collections/marine-licensing-nationally-significant-infrastructure-projects>

⁷² <https://www.gov.uk/guidance/uk-carbon-capture-and-storage-government-funding-and-support>

⁷³ <https://www.gov.uk/government/publications/call-for-ccus-innovation>

⁷⁴ <https://www.gov.uk/government/news/pm-commits-350-million-to-fuel-green-recovery>

demand. Despite these declines, the UK remains a large producer of oil and gas, and successive oil and gas licensing rounds attract significant interest. Reductions in the recent production and exploration of the UKCS sector led to the Wood Review in 2013, which set out a number of recommendations that were accepted by Government, including the creation of the OGA, an executive agency of BEIS formally established in April 2015 and which became a government company wholly owned by the Secretary of State for BEIS in 2016. The OGA has responsibilities including oil and gas licensing, exploration and production, fields, wells and other infrastructure, and CCS licensing, with environmental regulatory functions retained by BEIS, and administered by the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED).

The *Infrastructure Act 2015* amended the *Petroleum Act 1998* (Part 1A), creating an obligation on the Secretary of State to produce a Strategy for enabling the principal objective of "maximising the economic recovery of UK Petroleum" and for this strategy to be produced by April 2016. This resulted in the Maximising Economic Recovery (MER) UK Strategy which set out a central obligation (that relevant persons⁷⁵ must take the steps necessary to secure that the maximum value of economically recoverable petroleum is recovered from the strata beneath relevant UK waters) and a number of supporting obligations and actions. The strategy was revised in 2020 to account for the UK's net zero commitment, such that amendments were made in relation to the central obligation, and a number of supporting obligations, around relevant persons taking appropriate steps to assist the Secretary of State in meeting the net zero target. The OGA has been working on a number of initiatives to assist such a move, including on energy integration⁷⁶.

A linked factor in enhancing security of supply is the need for gas storage capacity since, until recently, seasonal fluctuations in UK gas demand were met by varying production rates from UK fields. Gas storage in the UK is comparatively smaller when compared to Europe, as supply has to date been dominated by domestic supply and an abundance of import infrastructure. Whilst new gas import infrastructure may be constructed, domestic gas supply has been in decline in recent years, which is enhancing import dependency. There are a small number of gas storage facilities in the UK, all of which are located onshore (see Appendix 1h). There are two proposed offshore facilities (Gateway, Deborah), however, it is not clear that these will proceed as no investment decision has been made. Existing facilities collectively have approximately 1.5 billion cubic metres (Bcm) of storage capacity and a delivery rate of 111 million cubic metres per day (mcm/day)⁷⁷, all of which are located onshore. The latest UK risk assessment of security of gas supply indicates that UKCS gas supply has increased year on year since 2014 due to the development of new fields, increased production, and the extraction of cushion gas at Centrica's Rough storage facility as it prepared for closure. However, the general trend is one of declining domestic production (as noted above). The National Grid Gas Ten Year Statement is published by National Grid annually as System Operator and Transmission Owner of the gas National Transmission System (NTS). The statement sets out how it is planned to operate the NTS over the next 10 years.

Following the accident involving the Deepwater Horizon semi-submersible in the Gulf of Mexico and subsequent problems in both stemming the flow of oil from the open well and

⁷⁵ Relevant persons has the meaning of, the OGA and those listed in section 9A(1)(b) of the *Petroleum Act 1998* (as amended). These include, a person who is the holder of a petroleum licence, an operator under a petroleum licence, the owner of a relevant offshore installation or upstream petroleum infrastructure.

⁷⁶ <https://www.ogauthority.co.uk/the-move-to-net-zero/energy-integration/>

⁷⁷ <https://www.ofgem.gov.uk/publications-and-updates/gb-gas-storage-facilities-2021>

adverse environmental and socio-economic impacts, the UK Government has taken various actions to ensure that the UK oil and gas sector operates appropriately (see BEIS guidelines on the demonstration of financial liabilities⁷⁸), and the establishment of an industry trade association (The Oil Spill Prevention and Response Advisory Group) by Oil and Gas UK which assessed and reported on the strengths and weaknesses in how the UK would respond to such an incident in its waters. The EU Directive on safety of offshore oil and gas operations (the offshore safety directive) which seeks to reduce, as far as possible, the occurrence of major accidents related to offshore oil and gas operations was transposed into UK law through secondary legislation (the *Offshore Installations (Offshore Safety Directive) (Safety Case etc.) Regulations 2015*, and the *Offshore Petroleum Licensing (Offshore Safety Directive) Regulations 2015*) and amendments to other Regulations including in relation to environmental liability have been made.

In order to implement the same environmental regulations which apply to the oil and gas industry to the storage and offloading of combustible gas, and the storage of carbon dioxide (i.e. those activities licensed under the *Energy Act 2008*), the *Energy Act (Consequential Modifications) (Offshore Environmental Protection) Order 2010* was made. This instrument ensures that regulations including the *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended), the *Offshore Combustion Installations (Pollution Prevention and Control) Regulations 2013* and the *Conservation of Offshore Marine Habitats and Species Regulations 2017* apply to these types of development.

The National Policy Statement for Ports was published in 2012, which outlines the framework for decision making in relation to nationally significant port developments in England and Wales, and recognises the strategic role of UK ports in the in movement of goods. Shipping and port activity has expanded considerably in recent years, and will remain the principal means by which the UK exchanges goods. Ships, though emitting less carbon dioxide per tonne of goods transported than other methods of bulk transport, represent a significant source of anthropogenic gaseous and particulate emissions. Regulation of these emissions is partial, and largely undertaken at the IMO level (for example, in regulations made under MARPOL to limit SOx emissions, and the IMO strategy on the reduction of greenhouse gas emissions from ships), however, the UK's clean maritime plan has indicated that new ships should be zero-emissions capable by 2025, with guidance also issued to ports to assist them in developing air quality strategies. The UK Government also proposes to include emissions from international aviation and shipping in future carbon budgets, as at present, these are not counted.

UK fisheries have reduced in recent years in part due to declining fish stocks and resulting management techniques including catch and effort management. The *Marine and Coastal Access Act 2009* aims to strengthen fisheries and environmental management protection. Inshore fisheries management is now handled by Inshore Fisheries and Conservation Authorities (IFCAs), which replaced Sea Fisheries Committees. IFCAs are responsible for activities out to 6nm from the coast and in estuaries where they will be responsible for sea fisheries management. In Scotland, Marine Scotland has a number of roles including marine research, marine policy and regulatory functions. The nature of the future management of fisheries in UK waters is likely to reflect the proposals set out in the White Paper, *Sustainable Fisheries for Future Generations*⁷⁹.

⁷⁸ <https://www.gov.uk/guidance/oil-and-gas-offshore-environmental-legislation>

⁷⁹ <https://www.gov.uk/government/consultations/fisheries-white-paper-sustainable-fisheries-for-future-generations>

4.9 Cultural heritage

Cultural Heritage	
International	<p>UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage (1972) Convention on the Protection of Underwater Cultural Heritage (2001) United Nations Convention on the Law of the Sea (UNCLOS) World Heritage Convention 1972 Tentative list of possible future world heritage nominations (2012-2014) - United Kingdom of Great Britain and Northern Ireland</p>
Regional	<p>Council of Europe, European Convention on the Protection of the Archaeological Heritage 1992, the 'Valetta Convention' Council of Europe, European Landscape Convention 2000</p>
UK	<p><i>Protection of Military Remains Act 1986</i> <i>Ancient Monuments and Archaeological Areas Act 1979</i> <i>National Heritage Act 2002</i> <i>Marine and Coastal Access Act 2009</i> <i>The Protection of Military Remains Act 1986 (Designation of Vessels and Controlled Sites) Order 2019</i> Marine Policy Statement (2011) Maritime and Marine Historic Environment Research Framework (2011, updated 2013)</p>
Local	<p><i>Protection of Wrecks Act 1973</i> - England, Wales and Northern Ireland <i>National Heritage Act 1983</i> (as amended) - England <i>Treasure Act 1996</i> - England and Wales <i>Planning (Listed Buildings and Conservation Areas) Act 1990</i> - England and Wales East (2014) and South (2018) Inshore and Offshore Marine Plans - England National Planning Policy Framework (2019) Historic England Advice Note 8 - Sustainability Appraisal and Strategic Environmental Assessment (2016) Marine Aggregate Levy Sustainability Fund (MALSF) Regional Environmental Characterisations including : South Coast, Thames, East Coast and the Humber areas. Historic England Climate Adaptation Report (2016) National Historic Seascape Characterisation Consolidation (2018) Historic Environment Good Practice Advice in Planning Note 3: The Setting of Heritage Assets, 2nd Edition (2017)</p> <p><i>Historic Environment (Wales) Act 2016</i> Conservation Principles for the sustainable management of the historic environment in Wales (2011) A Research Framework for the Archaeology of Wales (2011) Historic Environment Strategy for Wales (2013) Planning Policy Wales Edition 10 (2018) Welsh National Marine Plan (2019)</p> <p><i>Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997</i> <i>Marine (Scotland) Act 2010</i> <i>The Historic Environment Scotland Act 2014</i> Scottish Natural Heritage: Natural Heritage Futures (2002, updated 2009) Scottish Planning Policy (2014) and the National Planning Framework for Scotland 3 (2014) Historic Environment Policy for Scotland (2019) Heritage for all: corporate plan 2019 onwards - Historic Environment Scotland (2019) Scotland's National Marine Plan (2015) Consultation Report: Historic Marine Protected Areas (2019)</p>

The Planning (Northern Ireland) Order 1991
The Historic Monuments and Archaeological Objects (Northern Ireland) Order 1995
Marine Act (Northern Ireland) 2013
 Planning Policy Statement 6: Planning, Archaeology and The Built Heritage (Northern Ireland) (1999) and 2005 addendum
 Guidance on Setting and the Historic Environment (2018)
 The Marine Plan for Northern Ireland (consultation, 2018)

4.9.1 Key objectives and targets

United Nations Convention on the Law of the Sea (UNCLOS), and more recently the Convention on the Protection of Underwater Cultural Heritage (CPUCH). Though the UK is not a signatory of the latter, the convention received acceptance or ratification of the minimum number of 20 states on 2nd October 2008 and entered into force on 2nd January 2009. The CPUCH covers those archaeological, historical or cultural items which have been, ‘partly or completely under water, periodically or continuously, for at least 100 years’, which includes not only shipwrecks but buildings, artefacts, human remains, aircraft, cargo and prehistoric items. A central tenet of the Convention is that underwater heritage is preserved in situ.

At present, the principal form of marine heritage protection in the UK is for that of shipwreck, provided by the *Protection of Wrecks Act 1973*, the *Protection of Military Remains Act 1986* and the *Marine (Scotland) Act 2010*. These seek to protect either wrecks or wreck sites that contribute to the understanding of the past on account of their historical, archaeological or artistic importance, or vessels or aircraft which appear to have become sunk or stranded while in military service.

The *Marine and Coastal Access Act 2009* has a number of provisions in relation to the historic environment, including consideration of historic or archaeological sites within the grounds for designating MCZs. The *Marine (Scotland) Act 2010* allows Scottish Ministers to designate Historic Marine Protected Areas in Scottish territorial waters (i.e. out to 12nm). These designations have been used to cover all wrecks in Scottish waters formerly designated under the *Protection of Wrecks Act 1973*, which is no longer applicable to Scotland. Military wrecks remain within the remit of the *Protection of Military Remains Act 1986* for all UK waters.

Scottish territorial waters are not within the remit of this SEA other than for reserved matters (gas storage and oil and gas licensing), so any interaction with Historic Marine Protected Areas would be exclusively for these aspects of the draft plan/programme. For the purposes of the *Marine (Scotland) Act 2010* historic assets may include:

- a vessel, vehicle or aircraft (or a part of a vessel, vehicle or aircraft), or it’s remains
- an object contained in, or formerly contained in, a vessel, vehicle or aircraft
- a building or other structure (or a part of a building or structure)
- a cave or excavation
- a deposit or artefact (whether or not formerly part of a cargo of a ship) or any other thing which evidences, or groups of things which evidence, previous human activity

Under the reform of heritage protection, the Scottish Government released a policy document in 2008 which consolidated the Scottish Heritage Protection Policy series of reports, followed

by the Scottish Historic Environment Policy (SHEP) in 2011. Most recently, the Historic Environment Policy for Scotland (HEPS) was published in 2019 which sets out a number of policies and principles on how Scotland's historic environment should be managed. This includes policies on managing change as the result of decisions that effect the historic environment, or the planning and implementation of plans, programmes, policies and strategies, including that they should approach the historic environment in a way that protects and promoted it.

Historic England has produced its Historic England Corporate Plan 2020-23: Building the future. The plan sets out Historic England's strategic objectives, and the activities, outputs and outcomes to deliver these. A number of outcomes in the plan relate to enhancing knowledge and better informing decision making.

5 Environmental Baseline

5.1 Introduction

The provision of environmental information is required under Regulation 12(3), Schedule 2 of the *Environmental Assessment of Plans and Programmes Regulations 2004* (as amended).

The baseline will be described under a series of headings which relate to topics identified by the SEA Regulations on which to judge the “...likely significant effects on the environment, including short, medium and long-term effects, permanent and temporary effects, positive and negative effects, and secondary, cumulative and synergistic effects...” These include:

- Biodiversity, habitats, flora and fauna
- Geology, substrates and coastal processes
- Landscape/seascape
- Water environment
- Air quality
- Climate and meteorology
- Population and human health
- Other users, material assets (infrastructure, other natural resources)
- Cultural heritage
- Conservation of sites and species
- and the interrelationships of the above.

5.2 Overview of the Environmental Baseline

The environmental baseline for OESEA4 will build on upon that previously produced for OESEA3 (2016), and reflect ongoing work to keep the SEA baseline under review, including as part of a review of OESEA3 undertaken in 2018⁸⁰. The environmental baseline will be provided in full as an Appendix to the Environmental Report, having been updated to reflect the latest available primary and grey literature, and other inputs including from consultation. The geographic scope (entire UKCS) and level of detail will be the same as for previous OESEAs.

The environmental baseline will consider those topics introduced in Section 5.1 in a UK context, before providing more detailed information on key features specific to UK Regional Sea areas. The following provides a summary of the UK context for each SEA topic area, and the key updates which will be made to each topic chapter.

⁸⁰ <https://www.gov.uk/guidance/offshore-energy-strategic-environmental-assessment-sea-an-overview-of-the-sea-process#offshore-energy-sea-the-current-sea>

A number of technical reports will be commissioned during the SEA process to underpin individual baseline topic sections. In addition to these, a number of studies have been commissioned by BEIS since OESEA3 to inform understanding of the environment and its interactions with aspects of the plan/programme. Outputs from these studies are listed below where relevant.

Consultation Question

2. Consultees are invited to draw attention to and provide (where relevant/possible) additional information and data sets which they consider of potential relevance to this SEA.

5.3 UK Context

5.3.1 Biodiversity, habitats, flora and fauna

The UK has a rich marine biodiversity reflecting both the range of habitats from estuaries, through coastal waters to depths of >2400m, and its position where several biogeographical provinces overlap (see for example Longhurst (1998) and Spalding *et al.* (2007)). Some species and habitats are naturally rare, whilst others are endangered by human activities, and actions to protect and promote biodiversity are being taken at many levels. This section is subdivided into ecological components, with separate descriptions for plankton, benthos, cephalopods, fish & shellfish, turtles, marine birds and marine mammals.

5.3.1.1 Plankton

In broad biogeographical terms, the planktonic flora and fauna of UK waters is part of the North-East Atlantic Shelves Province which extends from Brittany to mid-Norway. In addition, the deeper Faroe-Shetland Channel and areas to the north are within the Atlantic sub-Arctic Province. Each province can be subdivided according to hydrography and plankton composition. The phytoplankton community is largely dominated by diatoms and dinoflagellates, with others, such as the calcifying coccolithophore *Emiliana huxley*, becoming significant components during their seasonal peak in abundance. Phytoplankton blooms typically take place in spring, with a smaller bloom in late summer. Some phytoplankton blooms may be toxic to marine life. The timing, composition and size of these blooms are dependent on a range of environmental factors with important spatial differences across the UKCS. The zooplankton community is dominated by copepods, particularly *Calanus* species which show a strong geographical divide, with *C. finmarchicus* and *C. helgolandicus* dominating northern and southern waters respectively. Jellyfish, krill and salps are also abundant, as are the larvae of fish, and many benthic animals (meroplankton).

5.3.1.2 Benthos

The composition of the seabed fauna of the UK reflects the intersection of four biogeographical zones:

- Boreal Province including the North and Irish Seas
- Lusitanian-Boreal Province comprising the Celtic Sea and west coasts of Ireland and Scotland

- Arctic Deep-Sea Province, a deep water zone centred on the Norwegian Sea but extending into the Faroe-Shetland and Faroe Bank Channels
- Atlantic Deep-Sea Province, a deep water zone to the west of northeast Europe

Within each Province it is possible to distinguish a series of faunal communities inhabiting specific sediment types and depth ranges. Often these communities extend over wide areas (e.g. the fine sands of the central North Sea and the sandy muds of the Fladen Ground in the northern North Sea) and include both infauna and epifauna. In addition, there are a number of highly localised habitats and communities, including reefs of long lived horse mussels and cold water corals, where high biodiversity is accompanied by high sensitivity to human pressures. Habitat characterisation across the UKCS continues to improve, including through the efforts made in identifying, designating and monitoring MPAs.

5.3.1.3 Cephalopods

Most cephalopods in UK waters are long-finned squids, short-finned squids, bobtail squids, octopuses or cuttlefish. The long-finned squids (including *Loligo forbesii*) tend to have a more coastal and northerly distribution. Short-finned squids are oceanic species and are recorded particularly to the west of the UK. Bobtail squids are abundant in shallow, coastal regions, while octopuses and cuttlefish are more common in southern areas. A number of deep-sea cephalopods are present in the deep waters of the Faroe-Shetland Channel and Rockall Trough.

5.3.1.4 Fish and shellfish

A wide range of biogeographic distribution patterns are shown by the fish in UK waters. The majority of continental shelf species have a north-east Atlantic/northern Atlantic distribution, although a proportion are found globally in the tropics/subtropics and others have a circum-polar pattern of occurrence. Widely distributed species often include local stocks with distinct breeding times and locations (e.g. herring). Widespread pelagic species include herring and mackerel, particularly around the western and northern parts of the UK. Demersal species include gadoids (e.g. cod, whiting) and flatfish (e.g. plaice, dab). Demersal communities tend to be more diverse in southern areas of the UK. Diadromous fish in UK waters include sea trout, Atlantic salmon and European eel, with significant recent declines reported for both salmon and eel. A number of sharks and rays are present in UK waters, including the basking shark for which western coasts appear particularly important. Deep water fish show different distribution patterns with major differences occurring north and south of the Wyville Thomson Ridge (ca. 60°N), and a distinct species group found in the cold waters of the Faroe-Shetland Channel and Norwegian Sea. Widespread commercial shellfish species include crustaceans (e.g. *Nephrops*, brown crab), bivalve molluscs (e.g. scallops, cockles) and gastropod molluscs (e.g. whelks). Many of these species, such as *Nephrops* and scallops, are closely tied to particular seabed sediments and so occupy distinct grounds. Virtually all commercially fished species are heavily exploited although there is some evidence of recovery for some stocks.

5.3.1.5 Turtles

Of the five species recorded in UK waters, the vast majority of records are of the leatherback turtle (*Dermochelys coriacea*) which is the only species considered a regular member of the UK marine fauna. While turtles have been observed along the majority of UK and Irish coasts, records are concentrated on the west and south coasts of Ireland, southwest England, south and northwest Wales, the west coast of Scotland, Orkney and Shetland.

5.3.1.6 Birds

The bird fauna of the UK is western Palaearctic, that is the great majority of species are found widely over western Europe and extend to western Asia and northern Africa. There are 3 regular patterns of species occurrence: resident, summer visitors (to breed) and winter visitors. Some of the summer visitors undertake long migrations to overwinter in southern Africa or South America. The seabird community in the UK comprises a number of gull, auk, tern and skua species, while numerous waders, ducks, and geese make up seasonal and year-round assemblages in coastal wetlands. A few species are found only or predominantly in the UK. For example, the three Pembrokeshire islands of Skomer, Skokholm and Middleholm are estimated to hold some 50%, and the Isle of Rum off western Scotland between a quarter and a third of the world's breeding population of Manx shearwaters.

5.3.1.7 Marine mammals

Many of the species of cetaceans found in UK waters have a worldwide distribution, although a number have restricted ranges, typically temperate to sub-Arctic or Arctic waters of the North Atlantic. British whales and dolphins include resident species as well as migrants (regularly moving through the area to and from feeding and breeding grounds) and vagrants (accidental visitors from the tropics or polar seas). The most abundant cetacean in UK waters is the harbour porpoise. The SCANS-III survey completed in the summer of 2016 (Hammond *et al.* 2017), provided abundance estimates for a wide range of species, including: harbour porpoise, bottlenose dolphin, Risso's dolphin, white-beaked dolphin, white-sided dolphin, common dolphin, striped dolphin, pilot whale, all beaked whale species combined, sperm whale, minke whale and fin whale. Two species of seal breed in the UK; the grey seal has a North Atlantic distribution with the UK holding over 40% of the world population; and the harbour seal, found along temperate, sub-Arctic and Arctic coasts of the northern hemisphere, with the UK population representing over 5% of the global total. Otters inhabit a variety of aquatic habitats, with some populations feeding in shallow, inshore marine areas. The most important otter populations utilising coastal habitats occur in western Scotland, Shetland, west Wales and the Wash and north Norfolk coast. Small numbers of the Nathusius' pipistrelle bat occur seasonally over UK waters on migrations between the UK and mainland Europe.

5.3.2 Geology substrates and coastal processes

The distribution of geological strata in the UKCS is determined by past geological and geomorphological processes. The distribution of sediments and certain topographic features is a function of the underlying geology, and millennia of aeolian, fluvial and glacial activity both in the marine and terrestrial environment. The distribution of sediments and deep geological structure of the UKCS, and the North Sea in particular, is quite well known, particularly in areas of mature oil and gas production which have been extensively explored since the 1960s. Oil and gas reserves are dependent on viable source rocks and a suitable impermeable cap-rock, and these reservoirs are responsible for the distribution of much offshore activity. Certain topographic features are notable, primarily for the quality of habitat they provide, and these are bound by geology (e.g. Haig Fras) or sediment type (e.g. north Norfolk sandbanks). There are over 100 estuaries in England and Wales of relevance to the draft plan, which can be divided into a number of broad geomorphological types. Potential areas which may be suitable for gas storage and CCS include hydrocarbon reservoirs, halite deposits and saline aquifers.

Existing levels of contamination in the UK marine environment vary considerably on both regional and local scales, and in general have declined appreciably in recent decades. The majority of marine pollution comes from land-based activities; most pollutants enter the UK marine environment through direct discharges of effluents, land run-off (mainly via rivers) or

indirectly via the atmosphere. The highest concentrations of contaminants, and hence the greatest effects, are therefore often in inshore areas. Water samples with the highest levels of chemical contamination are found at inshore estuary and coastal sites subject to high industrial usage. In offshore waters, contaminant levels (chiefly hydrocarbons) in water and sediments are generally expected to be at or near background concentrations. Levels are expected to be higher at close proximity to oil and gas infrastructure, with concentrations decreasing with increasing distance from the source.

5.3.3 **Landscape/seascape**

Seascape is defined by the European Landscape Convention (ELC) as “an area perceived by people, whose character is the result of the action and interaction of natural and/or human factors”, and can be separated into areas of sea, land and intervening coastline, and more recently in the MPS as, “landscapes with views of the coast or seas, and coasts and the adjacent marine environment with cultural, historical and archaeological links with each other.” The study of seascape is not only concerned with the physical character of a given view but the interaction of that view with individuals and how changes can affect overall visual amenity. Seascapes and coastal environments (including the sea itself) are extensively used for recreation which generates significant tourist income from which many coastal communities are dependent, and this can strongly conflict with commercial and industrial activity (Hill *et al.* 2001). The ‘value’ of many of the UK’s seascapes is reflected in the range of designations which relate in whole or in part to the scenic character of a particular area (e.g. AONB, Heritage Coast, National Scenic Area), however the ELC and MPS (and most recently seascape assessments covering the English Marine Plan regions) define landscape and how they are to be considered in more general terms, acknowledging the value of all landscapes whether or not they are subject to designation.

5.3.4 **Water environment**

The UK marine water environment is highly varied, ranging from entirely oceanic conditions to the north and west of the UK to complex estuarine systems widely distributed around the coast. It is also a dynamic environment, with a complex system of currents and varied oceanographic conditions including areas of considerable frontal activity and high-energy wave and tidal environments. The OESEA4 baseline will describe key information sources and monitoring programmes, as well as the characteristics of the UK water environment with respect to water masses and circulation, stratification and frontal zones, coastal tidal flows, temperature, salinity and wave climate.

5.3.5 **Air quality**

Whilst air quality is not monitored routinely offshore, regular air quality monitoring is carried out by local authorities in coastal areas adjacent to each Regional Sea and by the OSPAR Comprehensive Atmospheric Monitoring Programme (CAMP) network. The air quality of all local authorities is generally within national standards set by the UK government’s air quality strategy though a number of Air Quality Management Areas (AQMAs) have been declared to deal with problem areas, primarily related to road transport. Industrialisation of the coast and certain inshore areas has led to increased levels of pollutants in these locations which decrease further offshore, though oil and gas platforms provide numerous fixed point sources of atmospheric emissions. Shipping emissions represent a significant source of pollutants with emission control areas in operation (sulphur oxide) or approved (nitrogen oxide) in the North Sea.

5.3.6 **Climate and meteorology**

The UK lies within temperate latitudes and the climate is generally mild. Numerous easterly moving depressions meet the UK in the west leading to a gradient of relatively high wind speeds and precipitation in the exposed west and relatively low wind speeds and precipitation in the sheltered south and east. The upland nature of much of the west coast also contributes to this west-east gradient, with topography-induced enhanced precipitation, particularly in the north-west. The UK has a strong maritime influence, which has the effect of reducing the diurnal and annual temperature ranges; such effects are most notable at the coast and on islands (e.g. Orkney, Shetland). The North Atlantic Oscillation (NAO) has also been linked with variations in UK sea surface temperatures, wind strength, direction and rainfall. Human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels, with a likely range of 0.8°C to 1.2°C. There is a high degree of confidence that global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate (IPCC 2018). Related changes include increase in sea-level, possibly more changeable and extreme weather, and alteration to metocean conditions (also covered in relevant topic areas elsewhere).

5.3.7 **Population and human health**

The total mid-2019 UK population is estimated to have been 66.8 million people⁸¹. Population density was highest in England at 432 persons per km², comparably lower in Wales and Northern Ireland at 152 and 137 persons per km² respectively, and the lowest by a considerable margin in Scotland at 70 persons per km². In coastal areas, there are lower densities around much of the southwest of England, west and north Wales, the far north of England, and much of Scotland excluding the central belt. The highest coastal densities are around much of southeast England, part of northeast England, the Firths of Forth and Clyde, part of northwest England, south Wales and around the Severn Estuary. These areas are typically where conurbations are largest and most numerous, although more isolated areas of higher densities are dotted around much of the coast. Higher densities are also observed in several coastal areas of Northern Ireland.

Life expectancy at birth in the UK in 2017 to 2019 was 79.4 years for males and 83.1 years for females. England had the highest life expectancy at birth of 79.7 for males and 83.3 for females, Wales and Northern Ireland were similar at 78.5 and 78.7 for males and 82.3 and 82.6 for females, with Scotland having the lowest life expectancy at birth of 77.1 for males and 81.1 for females⁸².

5.3.8 **Other users, material assets (infrastructure, other natural resources)**

UK waters are subject to a multitude of uses – particularly in coastal areas. The range and importance of existing and potential uses of the sea will be fully described in an appendix to the Environmental Report. This will use accurate and recent information on other current and likely uses of the sea in the foreseeable future, using input from marine spatial plans where these have been completed.

The UK is heavily reliant on shipping for the import and export of goods and will remain so for the foreseeable future. Over 95% of the goods entering or leaving the UK are transported by

⁸¹ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates>

⁸² <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/lifeexpectancies/bulletins/nationallifetablesunitedkingdom/2017to2019#life-expectancy-at-birth-in-uk-countries>

ship, with substantial numbers of vessels also transiting UK waters *en route* to European and more distant ports. In recognition of the vessel traffic densities and topographic constraints on various routes, the IMO has established a number of traffic separation schemes and other vessel routing measures to reduce risks of ship collision and groundings. In addition, IMO regulations required that from 2005, an Automatic Identification System (AIS) transponder be fitted aboard all ships of >300 gross tonnage engaged on international voyages, all cargo ships of >500 gross tonnage and all passenger ships irrespective of size. AIS data allow precise tracking of individual vessels and provide accurate information on important areas for larger vessel navigation. From 2012, fishing vessels over a certain size (initially >24m, but >15m since 2014) have also been required to have an AIS installed.

Fishing in the UK has a long history and is of major economic and cultural importance. In 2018, there were 11,961 working fishermen in the UK (of which 80% were full time), operating 6,036 vessels (MMO 2020). These vessels, while fishing in UK and non-UK waters, landed 698,000 tonnes of sea fish and shellfish in 2018 (426,000 tonnes into UK ports), with a total value of £989 million (£727 million into UK ports) (MMO 2020). The livelihoods of individual fishermen depend on their ability to exploit traditional fishing grounds and to adapt to changing circumstances to maximise profit. Consequently, they are vulnerable to competition within the UK industry and with foreign vessels, and to being displaced from primary grounds. Various sources of information on fishing effort show that while the majority of UK waters are fished to some extent, certain areas receive considerably more effort than others. In general, the greatest density of fishing effort takes place in coastal waters, for both static (such as pots, traps or gillnets) and mobile (such as trawls and dredges) gears. Further offshore, the density of effort was greatest to the northeast of Scotland (particularly the Fladen Ground), around the Northern Isles and to the southwest of the UK.

Military use of the coasts and seas of the UK is extensive, with all three Services having defined Practice and Exercise Areas, some of which are danger areas where live firing and testing may occur. Additionally, several military radars – Air Surveillance and Control Systems (ASACS) – are present around the coasts of the UK. Tourism and recreational use of UK coasts and coastal waters is of major importance in many areas. Major recreational uses of the sea beyond beaches and coastal paths include yachting (for which the Royal Yachting Association has published charts of cruising and racing routes), surfing and sea angling. Taking indirect effects into account, the total estimated economic impact of sea angling in the UK in 2017 was estimated to be £1.94 billion and supporting c. 16,300 jobs (Hyder *et al.* 2020). Many visitors to the coast cite unspoilt and beautiful natural scenery as the important factors influencing their selection of location to visit. The importance of such attributes are widely recognised and protected through designations such as National Parks, AONBs and National Scenic Areas.

Various areas of sea are used or licensed/leased for marine aggregate extraction, telecommunications and other cables, disposal of capital and other dredging wastes, offshore wind farms and other marine renewables, surface and subsea oil and gas production, hydrocarbon gas storage and export infrastructure, and carbon dioxide storage. Potential future uses/enhanced use of the sea and seabed includes carbon dioxide storage in geological formations, wave, tidal and hydrogen projects, and subsea cables forming connections as part of an offshore grid. Projects in these areas are either in the demonstration phase or in early planning, but are expected to be commercially proven or be in planning in the coming years.

5.3.9 Cultural heritage

The collective inventory and knowledge of maritime sites in particular is quite poor and may be subject to recording biases. Archaeology associated with human and/or proto-human activities either on the current seafloor of the southern North Sea, in the coastal zone of the British Isles and further inland, has the potential to date back at least as far as 500,000 years BP.

Relatively recent finds of flint artefacts from the Cromer Forest-bed Formation, Suffolk date to as early as 700,000 years.

The current understanding of marine prehistoric archaeology is based on knowledge of the palaeolandscapes of the continental shelf between the UK and Europe during glacial phases and limited finds of archaeological materials, augmented with knowledge of analogous cultural and archaeological contexts from modern day terrestrial locations. The record for wreck sites is biased towards those from the post-Medieval and later periods, presumably a function of greater traffic and increased reporting associated with the introduction of marine insurance and the Lloyds of London list of shipping casualties in 1741. The strategic military importance of the sea, the importance of the North Sea as a fishing area, the importance of maritime trade routes and the treacherous nature of many near-shore waters, has led to a large number of ship and aircraft wrecks in UK waters.

A number of coastal sites have been designated as cultural World Heritage Sites for example St Kilda, the Cornwall and West Devon Mining Landscape and the Heart of Neolithic Orkney.

5.3.10 Conservation of sites and species

Designated conservation sites are widespread and abundant around the UK coast; a variety of levels of designations exist from statutory international to voluntary local, affording various levels of protection to habitats, species, and geological, cultural and landscape features. Some of the most widespread designations include Special Areas of Conservation and Special Protection Areas which cover a range of terrestrial and marine habitats and species, and Sites/Areas of Special Scientific Interest (SSSIs/ASSIs), which are largely terrestrial but which may contain coastal or intertidal components. The *Marine and Coastal Access Act 2009* required the identification and designation of Marine Conservation Zones (Marine Protected Areas in Scotland) and the current network of sites is the result of several designation phases. Detailed listing and descriptions of conservation sites, species and nature conservation measures will be provided as an appendix OESEA4.

5.4 Summary of UK Regional Seas

The previous Offshore Energy SEAs (OESEA and OESEA2) used the draft Regional Sea boundaries defined by JNCC (2004) as a means of considering the broad scale biogeographical regions within UK waters. Following a review of these and other boundaries during scoping for OESEA3, a modified version of the Charting Progress 2 boundaries were used (Figure 5.1) to distinguish several important areas including: the Atlantic South West Approaches (Regional Sea 5), and the Faroe-Shetland Channel (Regional Sea 9), Rockall Trough and Bank (Regional Sea 10), and Atlantic North West Approaches (Regional Sea 11). It is considered that the basis for these Regional Seas has not altered in the period since the publication of OESEA3.

The text below describes the broad physical features of each Regional Sea, including the features upon which their boundaries are based. Detailed information on key features of each

of the Regional Seas will be provided by the various sub-appendices of the Environmental Report.

5.4.1 **Regional Sea 1**

The northern North Sea is bounded by the Flamborough front to the south, marking the transition from the shallow mixed waters of the southern North Sea to the deeper waters (50-200m) in the north which stratify thermally in summer along with a transition from sands to muddier sediments. Waters are generally of coastal origin but with a strong influx of Atlantic water in the north; turbidity is moderate. The northern boundary marks the transition from water dominated by the continental shelf current to the North Sea waters of mixed origin.

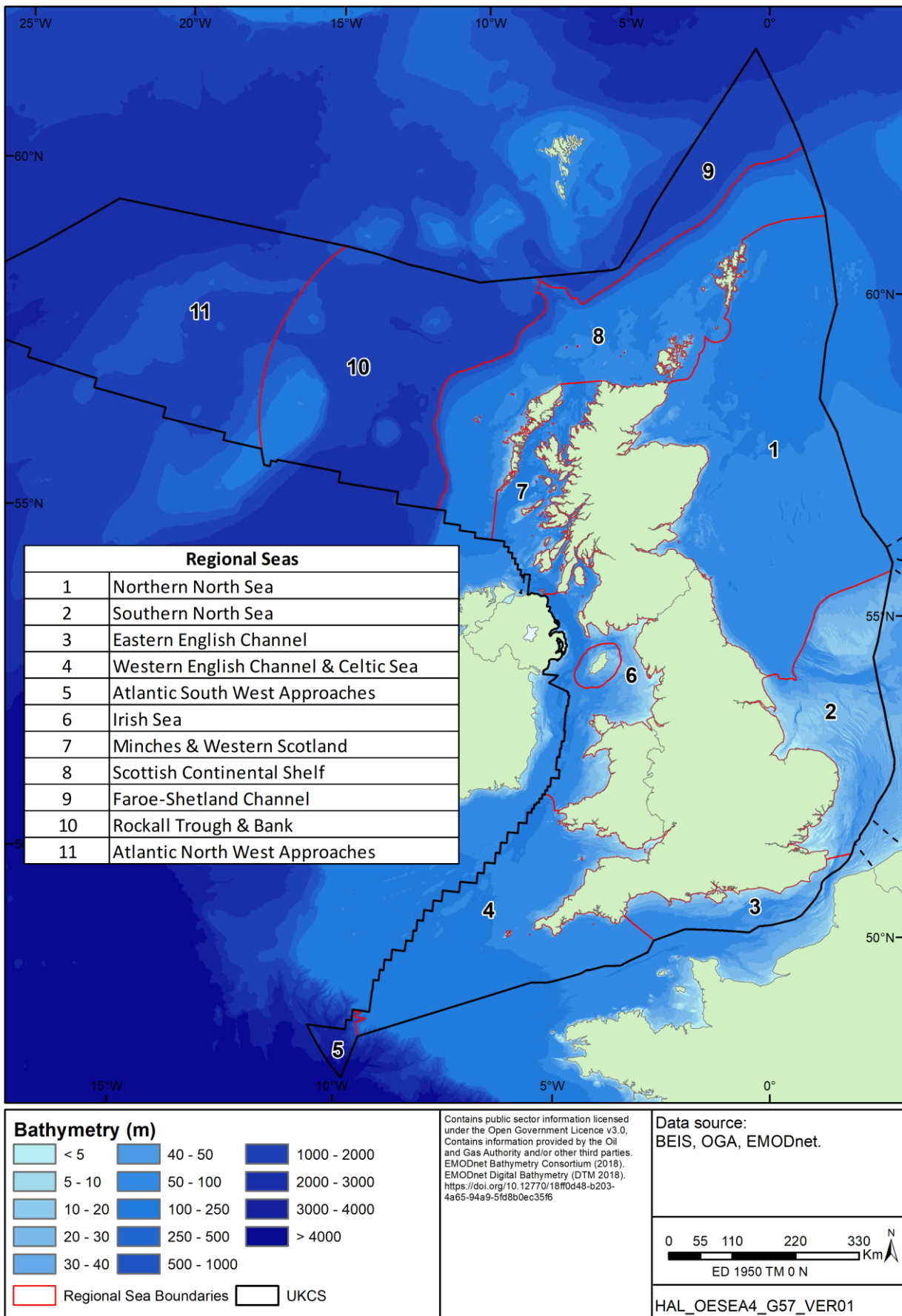
Regional Sea 1 supports an increasing diversity of cetacean species from south-north, high densities of seals (particularly around the Northern Isles), and an important population of bottlenose dolphins along the Scottish east coast. The adjacent coastline represents an important migratory pathway for many Arctic-breeding species, while the widespread and often remote cliff habitats support vast numbers of breeding seabirds; seabird densities at sea are relatively high over much of the area. The deeper waters over the mud and muddy sand of the Fladen Ground support an abundance of fish and *Nephrops*, yielding one of the most valuable fishing grounds in UK waters; additionally, inshore waters are heavily fished throughout the area. Regional Sea 1 supports a high number of coastal and offshore designations encompassing SAC, SPA, MPA and MCZ sites.

Oil and gas development is extensive, particularly in the east, and renewables activity is centred on the territorial and offshore waters of the Moray Firth and the Firth of Forth. The Meygen tidal power development in the Pentland Firth represents the first commercial scale tidal stream array in the world and there are a number of tidal and wave lease areas granted in the territorial waters around Orkney and Shetland.

5.4.2 **Regional Sea 2**

The southern North Sea extends from the Flamborough front in the north to north of the Dover Straits in the south, with a transition from North Sea water to Atlantic water. This region is shallow (generally 0-50m), with a predominantly sandy seabed, and mixed water experiencing large seasonal temperature variations. The influences of coastal water are particularly marked in this region, the water is turbid, and it exhibits a characteristic plankton composition.

Figure 5.1: Regional Sea subdivisions to be used in OESEA4



Much of Regional Sea 2 is less than 50m water depth, with many extensive sandbank features present at less than 25m depth; these include areas which have been designated under the Habitats Directive such as Dogger Bank SAC, the North Norfolk Sandbanks and Saturn Reef SAC, the Inner Dowsing, Race Bank and North Ridge SAC and the Haisborough, Hammond and Winterton SAC. Further seabed features have been designated as Marine Conservation Zones. The western flank of the Dogger Bank also supports high densities of seabirds, with notable colonies on the east coast located at Flamborough Head including for kittiwake, gannet, guillemot, razorbill and fulmar. Harbour porpoise are widely distributed throughout much of the area with the Southern North Sea SAC including key winter and summer habitat for the species. Large (but declining) numbers of harbour seals breed on the coast adjacent to the Wash; these animals forage widely in adjacent waters. Similarly, grey seals are present in increasing numbers throughout the area with a notable haulout and breeding site located at Donna Nook on the entrance to the Humber Estuary SAC.

The region experiences high densities of shipping activity, particularly in the south, and major shipping lanes run approximately parallel to the entire length of the coast. Fishing effort is moderate overall, with vessels generally avoiding the shallowest of sandbank areas, although inshore effort is fairly high in the south with international effort high in the southeast. Many dredging licence and application areas are present in the region. Gas development is extensive south of the Dogger Bank to approximately 53°N, while a number of existing, under construction and planned offshore wind farms are present in the greater Wash and Thames, the Dogger Bank and off Holderness (Hornsea area) and East Anglia. Regional Sea 2 is the most prospective area for carbon dioxide storage due to its underlying geology, and an Agreement for Lease and the first Carbon Dioxide Appraisal and Storage Licence acreage is located to the east of the Yorkshire coast.

5.4.3 Regional Sea 3

The eastern English Channel is bounded by the Dover Straits to the east and extends to the west to a line drawn between Start Point and Cherbourg on the north coast of France. Depths are generally shallow and rarely exceed 60m. There are isolated deeps of 80-100m (e.g. the Northern Palaeovalley) and shallower deeps (60-70m) such as St Catherine's Deep to the south of the Isle of Wight. Waters are mixed, with strong tidal current velocities in the central channel which decrease to the west and east. The seabed is variable; a general transition can be observed from coarser sediments in the west to sand in the east, although localised rock outcrops occur throughout the English Channel basin. Water temperatures vary considerably with season. The western boundary denotes a transition in benthic fauna from the eastern English Channel (Boreal fauna) to a different community in the western English Channel (Lusitanian fauna).

Regional Sea 3 contains a range of coastal SPA sites (e.g. Chesil Beach & The Fleet, Chichester & Langstone Harbours, Pagham Harbour, Solent & Dorset Coast). Additionally SACs include those with marine components (South Wight Maritime) or entirely offshore sites (Wight-Barfleur Reef SAC), augmented by a large number of MCZs.

The majority of Regional Sea 3 receives high to very high densities of shipping traffic, and has a water depth of less than 60m. The coastline is one of the most densely populated in the UK, and adjacent waters are used by a great number of recreational vessels. Additionally, very high levels of fishing activity occur, particularly in inshore waters, with high levels of effort by non-UK vessels also observed in this area. Many dredging licence and application areas are present in the region and the Round 3 Rampion offshore wind farm development was completed in 2018 with a potential extension planned.

5.4.4 **Regional Sea 4 and 5**

The western English Channel and Celtic Sea is a large region west of a line drawn between Start Point and Cherbourg and extending to approximately the 500m depth contour on the continental slope in the west. It is bounded to the northeast by the Celtic Sea front, marking the transition from oceanic water to the coastally influenced waters of the Irish Sea. Depth in the region varies from 50-200m with a general trend of increasing depth towards the west. The seabed is largely composed of sand and gravels with isolated rocky outcrops. The waters are generally subject to seasonal stratification, although mixing and seasonal temperature variation is greater in the east. The southern boundary is marked by a transition to warmer water and a community containing a greater number of Lusitanian species. The region is heavily influenced by Atlantic water, with reduced coastal influences; turbidity is moderate.

The Atlantic south west Approaches (formerly considered as a separate Regional Sea in OESEA and OESEA2), is a region bounded to the east by the shelf break and extends westwards into the northeast Atlantic. As only a very small proportion of this region lies within UK waters, it is therefore grouped with the adjacent Regional Sea 4. The seabed is generally composed of fine material. The water is oceanic in origin, with negligible coastal influences, low turbidity and is stratified. While comparable to the other deep water Regional Seas, influences from the Mediterranean current are stronger in this region leading to Lusitanian species being present in the water column. The area is intersected by submarine canyons, characterised by the upwelling of nutrient-rich deep waters and with cold-water corals present.

A large area with a water depth less than 60m extends west from the Bristol Channel to approximately 5°W, and also to some distance off the coast of north Cornwall. Surveys have observed seasonally high densities of seabirds in coastal waters around southwest England, while densities are also seasonally high in the north of the area around southwest Wales. The Celtic Sea is an important area for cetaceans, particularly common dolphins which may be seasonally present in large numbers. A large proportion of UK's leatherback turtle sightings occur in this region. In offshore waters west of Land's End lies Haig Fras – an area of rocky reef designated as a SAC. Additional SAC sites containing reef features are located in inshore waters including Start Point to Plymouth Sound and Eddystone SAC, Lizard Point SAC and Lands End and Cape Bank SAC. More recently, Marine Conservation Zones have been designated for features including high to moderate energy circalittoral, infralittoral or intertidal rock, and coarse sediments (Skerries Bank and Surrounds MCZ, Padstow Bay MCZ, East of Haig Fras MCZ). Two designated sites are located in the south west Approaches, including The Canyons MCZ (deep sea bed, cold water coral reefs, coral gardens, sea-pen and burrowing megafauna communities) and the South-West Deeps (West, subtidal coarse sediment, subtidal sand, subtidal mixed sediments, Celtic Sea relict sandbanks, subtidal mud and fan mussel), with the South-West Deeps (East, Celtic Sea relict sandbanks, deep-sea bed, subtidal coarse sediment and subtidal sand features) site yet to be submitted.

The inshore waters off the southwest coast of England receive some of the highest levels of fishing effort in UK waters. Fishing effort is also high across the majority of Regional Sea 4, while this area is also of considerable importance to recreational craft and commercial shipping. Several dredging licence and application areas are present in the inner Bristol Channel and off the south Wales coast. To date offshore energy activity has been limited, with no commercial hydrocarbon discoveries and proposals for marine renewables being at demonstrator scale. There have been a number of proposals for tidal lagoon developments in the Severn (Swansea Bay, Cardiff and Newport) but the planning permission for the Swansea Bay tidal lagoon has recently expired.

5.4.5 **Regional Sea 6**

The Irish Sea is bounded to the south approximately by the Celtic Sea front, and extends north to a line from the Mull of Kintyre, Scotland, to Fair Head, Northern Ireland, and includes the North Channel. Movements of species suggest the North Channel to represent an area of gradual transition rather than sharp change. The seabed is variable in nature, although dominated by glacial deposits re-worked by tidal currents. Waters are strongly influenced by coastal processes and turbid with influxes of water from the Celtic Sea and north from the continental shelf current. Stratification occurs in deeper waters but not in the coastal margin or in the north east of the area.

UK waters within the Irish Sea are generally shallow, with the majority of the area less than 60m depth from the coast west to approximately 5°W. Seabird densities are seasonally high in the west, particularly in the far north and south Irish Sea. Concentrations of Manx shearwaters occur in the Irish Sea, with colonies on islands off Pembrokeshire and in the Inner Hebrides representing the majority of the world breeding population of this species. Bottlenose dolphins occur off the west and north Welsh coast, with sightings focussed in Cardigan Bay where the species is the primary reason for designation of the Cardigan Bay SAC and one of the qualifying features of the Llyn Peninsula and the Sarnau SAC. Shell Flat and Lune Deep SAC is located in inshore waters near Morecambe Bay, and the territorial waters of Northern Ireland contain The Maidens SAC (reefs, sandbanks and grey seal) and Red Bay SCI (sandbanks). There are a number of designated MCZs located in Liverpool Bay including Fylde MCZ (subtidal sand and mud) and West of Walney MCZ (subtidal sand and mud, sea-pen and burrowing mega-fauna communities), as well as a number of MCZ sites not yet submitted (West of Copeland, Queenie Corner and South Rigg). In offshore waters, the Croker Carbonate Slabs SAC and Pisces Reef Complex SAC are designated for Annex I submarine structures made by leaking gases and reefs respectively.

High densities of shipping are experienced in the central St. George's Channel, off north Wales leading to the Mersey, and in the North Channel. High levels of fishing effort occur in the north, particularly to the west of the Isle of Man and off the Cumbria coast. Considerable gas infrastructure is present in the eastern Irish Sea associated with producing gas fields (and hence potential future CO₂ storage) and there are a limited number of producing oilfields. There are also a number of existing and planned offshore wind farms.

5.4.6 **Regional Sea 7**

The Minches and west Scotland is bounded to the south by a line from the Mull of Kintyre to Fair Head, to the west by the Malin front, and to the north by a line from the Butt of Lewis to Cape Wrath. The region encompasses waters which are largely sheltered from Atlantic swells by Northern Ireland and the Outer Hebrides. The seabed is characterised by muddy sand and mud, although more gravel is present in the south of the region. The waters in the region largely comprise North Atlantic water as part of the continental shelf current but are modified by coastal influences. The majority of the waters in the region stratify in the summer months, and turbidity is moderate-low.

Regional Sea 7 is characterised by relatively deep waters considering its coastal nature. The complex, undulating coastline with many islands is predominantly rural with very low population density and remote from large conurbations. The region is of high environmental sensitivity for a range of features. A high diversity and abundance of marine mammals and seabirds are present, along with many coastal otter populations. This area supports some of the highest densities of harbour seals in UK waters. Fishing effort is very high throughout much of the area, and is dominated by small, inshore vessels. Cold water corals occur in the area, and

other reef features are present in many of the sheltered sea lochs. These lochs also support extensive mariculture activities.

A very large number of designated conservation sites are present along the adjacent coast, including numerous habitat, species and landscape designations, as well as the East Mingulay SAC. Additionally, numerous MPAs have been designated, which include the Small Isles and Wester Ross – both have been selected on the basis of supporting a range of habitat and species features, with the former containing the only known aggregation of fan mussels in UK waters, and also marine geodiversity features. Three other significant MPA proposals are located in Regional Sea 7; these are, the Sea of the Hebrides, North-East Lewis and Shiant East Bank. Proposed site features range from seabed habitats and fauna (including fan mussel aggregations, basking shark, sandeel and marine mammals including minke whale and Risso's dolphin). Each site is also proposed for marine geodiversity features.

5.4.7 **Regional Sea 8**

The Scottish continental shelf runs along the continental shelf to the north and northwest of the UK. It is bounded to the west, south of the Wyville Thomson Ridge, by the 1,000m depth contour - reflecting the changes in community composition which has been observed in various studies on shelf slope fauna. To the north of the Wyville Thomson Ridge (also a designated SAC), the boundary lies along the 600m contour where the influence of cold Norwegian Sea/Arctic Intermediate water commences. The entire continental shelf is dominated by the warm (>8°C) North Atlantic waters of the continental shelf current until the Orkney and Shetland Isles. The boundary to the east reflects the division between Lusitanian and Boreal fauna in the channel between the Orkney and Shetland Islands, with Lusitanian fauna occurring in the Orkney Islands but not in the Shetland Islands. The seabed is characterised by sand and coarse sediment of glacial origin re-worked by tidal processes, and in deeper areas close to the shelf break sediments have been formed into iceberg ploughmarks – a complex matrix habitat of stony ridges and sandy troughs. Water in this region is subject to seasonal stratification, has low turbidity and there is a low level of material of terrestrial origin entering the sea.

Regional Sea 8 covers a large area and range of water depths, although waters shallower than 60m are generally restricted to those immediately west of the Outer Hebrides. The region supports a rich diversity and abundance of marine mammals, with all typical UK shelf species present in addition to many oceanic, deeper water species along the shelf edge to the north and west. Large numbers of grey seals breed on the several small remote islands present, including those around Orkney and Shetland. Seabird densities are high throughout coastal waters and to a considerable distance offshore. Of particular environmental sensitivity is the St. Kilda archipelago. Lying 66km west of the Outer Hebrides, these islands support very large populations of breeding seabirds and receive numerous conservation designations, including dual World Heritage status for both its natural and cultural significance, and SPA designation for the islands and surrounding waters. Large numbers of breeding seabirds also occur on the adjacent coast of the Outer Hebrides, north mainland and Northern Isles. The region includes two sites designated for reef features (Stanton Banks SAC and Solan Bank Reef SAC), and more recently MPA sites including the West Shetland Shelf, North-west Orkney and part of the Faroe-Shetland Sponge Belt.

Shipping density is particularly high along the north mainland and through the Pentland Firth, while fishing effort is moderately high throughout the majority of the region. A limited amount of oil and gas activity occurs to the west of Shetland. Population density along the adjacent coast is the lowest in the UK.

5.4.8 **Regional Sea 9**

The Faroe-Shetland Channel is characterised by the influx of dense cold water from the Arctic and Norwegian Sea into the channel at depths below 600m. The western boundary of the region is the Wyville Thomson Ridge which prevents the majority of the flow of cold water from entering the Rockall Trough, which instead exits to the northwest via the Faroe Bank Channel. The seabed of the channel is mainly composed of silt and clay at the base with more sand and some areas of gravel and cobbles/boulders on the flanks of the continental slope, particularly in areas sculpted in the past by icebergs; glacial dropstones occur throughout the area. Water temperatures vary considerably through the water column, from approximately 0°C at the seabed but above 600m depth, where North Atlantic water flows, between 6.5-8°C. Both main water masses in the region are oceanic in origin and turbidity is typically low but there are periods with elevated turbidity in near slope areas. The cold waters at depth result in a different characteristic benthic community to that found at shallower depths in adjacent areas or in the Rockall Trough.

Regional Sea 9 supports a diverse and abundant cetacean community, including many poorly understood oceanic and deep-diving species such as sperm whales, beaked whales and large baleen whales. Evidence suggests that this area represents a migratory route for a number of cetacean species. Along the southwest boundary of the area lies the Wyville Thomson Ridge SAC, a large area of full salinity stony and bedrock reef. The area also includes part of the Faroe-Shetland Sponge Belt MPA, and the North-East Faroe-Shetland Channel MPA. Amongst other features, both are designated for deep sea sponge aggregations and offshore subtidal sands, and contain representative marine geomorphological features.

A number of UKCS Blocks are presently licensed in Regional Sea 9, which has been subject to historical licensing covering most of the area. No fields have been developed to date in Regional Sea 9, however, a number of discovery fields are present.

5.4.9 **Regional Sea 10 & 11**

Regional Seas 10 and 11 cover the Rockall Trough and Bank and Atlantic North West Approaches. These are deep-sea regions west of the Scottish continental shelf, bound to the east by the 1,000m depth contour and to the west by the western extent of the UKCS. The seabed supports a different faunal community to that observed at depths less than 1,000m, and is mainly composed of muddy sand and mud, with clay mud present in the deep waters to the west. In shallower water, on Rockall Bank and the seamounts, the fauna is likely to be similar to those found at the western edge of the Scottish continental shelf. The waters of these regions are totally oceanic in origin with negligible inputs of material of a terrestrial origin and little seasonal change in primary productivity. Turbidity is very low. Waters are cooler in the Atlantic North West Approaches due to an influx of south flowing Arctic water.

Compared to UK shelf waters, information on the natural environment of Regional Seas 10 and 11, particularly the Atlantic North West Approaches, is sparse. Known key features include a diversity and abundance of cetaceans, including several large baleen whales species and deep diving species. Evidence suggests that this area represents a migratory route for a number of cetacean species. Several seamounts are present which are known to contain extensive reef habitat, including cold-water corals. In the far northeast of the region lies the Wyville Thomson Ridge SAC, and the Darwin Mounds SAC. In the far west of Regional Sea 10 lies the North West Rockall Bank SAC. Moderate levels of fishing effort by UK vessels occur over topographical rises in the area, such as the Anton Dohrn seamount and Rockall Bank; these features are also fished extensively by non-UK vessels.

Relatively little oil and gas licensing has taken place in Regional Sea 10; the most recent licensing in the area was in the 28th Round (2014), however, these licences have now been relinquished.

5.5 Relevant Existing Environmental Problems

The SEA Regulations requires consideration of any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of environmental importance, such as areas designated under the Habitats Regulations. More recently, the principal problems in UK waters have been reviewed and considered in relation to MSFD descriptors of GES, and set against relevant targets and monitoring programmes with a view to meeting the requirements of the MSFD⁸³. These inputs have been reviewed and are considered here in relation to their implications for this SEA. In addition to these, a number of other potential problems of relevance to the SEA not specifically related to conservation of environmental protection are considered, for instance in relation to material assets and cultural heritage. No judgement of importance should be inferred from the position of problems/issues in the section.

Consultation Question

4. Are there any additional environmental problems you consider to be relevant to the SEA?

5.5.1 Eutrophication

The majority of UK waters do not experience significant eutrophication – the eutrophication problems are restricted to a small number of areas in coastal waters, primarily estuaries and embayments with restricted water circulation. In a limited number of areas on the north east and southern coasts of the UK and on the south-west coasts of England and Wales and in Northern Ireland, inputs of nutrients of anthropogenic origin (notably nitrate and phosphate from agriculture and urban waste water sources) have resulted in nutrient enrichment in some small estuaries and bays. In general, changes in nitrogen and phosphorus inputs, concentrations of contaminants, chlorophyll concentrations and oxygen levels show improvements. Where measures have been taken to reduce nutrient inputs, it may take a long time to result in the desired outcome due to time lags between taking measures and change in the large reservoirs of nitrogen that have built up in soils and ground-waters in previous decades. However the existing programmes for assessing the eutrophication status for coastal and marine waters developed under the WFD and the OSPAR Convention have to a large extent already been applied successfully with the UK largely achieving GES in the latest 2018 assessment⁸⁴.

5.5.1.1 Implications for SEA

The SEA must consider the potential implications of the draft plan/programme on attaining good environmental status of both marine and coastal/estuarine waters as determined by the WFD and MSFD. One of the descriptors for determining GES under the MSFD (Descriptor 5)

⁸³ See Charting Progress 2, Marine Strategy Part 1 and Part 2.

⁸⁴ <https://moat.cefas.co.uk/pressures-from-human-activities/eutrophication/>

is that human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters. Whilst plan level activities may not directly contribute to or generate eutrophication, any effects which could lead to cumulative effects should be considered.

5.5.2 Hazardous Substances

The UK has largely achieved its aim of GES for contaminants. The updated assessment of achieving GES with respect to descriptor 8 (Defra 2019) indicates that concentrations of hazardous substances in the Celtic Seas and the Greater North Sea and their biological effects are generally meeting agreed target thresholds which means they are at levels that should not cause harm to sea life (89% for contaminant concentrations and 96% for biological effects). Highly persistent legacy chemicals are the cause of the few failures, mainly in coastal waters close to polluted sources.

Heavy metals (mercury, cadmium, and lead), polycyclic aromatic hydrocarbons (PAHs), organotins and synthetic substances such as polychlorinated biphenyls (PCBs) and polybrominated diphenyl ethers (PBDEs) are routinely measured for OSPAR. Measurements focus on marine sediments and on organisms in which these contaminants tend to accumulate or through which they biomagnify up the food chain. Contaminant concentrations have continued to decrease in the majority of areas assessed within the OSPAR area. Although concentrations are generally below levels likely to harm marine species, they mostly have not yet reduced to background levels. Concerns remain in some localised areas with respect to high levels of mercury, lead, and certain PCB compounds and locally increasing concentrations of PAHs and cadmium in open waters⁸⁵.

The volume of oil accidentally spilled varies widely from year to year and is generally small and of relatively minor significance unless there is a major spill.

5.5.2.1 Implications for SEA

The SEA must consider international and national scale measures to reduce operational and accidental discharges at sea and from the terrestrial environment in relation to the possible impacts of the draft plan/programme (e.g. operational and accidental discharges from oil and gas exploration and production, and transportation and storage of carbon dioxide), in the context of targets set for the attainment of good environmental status under the MSFD particularly for descriptor 8, including that, “Concentrations of substances identified within relevant legislation and international obligations are below the concentrations at which adverse effects are likely to occur” and that “Occurrence and extent of significant acute pollution effects (e.g. slicks resulting from spills of oil and oil products or spills of chemical) and their impact on biota affected by this pollution should be minimised through appropriate risk based approaches.”

5.5.3 Marine Litter

The issue of marine plastics (which represent ~70% of all marine litter) has attracted increasing scientific, media and societal attention in recent years. The potential negative consequences to marine fauna of entanglement and ingestion of macro-plastic (i.e. >5mm in size) continue to be reported, while there is a growing body of evidence on the global prevalence of microplastic

⁸⁵ <https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/key-messages-and-highlights/contaminant-concentrations-are-decreasing-concerns-remain/>

pollution (<5mm in size, including fibres and particles). Due to their persistence and increasing global annual production, levels of plastic in the marine environment are presumed to be rising and likely to do so for years to come, albeit with trends varying geographically and by type of plastic. In particular, the quantity of microplastic is likely to increase, as existing marine litter is eroded into increasingly small fragments and accumulations in river systems are flushed into the sea. The biological consequences of microplastic ingestion and their entry into the human food chain are largely unknown, and are the subject of increasing research.

5.5.3.1 Implications for SEA

The importance of tackling marine litter has been highlighted in the MSFD, and the high-level objective for descriptor 10 is the reduction of the amount of litter and its degradation products on coastlines and in the marine environment to levels that do not pose a significant risk to the environment. Defra is working with OSPAR to establish the feasibility of setting appropriate reduction targets and/or threshold values for litter on beaches, on the sea floor, sea surface, and microplastics, as well as whether the amount of litter ingested by marine animals will have adverse effects. The SEA must consider how marine litter is controlled for the potential activities arising from the plan (e.g. in relation to MARPOL Annex V), and any other potential waste sources and how they are handled (including waste to shore).

5.5.4 Impact of Climate Change

The pace of warming of the sea over the past 30 years has been highest to the north of Scotland and over much of the North Sea, rising at up to 0.24°C per decade. Plankton and fish communities are already changing in response to warming. Fish like sea bass and red mullet are becoming more common further north, while stocks of cold-adapted species in the North Sea such as cod, haddock and whiting have declined. Additionally, there is a northwards movement of non-native species.

Sea level is rising, increasing the risk to coastal erosion, and from flooding and loss of intertidal habitat due to 'coastal squeeze'. This is a particular concern in the southern North Sea, eastern Channel and Bristol Channel regions due to continued adjustment of the land following the end of the last glaciation, which is resulting in gradual sinking, and the coasts of south-eastern England are low lying. The coasts of the south and east are also generally formed of soft sediments compared to those in the north and west, which are susceptible to erosion and retreat. The southern North Sea and Channel coasts have the highest proportion of coastal defence and flood protection schemes in the UK and further development in response to rising sea level will add to the existing pressure on intertidal sediment habitats. In some areas, shoreline management plan and other coastal policies are directing management towards managed realignment or retreat where further defences may not be economically feasible or else would themselves be environmentally detrimental. A connected issue relates to the challenges involved in identifying and creating areas of potential compensatory habitat (e.g. in relation to flood defence measures and effects on SAC or SPA sites) as mitigation against loss of intertidal areas.

In addition to the direct effects of temperature changes, other effects include those from ocean acidification. Approximately 25% of all anthropogenically emitted carbon dioxide has been absorbed by the oceans, with acidification expected to continue to take place, with projections for 2100 in the range 0.06-0.32 pH (a change of approximately 0.1 pH units is regarded to have been connected to anthropogenic carbon dioxide uptake to date). Ecological consequences of reduced pH include changes to the carbonate system which could affect a range of calcifying organisms such as echinoderms, molluscs and corals.

5.5.4.1 Implications for SEA

Although oil and gas production will result in greenhouse gas emissions, upstream emissions directly related to the draft plan/programme are being addressed, for example, via the OGA strategy. Overall, the activities associated with the draft plan/programme are expected to make a net contribution to the reduction of UK carbon dioxide emissions, as set out in the relevant UK carbon budgets. This would be through carbon dioxide storage, and an increase in the proportion of UK energy demand supplied by renewable technologies. As such, adoption of the plan/programme subject to any spatial considerations and recommendations arising from OESEA4 will also contribute to the achievement of the UK's legally binding carbon budgets, including the target of net zero emissions by 2050, and in maintaining energy security.

The SEA should also consider relevant UK policy (e.g. MPS and National Planning Policy) and that of devolved administrations with regards to the design and siting of developments, particularly at or near the coast, in terms of resilience to climate change effects including sea-level rise.

5.5.5 Pressures on Fish Stocks

The latest updated assessment towards achieving good environmental status (Defra 2019) reported that demersal fish communities were recovering from over-exploitation in the past, but GES had not yet been achieved in either the Greater North Sea or the Celtic Seas, nor would be achieved for all fish communities by 2020. A partial assessment of pelagic shelf fish did not provide a clear result. ICES advise that several North Sea stocks are harvested unsustainably (e.g. cod, whiting, haddock, mackerel, and blue whiting). However in both regions, recent trends in the number of sensitive species increasing in abundance suggest an improving situation and further decline in the population abundance of sensitive fish species has been halted⁸⁶ (see also OSPAR Intermediate Assessment⁸⁷).

5.5.5.1 Implications for SEA

Activities resulting from implementation of the draft plan/programme may have the potential to improve local fish stocks through the designation of safety zones around structures, and fish attraction to structures, though the corollary to this is fisheries displacement. The SEA should also consider any potential source of effect on fish and shellfish from activities, in the context of the current understanding of fish stocks and pressures on these from other activities, and those targets and indicators set under the MSFD descriptor on populations of commercially exploited fish.

5.5.6 Declines in Bird Numbers

Along the eastern coast of the UK, some seabirds have continued to decline in numbers, and experience poor or failed breeding, possibly due to the combined effects of climate change and fishing on key species (e.g. sandeels). Fish discards from trawling may have contributed to elevated population sizes in some species. However, the implementation of the discard ban, phased in from 2015-2019 across the majority of EU fisheries, is expected to impact those seabird species that exploit this resource, e.g. herring gull, lesser black-backed gull, great black-backed gull, great skua, northern gannet, northern fulmar and black-legged kittiwake

⁸⁶ <https://moat.cefas.co.uk/biodiversity-food-webs-and-marine-protected-areas/fish/abundance/>

⁸⁷ <https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/biodiversity-status/fish-and-food-webs/recovery-sensitive-fish/>

(JNCC 2020). While the wider seabird population trends for 2000-2018 still show an increase for some species, e.g. northern gannet, black-headed gull and razorbill, there is still a general decline in several recorded species, most notably Arctic skua, black-legged kittiwake, northern fulmar, little tern and European shag. In some cases, this decline may be slowing and populations may be stabilising, albeit at numbers lower than that seen from the last census; the publication of final results from the Seabirds Count census (2015-2021) will provide a clearer understanding of seabird populations around the UK and Ireland.

Declines in seabird breeding numbers have also been observed to the west of Scotland associated with predation by introduced mammals and food supply shortages, the latter of which may be due in part to climate change, although eradication programmes of introduced predators on some islands is providing respite for seabirds vulnerable to predation.

While insufficient data makes it difficult to produce population trends for some species from Northern Ireland, a pattern of decline for some species e.g. northern fulmar, is evident, with (severe) weather, predation and food shortages cited as reasons for poor breeding or breeding failures. However, relative to overall UK trends, populations of some species, notably black-legged kittiwake, are stable (BTO 2020).

Populations of some waterbird species continue to decline, with numbers reduced at principal sites (those supporting more than 75,000 birds) on both the east and west coasts of the UK. Climate change is thought to be one of the biggest drivers of broad scale changes in wintering numbers and distributions; milder weather around the Baltic is likely shortening time many species spend in the UK, low numbers and poorer breeding success could be the result of adverse weather at breeding locations in Russia, while climate change is also thought to be leading to short-stopping in migration journeys of some species (e.g. European white fronted goose and goldeneye) and influencing colonisation by egrets. At a site-specific level, pressures such as coastal human disturbance and development at estuaries can affect numbers (Frost *et al.* 2020).

5.5.6.1 Implications for SEA

Given that many seabird and waterbird species may be in decline, the SEA should review potential areas which could be licensed/leased for oil and gas, offshore wind, marine renewable or carbon transport and storage activities, and ensure awareness so that potential activities do not exacerbate the risk of surface pollution or significant disturbance to bird populations. Potential activities which may impact on coastal and marine SPAs will be subject to Appropriate Assessment by the relevant Competent Authority. The SEA should consider any potential effect of plan activities in the context of targets relating to bird abundance and productivity under MSFD descriptors 1 and 4.

5.5.7 Damage to Seabed Habitats

Significant damage has occurred to shallow sediment habitats and reefs as a result of bottom fishing practices especially beam trawling (OSPAR 2010). While some recovery in sensitive fish species abundance is noted for the Celtic Sea, when considering the Greater North Sea, evidence for population recovery is unclear (OSPAR 2017⁸⁸). Around the UK, coastal and offshore seabed sediment habitats such as sands and muds are impacted by a range of activities, however the spatial extent of damage generated by bottom trawling activity, which

⁸⁸ <https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/key-messages-and-highlights/fish-communities-recovering/>

may damage ecosystem functioning, is considered to be the main source of pressure on benthic environments with an appropriate indicator developed for the updated assessment of GES (Defra 2019).

The extent of physical damage indicator combines the distribution and sensitivity of habitats (resilience and resistance), with information on the distribution and intensity of human activities and pressures that cause physical damage, such as mobile bottom gear fisheries (other human activities to be included in later rounds of assessments). Whilst there are considerable data gaps, results from 2010 to 2015 showed pressure and disturbance caused by fishing activities to be widespread, occurring to some degree in 57% of the cells within UK waters. Only the UK portion of OSPAR Region V (Wider Atlantic) was within the agreed disturbance targets. The assessed areas with the highest levels of disturbance were the southern Celtic Seas and English Channel, with around 75% of cells showing higher levels of disturbance. The habitat identified as being subject to the highest disturbance was sublittoral mud, with more than 75% of the total habitat area identified as subject to high disturbance in the southern Celtic Seas, northern Celtic Seas and northern North Sea⁸⁹.

5.5.7.1 Implications for SEA

The SEA should review potential areas which could be licensed/leased for oil and gas, offshore wind, marine renewable or carbon transport and storage activities and ensure awareness of existing problems related to the benthos so that potential activities do not exacerbate problem. Safety zones around surface infrastructure will likely locally reduce trawling activities in these areas thereby reducing trawling pressure on benthos. The potential for marine renewable devices to affect sediments and seabed morphology (e.g. through energy removal, changes to tidal regimes) should also be considered. The SEA should consider effects from activities likely to arise from adoption of the plan on benthos in the context of those targets set to achieve good environmental status under MSFD descriptors 1 and 6.

5.5.8 Poor Knowledge of the Status of Marine Mammals

At present, there are insufficient data on the populations of marine mammals in the OSPAR region III Celtic Seas (OSPAR 2010). Within this region, dolphins, porpoises and grey seals are impacted through fisheries by-catch. Harbour seals are counted every five or six years, the minimum to assess their status, and other marine mammals have little systematic recording. A third survey of cetaceans in European Atlantic waters (SCANS-III) is due to commence in the coming years. Marine mammals may become entangled in ropes and nets in coastal waters to the west of Scotland and in the Minches there is concern about entanglement of minke whales, which are important to the local economy, through marine wildlife watching.

5.5.8.1 Implications for SEA

There is the potential for disturbance of marine mammals from the activities that may result from implementation of the draft plan/programme. Activities will be spatially variable, though noise will certainly be concentrated for example in areas of renewable energy development involving pile driving, and oil and gas exploration activities using seismic survey methods, principally the North Sea, Irish Sea and west of Shetland. The SEA should consider such activities in the context of current controls on their occurrence, available mitigation, and

⁸⁹ <https://moat.cefas.co.uk/biodiversity-food-webs-and-marine-protected-areas/benthic-habitats/physical-damage/> and also see: <https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/key-messages-and-highlights/fish-communities-recovering/>

implications in relation to monitoring under the MSFD. There is also a collision risk associated with offshore structures and shipping activity.

5.5.9 **Problems associated with the conservation of species and habitats**

Pressures such as the removal of species (e.g. by fishing), loss of and damage to habitats, the introduction of non-indigenous species, obstacles to species migration and poor water quality are still present. Some pressures are still increasing in parts of the OSPAR area and all can act in synergy or be exacerbated by climate change. These pressures result in loss of biodiversity, including declines in the abundance and variety of species and habitats. Interruption of ecological processes, such as spawning, migration, and biological communication, may also occur.

The most sensitive features are those that are easily damaged and slow to recover. Reefs of the cold-water coral *Lophelia pertusa* and individuals of the fan mussel *Atrina fragilis* are slow-growing and delicate and can be severely damaged by bottom trawl fisheries.

Coastal waters contain feeding grounds, spawning and nursery areas, and feature on migration routes for seabirds and some fish species. These areas also host intense and varied human activities, which exert a wide range of pressures and can lead to the damage or loss of key habitats in estuaries and intertidal areas. Salt marshes and seagrass beds, which are highly productive and act as natural carbon sinks, are under pressure from relative sea-level rise and coastal development. Key areas of the shelf seas, including offshore banks and reefs, and frontal zones between different water masses, play important roles in pelagic productivity. Fishing is recognised as a key pressure on species and habitats in the shelf seas and there continues to be a need for information about ecologically important areas to guide improvements in management.

With reference to habitats and species protected under the Habitats Directive, JNCC have assessed their conservation status. This assessment of conservation status does not only relate to that component of the habitat area or species population to be found in Special Areas of Conservation, but to the totality of the habitats and species throughout the United Kingdom. The 2019 Article 17 report⁹⁰ prepared under the Habitats Directive is the fourth, six year report.

When assessing the conservation status of habitats, four parameters were considered: range, area, structure and functions (referred to as habitat condition), and future prospects. For species, the parameters were: range, population, habitat (extent and condition) and future prospects. Each of these parameters was assessed as being in one of the following conditions: Favourable, Unfavourable-inadequate, Unfavourable-Bad, or Unknown. An overall assessment was determined by reference to the conclusions for the individual parameters, and, in general, reflects the least favourable of the individual parameter conclusions.

The overall UK assessments for eight Annex I marine habitats assessed included: 3 which were determined to be in 'unfavourable-bad' condition (estuaries; mudflats and sandflats not covered by seawater at low tide; sandbanks which are slightly covered by seawater all the time); 4 in 'unfavourable-inadequate' condition (coastal lagoons; large shallow inlets and bays; reefs; submerged or partially submerged sea caves), and 1 in 'unknown' condition (submarine structures made by leaking gases). Compared to the 2013 assessment, there was a large decline in the overall status of sandbanks which are slightly covered by seawater all the time,

⁹⁰ <https://jncc.gov.uk/our-work/article-17-habitats-directive-report-2019/>

due to a change in the method, with the OSPAR indicator Extent of physical damage to predominant and special habitats⁹¹, being used to assess the condition of offshore sandbanks.

Of the 22 Annex II marine species assessed: 5 were considered in 'unfavourable-inadequate' condition (common seal, maerl, allis shad, twaite shad, Atlantic salmon), 3 in 'favourable' condition (grey seal, river lamprey, otter), and 14 in 'unknown' condition (leatherback turtle, bottlenose dolphin, common dolphin, harbour porpoise, killer whale, long-finned pilot whale, Risso's dolphin, Atlantic white-sided dolphin, white-beaked dolphin, minke whale, fin whale, sperm whale, sea lamprey, brook lamprey). With respect to the cetacean species there has been a change in overall conservation status from favourable to unknown since 2013. This is due to the implementation of a more robust assessment methodology, supported by updated EU Commission guidance, which requires consideration of population trends in setting the Favourable Reference Population (FRP) value. However, this requires a higher number of UK population estimates over time than are currently available, resulting in the unknown conclusion.

Hayhow *et al.* (2017) provide information on trends in abundance and breeding success of seabird and waterbird species, many of which are protected by SPA designations.

5.5.9.1 Implications for SEA

The SEA should consider the implications of the draft plan/programme and its alternatives on the wider marine environment, in relation to the features of conservation sites of International and national importance, and those areas for which designations are proposed. The SEA will need to draw attention to the current location of these sites and the species or habitats for which they are designated, and any sites which are currently being considered for designation, in addition to characterising the present baseline condition and issues relating more generally to the marine environment. At this more general level, the SEA must consider the potential implications of the draft plan/programme on attaining good environmental status of both marine and coastal/estuarine waters as determined by the WFD and MSFD.

5.5.10 Changes to landscape and seascape

Prior to the development of offshore renewables, offshore developments in UK waters have primarily been in relation to North Sea oil and gas installations where the only representation of such developments at the coast or on land was generally in the form of cable and pipe landfall and associated infrastructure, and also helicopter, port activity and vessel traffic. Drilling activity and production platforms have in the most part been too far from shore to be visible, notable exceptions being Beatrice in the Moray Firth, exploration well sites off Dorset and Cardigan Bay, structures in the east Irish sea and those associated with the Cromarty Firth rig support industry. The more recent development of offshore renewables, namely offshore wind farms, has led to a greater consideration of landscape/seascape issues as most have been restricted on technical and economic grounds to water depths of up to 60m (i.e. primarily in nearshore waters). Cost reduction and technical advances (including future tethered turbines) has led to deployment progressively moving offshore in most European countries. Pressures from changes to landscape and seascape also involve those onshore, including continued urban expansion and the development of the onshore renewables industry.

⁹¹ <https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/biodiversity-status/habitats/extent-physical-damage-predominant-and-special-habitats/>

5.5.10.1 Implications for SEA

The SEA should consider the potential scale and location of activities which could arise from the adoption of the plan in relation to seascape (including historic seascape) character, in the context of existing and proposed developments, and relevant landscape planning policy as contained in National Policy Statements, the MPS and national and regional marine plans of the UK and devolved administrations.

5.5.11 Impact of air quality on human health and the environment

Though the UK's terrestrial air quality is generally improving there are still areas which do not meet current exceedance levels for pollutants, primarily NO₂, SO₂ and particulate matter. SO₂ and NO₂ are known to be involved in acid deposition and the human health effects of particulates are still poorly understood but appear to have a considerable impact. Estimates of the fraction of mortality attributable to long-term exposure to current levels of anthropogenic particulate air pollution ranged from around 2.5% in some local authorities in rural areas of Scotland and Northern Ireland, to over 6% in some local authorities in the east and south east of England.

5.5.11.1 Implications for SEA

Consider potential scale of plan activities in relation to current air quality problems and in the context of the range of emissions controls there are for plan activities.

5.5.12 Possible disturbance of submerged cultural heritage

There is an increasing awareness of submerged archaeological material located for example in the southern North Sea, though their distribution is speculative and even the specific location of known sites are sometimes not precise. These include former occupied landscapes (palaeolandscapes) and any potential associated material, in addition to more recent maritime archaeology. These areas and sites are vulnerable to offshore operations which disturb the seabed (e.g. drilling, piling, cabling, and trawling), though development-led studies, for instance associated with the aggregates industry, have added considerably to knowledge in this area.

5.5.12.1 Implications for SEA

The SEA should consider the potential effects of plan activities in relation to current understanding of submerged cultural heritage in the context of international and national protection measures and planning policy. The SEA should raise awareness of available industry guidance (e.g. Gribble & Leather 2011) on marine cultural heritage.

5.5.13 Coastal erosion and flooding

A large proportion of the UK coastline is suffering from erosion (ca. 17% in the UK) with England (ca. 30%) and Wales (ca. 23%) having the greatest proportion of eroding coast, particularly the Yorkshire and Humber region. The coastline of England is also the most protected with ca. 46% of its length lined with coastal defence works (seawalls, groins) or fronted by artificial beaches. Estimates of the number of properties at risk from flooding and/or coastal erosion in England indicate that almost 3,000 dwellings are at risk for the period (2010-2025). Implementation of the respective Shoreline Management Plans (SMPs) was predicted to reduce this number to about 170.

5.5.13.1 Implications for SEA

The SEA should consider the potential scale and location of activities in particular tidal range schemes which could arise from the adoption of the plan, with respect to their potential impact on coastal erosion and flooding, and relevant SMP policies.

5.5.14 Underwater noise

Many human activities introduce sound into the marine environment, e.g. shipping, geophysical survey, underwater construction, and the use of sonars and explosives. Some of these sounds are of very high amplitude at source and often of low frequency, and therefore may be detectable by marine mammals at substantial ranges from the source. Recent technological developments have introduced many new sources of noise in offshore waters. Those typically of greatest concern to marine mammals, and marine fauna in general, are those producing the most intense sound pressure levels: seismic exploration, underwater explosions, sonar (particularly naval), pile-driving and some acoustic harassment devices (AHDs). However, less intense noise sources such as shipping are also of concern due to their persistent nature and long-range of audibility. Shipping is the dominant noise source at low frequencies in most locations, and its contribution to increased ambient noise levels has been considerable in recent decades.

5.5.14.1 Implications for SEA

The SEA should consider the potential scale and location of activities which could arise from the adoption of the plan, with respect to their potential to cause injury and/or disturbance to marine mammals and other sensitive marine fauna.

5.5.15 Cetacean bycatch

The OSPAR Intermediate Assessment (OSPAR 2017) recognised that bycatch was a major cause of human-induced mortality of harbour porpoise with nearly 4,000 harbour porpoises of a total population in excess of 490 000 drowned in fishing nets annually in the OSPAR area. However, it noted there was low confidence in the bycatch estimates due to incomplete monitoring data.

More recently, the 2020 ICES fisheries overview for the Greater North Sea also noted the patchy observer information with an unknown amount of bias, but advised that bycatch of common dolphins in the western English Channel (the far southwestern part of the Greater North Sea) may be unsustainable in population terms, while the bycatch of harbour porpoise in the Greater North Sea in nets was the ASCOBANS 1% precautionary environmental limit (ICES 2020a). For the Celtic Sea ecoregion, fisheries with high risk of cetacean bycatch were bottom setnets (bycatch of harbour porpoises) and pelagic trawls, particularly those for bass (bycatch of common dolphin) (ICES 2020b).

The ICES working group on bycatch of protected species (WGBYC) completed Bycatch Risk Assessments (BRA) for harbour porpoise in the Celtic Seas (CS) and Greater North Sea (NS) ecoregions. Data were pooled from 2015-2017 and minimum and maximum bycatch rates extrapolated using 2017 fishing effort data for nets, bottom trawls and pelagic trawls. The percentage mortality of the Greater North Sea harbour porpoise population was estimated at between 0.33-0.59% in nets, and in the Celtic Seas between 0.29-0.8% in nets and bottom trawls combined. Both estimates were below the ASCOBANS 1.7% threshold defining unacceptable levels of interaction and below the 1% precautionary environmental limit. However, it was noted that ICES ecoregions were arbitrary and unlikely to reflect the true

population structure of harbour porpoise; the working group therefore conducted a further BRA using the latest definition of a Celtic Sea subpopulation and this suggested that levels of mortality in 2017 due to bycatch may be between 2.1-5.6% of that subpopulation (ICES 2019).

5.5.15.1 Implications for SEA

The SEA should consider the potential scale and location of activities which could arise from the adoption of the plan, with respect to their potential to impact cetacean populations which may be experiencing levels of bycatch deemed unacceptable.

5.6 Likely Evolution of the Baseline

Schedule 2 of the *Environmental Assessment of Plans and Programmes Regulations 2004* (as amended) requires that the Environmental Report provides information on the likely evolution of the relevant aspects of the current state of the environment without implementation of the plan/programme.

Consultation Question

5. Are there any additional influences, and supporting data sources, on the likely evolution of the environmental baseline?

5.6.1.1 Biodiversity, habitats, flora and fauna

5.6.1.2 Plankton

The MSFD requires that the biodiversity, distribution and abundance of species and habitats be in line with prevailing physiographic, geographic and climatic conditions. The current status of pelagic habitats in the Greater North Sea and Celtic Seas is uncertain as plankton communities are experiencing changes in biomass, abundance, and community structure that may have consequences on the functioning, dynamics and structure of the whole marine ecosystem. Prevailing oceanographic and climatic conditions are likely to be driving these changes, but the extent of pressure from direct human activities is unclear. GES also requires that ecosystems are not adversely affected by eutrophication, contamination, and non-indigenous species introduced through anthropogenic activities. The planktonic ecosystem of the British Isles meets these criteria as, though eutrophication and contamination may occur in some highly localised areas, the majority of plankton are unaffected by nutrient loading or chemical contamination. Additionally, changes to marine foodwebs caused by alterations in plankton phenology (trophic mismatch) or community composition appear to be related to prevailing oceanographic and climatic conditions and are not likely to be the direct result of anthropogenic pressures although the cumulative effects of these pressures on the food web are unclear.

Long-term trends in the plankton indices indicate a general increase in phytoplankton biomass for most regions in the North Atlantic and in the regional seas around the British Isles, with differing timings for the main step-wise increase occurring being later in oceanic regions compared to the North Sea. In the North Sea, the population of the previously dominant and important zooplankton species (the cold-water copepod *Calanus finmarchicus*) has declined in biomass by 70% since the 1960s. Species with warmer-water affinities (e.g. *Calanus helgolandicus*) are moving northwards to replace the species but are not as numerically abundant (Edwards *et al.* 2020). Currently the distributions of plankton organisms are moving

northwards at an average rate of ~23km per year, although the rates of individual species vary substantially (Beaugrand *et al.* 2009). There is also evidence from the Continuous Plankton Recorder survey that warming temperatures decrease the size of the plankton community for both phytoplankton and zooplankton; this may also eventually lead to a decrease in size of fish species (Beaugrand *et al.* 2010).

The most recent MCCIP report card (Edwards *et al.* 2020) indicates a medium level of confidence in predictions of future changes to plankton from climate change. Future warming and increased ocean acidification are likely to alter the geographical distribution of primary and secondary plankton production (0-5 yrs), affecting ecosystem services such as oxygen production, carbon sequestration and biogeochemical cycling (20-50 yrs). Such changes have the potential to place additional stress on fish stocks and therefore on mammals and seabird populations which rely on fish as prey species.

5.6.1.3 Benthos

Over recent geological timescales (ca. 11,000 years) seabed habitats around the UK have been subject to continuous processes of change associated with post-glacial trends in sea level, climate and sedimentation. In the shorter term, seasonal, inter-annual and decadal natural changes in benthic habitats, community structure and individual species population dynamics may result from physical environmental influences (e.g. episodic storm events; hydroclimatic variability and sustained trends) and/or ecological influences such as reproductive cycles, larval settlement, predation, parasitism and disease.

Clark & Frid (2001) reviewed long-term changes in the North Sea ecosystem, at all trophic levels, and concluded that in the northern, western and central areas of the North Sea, long-term changes are predominantly influenced by climatic fluctuations. Here, primary productivity during a particular year is related to the effect of weather on the timing of stratification and the resulting spring bloom. In the southern and eastern areas of the North Sea, the lack of stratification and the large inputs of nutrients mean that primary productivity is more strongly influenced by variations in anthropogenic nutrient inputs, and is only weakly related to climatic variation. However, the weight of evidence shows that long-term changes in the ecosystem may ultimately be related to long-term changes in either climate or nutrients, although the long-term dynamics of certain taxa and communities do show evidence of being influenced by both anthropogenic factors and/or internal factors such as competition and predation.

The most recent MCCIP Report Card 2020 scientific review of shallow and shelf subtidal habitats (Moore & Smale 2020) concluded that:

- North Sea infaunal (burrowing) species have shifted their distributions in response to changing sea temperature, however, most species have not been able to keep pace with shifting temperature, meaning that species are subjected to warmer conditions. Leading (expanding) edges are responding more quickly than trailing (retreating) edges, which has been observed elsewhere in the world.
- A number of studies have used modelling approaches to predict changes in the distribution and/or abundance of kelp and cold-water corals at the UK scale, and benthic infauna and epifauna within the North Sea. All suggest significant shifts in species ranges into the future leading to altered community structures with implications for food-web dynamics, fisheries, carbon cycling and ultimately human society.

The MSFD requires that benthic biodiversity (descriptor 1) and sea-floor integrity (descriptor 6) are not adversely affected. The UK updated assessment for MSFD (Defra 2019) indicates that it is unlikely that GES will be achieved for benthic habitats by 2020. The main problem is caused by physical disruption of the seabed from fishing gear. The nature of the future management of fisheries in UK waters is likely to reflect the proposals set out in the White Paper, Sustainable Fisheries for Future Generations⁹². Potential future issues could arise from enhanced coastal squeeze from climate change related sea-level rise, impacts from ocean acidification, and from tidal range devices on intertidal habitats.

5.6.1.4 Cephalopods

The biology and ecology of many cephalopod species remains little known and as a result, the potential effects of a changing climate on cephalopod populations are not easy to predict. However, it is known that for many species, temperature has an important influence on a number of life history processes, including recruitment (through maturation rate and the rate of embryonic development), the timing of migration and the distribution range. As well as this, food availability and predator abundance and distribution are likely to be affected by changes in the marine environment.

5.6.1.5 Fish and Shellfish

The general colonisation of the warming southern North Sea and Celtic Sea regions by Lusitanian demersal species (e.g. sea bass), and a retreat of Boreal species (e.g. cod, whiting) into the deeper parts of UK waters in the northern North Sea is likely to continue. However, variations in habitat preferences and sensitivities to prey and environmental conditions of individual species, the possible role of food web effects, and particularly the extent of future fisheries may complicate this simple picture. Some pelagic fish species have and are likely to continue to show pronounced latitudinal responses to seasonal sea temperatures (e.g. anchovy, horse mackerel), although predicting their likely distribution is complicated by the important influence of poleward flowing shelf edge currents which carry warm water into high latitudes. Species which are unable to adapt their distributions due to strict habitat association (e.g. lesser sandeels which closely associate with coarse sandy sediments) are likely to be less able to respond to predicted climate changes (Heath *et al.* 2012).

The latest updated assessment towards achieving good environmental status as part of the UK Marine Strategy (Defra 2019) reported that in 2018 demersal fish communities were recovering from over-exploitation in the past, but GES had not yet been achieved in either the Greater North Sea or the Celtic Seas, nor would be achieved for all fish communities by 2020. However in both regions, recent trends in the number of sensitive species increasing in abundance suggest an improving situation.

5.6.1.6 Turtles

Records of marine turtle sightings and strandings in UK waters indicate that they are predominantly of leatherback turtles (e.g. Penrose & Gander 2014), with UK waters likely to represent the northerly limit of routine seasonal leatherback foraging migrations (e.g. McMahon & Hays 2006). Leatherback turtles visit only during the warmer months of the year and it has been suggested that through climate change increased seawater temperature might allow them to utilise UK waters for longer (McMahon & Hays 2006). However, the low numbers of

⁹² <https://www.gov.uk/government/consultations/fisheries-white-paper-sustainable-fisheries-for-future-generations>

recorded turtles and the quality of recording effort make determining likely future trends very difficult.

5.6.1.7 Birds

Seabird breeding populations in the UK increased in size over much of the last century, but since 1999 populations of some species have seen significant declines; in 2015, the UK seabird indicator stood at 22% below the 1986 baseline, with most of the decline occurring since the mid-2000s. Some of the greatest reductions have occurred in the northern North Sea and Scottish Continental Shelf and the decline has largely been driven by the declines for Arctic skua and black-legged kittiwake (BTO website, Hayhow *et al.* 2017). Breeding success has also declined over the same period for several species; between 2003-2018, data from the six most frequently monitored Arctic skua sites, recorded complete failure 43 times, with productivity below 0.2 chicks fledged on a further 16 occasions.

Of the top three threats to the world's seabirds (in terms of numbers affected and average impact), climate change is considered to be one of the primary causes of the decline in seabird populations in the UK; climate change affecting populations either directly (mortality from extreme weather) or indirectly (via changes in food supply) (Mitchell *et al.* 2020). Lack of food availability is a possible cause of poor breeding success in Arctic skua; this species steals prey (e.g. sandeels) from other seabird species, and reduced sandeel numbers around Shetland, thought to be as result of hydro-climatic, sea temperature and oceanographic changes, has reduced prey abundance and availability for these host species, and thus reduced feeding opportunities for Arctic skuas (JNCC 2020).

Warmer winter sea temperatures have resulted in changes in abundance, distribution and species composition of plankton in the North Sea that have contributed to the reduction in abundance and quality of seabird prey species such as sandeels, at times of peak energy demands in the breeding season, with knock-on effects for seabirds (Mitchell *et al.* 2020). There is growing evidence that breeding phenology is changing, with seabirds becoming increasingly de-synchronised from their prey, and species which have been unable to keep pace with the temporal changes of sandeel and their prey life history events, have had to rely on prey of lower calorific value during the chick rearing period (JNCC 2020). However, regional variations in the impacts of climate change are apparent, with weaker effects on seabird demography in the Irish Sea and Celtic Sea (Mitchell *et al.* 2020).

There is increasing evidence that the overwintering distributions of many waterbirds (e.g. wildfowl and wader species) have changed, along with evidence that populations of many wader species and some wildfowl species are in long-term decline (Burton *et al.* 2020). In recent decades, in response to warming, distributions for some species have shifted north and eastwards out of the UK. A correlation between temperature and distribution shift is more evident on those "deep water habitats" species (as defined by Pavón-Jordán *et al.* 2018) such as tufted duck, goldeneye, smew, and goosander, all of which are diving ducks, requiring ice-free water, less so with dabbling ducks (species defined as associated with "shallow-water habitats), e.g. wigeon. This has resulted in declines in usage of the UK's sites, e.g. by waders, in favour of The Netherlands, Sweden and Finland, but also suggests a wider, overall decline in abundance; there is growing evidence that predation and nest loss is a driver in the decline of wader populations, while changing land-use is also a threat that may translate into observed changes (Burton *et al.* 2020). A change in migration (and breeding) timing is also evident, with a general advancement in first arrival dates (e.g. wildfowl and waders) to breeding sites (resulting in those species which breed in the UK arriving earlier, and those species which over-winter in the UK, departing earlier to their breeding grounds).

5.6.1.8 Marine Mammals

Whilst the ability to detect long-term trends in cetaceans around the UK is limited by the paucity of effort-based sightings data, range shifts appear to have been observed in a number of cetacean species (Evans & Bjørge 2013). For example, short-beaked common dolphin and striped dolphin appear to have extended their shelf sea range further north off western Britain and around into the northern North Sea, and these have been linked to increasing sea temperatures. However, the mechanisms causing those changes remain uncertain, and for some species, it is difficult to differentiate between short-term responses to regional resource variability and longer-term ones driven by climate change. With respect to seals, whilst it is possible that recent demographic changes (increases in most grey seal populations and declines in some harbour seal populations) are linked in some way to climate-mediated changes in food supply, other factors (depletion of food resources from fishing, recovery from epizootics, interspecific competition, density dependent effects) may be more important (SCOS 2008, cited in Evans & Bjørge 2013).

5.6.1.9 Geology, Substrates and Coastal Geomorphology

The environmental baseline is likely to evolve slowly in the absence of anthropogenic influences. At present there are no anthropogenic activities which are likely to cause significant regional scale changes to geology and sediments, though trawling and dredging activities can generate localised scour and sediment plumes, and energy removal has the potential to result in local or regional changes to sedimentary processes.

Relative sea levels under the RCP 2.6 scenario are predicted to rise by 29-70cm by 2100 (relative to 1981-2000 average) (for London) – note there are regional UK variations in the predicted rate of sea-level rise, including due to glacial isostasy. For example, under the same scenario, Edinburgh is predicted to experience sea level change of 8-49cm by 2100. Under the RCP8.5 scenario sea level is expected to rise to between 53-115cm for London and 30-90cm for Edinburgh (Palmer *et al.* 2018). Coastal erosion is estimated to affect 17% of UK coasts and there are large regional variations connected with coastal rock types – England and Wales have the highest overall erosion rates with 28% of coasts retreating at more than 10cm per year. These rates are expected to rise in the future, corresponding primarily to higher sea levels.

5.6.1.10 Landscape/Seascape

There are presently 8 (2 in Scotland) offshore wind farms in planning and a further 6 (4 in Scotland) which have been consented, adding to the 40 (6 in Scotland) which are operational or the 6 (3 in Scotland) under construction. A number of these are, or are likely to be, visible from the coast (e.g. those in the territorial sea) and future leasing rounds for wind and other renewable technologies which could be developed in proximity to the coast, or be coast connected, are possible. There is a likelihood of landscape effects from coastal and terrestrial wind generation projects, other marine energy developments and continued industrial, port and urban expansion.

5.6.1.11 Water Environment

Climate change has and will continue to have a pervasive effect on all aspects of the coastal and marine environment including flooding, coastal erosion, water quality and resources. Over the 21st century, the ocean is projected to transition to unprecedented conditions with increased temperatures (virtually certain), greater upper ocean stratification (very likely), further acidification (virtually certain), oxygen decline (medium confidence), and altered net

primary production (low confidence). The rates and magnitudes of these changes will be smaller under scenarios with low greenhouse gas emissions (very likely) (IPCC 2019).

Warming of UK shelf seas is projected to continue over the coming century with most models suggesting an increase of between 0.25°C and 0.4°C per decade. There may be some regional differences with warming expected to be greatest in the English Channel and North Sea, with smaller increases in the outer UK shelf regions (MCCIP 2020, Tinker & Howes 2020).

There is a history of strong variability in UK wave climate. Inter-annual variability in the modern wave climate is strongest in the winter and can be related to atmospheric modes of variability, most notably the NAO. Rather dramatic increases in wave height occurred between 1960 and 1990, but these are now seen as just one feature within a longer history of variability and there is no clear pattern in results since 1990. There is as yet no consensus on the future storm and wave climate (Woolf & Wolf 2013, Wolf *et al.* 2020).

Temperature stratification over the NW European shelf seas is showing evidence of beginning slightly earlier in the year, on average although it is very difficult to decipher trends against natural variability (Sharples *et al.* 2013, 2020).

5.6.1.12 Air Quality

Air quality statics for the UK (urban and rural areas) indicate a general long-term improvement in air quality metrics, and fewer days of moderate or higher pollution although prolonged hot and sunny conditions in 2018 and 2019 and associated higher ozone levels were responsible for an increase in the number of days of moderate or higher pollution at urban sites. Road transport is the main source in 97% of the air quality management areas declared for NO₂ and in 79% of the AQMAs declared for PM10.

Atmospheric emissions associated with offshore oil and gas have in general remained relatively stable over the last decade although data for the latest year (2017) indicated increases in SO₂, CO₂, NO_x and NMVOC compared to 2016 figures. SO₂ emissions vary greatly year on year, as they are largely dependent on consumption of diesel for power generation which is determined by periods of shut down and as fields deplete there is a greater reliance on diesel to replace fuel gas. Carbon dioxide accounts for the greatest proportion of emissions to air from UKCS offshore installations, primarily generated from fuel consumed by combustion equipment to provide electrical power and drive compressors for oil and gas export (Oil & Gas UK 2018). Factors which may influence atmospheric emissions in the future, include ageing fields requiring a higher consumption of energy (e.g. additional compression), and the consequent depletion of available gas for fuel, which may require additional usage of diesel for power generation leading to increased atmospheric emissions (OSPAR 2014); however, recent energy integration concepts such as platform electrification from shore or offshore renewable sources may significantly ameliorate this.

5.6.1.13 Climate and Meteorology

Reflecting the long-term warming trend since pre-industrial times, observed global mean surface temperature (GMST) for the decade 2006–2015 was 0.87°C (likely between 0.75°C and 0.99°C) higher than the average over the 1850–1900 period (very high confidence). Estimated anthropogenic global warming is currently increasing at 0.2°C (likely between 0.1°C and 0.3°C) per decade due to past and ongoing emissions (high confidence) and is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate (high

confidence). Potential regional changes to climate associated with global warming up to 1.5°C, include warming of extreme temperatures in many regions (high confidence), increases in frequency, intensity, and/or amount of heavy precipitation in several regions (high confidence), and an increase in intensity or frequency of droughts in some regions (medium confidence) (IPCC 2018).

5.6.1.14 Population and Human Health

In the UK as a whole, population is expected to increase by 4.5% percent to 69.4 million by 2028 compared with the estimated UK population for 2018 (66.4 million). Growth is projected to be most significant in England (5% growth) and least in Scotland (1.8%) over the same period. Within England, regions in the north are projected to grow at a slower rate than regions in the Midlands (East Midlands – 7%) and south. The North East is the region with the slowest projected population growth (2.3%)⁹³. Continued growth will increase population density. Human health in the UK is unlikely to change considerably in the near future, with life expectancy at birth projected to increase to 82.6 years for males and 85.5 years for females by 2043, an increase of around three years since 2019. The UK population is an ageing population with the proportion aged >85 years projected to almost double over the next 25 years.

5.6.1.15 Other Users

Existing marine activities include shipping and port activities, military exercises, fishing, recreational sailing, oil and gas exploration, production and decommissioning, aviation and offshore wind farm construction and operation. Port activities have been continuously expanding and associated with this expansion, shipping tonnage has also increased. The fishing industry is dynamic with frequent and sometimes unpredictable changes in fish abundance and distribution, climatic conditions, management regulations and fuel costs all affecting activity. Consequently the baseline is rapidly evolving. In general, the fishing industry has been in decline in recent years in terms of numbers employed, vessels at sea and catch, and in coming years technical developments, economics, changes in management strategy and changes in target species, abundance, composition and distribution are all likely to be important. A number of demonstrator and small array scale wave and tidal power electricity generation devices have been deployed which may lead to commercial scale developments in the future. Whilst the planning permission for the Swansea Bay tidal lagoon has recently expired, there are a number of other tidal lagoon projects at the pre-planning stage which may be developed during the currency of OESEA4.

5.6.1.16 Cultural Heritage

There is an increasing awareness of submerged archaeological material located for example in the southern North Sea, though their distribution is speculative. These areas are vulnerable to offshore operations which disturb the seabed (drilling, piling, cabling). The development of increasingly sophisticated detection methods, mapping, and underwater excavation and updated guidance to industry means that the recovery of archaeological material or information is increasingly likely.

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<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/nationalpopulationprojections/2018based#births-deaths-and-migration>

5.6.1.17 Conservation of Sites and Species

MCZs and MPAs established under the *Marine and Coastal Access Act 2009* (and equivalent Acts of the devolved administrations) have the aim of completing an ecologically coherent and well-managed network of MPAs, together with existing and future SACs, SPAs, OSPAR and other conservation sites. Defra, the Welsh Government, the Scottish Government and the Department of Agriculture, Environment and Rural Affairs Northern Ireland have recently reported on progress on the MPA network. As of March 2021, there were 372 designated MPAs protecting 38% of UK waters compared to 217 sites covering 8% of UK waters in 2012. The recent assessment of progress towards an ecologically-coherent and well-managed network of Marine Protected Areas in the UK concluded that MPAs across the UK marine area will contribute towards achieving and maintaining GES over the coming years, and to an ecologically coherent and well-managed network of MPAs under the OSPAR Convention⁹⁴.

5.6.1.18 Onshore

Coastal habitats in the UK (e.g. saltmarsh, machair, sand dunes, shingle and maritime cliff and slope), provide many ecosystem services, such as flood defence, climate regulation, and tourism opportunities, which are all beneficial to society and the economy. They represent a zone of transition between the terrestrial and marine domain and are in a constant state of flux. Coastal processes are dependent on tides, waves, winds, flora, fauna, and sediment processes; they are susceptible to and altered by climatic changes, whilst also vulnerable to, and often negatively affected by, human activities (Burden *et al.* 2020).

The total rise in sea-level around the UK coast may exceed one metre by 2100 (Palmer *et al.* 2018). The frequency of intense storm events is expected to increase and lead to more coastal flooding. Temperatures are expected to rise, particularly in the south and east of the UK. Winter precipitation is likely to increase markedly on the northern and western UK coastline. Coastal erosion is also expected to increase, partly due to sea-level rise. Low-lying and soft-sediment coasts in the east of England will be most vulnerable as they are most easily eroded. The most-exposed locations and estuaries may be particularly vulnerable (Burden *et al.* 2020).

Jones *et al.* (2013) and Burden *et al.* (2020) summarise the likely impact that climate change will have on coastal habitats. In addition to sea-level rise, changes in temperature, rainfall, wind speed and direction will affect dune landform development, but the likely results of such changes are uncertain. The range of some plant communities may extend northwards, such as the *Leymus arenarius* and the *Ammophila arenaria-Festuca rubra-Hypnum cupressiforme* subcommunity. Warmer and wetter conditions may be favourable in terms of dune stabilisation and development, these are likely to be offset by drought periods and storms. Hydrological changes in dune slacks may also lead to changes in dune slack communities. Low-lying machair habitats are similarly affected by sea-level rise and storm events should they increase as a result of climate change. Similarly, saltmarsh environments may be affected by sea-level rise and any increase in storminess, which may further decrease their extent. Their inability in some cases to adjust through inland migration enhances their vulnerability. Regional changes in precipitation could also result in effects such as changes in sediment supply from freshwater runoff, and species distribution could be affected by elevated carbon dioxide levels. Shingle beaches and structures may be affected by changes in wave and tidal energy potentially resulting in the movement of some features out of designated site boundaries. Where movement is not considered acceptable (e.g. in proximity to Dungeness power station),

⁹⁴ <https://moat.cefas.co.uk/biodiversity-food-webs-and-marine-protected-areas/marine-protected-areas/>

replenishment will be required. There is likely to be landward migration of narrow beaches (coastal squeeze), and coastal defences may be more at risk of being undermined as beach levels lower. Sea-level related impacts to key shingle areas may be disproportionate as they coincide with areas where projected sea-level rise is greatest (i.e. in the south and east). Changes in vegetation of shingle beaches are also likely (for instance the loss of the northern oysterplant in several southern areas is attributed to warmer temperatures, along with assisting the spread invasive garden species which could displace native species. Additionally, more frequent storms could also affect the rate of recolonisation of sparse native vegetation.

Maritime cliffs may erode more rapidly as sea-level and storminess increase, exacerbated by an increase in rainfall which may help promote a greater number of landslips. Such increased disturbance would favour early successional species and may reduce vegetation mosaics important for scarce invertebrates, and warmer temperatures may also favour invasive species.

6 Approach to Assessment

6.1 Introduction

This SEA will cover a very large marine area comprising relevant UK territorial and offshore waters from the low water mark to depths of more than 2,400m. The draft plan/programme includes hydrocarbon, gas storage, hydrogen and renewable energy based elements and associated infrastructure. The assessment will therefore have to address complex issues and multiple interrelationships where a simplistic score based matrix assessment would be inadequate. An evidence based consideration is therefore proposed for this SEA. Significant use will also be made of Geographical Information System (GIS) tools to collate, process, analyse and present spatial information.

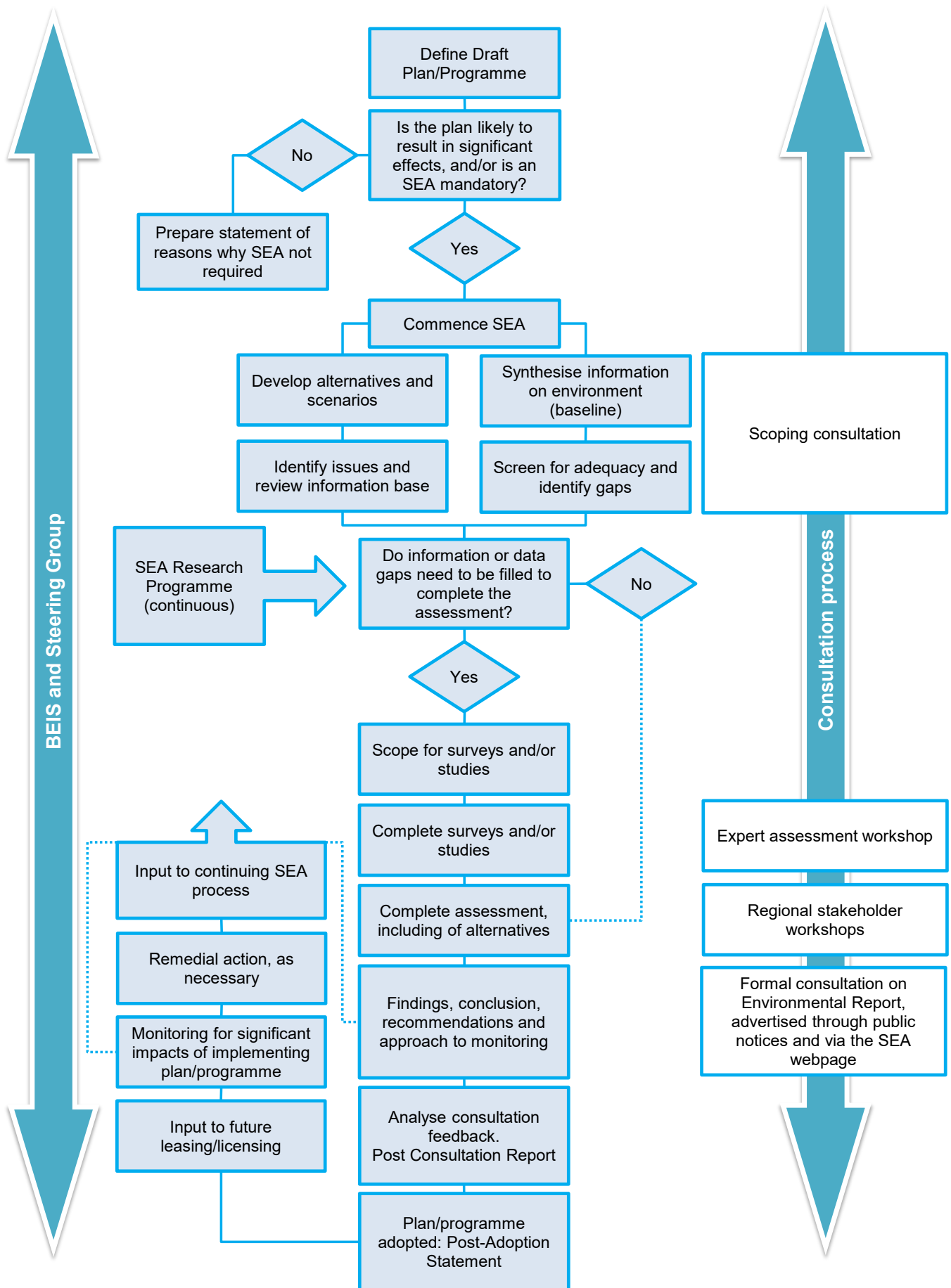
The assessment for this SEA is a staged process incorporating inputs from a variety of sources:

- Baseline understanding of the relevant receptors (including other users) grouped according to Schedule 2 of the SEA Regulations together with existing environmental problems and the likely evolution of the baseline conditions
- The likely activities, and potential sources of effect and the existing mitigations, regulatory and other controls
- The evolving regulatory framework
- The evolution of technology
- SEA objectives
- The evidence base regarding the relative risks and potential for significant effects from offshore wind farm, offshore oil and gas exploration and production, hydrogen and gas transportation and storage including of carbon dioxide
- Steering Group, statutory consultee and stakeholder perspectives on important issues, information sources and gaps, and potential areas to exclude from licensing/leasing derived from scoping, SEA stakeholder and assessment workshops, meetings and other communications

At a strategic level, a distinction will be drawn for various effect mechanisms between impacts which may be significant in terms of conservation status of a species or population (and hence are significant in strategic terms), and impacts which may be significant to individual animals, but which will not influence sufficient numbers to have a significant effect on population viability or conservation status (and hence not be strategically significant).

Examples of this approach might include the consideration of acoustic effects on marine mammals, collision risk for birds and oil spill effects. This approach does not imply that mortality or sub-lethal effects on individual animals are unimportant (clearly there are welfare considerations, particularly for avian and mammalian species); but it is appropriate that strategic considerations are made at a biogeographic population or species level – as is done for example, in the selection of qualifying features for conservation sites.

Figure 6.1: Overview of the SEA process



6.2 Consideration of Alternatives

It is intended to review the initial alternatives in the Environmental Report using the hierarchy of options shown below:

Need or demand: is it necessary?

Can the need or demand be met without implementing the plan or programme at all?

Mode or process: how should it be done?

Are there technologies or methods that can meet the need with less environmental damage than 'obvious' or traditional methods?

Location: where should it go?

Timing and detailed implementation: When, in what form and in what sequence, should the plan or programme be carried out? What are the important issues? Do existing controls and measures address them? What other controls and measures are required?

Adapted from: Office of the Deputy Prime Minister (2005)."

The following initial alternatives to the draft plan/programme have been identified as:

- Not to offer any blocks for licensing or lease/license any activities
- To proceed with the licensing/leasing programme as proposed
- To restrict the licensed/leased areas temporally or spatially

Consultation Question

6. Are there any additional alternatives that you feel the SEA should reflect?

6.3 Draft SEA Objectives and Indicators

The development of SEA objectives is a recognised way in which environmental considerations can be described, analysed and compared in an assessment. The objectives and indicators for previous Offshore Energy SEAs were developed with a range of stakeholder inputs, including discussion with the Steering Group. A list of draft objectives and indicators proposed for this SEA are given in Table 6.1. The guide phrases, which are included to assist in interpretation, were drafted as part of OESEA2 and OESEA3 and in part reflect descriptors of GES associated with the UK Marine Strategy.

Consultation Questions

- 7. Are there any objectives that you feel should be included or removed?**
- 8. Are the indicators for each objective suitable? If not please suggest alternatives.**

Table 6.1: SEA topics, objectives and indicators

SEA Objectives	Guide Phrases	SEA Indicators
Biodiversity, habitats, flora and fauna		
<p>Contributes to conservation of the biodiversity and ecosystems of the United Kingdom and its seas.</p>	<p>Plan activities do not lead to the loss of biological diversity, the degradation in the quality and occurrence of habitats, and the distribution and abundance of species.</p>	<p>No significant loss of diversity or decline in a population attributable to plan related marine activities and promotion of recovery wherever possible.</p>
<p>Avoids significant impact to conservation sites designated at an International and National level (e.g. Ramsar, SACs, SPAs, MCZs, MCMPAs, and SSSI).</p>	<p>Plan activities do not cause adverse effects on marine ecosystems/valued ecosystem components.</p>	<p>Activities subsequent to licensing/leasing which overlap, or potentially affecting designated sites (e.g. SACs, SPAs, Marine Conservation Zones, Nature Conservation Marine Protected Areas), or with the potential to disturb a protected species, are compliant with the requirements of relevant UK and devolved Regulations⁹⁵, and consistent with national and regional policy.</p>
<p>Avoids significant impact to, or disturbance of, protected species and loss of habitat.</p>	<p>Plan activities contribute to the ecological knowledge of the marine and coastal environment through survey and discovery.</p> <p>Plan activities do not lead to disruption in habitat and species connectivity.</p> <p>Plan activities do not lead to the introduction of noise at levels which adversely affect the marine environment, including by leading to significant effects on conservation sites and sensitive species.</p>	<p>No adverse change in the environmental status of marine sub-regions, including in relation to the attainment of targets for MSFD descriptors; or in the ecological status of WFD transitional waters and the attainment of good status/potential.</p>

⁹⁵ *The Conservation of Habitats and Species Regulations 2017, The Conservation of Offshore Marine Habitats and Species Regulations 2017, the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended), the Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001 (as amended).*

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SEA Objectives	Guide Phrases	SEA Indicators
	<p>Plan activities do not lead to the introduction of non-native species at levels which adversely alter marine ecosystems.</p> <p>The plan recognises the ecosystem importance of land-sea coupling, for instance its role in species migration.</p> <p>The plan promotes the achievement of good ecological/environmental status for water bodies and marine sub-regions as outlined at a European Level.</p>	<p>No adverse impact on the ability of the UK to achieve its objectives for good environmental status, and related MSFD indicators.</p>
Geology and Soils		
<p>Protects the quality of the seabed and its sediments, and avoids significant effects on seabed morphology and sediment transport processes.</p>	<p>Activities arising from the plan do not adversely affect the quality and character of the geology and geomorphology of seabed or coastal sediments.</p>	<p>No adverse change in quality of seabed sediments, and seabed sediment transport, at a series of regional monitoring stations⁹⁶.</p>
<p>Protects the integrity of coastal and estuarine processes.</p>		

⁹⁶ Including Oil & Gas UK environmental monitoring committee surveys.

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SEA Objectives	Guide Phrases	SEA Indicators
<p>Avoids significant damage to geological conservation sites and protects important geological/geomorphological features.</p>	<p>Plan activities do not lead to changes in seafloor integrity which could adversely affect the structure and function of ecosystems.</p> <p>Plan activities avoid adverse effects on designated geological and geomorphological sites of international and national importance.</p>	<p>No physical damage to designated marine and coastal geological conservation sites (e.g. GCRs, SSSIs, MCZs/MPAs).</p>
Landscape/Seascape		
<p>To accord with, and contribute to the delivery of the aims and articles of the European Landscape Convention and minimise significant adverse impact on seascape/landscape including designated and non-designated areas.</p>	<p>Activities do not adversely affect the character of the landscape/seascape.</p> <p>The plan helps to conserve the physical and cultural visual resource associated with the land and sea.</p>	<p>No significant impact on nationally-designated areas (including the setting of heritage assets).</p> <p>Number of areas of landscape sensitivity (e.g. national or local landscape designations) affected by proposed developments (e.g. offshore wind).</p> <p>Extent of the visual resource potentially affected by plan activities.</p> <p>Trajectory of change in coastal Character Areas defined at UK constituent country</p>

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SEA Objectives	Guide Phrases	SEA Indicators
		level show no adverse effects arising from plan activities.
Water Environment		
Protects estuarine and marine surface waters, and potable and other aquifer resources.	Plan activities do not result in concentrations of contaminants at levels giving rise to pollution effects.	No adverse change in quality of WFD water body status, including in relation to attainment of good ecological status or potential, or good chemical status.
Avoid significant impact on flood and coastal risk management activities.	<p>Plan activities do not result in permanent alteration of hydrographical conditions which adversely affect coastal and marine ecosystems.</p> <p>Plan activities do not result in adverse effects on saline and potable aquifer resources.</p>	<p>No adverse impact on the ability of the UK to achieve its objectives for good environmental status, and related MSFD indicators.</p> <p>UKCS Exploration and Production (E&P) meets OSPAR discharge reduction targets.</p> <p>Number of oil and chemical spills and quantity of material spilled.</p> <p>No adverse impact on flood risk as a result of plan activities.</p>

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SEA Objectives	Guide Phrases	SEA Indicators
Air Quality		
<p>Avoids degradation of regional air quality from plan related activities.</p>	<p>The plan contributes to the achievement of air quality targets outlined in the Clean Air Strategy 2019, Cleaner Air for Scotland 2, and other strategies of devolved administrations.</p> <p>Emissions from plan activities do not contribute to, or result in, air quality issues which adversely affect human health or the wider environment.</p>	<p>Monitoring of local air quality shows no adverse impact.</p> <p>Targets relating to airborne emissions at a regional and UK level are not exceeded.</p>

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SEA Objectives	Guide Phrases	SEA Indicators
Climatic Factors		
<p>Minimises greenhouse gas emissions.</p>	<p>The plan contributes to decarbonisation in the energy sector, and the achievement of targets relating to greenhouse gases at a national and international level, which include the UK's Net Zero target, related carbon budgets, and the Nationally Determined Contribution under the Paris Agreement.</p>	<p>Reductions in upstream greenhouse gas emissions from oil and gas exploration and production, consistent with requirements under the Oil and Gas Strategy.</p> <p>UK progress towards meeting legally mandated greenhouse reduction targets, and the relative reduction in emissions delivered by aspects of the plan/programme.</p> <p>Progress towards 2030 targets for offshore wind installed capacity, and offshore carbon dioxide transport and storage associated with CCUS (e.g. that deployed in industrial clusters).</p>
<p>Resilience to climate change</p>	<p>Plan activities recognise the potential impact of climate change during their lifetime, in relation to their potential impact on coastal change, flood risk, or other climate change adaptation. Plan activities recognise the potential for climate change related impacts to affect them, and take this into account in their design.</p>	<p>See also; water environment indicators in relation to flood and coastal risk management.</p>

Offshore Energy SEA 4: Scoping for Environmental Report

SEA Objectives	Guide Phrases	SEA Indicators
Population and Human Health		
<p>Has no adverse impact on human health and wellbeing.</p>	<p>Plan activities do not result in, or contribute to the contamination of fish and other seafood for human consumption at levels which exceed those established in legislation or other relevant standards.</p> <p>Plan activities avoid adverse effects on physical and mental health.</p>	<p>Progress in achieving measures set out by OSPAR, for the continued reduction in the harmfulness of offshore discharges.</p> <p>No adverse impact on the ability of the UK to achieve its objectives for good environmental status, and related MSFD indicators.</p> <p>Relevant Office for National Statistics wellbeing metrics.</p> <p>Percentage of population in good health.</p>
<p>Avoids disruption, disturbance and nuisance to communities.</p>	<p>Plan activities avoid adverse nuisance to communities, for instance through noise or vibration.</p> <p>Adverse effects on the quality or access to areas used for recreation (e.g. amenity, sailing, surfing), are minimised or avoided.</p>	<p>Monitoring in relation to Noise Action Plans shows no adverse effects.</p> <p>See also; seascape indicators and those for other users of the sea, material assets.</p>

Offshore Energy SEA 4: Scoping for Environmental Report

SEA Objectives	Guide Phrases	SEA Indicators
Other users of the sea, material assets (infrastructure, and natural resources)		
Balances other United Kingdom resources and activities of economic, safety, security and amenity value including defence, shipping, fishing, aviation, aggregate extraction, dredging, tourism and recreation against the need to develop offshore energy resources.	<p>Plan activities integrate with the range of other existing uses of the marine environment.</p> <p>Plan activities do not result in adverse effects on marine assets and resources.</p>	<p>Spatial planning capable of addressing changes in technology, policy and prioritisation of site selection.</p> <p>Economic and social impact (both positive and negative).</p>
Safety of Navigation.	Plan activities avoid adverse effects on, and contribute to the maintenance of, safe navigation, including recognised shipping routes, traffic separation and existing and proposed port operations.	Increased collision risks and restrictions on pollution prevention methods or Search & Rescue options in the event of an emergency.
Reduces waste.	Properties and quantities of waste and litter resulting from plan activities do not cause harm to the coastal and marine environment.	Progress in reducing volumes of waste to landfill from plan activities.
Cultural Heritage		
Protects the historic environment and cultural heritage of the United Kingdom, including its setting.	Activities avoid adverse effects on the character, quality and integrity of the historic and/or cultural landscape, including those sites which are designated or registered, and areas of potential importance.	Any impact upon the condition of designated sites and features (including impact on their setting) and all other recorded sites and features.

Offshore Energy SEA 4: Scoping for Environmental Report

SEA Objectives	Guide Phrases	SEA Indicators
Contributes to archaeological knowledge.	Plan activities contribute to the archaeological and cultural knowledge of the marine and coastal environment through survey and discovery.	Number of archaeological finds reported through best practice as a result of plan activities, and their deposit with national curatorial bodies of archaeological studies produced by offshore energy projects.

6.4 Potential Sources of Effect

Those activities outlined in Section 3.3 can interact with the natural and broader environment in a number of ways. An initial list of the main potential sources of environmental effects from activities which could follow adoption of the draft plan/programme is provided below:

- Noise (impulsive, semi-continuous or continuous)
- Physical damage or change to the seabed and subsurface
- Other indirect physical effects on seabed and water column
- Ecological effects of presence of structures
- Interactions with other users of the sea
- Visual intrusion
- Chemical and other inputs
- Atmospheric emissions
- Electromagnetic fields
- Waste disposal onshore
- Decommissioning and legacy issues
- Accidental events

These are further elaborated upon in Table 6.2 below, where more specific potential sources of significant effects on the environment from the activities covered in the draft plan/programme have been identified, including on which SEA topics effects are considered possible. A question mark indicates uncertainty of potential for effect.

Consultation Question

9. Do you have any comments on the sources of potentially significant effect for each of the activities covered by the draft plan/programme, including whether they should be scoped in or out of assessment in the Environmental Report?

Table 6.2: Sources of Potentially Significant Effect against Plan Level Activities

Sources of Potentially Significant Effect	Oil & Gas	Gas Storage	CCUS	Offshore Wind	Tidal Stream	Tidal Range	Wave	Hydrogen
	Biodiversity, habitats, flora and fauna							
Physical damage to biotopes from infrastructure construction, vessel/rig anchoring etc (direct effects on the physical environment)	X	X	X	X	X	X	X	X
Behavioural and physiological effects on marine mammals, birds and fish from seismic surveys	X	X	X					
Behavioural and physiological effects on marine mammals, birds and fish from other geophysical surveys	X	X	X	X	X	X	X	X
Behavioural and physiological effects on marine mammals, birds and fish associated with construction phase noise ⁹⁷	X	X	X	X	X	X	X	X
Behavioural and physiological effects on marine mammals, birds and fish associated with operational noise	X	X	X	X	X	X	X	X
Behavioural and physiological effects on marine mammals, birds and fish associated with decommissioning noise	X	X	X	X	X	X	X	X
The introduction and spread of non-native species	X	X	X	X	X	X	X	X
Behavioural disturbance to fish, birds and marine mammals etc from physical presence of infrastructure and support activities	X	X	X	X	X	X	X	X
Collision risks to birds				X	X		X	

⁹⁷ May include piling noise, and the detonation of unexploded ordnance (UXO).

Sources of Potentially Significant Effect								
	Oil & Gas	Gas Storage	CCUS	Offshore Wind	Tidal Stream	Tidal Range	Wave	Hydrogen
Collision risks to bats				X				
Collision risks to water column megafauna (e.g. fish, marine mammals).					X	X	X	
Barriers to movement of birds (e.g. foraging, migration)				X		X		
Barriers to movement of fish and marine mammals					X	X	X	
Changes/loss of habitats from major alteration of hydrography or sedimentation (indirect effects on the physical environment)				?	?	X	?	
Potential for effects on flora and fauna of produced or treated water and drilling discharges	X	X	X	X	X	?	X	X
EMF effects on electrosensitive species				X	X	X	X	
The nature and use of antifouling materials				?	X	?	X	
Accidental events – major oil or chemical spill	X	?	?	?	?	?	?	
Accidental events – major release of carbon dioxide			X					
Accidental events – major release of hydrogen								X
Geology and Soils								
Physical effects of anchoring and infrastructure construction (including pipelines and cables) on seabed sediments and geomorphological features (including scour)	X	X	X	X	X	X	X	X
Sediment modification and contamination by particulate discharges from drilling etc or resuspension of contaminated sediment	X	X	X	X	X	X	X	X

Sources of Potentially Significant Effect								
	Oil & Gas	Gas Storage	CCUS	Offshore Wind	Tidal Stream	Tidal Range	Wave	Hydrogen
Effects of reinjection of produced water and/or cuttings and carbon dioxide	X	X	X					
Onshore disposal of returned wastes – requirement for landfill	X	X	X					
Post-decommissioning (legacy) effects – cuttings piles, footings, foundations, <i>in situ</i> cabling etc	X	X	X	X	X	X	X	X
Changes to sedimentation regime and associated physical effects					X	X	X	
Accidental events – risk of sediment contamination from oil spills	X	?	?	?	?	?	?	?
Accidental events – blow out impacts on seabed	X	X	X					
Offshore disposal of seabed dredged material	X	X	X	X	X	X	X	X
Landscape/Seascape								
Potential effects of development on seascape including change to character (interactions between people (and their activities) and places (and the natural and cultural processes that shape them))	X	X	X	X	X	X	X	X
Water Environment								
Contamination by soluble and dispersed discharges including produced water, saline discharges (aquifer water and halite dissolution), and drilling discharges from wells and foundation construction	X	X	X	X	X	?	X	X
Changes in seawater or estuarine salinity, turbidity and temperature from discharges		X	X			X		

Sources of Potentially Significant Effect								
	Oil & Gas	Gas Storage	CCUS	Offshore Wind	Tidal Stream	Tidal Range	Wave	Hydrogen
(such as aquifer water and halite dissolution) and impoundment								
Energy removal downstream of wet renewable devices					X	X	X	
Effects on hydrodynamics (including interaction with currents and stratification)				X				
Accidental events - contamination of the water column by dissolved and dispersed materials from oil and chemical spills or gas releases	X	X	X	?	?	?	?	?
Air Quality								
Local air quality effects resulting from exhaust emissions, flaring and venting	X	X	X	X	X	X	X	X
Air quality effects of a major gas release or volatile oil spill	X	X	X					X
Climatic Factors								
Contributions to net greenhouse gas emissions	X	X						
Reduction in net greenhouse gas emissions			X	X	X	X	X	X
Population and Human Health								
Potential for effects on human health associated with reduced local air quality resulting from atmospheric emissions associated with plan activities	X	X	X					
Potential for effects on human health associated with discharges of naturally occurring radioactive material in produced water	X	X	?					

Sources of Potentially Significant Effect								
	Oil & Gas	Gas Storage	CCUS	Offshore Wind	Tidal Stream	Tidal Range	Wave	Hydrogen
Accidental events – potential food chain or other effects of major oil or chemical spills or gas release	X	X	X	?	?	?	?	?
Other users of the sea, material assets (infrastructure, and natural resources)								
Positive socio-economic effects of reducing climate change			X	X	X	X	X	X
Interactions with fishing activities (exclusion, displacement, seismic, gear interactions, “sanctuary effects”)	X	X	X	X	X	X	X	X
Other interactions with shipping, military, potential other marine renewables and other human uses of the offshore environment	X	X	X	X	X	X	X	X
Accidental events – socio-economic consequences of oil or chemical spills and gas releases	X	X	X	?	?	?	?	?
Cultural Heritage								
Physical damage to submerged heritage/archaeological contexts from infrastructure construction, vessel/rig anchoring etc. and impacts on the setting of coastal historic environmental assets and loss of access.	X	X	X	X	X	X	X	X

The Environmental Report will be subdivided both thematically and geographically. The assessment will consider the environmental effects (short, medium, long-term; temporary, permanent; positive and negative; and secondary, cumulative and synergistic) by SEA topic – note at this stage no activities, potential effects or receptors have been scoped out.

The assessment will consider the entirety of the relevant waters for each aspect of the plan, however, it is proposed that the assessment is also focussed by considering the resource areas identified for each aspect of the plan, where relevant (see Section 3.6).

6.5 Overall spatial consideration

It is proposed that a spatial assessment of the theoretical potential of offshore wind capacity in relevant UK waters is undertaken building on that of previous OESEAs. The assessment would assist in the understanding of the potential of these waters to contribute to the UK's 40GW offshore wind generation capacity target for 2030, and beyond (see Section 3.6). For the resource areas identified in Figure 3.9, the analysis will consider a range of "hard" and "other" constraints mainly relating to other offshore users, and will present visualisations of the potential relative constraint from other environmental and socio-economic factors for those areas which remain following the application of the hard constraints.

For the purposes of this analysis, and on the basis of recent proposed or consented offshore wind farms, it is proposed that an energy density of 3.1MW/km² is used for those areas which do not coincide with hard constraints. Areas of relevant waters for which a theoretical capacity of less than 400MW could be achieved will be excluded from the analysis for standalone wind farms, or 300MW for potential extensions where potentially viable resource areas abut existing wind farms. This assessment will make no specific recommendations on the feasibility of areas for offshore wind farm development, which will need to be subject to further assessment at the project level, but it will act as a high-level appraisal of the relative constraint on the UK's ambitions for decarbonisation from offshore wind.

It is not proposed that potential capacity values are calculated for offshore wave and tidal technologies in view of their relative maturity, and likely contribution to UK emissions reductions, particularly in English and Welsh waters. However, likely hard and other constraints for these technologies will be mapped against their resource areas, as shown in Figure 3.10 to Figure 3.12.

6.6 Monitoring

In fulfilment of the requirements of the *Environmental Assessment of Plans and Programmes Regulations 2004 (as amended)*⁹⁸, BEIS will monitor the effects of the activities arising following the adoption of the draft plan/programme for the purpose of identifying unforeseen adverse effects at an early stage, and to allow appropriate remedial action to be undertaken where necessary. The indicators shown in Table 4.1 form the basis of providing a high-level framework within which to monitor the effects of the plan/programme, and previous SEAs have utilised a number of existing monitoring and other arrangements to fulfil the requirements of the Regulations⁹⁹. A high-level overview of these sources is provided in Table 6.3 below.

⁹⁸ Regulation 17(1), "The responsible authority shall monitor the significant environmental effects of the implementation of each plan or programme with the purpose of identifying unforeseen adverse effects at an early stage and being able to undertake appropriate remedial action."

⁹⁹ In keeping with Regulation 17(2), "The responsible authority's monitoring arrangements may comprise or include arrangements established otherwise than for the express purpose of complying with paragraph 17(1)".

Consultation Question

11. Are there any additional information sources or existing monitoring arrangements which could be used to inform monitoring of the offshore energy draft plan/programme?

Table 6.3: SEA Indicators and Related Monitoring

Indicator	High Level Monitoring Outcomes and Relevant links
Biodiversity, habitats, flora and fauna	
<p>No significant loss of diversity or decline in population attributable to plan related marine activities and promotion of recovery wherever possible.</p>	<p>Research and monitoring relating to conservation sites and species are kept under review by BEIS as part of the SEA programme. These include:</p> <p>Monitoring and Advice by The Special Committee on Seals (SCOS)</p> <p>The Seabird Monitoring Programme (SMP)</p> <p>The Wetland Bird Survey (WeBS)</p> <p>Site condition monitoring for conservation sites</p> <p>Common Standards Monitoring for Designated Sites (CSM)</p> <p>The Clean Seas Environment Monitoring Programme (CSEMP)</p> <p>Studies undertaken to further understand potential effect of plan activities on birds and marine mammals – see OESEA gov.uk webpages</p> <p>Links: UKMMAS, SCOS Reports, SMP Results, WeBS Report, CSM, CSEMP, Supporting documents for OESEA and OESEA2 and OESEA3, the Offshore Energy SEA BGS data archive, Marine Strategy Part Two: UK Marine Monitoring Programmes¹⁰⁰ (to be considered in relation to all MSFD Annex I descriptors)</p>
<p>Activities subsequent to licensing/leasing which overlap, or potentially affecting designated sites (e.g. SACs, SPAs, Marine</p>	<p>HRA screenings (and Appropriate Assessments where a likely significant effect were identified) have been undertaken prior for Block licence awards for all recent oil & gas Licensing Rounds.</p>

¹⁰⁰ Recently updated: <https://www.gov.uk/government/publications/marine-strategy-part-two-uk-marine-monitoring-programmes>

Indicator	High Level Monitoring Outcomes and Relevant links
<p>Conservation Zones, Nature Conservation Marine Protected Areas), or with the potential to disturb a protected species, are compliant with the requirements of relevant UK and devolved Regulations, and consistent with national and regional policy.</p>	<p>Appropriate Assessment was undertaken for offshore wind leasing by The Crown Estate, including for project extensions. HRA is being undertaken in relation to six proposed Round 4 projects.</p> <p>Links: https://www.gov.uk/government/consultations/32nd-seaward-licensing-round-appropriate-assessment, https://www.thecrownestate.co.uk/en-gb/media-and-insights/news/2019-28-gw-of-offshore-wind-extension-projects-to-progress-following-completion-of-plan-level-habitats-regulations-assessment/, https://www.thecrownestate.co.uk/en-gb/what-we-do/on-the-seabed/offshore-wind-leasing-round-4/round-4-plan-level-habitats-regulations-assessment/</p>
<p>No adverse change in the environmental status of marine sub-regions, including in relation to the attainment of targets for MSFD descriptors; or in the ecological status of WFD transitional waters and the attainment of good status/potential.</p> <p>No adverse impact on the ability of the UK to achieve its objectives for good environmental status, and related MSFD indicators.</p>	<p>Progress towards achieving Good Environmental/Ecological Status in relation to the MSFD and WFD.</p> <p>Links: Marine Strategy Part Two: UK Marine Monitoring Programmes, Environment Agency Catchment Data Explorer</p>
Geology and soils	
<p>No adverse change in quality of seabed sediments, and seabed sediment transport, at a series of regional monitoring stations.</p>	<p>Results from regional surveys (e.g. OGUK, those commissioned as part of the OESEA programme) and syntheses of offshore wind farm licensing conditions monitoring do not reveal adverse changes to sediment quality or character associated with plan activities.</p> <p>Links: Review of Offshore Wind Farm Monitoring Data 2010 and 2014, OSPAR Coordinated Environmental Monitoring Programme (CEMP) Reporting, Marine Strategy Part One,</p>

Indicator	High Level Monitoring Outcomes and Relevant links
	Marine Strategy Part Two: UK Marine Monitoring Programmes (to be considered in relation to MSFD Annex I descriptors 6 and 7)
No physical damage to designated marine and coastal geological conservation sites (e.g. GCRs SSSIs, MCZs/MPAs).	<p>Keep under review the level of plan related activity, e.g. new pipelines (including landfalls)</p> <p>For those constructed, each was subject to EIA and consultation with the public and statutory consultees including nature conservation bodies responsible for the identification and management of conservation sites.</p> <p>BEIS have required consideration of designated and potential MCZs for all new Block licence applications in recent licensing rounds, and requires their consideration during permitting of all subsequent activities.</p> <p>Links: Environmental Statements reviewed/ approved in relation to oil and gas activity (including pipelines), Nationally Significant projects related to the plan/programme</p>
Landscape/seascape	
No significant impact on nationally-designated areas.	Maintain awareness of any development following plan adoption refused consent on the basis of landscape or seascape effects on nationally-designated sites.
Extent of the visual resource potentially affected by the particular developments.	Taken as a measure of the number of proposed or approved developments associated with the plan which are within 12nm, or viewable distance, of the coast.
Number of areas of landscape sensitivity affected by proposed developments (e.g. offshore wind).	Taken as a measure of the number of proposed or approved developments associated with the plan which are within 12nm, or viewable distance, of sensitive or designated landscapes.
Trajectory of change in coastal National Character Areas shows no adverse effects arising from plan activities.	The majority of plan activities to date have taken place some distance offshore or are transient, however the scale of future offshore wind may present changes to the character of some coasts associated with National Character Areas (NCAs). Such a trajectory of change will be reviewed following offshore wind farm construction and review of NCAs, however it is acknowledged

Indicator	High Level Monitoring Outcomes and Relevant links
	<p>that these are identified as a driver of change within certain NCA descriptions.</p> <p>Link: National Character Areas</p>
Water Environment	
<p>No adverse change in quality of WFD water body status, including in relation to attainment of good ecological status or potential, or good chemical status.</p>	<p>WFD indicators of chemical and biological status for coastal and transitional waters.</p> <p>Trends or condition with regards to hazardous substances, eutrophication, litter and radioactivity in marine waters.</p> <p>Links: Marine Strategy Part Two: UK Marine Monitoring Programmes (to be considered in relation to MSFD Annex I descriptors 5, 8 and 10), Environment Agency Catchment Data Explorer, Marine Strategy Part One</p>
<p>No adverse impact on the ability of the UK to achieve its objectives for good environmental status, and related MSFD indicators.</p>	<p>Marine Strategy Part Two: UK Marine Monitoring Programmes (to be considered in relation to MSFD Annex I descriptors 5, 8 and 10)</p>
<p>UKCS Exploration and Production (E&P) meets OSPAR discharge reduction targets.</p>	<p>Note that OSPAR reduction targets of 15% on 2000 figures by 2006 exceeded for oil in produced water: 24% by 2006 and 45% by 2008.</p> <p>Since 2008, the quantity of produced water discharged has reduced from 198 to 139 million m³, with a minor average increase in oil in produced water from 16 to 18.8mg/l.</p> <p>Links: OSPAR discharges, spills and emissions from offshore oil and gas installations</p>
<p>Number of oil and chemical spills and quantity of material spilled.</p>	<p>Links: PON1 reporting</p>
<p>No adverse impact on flood risk as a result of plan activities.</p>	<p>Changed in coastal flood risk as noted in updates to the UK Climate Change Risk Assessment.</p>

Indicator	High Level Monitoring Outcomes and Relevant links
Air Quality	
<p>Monitoring of local air quality shows no adverse impact.</p>	<p>Contribution of plan activities to emissions associated with designation of Local Air Quality Management Areas.</p> <p>Links: Air Pollution in the UK annual report</p>
<p>Targets relating to airborne emissions at a regional and UK level are not exceeded.</p>	<p>Levels of pollutants on the National Atmospheric Emissions Inventory (NAEI) during the currency of the plan/programmes for England and the devolved administrations. National Emissions Ceilings Directive targets for NOx, NMVOCs, SO2 and NH3 and those targets set under the Gothenburg Protocol, to be met by 2020.</p> <p>Regional deposition of air pollutants around the North Sea and the North-East Atlantic.</p> <p>Links: OSPAR Comprehensive Atmospheric Monitoring Programme (CAMP) Reporting, Emissions of Air Quality Pollutants 1970-2018, NAEI data and reports, National Statistics: Emissions of air pollutants</p>
Climatic Factors	
<p>Reductions in upstream greenhouse gas emissions from oil and gas exploration and production, consistent with requirements under the Oil and Gas Strategy.</p>	<p>UK E&P greenhouse gas emissions through the duration of the plan/programme.</p> <p>Link: OSPAR oil and gas emissions and discharges, UK greenhouse gas emissions statistics (Exploration, production and transport of oils and gas)</p>
<p>UK progress towards meeting legally mandated greenhouse reduction targets, and the relative reduction in emissions delivered by aspects of the plan/programme.</p>	<p>BEIS are mindful of the updated IPCC (2013) physical science basis (and its update as part of the Sixth Assessment Report (AR6) due for release in 2022), and subsequent special reports (e.g. on global warming of 1.5°C and on the Oceans and Cryosphere) and the introduction of a revised set of emissions scenarios to inform modelling of UK regional and National trends. This indicator is being kept under review.</p> <p>Link: UK greenhouse gas emissions statistics, UK Carbon Budget</p>

Indicator	High Level Monitoring Outcomes and Relevant links
<p>Progress towards 2030 targets for offshore wind installed capacity, and offshore carbon dioxide transport and storage associated with CCUS (e.g. that deployed in industrial clusters).</p>	<p>The indicator will be kept under review.</p> <p>Links: Renewable Energy Planning Database</p>
Population and human health	
<p>Progress in achieving measures set out by OSPAR, for the continued reduction in the harmfulness of offshore discharges.</p>	<p>See response to indicators for Water Environment and Air Quality</p>
<p>No adverse impact on the ability of the UK to achieve its objectives for good environmental status, and related MSFD indicators.</p>	<p>Link: Marine Strategy Part Two: UK Marine Monitoring Programmes (to be considered in relation to MSFD Annex I descriptor 9)</p>
<p>Monitoring in relation to Noise Action Plans shows no adverse effects.</p>	<p>Contribution of plan activities to noise for those agglomerations where Noise Action Plans have been implemented.</p> <p>Link: Noise Action Plans</p>
<p>Relevant Office for National Statistics wellbeing metrics.</p>	<p>Trends in well-being are reported through the Office for National Statistics (ONS).</p> <p>Link: Relevant ONS wellbeing statistics</p>
Other users of the sea, material assets (infrastructure, and natural resources)	
<p>Spatial planning capable of addressing changes in technology, policy and prioritisation of site selection</p>	<p>Keep emerging marine spatial planning policy under review.</p> <p>Link: Marine Plans (England), National Marine Plan for Scotland, Wales, Northern Ireland</p>

Indicator	High Level Monitoring Outcomes and Relevant links
<p>Economic and social impact (both positive and negative).</p>	<p>Contribution of the plan/programme to the maintenance of security of supply, jobs and fiscal returns.</p> <p>Links: Oil & Gas UK Economic Reporting, The ONS UK Environmental Accounts, BEIS Energy Trends, Recent Decisions on Energy Infrastructure Applications, Charting Progress Productive Seas feeder report</p>
<p>Increased collision risks and restrictions on pollution prevention methods or Search & Rescue options in the event of an emergency.</p>	<p>Compliance of all developments to undertake suitable navigational risk assessments. Adherence of offshore wind farm applications to MCA Marine Guidance Note 543: Offshore Renewable Energy Installations (OREIs)¹⁰¹ - Guidance on UK Navigational Practice, Safety and Emergency Response Issues.</p> <p>Links: Oil and gas environmental data: consent to locate, relevant offshore wind farm application navigation risk assessments, inspectorate recommendations and SoS decisions</p>
<p>Progress in reducing volumes of waste to landfill.</p>	<p>Waste quantity, type and disposal route (e.g. landfill, recycling) as monitored by BEIS through EEMS.</p> <p>General trends in operator waste production and disposal routes publicised through annual OSPAR Environmental Management System (EMS) reporting requirements.</p> <p>Links: EMS Public statements</p>
Cultural Heritage	
<p>Any impact upon the condition of designated sites and features (including impact on their setting) and all other recorded sites and features.</p>	<p>Any plan activities which could interact with designated protected sites (e.g. Military remains, protected wrecks).</p>
<p>Number of archaeological finds reported through best practice as a result of plan</p>	<p>Information collected by the Receiver of Wreck, relevant local Historic Environment Records and National Monuments Records.</p>

¹⁰¹ This is presently subject to review: <https://www.gov.uk/government/consultations/second-consultation-on-the-review-of-mgn-543-and-methodology>

Indicator	High Level Monitoring Outcomes and Relevant links
activities, and their deposit with national curatorial bodies of archaeological studies produced by offshore energy projects.	Link: Wreck and salvage law

6.7 Production of the Environmental Report

Table 6.4, indicates the proposed Environmental Report document structure be divided into 7 sections not including a bibliography, glossary, non-technical summary and appendices.

Table 6.4: Proposed Environmental Report Section Contents

Report Section	Summary	Environmental Report	
Non-technical summary	A standalone summary of the Environmental Report, its findings and conclusions, written in non-technical language.		
Section 1: Introduction	Describes the background to the draft plan/programme and its regulatory context, along with that of the SEA and ER.		
Section 2: Overview of the draft plan/programme & Relationship to Other Initiatives	Will provide details of the background to the proposed plan/programme, the plan/programme itself, its objectives and relationships to other initiatives. Alternatives to the plan/programme will also be described.		
Section 3: SEA approach	Describes the SEA process, its scope, objectives and assessment approach.		
Section 4: Environmental Information	Describes the environmental characteristics of the areas relevant to the SEA. The section will identify existing environmental problems and the possible evolution of the environmental baseline. The information will be organised by SEA topic for each Regional Sea. Detailed supporting information will be presented in an Appendix. Where appropriate the information will be presented as/supported by GIS outputs/maps.		
Section 5: Assessment	Provides details of the assessment methodology and documents the assessment of the draft plan/programme and its alternatives. Considers spatial issues, cumulative and transboundary impacts and identifies mitigation and enhancement measures to prevent, reduce or counteract any significant adverse effects identified during the assessment process. OESEA4 will cover a very large marine area comprising all UK waters with water depth from the intertidal to more than 2,400m and the draft plan/programme includes both hydrocarbon and renewable energy based elements. The assessment therefore has to address complex issues and multiple interrelationships, where a simplistic score based matrix assessment would be inadequate, and an evidence based consideration is proposed. In addition, significant use		

Report Section	Summary	
	will be made of GIS tools to collate, process, analyse and present spatial information.	
Section 6: Recommendations and Monitoring	Provides overall findings and conclusions regarding the likely implications of the proposed licensing/leasing and alternatives, together with recommendations for mitigation and monitoring and gaps in understanding relevant to the process. Describes the approach to SEA monitoring.	
Section 7: Next Steps	Describes the consultation phase for the Environmental Report and proposed plan/programme and the process by which the plan/programme would be adopted.	
References	List of all sources cited in the assessment text and appendices.	
Glossary & abbreviations	-	
Appendix 1: Environmental Baseline	Underpins Section 4 and contains a series of 10 sub-appendices (A3a to A3j) describing the key characteristics in relation to biodiversity, habitats, flora and fauna; geology, substrates and coastal morphology; landscape/seascape; water environment; air quality; climate and meteorology; population and human health; other users, material assets (infrastructure, other natural resources); cultural heritage and conservation of sites and species in relation to UK waters as a whole and drawing important points for each of the draft regional seas	Appendices to Environmental Report
Appendix 2: Key issues and inputs to the SEA	Will include a matrix of key thematic issues to be addressed in the Environmental Report based on responses provided by consultation bodies/authorities and stakeholders to the initial scoping consultation as well as issues raised during assessment and stakeholder workshops	
Appendix 3: SEA Workshops	Will contain summaries of the SEA workshops which will be held to contribute to the SEA process and information base.	
Appendix 4: Other initiatives	Describes in a hierarchy other initiatives, plans and programmes of relevance to the proposed plan/programme, the implications of these for the proposed plan/programme and the implications of the proposed plan/programme on these other plans and programmes.	
Appendix 5: Regulatory and other controls	Summarises the key environmental legislation and controls in relation to the draft plan/programme.	

7 Consultation

The OESEA consultation process has been designed to be in keeping with the Cabinet Office guidance¹⁰² on Consultation Principles for engaging stakeholders when developing policy and legislation.

7.1 Consultation process

There are several opportunities for consultation bodies and other stakeholders to provide input during the different phases of the SEA process as described below.

Consultation Question

11. Do you have any comments on the proposed approach to consultation?

7.1.1 Scoping

A copy of the scoping report will be sent to the relevant statutory consultation bodies/authorities listed below with a formal request for their input. Input from other stakeholders is also welcomed and during this period and the scoping report will also be available to freely download from the SEA pages of the gov.uk website¹⁰³.

In accordance with the requirements of the relevant SEA Regulations, the period of consultation for this SEA scoping report will be five weeks. All feedback from the scoping consultation will be reviewed and, where appropriate, addressed in the Environmental Report. A compilation of the scoping feedback and a response to these will be published at the end of the scoping stage on the [OESEA pages of gov.uk](#). The scoping feedback will be used to inform the SEA process.

7.1.2 Workshops

It is proposed to hold a number of workshops during the preparation of the SEA. These will include expert assessment workshops, sectoral meetings and workshops, and regional stakeholder workshops. Depending on the timing the SEA programme and ongoing restrictions relating to COVID-19, these workshops may be held virtually.

7.1.3 Environmental Report

The OESEA4 Environmental Report and the draft plan/programme will be issued for formal public consultation for a period of 8 weeks, which is likely to be in late 2021. During this period, OESEA4 and any supporting documents will be available to view or freely download from the [SEA pages of the gov.uk website](#). Other stakeholders will be variously alerted by, for example, emailing advertising services. Notices will be inserted in national and regional newspapers to inform the public consultees of the SEA consultation. Copies of the OESEA4

¹⁰² <https://www.gov.uk/government/publications/consultation-principles-guidance> (accessed 5th February 2021)

¹⁰³ <https://www.gov.uk/guidance/offshore-energy-strategic-environmental-assessment-sea-an-overview-of-the-sea-process>

Environmental Report will be sent to statutory consultation bodies and authorities in the UK and to Member States, as required by the Regulations.

7.1.4 **Post Consultation**

Following the consultation period, a post consultation report will be prepared which will present a summary of the issues raised and other comments received during the public consultation. Where appropriate, responses and clarifications to comments will be included which provide factual and technical clarifications. The post consultation report will be available to view of freely download from the SEA pages of the gov.uk website.

There are many considerations which BEIS will take into account in making decisions regarding the draft plan/programme; the responses to the public consultation and the Environmental Report are important inputs to this process. Subject to the outcome of the above SEA process, a post adoption statement will be issued, describing inter alia how environmental considerations have been integrated into the plan or programme and how the Environmental Report and opinions expressed in response to the consultation has been taken into account in line with the requirements of the SEA Regulations.

7.1.5 **Consultation Bodies**

Since the 2004 Regulations were made, a number of the nominated consultation bodies/authorities have been subject to organisational/name change. The following are the current statutory consultation bodies/authorities for this SEA:

- Historic England
- Natural England
- Environment Agency
- Historic Environment Scotland (previously Historic Scotland)
- NatureScot (previously Scottish Natural Heritage)
- Scottish Environment Protection Agency
- Cadw (Welsh Assembly Government's historic environment division)
- Natural Resources Wales
- Department of Agriculture, Environment and Rural Affairs (NI) (taking over relevant functions from the former Department of the Environment)

In addition, the Joint Nature Conservation Committee, the Marine Management Organisation and Marine Scotland are included as consultees for this SEA. It is also proposed to include the wide range of interested stakeholders and the general public in the scoping consultation exercise. The plan scope and other aspects of this document have also been informed by the SEA Steering Group, meetings of which will take place through the SEA process. The SEA Steering Group¹⁰⁴ is composed of departmental representatives, conservation and other agencies, NGOs, industry representatives and independent experts.

¹⁰⁴ <https://www.gov.uk/government/groups/offshore-energy-sea-steering-group>

8 Input to Scoping and Next Steps

8.1 Scoping Input

For convenience the consultation questions are listed again below:

Consultation Questions

- 1. Consultees are invited to highlight additional initiatives which they consider are relevant to the draft plan/programme.**
- 2. Consultees are invited to draw attention to and provide (where relevant/possible) additional information and data sets which they consider of potential relevance to this SEA.**
- 3. Do you agree with the choice of Regional Seas used to help describe the environmental baseline?**
- 4. Are there any additional environmental problems you consider to be relevant to the SEA?**
- 5. Are there any additional influences, and supporting data sources, on the likely evolution of the environmental baseline?**
- 6. Are there any additional alternatives that you feel the SEA should reflect?**
- 7. Are there any objectives that you feel should be included or removed?**
- 8. Are the indicators for each objective suitable? If not please suggest alternatives.**
- 9. Do you have any comments on the sources of potentially significant effect for each of the activities covered by the draft plan/programme, including whether they should be scoped in or out of assessment in the Environmental Report?**
- 10. Are there any additional information sources or existing monitoring arrangements which could be used to inform monitoring of the offshore energy draft plan/programme?**
- 11. Do you have any comments on the proposed approach to consultation?**

8.2 Next Steps

All feedback from the scoping consultation will be reviewed and, where appropriate, addressed in the Environmental Report. A compilation of the scoping feedback and a response to these will be published at the end of the scoping stage on the [OESEA pages of gov.uk](#). The scoping feedback will be used to inform the SEA process.

The Environmental Report will be published for a period of public consultation expected to be in late 2021.

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